Pacific Gas and Electric Company®

**Andrew M. Vesey**
Chief Executive Officer and President

77 Beale Street
32nd Floor
San Francisco, CA 94105

July 29, 2020

**VIA EMAIL**

Caroline Thomas Jacobs
Director, Wildfire Safety Division
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

Re: Pacific Gas and Electric Company's Request for 2020 Safety Certification Pursuant to P.U.C. § 8389

Dear Ms. Thomas Jacobs:

Section 8389(f)(1) of the Public Utilities Code[1] provides that an electrical corporation qualifies for the issuance of an initial safety certification from the Executive Director of the California Public Utilities Commission ("Commission") by providing documentation that it is meeting the requirements set forth in paragraphs (1), (2), (3), and (5) of Section 8389(e). Pacific Gas and Electric Company ("PG&E") was granted initial safety certification on August 23, 2019, valid for 12 consecutive months after issuance. Section 8389(f)(2) of the Public Utilities Code provides that, before the expiration of an initial certification, an electrical corporation shall submit a request for a subsequent certification, providing documentation that it has satisfied the requirements of each paragraph of Section 8389(e). The May 6, 2020 letter from the Director for Wildfire Safety Division ("WSD"), Ms. Caroline Jacobs, provides further guidance on initiating the subsequent certification process under Section 8389(f)(2) by providing documentation that it is meeting the requirements set forth in paragraphs (1), (2), (3), (4), (5), (6) and (7) of Section 8389(e).

PG&E respectfully requests a safety certification in accordance with Section 8389 and the Wildfire Safety Division Guidance on Submission of 2020 Safety Certification. This cover letter summarizes how PG&E meets the relevant requirements of Section 8389, as further documented by the supporting materials referenced herein. My affidavit is also attached, confirming that all of the information provided in this request is true and accurate.

**Paragraph (1) of Section 8389(e):** ***"The electrical corporation has an approved wildfire mitigation plan."***

On June 11, 2020, the Commission voted unanimously to adopt Resolution WSD-002 and Resolution WSD-003, which conditionally approved PG&E's 2020 Wildfire Mitigation Plan ("WMP"). Additionally, in a June 25, 2020 letter from the WSD, Ms. Caroline Jacobs stated that such Commission ratification of the WSD's approval of an electrical corporation's 2020 WMP,

[1] As added by Assembly Bill 1054 (Holden), Chapter 79, Statutes of 2019.

subject to the conditions in the ratifying resolution, constitutes documentation of an approved WMP pursuant to Public Utilities Code Section 8389(e)(1). PG&E's WMP was filed February 7, 2020, and subsequently updated on February 28 and March 17, 2020.

PG&E's WMP provides details on PG&E's comprehensive Community Wildfire Safety Program ("CWSP"), incorporates lessons learned from the 2019 wildfire season, and outlines the additional programs planned from 2020 to 2022 to prevent catastrophic wildfires. See Attachment A for details.

**Paragraph (2) of Section 8389(e):** ***"The electrical corporation is in good standing, which can be satisfied by the electrical corporation having agreed to implement the findings of its most recent safety culture assessment, if applicable."***

The Commission's Safety and Enforcement Division ("SED") selected NorthStar Consulting Group ("NorthStar") to assist with performing an assessment of PG&E's safety culture beginning in April 2016. On May 8, 2017, NorthStar issued a report setting forth its recommendations. PG&E agreed to implement all recommendations and proposed an implementation plans for each recommendation.[2] The Commission subsequently adopted the SED's recommendations, as set forth in the NorthStar report, and directed PG&E to implement them and serve quarterly reports on the status of its implementation.[3] On March 29, 2019, NorthStar performed its first update to the assessment of PG&E's safety culture, containing additional recommendations, constituting the most recent safety culture assessment of PG&E. In its initial safety certification application, PG&E similarly agreed to implement all of the recommendations in NorthStar's March 29, 2019 report. PG&E provides further details regarding its efforts to implement all changes recommended by NorthStar in Attachment B.

**Paragraph (3) of Section 8389(e):** ***"The electrical corporation has established a safety committee of its board of directors composed of members with relevant safety experience."***

PG&E's Safety and Nuclear Oversight ("SNO") Committee is responsible for, among other things, overseeing goals, programs, policies, and practices with respect to promoting a strong safety culture, and monitoring the impact of changes in laws and regulations affecting safety. Its responsibilities include oversight of, for example, the CWSP and the Public Safety Power Shutoff program. The Committee also monitors and reviews the adequacy and direction of the corporate safety function.[4]

Individual members of PG&E's current Board "possess deep technical and operational expertise related to gas pipeline safety, electric transmission and distribution safety, electric generation safety, nuclear safety, and occupational safety; expertise related to physical asset security and cyber threats; expertise related to pipeline safety management systems, enterprise risk management, and improving safety culture; and expertise related to procedures and protocols for safeguarding individuals and property in various threat contexts and public

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[2] PG&E, *Pacific Gas and Electric Company Safety Culture and Governance OII Prepared Testimony* (January 8, 2018), at 2-1 ("PG&E agrees with all of the 61 recommendations directed at PG&E, commits to complete most recommendations by the end of 2018, and supports their adoption by the Commission.").
[3] *See* D.18-11-050, Ordering Paragraph 1 and 2.
[4] *See* PG&E 2019 Joint Proxy Statement at 43, and Charter for Safety and Nuclear Oversight Committee.

emergencies."[5] The SNO Committee is currently comprised entirely of independent directors. Specifically, the committee is chaired by Cheryl F. Campbell, with Admiral Mark E. Ferguson III, W. Craig Fugate, Michael R. Niggli[6], and Dean L. Seavers completing the membership list. Details of each Board member's safety-specific education, training, work experience, and Board experience is reflected in Attachment C hereto. PG&E will provide similar information regarding any new members, including the membership of its SNO Committee, by attaching it to a subsequent quarterly advice letter filed in accordance with Section 8389(e)(7).

**Paragraph (4) and (6) of Section 8389(e):** ***"The electrical corporation has established an executive incentive compensation structure approved by the division and structured to promote safety as a priority and to ensure public safety and utility financial stability with performance metrics for all executive officers, including incentive compensation based on meeting performance metrics that are measurable and enforceable, for all executive officers as defined in Section 451.5" and "the electrical corporation has established a compensation structure for any new or amended contracts for executive officers as defined in Section 451.5…"***

PG&E has established an executive compensation structure that complies with and is based on the principles outlined in Public Utilities Code Sections 8389(e)(4) and 8389(e)(6)(A). That structure was conditionally approved by the Commission on May 28, 2020 in Decision 20-05-053, subject to certain additional requirements imposed by that Decision and subject to future proceedings. This structure, including the additional requirements imposed by the Commission, will go into effect immediately upon the effective date of the Plan of Reorganization. In addition to implementing the approved structure, PG&E will provide additional information affirming compliance with additional commitments outlined in the Decision in a future proceeding as directed by the Commission. The approved executive compensation structure is available in Attachment D.

**Paragraph (5) of Section 8389(e):** ***"The electrical corporation has established board-of-director-level reporting to the commission on safety issues."***

The Board is dedicated to achieving safe utility operations and a strong safety culture, and since being seated has invested substantial time and attention to safety issues. In its initial safety certification request, PG&E established Board-of-Director level reporting to the Commission on safety issues by identifying William Johnson, Chief Executive Officer ("CEO") and President of PG&E Corporation, as the designated person for the past year, which is consistent with PG&E's Corporate Governance Guidelines. As of the time of filing of this application I, Andrew Vesey, CEO and President of PG&E, have assumed the role as the designated person to report to the Commission on safety issues, consistent with Section 8389(e)(5).

While the WSD's Guidance Letter seeks documentation of reporting protocols or schedules, PG&E has not established any such protocols or schedules, nor does it believe they are required under any statute or regulation. PG&E is willing to establish such protocols or schedules at the Commission's or WSD's direction, recognizing that the Commission's ex parte rules, as applicable, may be implicated.

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[5] PG&E. *Compliance Filing of Pacific Gas and Electric Company (U 39 M) and PG&E Corporation Pursuant to D.19-06-008 in Investigation 15-08-019* (July 3, 2019), at 4-5.

[6] Member of the PG&E Corporation Safety and Nuclear Oversight Committee only.

As discussed below, PG&E also has provided Board-level communications to the CPUC by submitting reports to the Commission regarding its SNO Committee's safety-related activities as part of quarterly advice letters filed pursuant to Section 8389(e)(7), which incorporate PG&E's Safety Order Instituting Investigation quarterly compliance reports containing safety-related discussions and approved meeting minutes. In addition, NorthStar, on behalf of SED, has been attending PG&E Board meetings and meetings of various Committees of the Board and of PG&E Corporation's Board.

| Date | Meeting |
|---|---|
| September 10, 2019 | Safety and Nuclear Oversight (SNO) Committee |
| November 19, 2019 | Joint Audit/Compliance and Public Policy (CPP)/SNO Committees |
| December 10, 2019 | SNO Committee<br>CPP Committee |
| January 24, 2020 | CPP Committee |
| February 20, 2020 | CPP Committee<br>SNO Committee |
| March 27, 2020 | SNO Committee |
| April 28, 2020 | SNO Committee<br>Joint Audit/CPP/SNO Committees |
| April 29, 2020 | Board meeting |
| June 3, 2020 | SNO Committee |
| June 4, 2020 | Board meeting |

More information on the safety topics covered in these meetings can be found in PG&E's Advice Letters 5700-E, 5786-E, and 5817-E available in Attachment E.

**Paragraph (7) of Section 8389(e): "*The electrical corporation is implementing its approved Wildfire Mitigation Plan" and "shall file a tier 1 advice letter on a quarterly basis that details the implementation…."***

Per WSD's Guidance on Submission of 2020 Safety Certification, PG&E includes in Attachment E hereto, the Tier 1 Advice Letters it has filed since issuance of its initial safety certification, pursuant to Section 8389(e)(7). These include:

PG&E Advice Letter 5700-E (November 27, 2019) – 120-day suspension expired, no further disposition received

PG&E Advice Letter 5786-E (March 20, 2020) — approved

PG&E Advice Letter 5817-E (April 30, 2020) – suspended

Each of the Advice Letters details PG&E's implementation of its approved wildfire mitigation plan, including the status of all WMP targets. Additionally, each describes the implementation of its most recent safety culture assessment, contains a statement on the recommendations of the Board of Directors Safety Committee meetings from the previous quarter, and describes the status of implementing such recommendations.

To date, there have been no WSD compliance audits for either the 2019 WMP or the 2020 WMP and therefore no associated findings. The results of PG&E's Section 8389(e)(7) advice letters are noted above.

Therefore, this information demonstrates that PG&E is satisfactorily executing and in compliance with its approved WMP pursuant to the requirements of Section 8389(e)(7) and WSD's Guidance on Submission of 2020 Safety Certification.

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PG&E respectfully submits that, in light of the foregoing, it has met the requirements set forth in paragraphs (1), (2), (3), (4), (5), (6) and (7) of Section 8389(e) and is entitled to the issuance of a safety certification for 2020 within 90 days. Please do not hesitate to contact me with any questions regarding PG&E's request for a subsequent Safety Certification.

Sincerely,



Andrew M. Vesey
CHIEF EXECUTIVE OFFICER AND PRESIDENT,
PACIFIC GAS AND ELECTRIC COMPANY

cc: Service list of Rulemaking 18-10-007

**VERIFICATION**

I am Chief Executive Officer and President of Pacific Gas and Electric Company, and am authorized to make this verification on its behalf. I am informed and believe that the matters stated in the foregoing document are true and accurate.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 28th day of June, 2020, at San Francisco, California.

Andrew M. Vesey
CHIEF EXECUTIVE OFFICER AND
PRESIDENT,
PACIFIC GAS AND ELECTRIC COMPANY

# Attachment A

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN REPORT

# UPDATED

# RULEMAKING 18-10-007

# FEBRUARY 28, 2020



**Updates to Pacific Gas and Electric Company's 2020 Wildfire Mitigation Plan**

Pacific Gas and Electric Company (PG&E) hereby provides notice that it has identified updates to the 2020 Wildfire Mitigation Plan (2020 WMP), filed February 7, 2020. The updates to the 2020 WMP are described below and have been posted to the PG&E Wildfire Mitigation Plan website PGE.com/2020WMP (WMP Website).

PG&E is providing updates to the 2020 WMP and to Attachment 1 to the 2020 WMP, which included all of the tables required by the WMP Guidelines (Attachment 1).

The tables below summarize the changes made to the updated documents. Table 1 summarizes changes to the 2020 WMP; location of the change, the original text, and a redline version of the update. In cases where the update could not easily be shown in this table format, the update is described. For example, the update p. 4-7, Figure PG&E 4-1 is a page sized chart which was not practical to show in redline form in the Table 1 format.

Table 2 below provides a summary of updates to Attachment 1, Tables 1 – 31. Because it is not practical to show entire tables in a summary table format, the summaries are descriptions rather than a redline format. Understanding that stakeholders may want to compare the old tables to the updated tables, PG&E has retained a copy of the original version of Attachment 1 on the WMP Website called "Original Attachment 1: All Tables Required by the WMP Guidelines." In cases where updates are to tables that are in both the 2020 WMP and Attachment 1 the update is noted in both Table 1 and Table 2 below.

**Table 1: Summary of Updates to the WMP**

| Location | Original | Update (with redlines) |
|---|---|---|
| p. 2-5, Table 1 | N/A Table being replaced | Add section numbers 2-4 to Table 1-1 and add a comments column. Add comments below table 1-1. |
| p. 2-20, second and third bullets | • **Items 8.a., 8.b., 9.a, and 9.b.** - PG&E is providing in the above table data for 2015 through 2019 for wildfires that CAL FIRE concluded were caused by PG&E equipment. The "structures damaged" metric represents the count of structures destroyed from incidents listed on CAL FIRE's website that can be linked to a fire | • ~~**Items 8.a., 8.b., 9.a, and 9.b.** - PG&E is providing in the above table data for 2015 through 2019 for wildfires that CAL FIRE concluded were caused by PG&E equipment. The "structures damaged" metric represents the count of structures destroyed from incidents listed on CAL FIRE's website that can be linked to a fire ignition in PG&E's fire incident report.~~<br>• ~~**Item 10** - The 2015 through 2018 ignition data is primarily based on~~ |

| Location | Original | Update (with redlines) |
|---|---|---|
| | ignition in PG&E's fire incident report.<br>• **Item 10** - The 2015 through 2018 ignition data is primarily based on fire incident reports filed with the CPUC annually in accordance with D.14-02-015. These reports include fire incidents that may be associated with PG&E facilities and meet the following conditions: (1) a self-propagating fire of material other than electrical and/or communication facilities (2) the resulting fire traveled greater than one linear meter from the ignition point, and (3) PG&E has knowledge that the fire occurred. Where not already included as part of the CPUC fire incidents report data, PG&E also included data for 2015 through 2018 wildfires that CAL FIRE concluded were caused by PG&E equipment. As of the time of the 2020 WMP filing, 2019 ignition data is being reviewed by PG&E in preparation for its 2019 fire incident that will be submitted by April 1, 2020 per CPUC Decision D.14-02-015. The 2019 data in this table is preliminary and may be revised by the time that report is submitted. | ~~fire incident reports filed with the CPUC annually in accordance with D.14-02-015. These reports include fire incidents that may be associated with PG&E facilities and meet the following conditions: (1) a self-propagating fire of material other than electrical and/or communication facilities (2) the resulting fire traveled greater than one linear meter from the ignition point, and (3) PG&E has knowledge that the fire occurred. Where not already included as part of the CPUC fire incidents report data, PG&E also included data for 2015 through 2018 wildfires that CAL FIRE concluded were caused by PG&E equipment. As of the time of the 2020 WMP filing, 2019 ignition data is being reviewed by PG&E in preparation for its 2019 fire incident that will be submitted by April 1, 2020 per CPUC Decision D.14-02-015. The 2019 data in this table is preliminary and may be revised by the time that report is submitted.~~<br>• **Items 8.a., 8.b., 9.a, 9.b., and 10** The 2015 through 2018 ignition data is primarily based on fire incident reports filed with the CPUC annually in accordance with D.14-02-015. These reports include fire incidents that may be associated with PG&E facilities and meet the following conditions: (1) a self-propagating fire of material other than electrical and/or communication facilities (2) the resulting fire traveled greater than one linear meter from the ignition point, and (3) PG&E |

| Location | Original | Update (with redlines) |
|---|---|---|
| | | has knowledge that the fire occurred. Where not already included as part of the CPUC fire incident report data, PG&E also included data for 2015 through 2018 wildfires that CAL FIRE concluded were caused by PG&E equipment and 2019 wildfires that CAL FIRE is currently investigating where the point of ignition may be located near PG&E overhead electric facilities. As of the time of the 2020 WMP filing, 2019 ignition data is being reviewed by PG&E in preparation for its 2019 fire incident report that will be submitted by April 1, 2020 per D.14-02-015. The 2019 data in this table is preliminary and may be revised by the time that report is submitted. |
| p. 2-28, Table 4, third cell in the "Underlying Assumptions" column | Reduce wildfire through (1) overhand clearing 4ft vertical from conductor to sky, | Reduce wildfire through (1) overhand clearing 4ft vertical from conductor to sky~~,~~ for particular trees, |
| p. 4-7, Figure PG&E 4-1 | N/A Figure being replaced | Figure Update: "Outcome Type" fields have been updated; edit made to the bowtie visual so it accurately represents the safety consequences accounted for in the case of small and large fire outcomes in the Wildfire Risk Model. |
| p. 5-24, Section 5.1.D.3.17 | **5.1.D.3.17 Sensor IQ** Type: New Technology (Commercially Available Offering) Description: Itron/SSN is being contracted to implement Sensor IQ, which allows for a parallel, more granular data path (outside of | ~~**5.1.D.3.17 Sensor IQ**~~ ~~Type: New Technology (Commercially Available Offering) Description: Itron/SSN is being contracted to implement Sensor IQ, which allows for a parallel, more granular data path (outside of billing) to support distribution asset~~ |

| Location | Original | Update (with redlines) |
|---|---|---|
| | billing) to support distribution asset analytics use cases. Deployment enables customizable Network Interface Card (NIC) data sampling, read jobs, and alarms. The scope includes implementing Sensor IQ to all SmartMeters in HFTD areas and customizing reads and alarms to identify service transformer failures, with other use-cases to be considered based on wildfire risk reduction and/or business value. The data collected through Sensor IQ is critical for a variety of other wildfire related initiatives, including: (i) Rapid Earth Fault Current Limiter which requires feeder phasing to determine the line-earth capacitive imbalance; and (ii) increasing the data collected (voltage, current, power factor) and increasing the frequency of data collection will improve wires down algorithms to find faults. | ~~analytics use cases. Deployment enables customizable Network Interface Card (NIC)~~ ~~data sampling, read jobs, and alarms. The scope includes implementing Sensor IQ to~~ ~~all SmartMeters in HFTD areas and customizing reads and alarms to identify service~~ ~~transformer failures, with other use-cases to be considered based on wildfire risk~~ ~~reduction and/or business value. The data collected through Sensor IQ is critical for a~~ ~~variety of other wildfire related initiatives, including: (i) Rapid Earth Fault Current Limiter~~ ~~which requires feeder phasing to determine the line-earth capacitive imbalance; and (ii)~~ ~~increasing the data collected (voltage, current, power factor) and increasing the~~ ~~frequency of data collection will improve wires down algorithms to find faults.~~ |
| p. 5-35, first sentence under Alternatives Analysis | "January 15, 2019" | "January 15, ~~2019~~ 2020" |
| P 5-38, last sentence of first paragraph | These Non-Wildfire Programs are identified as "existing" programs on the Section 5.3 charts, even though 2020 costs are awaiting resolution of PG&E's 2020 GRC, because historical costs of these | ~~These~~ Non-Wildfire Programs are identified as "existing" programs on the Section 5.3 charts, even though 2020 costs are awaiting resolution of PG&E's 2020 GRC, because historical costs of these programs have been authorized in prior GRC decisions. |

| Location | Original | Update (with redlines) |
|---|---|---|
| | programs have been authorized in prior GRC decisions. | |
| p. 5-38, last sentence | "Table 21" | "~~Table 21~~ Tables 21-30" |
| p. 5-40, before last sentence in the Overview section | N/A - new language to be added | "See Attachment 1, Table 21 for the additional information associated with the initiatives discussed in the section" |
| p. 5-91, Section 5.3.2.2.3, second to last sentence in first paragraph | "Tier 2 and Tier 2 HFTD" | "Tier 2 and Tier ~~2~~ 3 HFTD" |
| p. 5-94, Section 5.3.2.2.6 | PG&E is piloting Sensor IQ on approximately 500K SmartMeters™ in HFTD areas and customizing reads and alarms to identify service transformer failures, with other use-cases to be considered based on wildfire risk reduction and/or business value. The data collected through Sensor IQ is critical for a variety of other wildfire related initiatives, including: (i) Rapid Earth Fault Current Limiter which requires feeder phasing to determine the line-earth capacitive imbalance; (ii) increasing the data collected (voltage, current, power factor) and increasing the frequency of data collection will improve wires down algorithms to find faults. | PG&E is piloting Sensor IQ on approximately 500K SmartMeters™ in HFTD areas and customizing reads and alarms to identify service transformer failures, with other use-cases to be considered based on wildfire risk reduction and/or business value. SSN is being contracted to implement Sensor IQ, which allows for a parallel, more granular data path (outside of billing) to support distribution asset analytics use cases. Deployment enables customizable Network Interface Card (NIC) data sampling, read jobs, and alarms. The data collected through Sensor IQ is critical for a variety of other wildfire related initiatives, including: (i) Rapid Earth Fault Current Limiter which requires feeder phasing to determine the line-earth capacitive imbalance; (ii) increasing the data collected (voltage, current, power factor) and increasing the frequency of data collection will improve wires down algorithms to find faults. |

| Location | Original | Update (with redlines) |
|---|---|---|
| p. 5-97, Section 5.3.2.3.2 | PG&E does not have a program to install addition fault indicators in fire areas for future years. | PG&E does not have a program to install additional fault indicators in fire areas for future years. |
| p. 5-122, Transmission Line Assessments, second paragraph | Prior to next fire season, PG&E will be evaluating all 552 transmission lines in HFTD areas to determine which lines can be removed from future PSPS Event scope via: supplemental inspections (ultrasonic), below-grade inspections and repairs, increased Vegetation Management (i.e. expanded Rights Of Way), accelerated repairs or replacement of assets." | Prior to next fire season, PG&E will be evaluating all 552 transmission lines in HFTD areas to determine which lines can be removed from future PSPS Event scope. ~~via: supplemental inspections (ultrasonic), below-grade inspections and repairs, increased Vegetation Management (i.e. expanded Rights Of Way), accelerated repairs or replacement of assets.~~" |
| p. 5-150, new section | N/A – new language to be added | "**5.3.3.18.3 – Building and Sourcing Services**<br><br>Building services supports the WMP initiatives in two primary ways: (1) securing office space for employees and contractors supporting the WMP initiatives; and (2) securing yards and staging areas for materials needed to complete WMP work.<br><br>Sourcing provides strategic, operational, and execution level support of PG&E's WMP. Sourcing provides sourcing program management support, develops project plans, and coordinates sourcing activities with cross functional teams. Sourcing support includes but is not limited to facilitating supplier evaluations, contract bidding and bid awards processes, and direct negotiations. |

| Location | Original | Update (with redlines) |
|---|---|---|
| | | Placement in Section 5.3.3 is based on the desire to put these services within the Section 5.3 initiatives, but note the services support all the WMP initiatives.” |
| p. 5-165, Section 5.3.4.9, add to end of first paragraph | N/A- new language to be added | “Ultrasonic inspection is included in the details and data associated with Attachment 1, Table 24 Section 12, Patrol inspections of transmission electric lines and equipment.” |
| p. 176, bullet at bottom of page, Overhand Trimming | Removing overhanging branches and limbs four feet out from the lines and up to the sky around electric power lines required by regulatory requirements to further reduce the possibility of wildfire ignitions and/or downed wires and outages due to vegetation-conductor contact. | Removing overhanging branches and limbs four feet out from the lines and up to the sky for particular trees around electric power lines ~~required by regulatory requirements~~ to further reduce the possibility of wildfire ignitions and/or downed wires and outages due to vegetation-conductor contact. |
| p. 5-177, Section 3. | For example, instead of the required four feet radial clearance around conductors, PG&E is trimming trees from the conductor to sky for overhang clearing. | For example, instead of the required four feet radial clearance around conductors, PG&E is trimming trees from the conductor to sky for overhang clearing on particular trees. |
| p. 5-190, Section 5.3.5.9 | "Further, in Wildland-Urban Interface (WUI) inspections are performed as frequently as quarterly, so 3 additional inspections in a year on top of the routine program’s once-annual inspection." | "~~Further, in Wildland-Urban Interface (WUI) inspections are performed as frequently as quarterly, so 3 additional inspections in a year on top of the routine program’s once-annual inspection~~." |
| p. 5-190, Section 5.3.5.9 | "PG&E will also inspect for and remove incidental vegetation that restricts access for safe and efficient removal of dead and dying trees may also be removed." | "~~PG&E will also inspect for and remove incidental vegetation that restricts access for safe and efficient removal of dead and dying trees may also be removed.~~" |

| Location | Original | Update (with redlines) |
|---|---|---|
| p. 5-196, Section 5.3.5.15 | "In addition to establishing "new" miles that have been treated with EVM, PG&E will perform annual, follow-up vegetation maintenance work on the sections of line where EVM was previously established to remove overhangs and to keep branches above powerline height from growing back into an overhanging position. As the number of miles initially worked to remove overhangs increases, the annual maintenance and upkeep effort will also grow along with the continued removal of hazard trees as outlined above." | "~~In addition to establishing "new" miles that have been treated with EVM, PG&E will perform annual, follow-up vegetation maintenance work on the sections of line where EVM was previously established to remove overhangs and to keep branches above powerline height from growing back into an overhanging position. As the number of miles initially worked to remove overhangs increases, the annual maintenance and upkeep effort will also grow along with the continued removal of hazard trees as outlined above.~~" |
| p. 5-217, footnote 27 | "Rulemaking 18-12-025" | "Rulemaking 18-12-~~025~~005" |
| p. 5-240, third bullet | Direct Mail/Print Media Engagement: | Direct Mail/Print Media Engagement: Add Footnote 1: See Table 30 Section 5-1 for details regarding PSPS and emergency preparedness media education campaigns |
| p. 5-247, Section 5.3.9.7.1 | N/A- new language to be added | "In addition to contractor resources and Mutual Assistance agreements, PG&E owns and maintains aviation resources. The 2020 – 2022 aviation operations and maintenance expense forecast in Table 29, Section 7 was determined by forecasting total operation and maintenance expenses, less forecast chargebacks and forecast reimbursements from CAL FIRE for utilizing PG&E helicopters." |
| | | |

**Table 2: Summary of Updates to Attachment 1, Tables 1 - 31**

| Location: Table, Section | Description of Change |
|---|---|
| Table 1; Table 1-1 (Distribution) | Add Sections 2-4 to Table 1-1, add comments column, add comments below Table 1-1. |
| Table 4, eighth cell in the column "Underlying assumptions" | Edit to the language describing the underlying assumptions. |
| Table 13 | Data updated using an improved database query methodology that provides a more accurate estimate of the number of electric PG&E customers located in each Fire Threat District category. Most of the data in the table has been updated. |
| Table 22, Section 2-5 | Update to new/existing information. |
| Table 22, Section 7-2 | Correction to line miles and spend/treated line mile; line miles should be N/A for all years and spend/treated line mile should be $0 for all years. Update to Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. Updated memorandum account information. |
| Table 23, Section 2-3 | Update to the proceeding and memorandum account information. |
| Table 23, Section 5 | Update comment/reference. |
| Table 23, Section 8-6 | Add the word Substation to the end of the Initiative Activity title. Updates to the Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. |
| Table 23, Section 12-1 | Remove the words "combined mitigation and control" from the Initiative Activity title. Update Ignition probability drivers targeted. |

| Location: Table, Section | Description of Change |
|---|---|
| Table 23, Section 12-2 | Remove the words “combined mitigation and control” from the Initiative Activity title. Update Ignition probability drivers targeted. |
| Table 23, Section 18 | Add new set of rows, “Other/not listed, Building and Sourcing Services-Transmission and Distribution” |
| Table 24, Section 1 | Update to Costs, spend/treated line mile and memorandum account information. |
| Table 24, Section 2 | Update to Costs, spend/treated line mile. |
| Table 24, Section 9 | Details provided are duplicative to Table 24 Section 15-2. Delete data from Table 24 Section 9 and add new comment. |
| Table 24, Section 10 | Details provided are duplicative to Table 24 Section 15-1. Delete data from Table 24 Section 10 and add new comment. |
| Table 24, Section 11 | Update Costs due to mathematical error and update spend/treated line mile. |
| Table 24, Section 15-1 | Update Costs and In/exceeding compliance with regulations |
| Table 24, Section 15-2 | Update Costs and In/exceeding compliance with regulations |
| Table 25, Section 5 | Update to Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. |
| Table 25, Section 7-1 | Update to Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. |
| Table 26, Section 3 | Revise rows with new data and details. |
| Table 26, Section 4-1 | Update to Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. |

| Location: Table, Section | Description of Change |
|---|---|
| Table 26, Section 4-2 | Update to Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. |
| Table 26, Section 5-2 | Update to Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. |
| Table 26, Section 5-3 | Update to Ignition probability drivers targeted, Risk reductions, Risk-spend efficiency, and Other risk drivers addressed. |
| Table 29, Section 2 | Revise comment. |
| Table 29, Section 7 | Add new set of rows, Other/not listed – Aviation Support |
| Table 30, Section 4 | Update rows to include details for “Forest service and fuel reduction cooperation and joint roadmap”. |
| Table 30, Section 5-1 | Add new set of rows, “Other/not listed, Emergency preparedness education campaign” |

PACIFIC GAS AND ELECTRIC COMPANY
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# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# EXECUTIVE SUMMARY

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## A. Introduction

Over the past few years, California has experienced an unprecedented number of catastrophic wildfires due to climate change. Many of these fires have occurred in Pacific Gas and Electric Company's (PG&E or the Company) service territory in Northern California. PG&E recognizes the urgent need to reduce the frequency, scope and impact of wildfires and is taking extensive measures to address this challenge and protect the safety of the customers and communities we serve.

PG&E conducted massive Vegetation Management (VM) and asset inspection efforts in 2019. At the same time, we worked with regulators, communities, other utilities and industry experts to get a better understanding of the wildfire problem and ways to address and limit wildfire risk. Based on our work and experience in 2019, in 2020 PG&E will be implementing continued VM activities, enhanced inspection practices, more strategic system hardening, increased situational awareness tools, and additional system automation devices. In addition to further reducing wildfire risk we anticipate these efforts will enable the Company to implement smarter, smaller, and shorter Public Safety Power Shutoffs (PSPS) during future fire seasons.

This document describes the measures that PG&E is taking to reduce the risk of catastrophic wildfires in Northern California. These measures have ramped up in the last few years because Northern California's wildfire problem has grown significantly during that time. These programs are evolving as our understanding of the wildfire threat improves, and as we learn more from the customers, communities and governments we serve about how to improve the effectiveness and impact of these efforts. The table on the next page summarizes the major 2020 wildfire mitigation activities described in Section 5 of PG&E's 2020 Wildfire Mitigation Plan (WMP).

## B. PG&E's System and Wildfire Threat

Over half of PG&E's service territory lies in the High Fire Threat District (HFTD) as identified by the California Public Utilities Commission (CPUC or Commission) in 2018. Approximately 5,500 line-miles of electric transmission and 25,500 line-miles of distribution assets lie within these HFTDs. Many of these are long lines that serve low-density, non-urban customers and communities located within the "wildland-urban

interface," who face an increased fire risk. This wildfire threat has increased significantly over the past ten years. The U.S. Forest Service estimates that 147 million trees died in California from drought and invasive beetles from 2010-2018. This contributed to the CPUC significantly increasing the size of the HFTDs within PG&E's service territory, effective January 2018.

**FIGURE 1**
**CPUC FIRE-THREAT MAP (2018)**

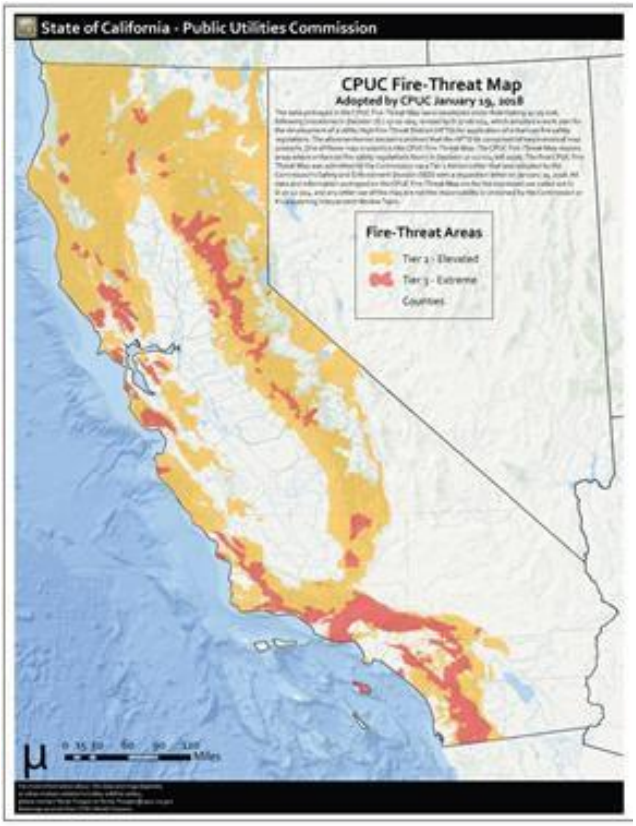


**TABLE 1**
**SUMMARY OF 2019 AND 2020 WILDFIRE MITIGATION ACTIVITIES**

| | PROGRAM | 2019 PROGRESS* | 2020 TARGETS* | NOTES | REFERENCE |
|---|---|---|---|---|---|
| REDUCE WILDFIRE IGNITION POTENTIAL | **1.A Enhanced VM — VM and Tree Clearing Reduce Fire Risk by Reducing Potential Vegetation Contacts With Utility Equipment** | | | | |
| | Enhanced VM (EVM) | 2,498 line-miles | 1,800 line-miles | EVM activities are in addition to PG&E's routine VM practices. | 5.3.5 |
| | Catastrophic Event Memorandum Account (CEMA) (Dead Tree Removal) | 48,000 trees | Removals per inspection results | 2020 activities will include some trees identified in 2019 | 5.3.5.9 |
| | **1.B Asset Inspection and Repair/Replacements — Identify and Fix Actual and Potential Equipment Problems That Could Contribute to a Failure or Wildfire Ignition** | | | | |
| | Enhanced Inspections | Transmission – aerial and visual for 49,715 structures | Transmission – aerial and visual for ~22,000 structures | Transmission 2019 data reflect some inspections performed in late 2018 as well. All structures in HFTD inspected in 2019 and late 2018; for 2020 all HFTD Tier 3 and one third of Tier 2 assets will be inspected. | 5.3.4.2 |
| | | Distribution – 694,250 poles | Distribution – ~344,000 poles | | 5.3.4.1 |
| | | Substations – 222 | Substations – ~105 | | 5.3.4.15 |
| | Repairs and Replacements | Transmission – repaired 5,215 A&B tags | Continue risk-prioritized repairs identified in 2019 and perform new corrective actions identified during 2020 inspections. | Repaired all A tags and 94 percent of B tags identified through 2019 inspections. | 5.3.4.2 |
| | | Distribution – repaired 4,881 A&B tags | | | 5.3.4.1 |
| | | Substations – repaired 745 A&B tags | | | 5.3.4.15 |
| | **1.C System Hardening — Replace or Eliminate Overhead Distribution Lines in High-Risk Areas With Stronger, More Resilient Equipment** | | | | |
| | Miles Hardened | 171 line-miles | 241 line-miles | Hardening includes replacing bare overhead conductor by (1) eliminating the line entirely, (2) undergrounding or (3) replacing with covered conductor and stronger poles. | 5.3.3 |
| | **1.D System Automation — Enable Remote Control and Automated Operation of Field Equipment to More Precisely Deenergize Sections of the Grid When Fire Risk Is High** | | | | |
| | Reclosers | Supervisory Control and Data Acquisition (SCADA)-enabled all remaining (287) manual reclosers | SCADA expansion as needed | SCADA-enabled recloser allows remote control to prevent a line from reenergizing after a fault. | 5.3.3.9 |
| | Automated Sectionalization | 298 devices | 592 devices | Sectionalization devices enable separating the distribution grid into smaller sections for greater operational flexibility | 5.3.3.8 |
| | **1.E Public Safety Power Shutoffs —Shutting Off Power in High-Risk Fire Areas Under High-Risk Weather Conditions Prevents Utility Equipment From Igniting a Potentially Catastrophic Fire** | | | | |
| | PSPS Events | 9 PSPS outages lasting from ~14 to 55 hours (on average for all affected customers) | Working to make each 2020 PSPS event affect one-third fewer customers than it would have in 2019 and to shorten restoration time after high-risk weather clears to ~50 percent shorter than the 2019 PSPS target. | Particularly working to reduce PSPS impacts on communities forecast to be most frequently affected by PSPS events. | 4.1 |
| REDUCE FIRE | **2.A Situational Awareness — More Real-Time Monitoring of High-Risk Fire Areas Enables Earlier Warning and Detection of Wildfires, More Effective Proactive Grid Operation, and Faster Response by First Responders** | | | | |
| | Weather Stations | 426 installed (total 626 to date) | Install 400 in 2020; goal of 1,300 total by 2021 | These tools enable better real-time monitoring of high-risk fire areas and conditions; all data feeds are shared publicly at pge.com/weather. | 5.3.2.1 |
| | High-Def Cameras | 133 installed (total 142 to date) | Install 200 in 2020; goal of 600 total by 2022 | | 5.3.2.1 |
| | **2.B Wildfire Safety Operations Center and Meteorology — Leverage Better Situational Awareness and Analytical Capability to identify and Respond to Fire Threats More Effectively** | | | | |
| | Wildfire Risk Identification | Enhanced meteorology and Wildfire Safety Operations Center (WSOC) capabilities and tools including Satellite Fire Detection technology and fire spread modeling to better understand real-time (and modeled) wildfire risk. | Continue integrating all weather and wildfire forecasting, modeling and situational awareness tools | | 5.3.2 |

**TABLE 1**
**SUMMARY OF 2019 AND 2020 WILDFIRE MITIGATION ACTIVITIES**
**(CONTINUED)**

| | PROGRAM | 2019 PROGRESS* | 2020 TARGETS* | NOTES | REFERENCE |
|---|---|---|---|---|---|
| REDUCE | **3.A Reduce Number of PSPS-Affected Customers — Smaller Distribution Sections, More Precise Transmission Line Switching and Operating Temporary Microgrids Make it Possible to Reduce the Size of PSPS Outages** | | | | |
| | Distribution Sectionalization | See 1.D above | See 1.D above | Distribution sectionalization makes it possible to focus PSPS outages on smaller sections of the grid, and transmission switching enables more targeted transmission outages to lessen downstream customer impacts. | 5.3.3.8 |
| | Transmission Line Switching | None completed for PSPS mitigation purposes | 23 switches | | 5.3.3.8 |
| | Distributed Generation and Microgrids | Completed 1 temporary microgrid pilot and operated 3 additional temporary microgrids during PSPS events | Operate additional microgrids during PSPS events in 2020 | | 5.3.3.8 |
| | **3.B Reduce PSPS duration — Shorter Outages, Through Increased Operational Tools and Improved Processes, Will Reduce Burden of PSPS Events on Customers and Communities** | | | | |
| | Faster Power Restoration | PSPS Restoration target of 24 daylight hours from weather "all clear" to power restored, generally achieved | New PSPS Restoration target aims for 50 percent improvement: restore power for 98 percent of affected customers within 12 daylight hours from weather "all clear" | Faster power restoration should reduce the degree of customer and community disruption from an outage. | 5.6.2.3 |
| | **3.C Reduce Frequency of PSPS — Tighter Geographic Understanding of Weather and Fire Risk And Analysis of Transmission Lines Allows More Accurate Design of PSPS Need and Scope** | | | | |
| | Meteorology | Weather forecasted at 3 km X 3 km resolution. Updated weather impact models, datasets & improved meteorology computing power. | Integrating additional tools and datasets to increase weather forecast granularity to 2 km x 2 km (>2x better than 2019 resolution) | Better meteorology tools and geographic precision improves identification of high-risk fire conditions and thus better tailoring of operational actions to respond to high-risk threats and events. | 5.3.2.1 |
| | Transmission Line Assessment | Limited assessments in 2019 | PG&E is analyzing all 500+ transmission lines that run through HFTDs to identify possible ways to avoid taking a line out of service under high fire risk conditions. | | 5.3.3.8 |
| | **3.D Community and Customer Support — Lessen the Burden of PSPS Outages by Increasing Customer and Community Coordination, Information, Preparation and Services Before and During Outages** | | | | |
| | Community Resource Centers (CRC) | Established 70+ temporary CRCs during late October / early November 2019 PSPS event | Partnering with counties to improve targeting of CRCs, including using existing buildings as well as temp facilities in coordination with distributed generation | | 5.6.2.1 |
| | Communication and Outreach | Community outreach program included hosting 23 open houses plus webinars and other events throughout the service territory to educate customers about wildfire risks, wildfire preparations, and PG&E's Wildfire Safety Programs and PSPS | Approximately doubling the number of in-person open houses across potentially affected areas to educate and inform customers, alongside other additional outreach measures. Improve social media usage for customer information and feedback. | | 5.3.9.2 |
| | Website and Call Center | Website upgrades since October 2019 include improved scalability of PGE.com using cloud-based systems; Call Center Operations refined to support peak call volumes during PSPS events | Continuing to test and monitor website capacity and call center operations, including flexible human resource deployment, to support peak PSPS-event web traffic and call volumes | | 5.6.2.4 |

* All data are for activities and assets within CPUC-designated HFTDs unless otherwise indicated; 2020 activities will include some items identified in 2019; targets as of February 7, 2020.

### 1. Reduce Wildfire Ignition Potential

Reducing the risk of catastrophic fires begins with understanding the causes of utility-related fire ignitions in PG&E's service territory. Historically, 49 percent of ignitions in PG&E's HFTD regions have been caused by vegetation contact with electrical equipment and another 28 percent were caused by utility equipment failures; the remaining ignitions were caused by third-party actions, animals, and other causes. Although PG&E was following regulatory requirements and standard industry practices for VM (tree-trimming) and equipment inspections and maintenance, the increased number of dead trees, drought, hotter temperatures and higher winds due to climate change have radically increased the risk of a significant wildfire in the event of an ignition.

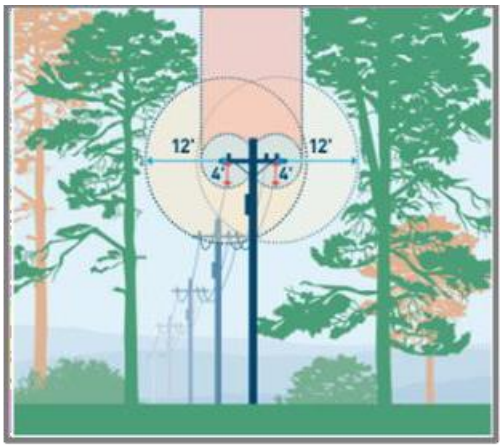
PG&E is going beyond existing regulatory requirements to address the new normal. In 2018 PG&E developed an aggressive program to reduce wildfire ignitions, with five primary elements that directly address the causes of fire ignition and spread.

#### a. Enhanced VM

Vegetation located in close proximity to electrical equipment can cause a fire by contacting that equipment, either catching fire or dropping a spark that could cause other vegetation to catch fire. Vegetation trimming and dead tree removal also reduce the availability of fuel that could start or spread a fire, whatever the cause. PG&E's routine VM program inspects approximately 100,000 miles of overhead electric facilities at least annually to identify and clear vegetation that might grow or fall into utility equipment to reduce the risk of contact and ignition. The vegetation inspection process entails ground patrols and the use of Light Detection and Ranging and advanced analysis techniques to identify dead and risky trees that are too close to utility facilities.

In addition to the routine VM practices, in 2019 PG&E's EVM Program inspected and further trimmed or removed vegetation along 2,498 line-miles (~10 percent) of distribution lines within HFTDs. Beyond the EVM and routine vegetation clearance work, PG&E also removed approximately 48,000 dead trees close to facilities through the CEMA Program. These measures reduce the likelihood of future vegetation-into-line fire ignitions and the amount of fuel available to spread a fire.

**FIGURE 2**
**PG&E'S EVM PROGRAM**




**Enhanced Veg. Mgmt: High Risk Trees + Overhang Removal**

1. Maintain 12' recommended radial clearance
2. Remove high risk trees within fall zone
3. Remove overhangs out 4 feet from power lines
4. Reduce dry fuel on a targeted basis

PG&E plans to conduct EVM on approximately 1,800 miles of lines in 2020 and beyond based on insights gained from the 2019 effort. We are assessing the impacts of the 2019 routine full system plus EVM efforts to be sure that we use our resources most effectively in the years ahead. For instance, we plan to shift some EVM work from distribution to lower voltage transmission lines to expand Rights-of-Way (ROW) and remove incompatible species; this work will reduce wildfire risk and reduce the footprint of future PSPS events by allowing some transmission lines to remain energized.

### b. Asset Inspection and Repair

Over late 2018 and 2019, PG&E inspected all equipment within the HFTDs in our service territory to identify any structures or equipment that were damaged, degraded or could fail and potentially cause a fire. While most utility equipment failures can be visually identified, PG&E has deployed a suite of techniques for enhanced inspection across transmission, distribution and substation equipment. These techniques include:

- Routine patrols by ground (truck and walking) or helicopter;
- Use of enhanced visual, infrared and ultrasonic inspection methods; and
- Structure climbing, aerial image capture, wood pole testing, ground and below-grade foundation assessment.

PG&E uses inspection results to prioritize and manage equipment repair needs. The most severe equipment problems are immediately repaired or made safe (potentially by taking the affected line out of service). Less severe problems are addressed within a risk-informed timeframe, based on CPUC requirements.

PG&E's 2019 Wildfire Safety Inspection Program covered all of the nearly 750,000 poles and structures in HFTDs and identified needed maintenance and replacement. Building on this foundation, PG&E is incorporating the enhanced inspection processes and tools into our Routine Inspection and Maintenance Program and will use risk-informed maintenance cycles in the years ahead—for instance, PG&E will initially conduct annual inspections of all facilities in HFTD Tier 3 areas and use 3-year inspection cycles for Tier 2 facilities. Future year inspection cycles may be adjusted to align with our understanding of the risks associated with changing weather patterns, repairs, replacements, and information gathered via inspections.

### c. System Hardening

System hardening entails replacing or eliminating distribution lines in HFTD areas with equipment that is less likely to start a fire and more likely to survive one. Hardening methods include replacing bare overhead conductor with covered conductor and installing stronger poles or undergrounding a line. Some lines or spans could be eliminated entirely if customers, the community or a substation can be supplied through some other means, including remote grids or self-generation. Each system hardening project requires extensive field assessment and engineering analysis to determine the best method to reduce fire threat and consequence for that line. PG&E is starting this work in the areas that have been determined as the highest fire risk facilities.

In 2019, PG&E completed hardening for 171 miles of distribution lines. The 2020 system hardening plan targets hardening 241 line-miles and completing a total of 7,100 line-miles over 12-14 years.

### d. System Automation

System automation is an important tool to prevent and mitigate fires associated with utility equipment. PG&E is using two principal automation tools on our system in HFTDs. PG&E has installed SCADA-enabled reclosers in place of manual devices, to allow system operators to remotely prevent a line from automatically reenergizing ("reclosing") after a fault. This assures that if any potential fire or other risk event causes a line to drop out of service, that line will remain out of service and not

contribute to a fire until PG&E personnel can verify that it is safe to put the line back in operation. In 2019, PG&E completed SCADA-enabling all line reclosers serving HFTD areas.

Automated sectionalization devices are used to separate the distribution grid into smaller sections for greater operational flexibility. These devices can be used to isolate parts of the grid, to respond to outages or emergency situations more quickly, or to create a zone for microgrid operations. PG&E will use sectionalization to create smaller zones for PSPS outages, and to take smaller sections out of service as needed for asset repairs or replacements. The Company installed 298 automated sectionalization devices in 2019 and plans to install another 592 devices in 2020.

Reclosers and automated sectionalization devices reduce wildfire risk by allowing PG&E operators to keep lines out of service to prevent ignitions under hazardous conditions. These devices enable deenergization and reenergization of smaller, more precise sections of the grid with higher speed, enabled by remote operation and automation.

**e. Public Safety Power Shutoffs**

In 2018, the CPUC confirmed the need for all California utilities to use PSPS as a way to prevent catastrophic wildfires. Significant wildfires are most likely to occur under the high-risk conditions of high winds, low humidity, and where there is a high level of dry fuel—as in the late summer or fall in the heavily forested mountain areas of Northern California, where many of PG&E's distribution and transmission assets (red lines in map) and power plants are located. Under extremely high-risk conditions, it is necessary to deenergize some transmission or distribution lines to reduce the risk that vegetation or other flammable items that could start a wildfire could contact live wires.

**FIGURE 3**
**PG&E'S TRANSMISSION SYSTEM (IN RED)**




Although deenergizing a power line may prevent the ignition of a potentially catastrophic wildfire, shutting off a transmission line has major consequences for communities and customers. Service to all customers who are directly served by a single long radial transmission or distribution line will be shut off for the duration of the PSPS event, as has happened to many communities located in the Sierras and foothills. Further, any customers and communities whose service is fed primarily by deenergized transmission lines and cannot be fully served by alternate lines are also shut off, even though they may not be experiencing the same high-risk weather conditions.

Extreme hazard weather conditions were particularly severe during the 2019 fire season, forcing PG&E to conduct nine PSPS events. The largest PSPS event occurred on October 26 through November 1, affecting approximately 968,000 customers in 38 counties for an average of about 55 hours and some communities for almost a week. During that period, peak wind gusts in the fire risk areas reached speeds as high as 102 miles per hour, which is strong enough to blow tree limbs into power lines from a considerable distance.

The 2019 PSPS events taught PG&E some difficult lessons. Although grid deenergization is effective at reducing ignitions and utility-caused wildfires in high fire risk areas, PSPS events are extraordinarily disruptive for our customers and communities. Over the course of the 2019 PSPS events, we learned many lessons

about how to conduct these more effectively, and how to better help our customers prepare for and manage through PSPS events. We also worked to determine how to make future PSPS events smaller, shorter and less frequent. These lessons are discussed in Section 3 below.

PG&E's process for deciding whether to initiate a PSPS involves continuous monitoring to determine when and where extreme weather patterns and high-risk fire conditions exist. Under those circumstances, a PG&E officer, following well-documented policies, processes, and procedures, makes the decision on whether it will be necessary to shut down distribution lines in the identified high-risk fire areas. PG&E then begins governmental and customer notifications based on the identified distribution lines. PG&E also assesses the transmission circuits within the high-risk footprint and identifies the downstream areas and customers affected by those lines. We identify specific transmission lines that must be shut down based on updated wildfire risk and public safety risk. Company engineers perform electric power flow analyses to determine shut-down impacts and safe power rerouting options and coordinate those with the California Independent System Operator (i.e., CAISO, the state's grid operator). If additional areas must be deenergized due to transmission line shut-offs, PG&E updates governmental and customer notifications as soon as possible.

Once PG&E meteorologists issue the "weather all-clear" for a PSPS event, PG&E conducts safety assessments of our lines and equipment. The Company may use internal personnel, contractors, and mutual aid (personnel from other utilities) for ground patrols, as many as 65 helicopters for real-time aerial assessment, and fixed-wing aircraft with cameras and infrared equipment that may be able to inspect assets at night. PG&E repairs or resolves identified damage locations and issues such as vegetation on the lines and then reenergizes lines on a rolling basis to restore power to affected customers as quickly as is safe to do so.

PG&E recognizes the burden that PSPS places upon affected customers and communities and is committed to minimizing the number of PSPS events and their scope (number of customers affected) and duration, while working to keep our customers and communities safe during times of severe weather and high wildfire risk. The Company is adopting a variety of system tools and analytical methods, described below, to make future PSPS events smarter, smaller, and shorter.

### 2. Reduce Fire Spread

PG&E is continuing to invest in tools, equipment, resources and a skilled workforce to improve our understanding of upcoming and real-time weather and fire conditions, so we can act proactively to reduce fire ignitions and respond quickly to slow the spread of a fire once it starts.

#### a. Situational Awareness

PG&E is installing a variety of weather and fire monitoring devices across HFTD areas. These monitoring devices allow early warning of high fire risk conditions and real-time identification of emerging wildfires, which in turn enable faster action by first responders and more proactive grid operation to avert fire ignition and spread.

PG&E's situational awareness tools in the HFTDs include:

- Weather stations – PG&E installed 426 in 2019, for a total of 626 to date; another 400 will be installed in 2020;
- High-definition cameras – PG&E installed 133 in 2019, for a total of 142 to date; another 200 will be installed in 2020;
- Enhanced wire-down detection tools;
- Satellite monitoring of PG&E service territory; and
- Access to multiple external real-time weather service feeds.

All of these sources are used to track real-time fire conditions and create highly localized weather and fire risk forecasts. PG&E uses this information to flag high-risk locations and system conditions, share it with government and first responders, and activate PG&E field crews and operational measures accordingly to prevent outages and respond to wires down or actual fires.

#### b. Wildfire Safety Operations Center and Meteorology

PG&E has established a highly qualified, 24/7 meteorology operation that supports a WSOC, as well as day-to-day gas and electric system operations more broadly. These two integrated organizations have the field tools and analytical capabilities to forecast wildfire threats, identify actual fires, and support rapid fire response and grid operational responses.

PG&E's WSOC plays a key role in addressing the challenges of climate-driven extreme weather events and customer and community safety. The WSOC serves as a coordination, facilitation and communications hub for wildfire activities, including using weather data to monitor fire threats. In the event of a potential fire threat or actual fire,

it coordinates and mobilizes response efforts with appropriate PG&E field personnel, first responders, media, local government, and other safety officials. The WSOC operates on a 24-hour basis and is staffed with experienced personnel knowledgeable in electric operations, safety, engineering, meteorology, fire science and other areas. The WSOC staff includes field teams of Public Safety Specialists who train first responders and local agencies on how to safely respond to emergencies associated with electric and gas facilities. WSOC specialists partner with local entities for emergency planning and coordination and fire response.

PG&E's WSOC developed and deployed an industry-leading satellite fire detection system in 2019 that uses remote sensing data from five geostationary and polar orbiting satellites to detect fires. The Company has also developed a suite of fire spread modeling tools to understand potential wildfire risks and paths.

PG&E's meteorology department integrates weather data from numerous internal and external sources, including hundreds of PG&E's own weather stations located in HFTDs. Several times each day, PG&E meteorologists use these data streams to forecast wind and weather patterns and calculate fire risk levels across the service territory. These forecasts support PG&E operations and guide the need for wildfire preparation and mitigation activities, including possible PSPS.

In late 2018 and 2019, PG&E's meteorology team compiled one of the largest known high-resolution climatological datasets in the utility industry: a 30-year, hourly, 3 kilometer (km) spatial resolution dataset consisting of weather, dead and live fuel moistures and fire weather assessments, to improve identification of high-risk weather patterns. In 2019, PG&E's weather condition forecasting and fire risk analysis primarily used 3 km by 3 km resolution to forecast conditions within each 9 square km section of PG&E's entire HFTD area. In 2020, PG&E will be performing these forecasts at an even tighter resolution, in 2 km by 2 km sections. This improved geographical precision will allow better determination of which specific areas and lines are at high fire risk, and which lines at less risk can be excluded from potential PSPS consideration. This precision will also enable faster identification of when high fire risk has abated and assessment and reenergization can begin. PG&E will work in 2020 to further consolidate and integrate all of our situational awareness tools, data and analytical capabilities for deeper insights and actionable analyses.

### 3. Reduce impact of PSPS

PG&E is working to make PSPS de-energization events smaller, shorter and less burdensome on affected communities. In 2019, PG&E conducted nine PSPS events, most during October and November, causing outages that affected hundreds of thousands of customers. While the PSPS events were successful in that utility equipment caused fewer overall ignitions within HFTDs and no fatal wildfires occurred in 2019, those events caused severe disruptions for the communities and customers we serve.

Based on what we learned from the 2019 PSPS events, PG&E is working to make any future PSPS events smaller in scope, shorter in duration and smarter in performance while working to keep customers and communities safe during times of severe weather and high wildfire risk. By taking the actions described below, PG&E aims to have any 2020 PSPS events affect approximately one-third fewer customers than a comparable event would have in 2019 (based on an analysis of the projected impacts of these new programs under conditions of the large October 2019 PSPS events). We will focus particularly on how to alleviate the PSPS burden on the communities we serve in highest fire risk areas that are expected to be most frequently affected by PSPS events.

#### a. Reduce the number of PSPS-affected customers

One major factor affecting the scope of a PSPS event is the number of transmission lines included in the footprint of the event, as transmission lines have significant impacts on downstream communities that might otherwise not be affected by the extreme weather or are even outside a high fire risk area. PG&E will use several methods to further reduce the number of transmission lines that must be included in future PSPS events. The first step being taken is to analyze every one of the 552 transmission lines in HFTDs before the start of fire season to determine whether the various line inspections, repairs, VM and other measures taken have reduced fire risk for that line enough that it could be essentially removed from consideration for PSPS (or whether additional immediate action could do so). Second, on high risk fire days, more granular meteorological fire risk forecasting at 4 sq. km resolution may reveal that some transmission and distribution lines are not at high risk, so those lines would not need to be deenergized. Every line that can be safely excluded from a PSPS event reduces the number of customers subject to a PSPS outage.

PG&E's investment in additional transmission switching and distribution sectionalization will enable the Company to more precisely control and limit the size and sections that must be taken out of service in a PSPS event. By making those PSPS areas smaller, we can reduce the number of customers affected by an outage event.

PG&E is also using distributed generation, in combination with switching and sectionalization, to isolate particular communities and critical facilities and serve them when the rest of the local area is shut down by a PSPS. In 2019, PG&E completed a temporary microgrid pilot for PSPS mitigation in Angwin, California, and operated temporary microgrids at three substations during 2019 PSPS events. We intend to establish additional PSPS-mitigating microgrids and distributed generation resources in 2020.

### b. Reduce PSPS Duration

With improved meteorology data on wildfire threat conditions, PG&E's ability to identify the start and end of high-risk weather will continue to improve. More sophisticated weather and fire risk understanding will inform PG&E's operational measures to respond to high-risk threats and events—and to confirm area-specific "weather all-clear" status more quickly to speed service restoration and shorten the duration of PSPS events.

Based on operational lessons learned from the 2019 PSPS season, PG&E is adjusting some practices and increasing the resources we will deploy to support PSPS restoration in 2020. PG&E is establishing contracts to have as many as 65 helicopters available for real-time aerial assessment (up from ~35 in 2019) and fixed-wing aircraft equipped with cameras and infrared equipment that may allow us to inspect assets at night. In 2019, PG&E's target was to restore service after a PSPS within 24 hours after the "weather all-clear." Leveraging these additional resources and other process improvements, for 2020 PG&E is aiming for a 50 percent improvement, restoring power for 98 percent of affected customers within 12 daylight hours from the "weather all-clear."

### c. Reduce the frequency of PSPS

As noted above, more accurate weather and fire risk forecasting on a 2 km by 2 km resolution will improve threat identification and may enable PG&E to avoid calling PSPS in areas that are not at severe fire risk. PG&E's weather and fire forecasting improvements, particularly with respect to identifying high wind speeds and sustained

winds, may also help avoid over-estimating actual fire hazard levels, and thus avoid calling for a PSPS when weather and fire risk conditions may not require it. Better fire-spread modelling capabilities will also let PG&E determine when a potential or actual fire could have less severe consequences, and therefore may not merit PSPS action.

Advanced analyses of all of the HFTD transmission lines will enable PG&E staff to identify possible ways to avoid taking a line out of service under high fire risk circumstances. This will be particularly beneficial for customers who are served downstream from those lines.

**d. Community and customer coordination and support**

Given the high risk and consequences of catastrophic wildfires for California communities, and the high burdens created by PSPS events, communication and education about wildfire risks, preparations and possible PSPS events are essential. PG&E is building partnerships with all of our stakeholder groups, coordinating with affected governments and communities, improving customer communications, and listening carefully to all of these stakeholders to improve our customer and community support.

PG&E's activities have included extensive county and tribal engagement to improve coordination, including meetings, community open houses, listening sessions and joint identification of critical facilities. Key staff have been designated as community and governmental liaisons to coordinate and provide real-time information leading up to and during a PSPS event. Our teams coordinate year-round with fire and other first responder agencies on overall safety efforts, with an increasing focus on wildfire and PSPS preparation. We are working to serve Access and Functional Needs (AFN) customers more effectively, including identifying those customers for additional notification in the event of a PSPS event and establishing an AFN council to advise on and inform our practices.

PG&E has and is actively communicating and engaging customers and communities to learn how we can improve PSPS planning and community support. In 2019, PG&E conducted 23 open houses, 6 webinars, 17 PSPS planning workshops, and over 1,000 stakeholder meetings. The Company sent out 18.8 million PSPS-related direct mail pieces, ran 36,000 radio ads and used extensive social media outreach and web-based information such as outage maps and the locations of emergency support services. PG&E values the many requests and suggestions from

our customers and our communities, the CPUC, the Governor's office, state agencies and other stakeholders. We implemented many suggestions and improvements in real time during successive PSPS events in 2019 and are working to implement more for potential future PSPS events. Our 2020 outreach will expand upon 2019 efforts, including approximately doubling the number of community open houses, and continue to address emergency readiness and reach vulnerable populations using diverse outreach opportunities and communications channels.

PG&E is committed to reducing the number of customers affected by and duration of future PSPS events. But given the high fire risk in our service territory, it is not possible to eliminate all PSPS events in the near future. Acknowledging this reality, PG&E has worked to implement CRCs in communities affected by PSPS events, to give customers a place to go for essential services when power is out. In coordination with local communities and governments, PG&E set up 77 temporary CRCs by the last PSPS of 2019 and is working now to see whether some permanent facilities (such as schools or community centers) are appropriate and feasible to be used as CRCs in 2020.

### 4. Program Evolution for Continuous Improvement

PG&E's Community Wildfire Safety Program (CWSP) is evolving rapidly as we gain experience on how various measures and technologies work to reduce the threat and actuality of catastrophic fires. Actions such as VM, equipment repairs and line hardening may materially reduce the risk, number and extent of wildfires—but at the same time, climate change-driven factors such as drought, high temperatures and bark beetles may increase that risk and counteract our efforts over time. PG&E will study and analyze the impact and cost-effectiveness of the measures we are taking. We will work with our customers, communities and partners to learn how to serve their needs better and reduce wildfire and wildfire mitigation consequences in the future.

We are continuing to identify and incorporate lessons learned from 2019 into PG&E's wildfire mitigation efforts, this 2020 WMP and the associated program targets. Some key examples include:

- Enhanced VM (1.A): Based on analysis of the 2019 routine full system plus EVM efforts, PG&E is re-balancing VM activities to use VM labor resources more effectively in the years ahead. In particular, we will be shifting resources to expand ROWs on lower voltage transmission lines, for the double benefit of reducing wildfire risk and possibly reducing the footprint of future PSPS events.

- Enhanced Inspections (1.B): PG&E performed enhanced inspections of all poles and structures within HFTDs in 2019. With that assessment of all HFTD structures as the foundation, PG&E is adopting a risk-informed inspection process going forward. We have incorporated 2019's enhanced inspection processes and tools into our Routine Asset Inspection Program. Starting in 2020, we will inspect facilities in HFTD Tier 3 annually and inspect Tier 2 facilities on a 3-year cycle. This will deploy inspection resources more cost-effectively and facilitate a thorough understanding of asset conditions in the high fire threat areas.
- System Hardening (1.C): Building on operational insights and system hardening work from the second half of 2019, PG&E is increasing system hardening line-miles by over 40 percent starting in 2020.
- PSPS Scope Mitigations (3.A): Based on analysis of the 2019 PSPS events, PG&E will be using the automation measures and transmission impact analyses discussed above to reduce the size of PSPS events for the 2020 wildfire season. We will also use microgrids and distributed generation to support some communities in PSPS zones. These efforts are expected to reduce 2020 PSPS customer impacts by one third relative to comparable fire-risk events in 2019.
- PSPS Duration Reduction (3.B): Building on the operational practices and insights from 2019, PG&E will leverage additional resources and processes for asset inspection and fire condition monitoring to speed post-event restoration.

PG&E anticipates that the programs and approaches described in this plan will further change and evolve over time to reflect new insights, risks, and opportunities. This may create inconsistencies with PG&E's CWSP proposals in the General Rate Case (GRC) or other regulatory proceedings. In December 2019, PG&E and other parties submitted to the Commission a multi-party settlement agreement for PG&E's 2020 GRC, which included provisions addressing PG&E's CWSP for the period 2020-2022. PG&E's 2020 WMP reflects many of the wildfire mitigations as described in the 2020 GRC. However, wildfire risk is not static, nor are PG&E's efforts to mitigate that risk. Since the 2020 WMP reflects PG&E's updated plans, PG&E intends to work with regulators and other parties to assure that costs are clearly identified and tracked through the proposed two-way balancing accounts for CWSP and VM. These balancing account mechanisms and associated audit and reporting requirements give PG&E adequate resources and flexibility to address evolving needs related to wildfire

mitigation, yet provide full transparency and accountability into how PG&E spends CWSP-related and VM funds.

The 2020 WMP, Utility Survey and related attachments below are being submitted as part of a new process led by the CPUC Wildfire Safety Division (WSD). For this first iteration of the new format and approach, PG&E has attempted to provide all data, explanations and information requested as completely as possible, but we acknowledge that not all elements are complete. Consistent with the WSD's direction that this is an evolving process, PG&E will continue learning, iterating and improving our wildfire risk reduction efforts, in conjunction with stakeholders and partners, pursuing our shared goal to further reduce wildfire risks in the years ahead.

## C. Conclusion

The risk of catastrophic wildfires in California has increased dramatically over the past few years, and PG&E has transformed how we respond to that risk. We hold the safety of our customers, communities and workforce as our highest priority and have committed the Company to the effort of reducing the frequency, scope and impact of utility-caused wildfires. We have been working with many partners and parties to identify and implement effective methods to reduce wildfire ignitions and risk, reduce the impacts of PSPS events used to limit wildfire ignitions under extreme fire risk conditions, and to help our communities cope with these changes and challenges. PG&E will continue to implement and improve these efforts, working in concert with those we serve to lower the wildfire risk for all.

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# SECTION 1

# PERSONS RESPONSIBLE FOR EXECUTING THE WMP

## 1. Persons Responsible for Executing the Wildfire Mitigation Plan

*Provide an accounting of the responsibilities of the responsible person(s) executing the plan, including:*

1. *Executive level with overall responsibility*

2. *Program owners specific to each component of the plan*

*Ensure that the plan components described in (2) include an accounting for each of the* Wildfire Mitigation Plan (*WMP) sections and subsections.*

The following individuals have responsibilities for execution of Pacific Gas and Electric Company's (PG&E) 2020 WMP.

Executive Level Responsibility:

- Michael Lewis, Senior Vice President, Electric Operations

Program Owners for Each Component of Plan:

| Plan Component | Program Owner | WMP Section |
|---|---|---|
| Plan Objective, Wildfire Mitigation Strategy, WMP Implementation | Matthew Pender | 2.5, 4.1, 5.1, 5.2, 5.3, 5.10, 5.11, 6.6 |
| Metrics, Risk Analysis, Asset Allocation | Mark Esguerra | 2.1-2.4, 2.6, 2.7, 3.2, 3.4.2, 3.4.3, 4.2, 4.2.1, 4.3, 4.4, 5.3,1, 5.3.3, 5.3.7, 5.3.8, 5.4, 5.6.1, 6.2, 6.5 |
| PSPS, Situational Awareness, Grid Operations | Mark Quinlan | 3.1, 3.3, 3.4.1, 5.3.2, 5.3.6, 5.3.9, 5.6.2, 6.1, 6.3 |
| Vegetation Management | Michael Ritter | 5.3.5 |
| Mapping, Data Governance | Jay Singh | 2.7, 3.4.1, 5.3.7, 6.4 |
| Execution Risk | Jonathan Seager | 5.5 |
| Inspections | Mary Hvistendahl | 5.3.4 |
| Customer Support | Megan Ardell | 5.3.9 |
| Public Partnerships | Mary Ellen Ittner | 5.3.9 |

## Verifl :ation

I am an officer of the applicant corporation herein, and am authorized to make this verification on its behalf. The statements in tl1e foregoing document are true of my own knowledge, except as to matters which are therein stated on information or belief, and as to those matters I believe them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on t e.:'vr u-H (, b J..ui°at )!1\11 Fo ,n<iJLO , California.
(Date) (Name of city)

Michael O. Lewis SVP Electric Operations PG&E

(Signature and Title of Corporate Officer)

## 1.1 Explanation of Data and Formatting

The WMP Guidelines provided include thorough tables for the utilities to complete as part of their 2020 WMPs.[1] The 2020 WMP represents an entirely new format and approach to communicating about wildfire risk mitigation activities compared to what was submitted, reviewed, and approved in the 2019 WMP process. Driven by new legislation (e.g., Assembly Bill 1054) and the direction of the Wildfire Safety Division (WSD), this new format is itself an ongoing evolution in how the state discusses and reviews utility wildfire risk mitigation activities.

PG&E has attempted to the best of its ability to provide the information requested in the time allotted. Due to the relatively condensed period in which to complete the 2020 WMP in response to the WMP Guidelines and subsequent clarifications, there may be some areas where PG&E is unable to provide the requested data.

To assist the WSD and others in understanding PG&E's 2020 WMP, we are providing the following clarifications and explanations.

Additional Data

The WMP Guidelines direct the utilities to work with federal, state, and local agencies, stakeholders, and partners to collect or compile information that the utility has not collected and could not ascertain. Where the utility is unable to obtain information from third parties, the WMP Guidelines direct the utility to identify alternative data points. While PG&E was able to obtain supplemental information from other entities such as California Department of Forestry and Fire Protection, PG&E was not able to reach out to or obtain data from third parties in all situations.

Use of WMP Metrics

PG&E has provided WMP metrics and data requested by WSD. However, providing these metrics should not be interpreted as agreement that all of the requested metrics are useful or appropriate for the purposes of analyzing risk. For example, in some cases where WSD asked for 5-year historical averages, use of that average may not adequately reflect either a strong upward or downward trend, or extreme year-over-year variability.

Instructions and Additional Tables and Figures

To provide context to help understand the tables and narrative, PG&E has included the instructions from the WMP Guidelines in *italics* at the beginning of each section and table in the WMP.

In addition to the tables set forth in the WMP Guidelines, PG&E is also providing additional tables to explain various additional data or calculations that PG&E performed to complete the required tables. PG&E has included only the required WMP Guideline

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[1] The WMP Guidelines were included as Attachment 1 to the *Administrative Law Judge's Ruling on Wildfire Mitigation Plan Templates and Related Material and Allowing Comment*, Rulemaking 18-10-007 (December 16, 2019).

tables, not the PG&E-specific tables, in the excel files that it is posting with the WMP. The additional PG&E-specific tables are identified in the following format in the narrative:

**TABLE PG&E-SECTION#-TABLE#.**

For example, the second PG&E-specific table in Section 3 of the WMP would be TABLE PG&E-3-2.

Likewise, where PG&E has provided figures to supplement the narrative, these PG&E-specific figures are identified in the same format:

**FIGURE PG&E-SECTION#-FIGURE#.**

For example, the first figure in Section 2 of the WMP would be FIGURE PG&E-2-1.

Definition of Terms

Generally, PG&E relies upon the Glossary provided in the WMP Guidelines as a reference source for terminology used in the tables. Where PG&E uses other non-common terms or phrases, PG&E has attempted to define these terms in the narrative accompanying the charts or sections. In addition, please note that in contrast to the use of the term “transmission” in the WMP Guidelines, PG&E defines electric transmission lines as those lines 60 kilovolt and above.

Attachments

PG&E is providing the following attachments to its 2020 WMP on its website:

- Attachment 1: All Tables Required by the WMP Guidelines
- Attachment 2: List of Community Resource Centers per Section 5.6.2.2
- Attachment 3: List of Critical Facilities per Section 5.6.2.4 (CONFIDENTIAL)
- Attachment 4: PG&E’s Utility Survey Responses
- Attachment 5: Additional Detail on PG&E’s Utility Survey Responses
- Attachment 6: GIS Files

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# SECTION 2

# METRICS AND UNDERLYING DATA

# 2 Metrics and Underlying Data

*Instructions: Report performance on the following progress and outcome metrics within the utility's service territory over the past five years. Where a utility does not collect its own data for a given metric, that utility shall work with the relevant sources to collect the information for its service territory, and clearly identify the owner and dataset used to provide the response in "Comments" column.*

*Progress metrics, listed below, track how much utility wildfire mitigation activity has managed to change the conditions of utility wildfire risk exposure in terms of drivers of ignition probability.*

*Outcome metrics measure the performance of a utility and its service territory in terms of both leading and lagging indicators of wildfire risk, PSPS risk, and other direct and indirect consequences of wildfire and PSPS, including the potential unintended consequences of wildfire mitigation work.*

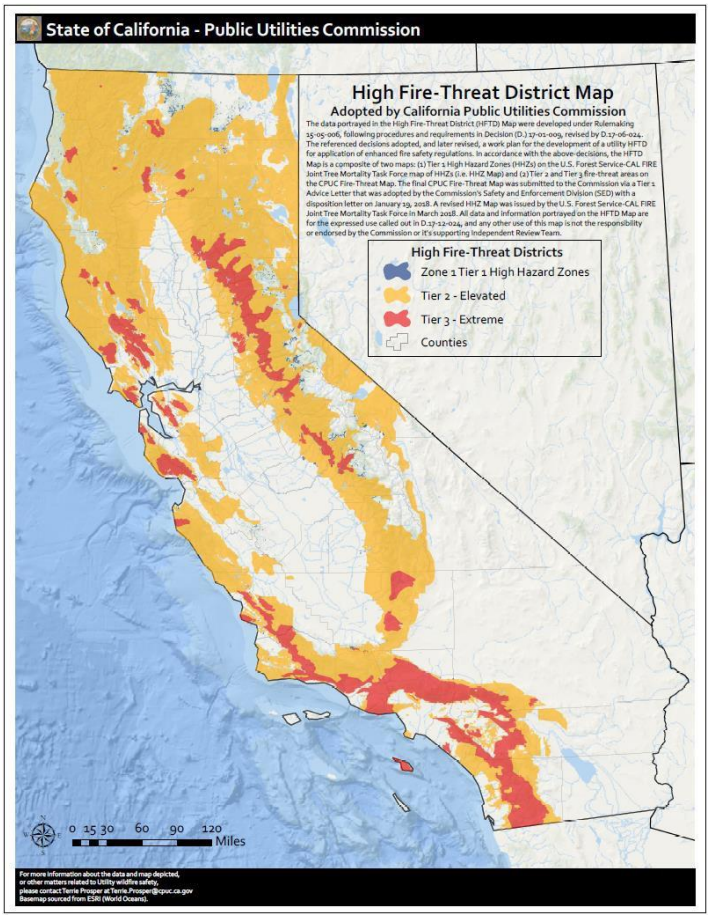
*In the 2019 WMPs, utilities proposed sets of "program targets" that enable tracking implementation of proposed wildfire mitigation activities against the scope of those activities as laid out in the WMPs but do not track the efficacy of those activities. Utilities shall continue to report program targets, however, the primary use of these will be to gauge follow-through on WMPs while recognizing that some WMP initiatives should be adjusted after plan submittal based on new information and lessons learned.*

## 2.1 Lessons Learned: How Tracking Metrics on the 2019 Plan Has Informed the 2020 Plan

*Describe how the utility's plan has evolved since the 2019 WMP submission. Outline any major themes and lessons learned from the 2019 plan and subsequent implementation of the initiatives. In particular, focus on how utility performance against the metrics used has informed the utility's 2020 WMP.*

PG&E is continuously reviewing, evaluating, and modifying as needed the programs described in PG&E's 2019 Wildfire Mitigation Plan (2019 WMP) and now in this 2020 Wildfire Mitigation Plan (2020 WMP). PG&E's 2019 WMP focused on measures that would reduce the risk that PG&E facilities would cause wildfires and create public safety risks, specifically in High Fire Threat District (HFTD) areas. HFTD areas are defined by the map adopted by the California Public Utilities Commission (CPUC or Commission) in January 2018. The HFTD map is reprinted below in Figure PG&E-2-1.

**FIGURE PG&E-2-1: CPUC 2018 FIRE-THREAT MAP**




HFTD areas include:

- Tier 3 – Extreme Fire Risk areas
- Tier 2 – Elevated Fire Risk areas
- Zone 1 – United States Forest Service (USFS) and CAL FIRE Tree Mortality High Hazard areas not included in Tier 3 or Tier 2.

Over 50% of PG&E's service territory is in HFTD areas. Thus, PG&E's 2019 WMP focused on mitigating fire threat in these areas. The major themes and lessons learned from the 2019 WMP are as follows:

- The execution of the combined 2019 WMP was successful in mitigating catastrophic wildfires in the PG&E service territory;
- Ignitions were reduced by 24% from 2018;
- The increased coverage from installed weather stations improved the accuracy of meteorology models and the capabilities of the Wildfire Safety Operations Center (WSOC);

- Extreme hazard weather conditions were severe during the 2019 fire season, and Public Safety Power Shutoff (PSPS) events were highly effective at reducing the risk of vegetation or other flammable items contacting live wires and starting fires; and

- PG&E gained a better appreciation of the burden PSPS places upon affected customers and communities, and is committed to reducing the frequency, scope, and duration of PSPS events.

The 2019 WMP metrics focused on the completion of inspections and the resolution of high priority identified items, as well as the implementation of wildfire risk mitigation activities such as enhanced vegetation management and system hardening. PG&E provided to the Commission and stakeholders on January 15, 2020 in *Pacific Gas and Electric Company's Updated Progress Report of Wildfire Mitigation Plan* a detailed summary of the initiatives, commitments, and metrics in the 2019 WMP and how PG&E performed.[1]

Based on its experience preparing and implementing the 2019 WMP, as well as feedback from the Commission and stakeholders, PG&E has expanded focus of its wildfire safety programs. PG&E's 2020 WMP is focused on three key areas: reducing the potential for fires to be started by electrical equipment, reducing the potential for fires to spread, and minimizing the frequency, scope and duration of PSPS events. The 2020 WMP metrics are more focused on the system performance areas that the analysis and inspections during 2019 indicate are the key measures for electric system safety from a wildfire perspective.

For example, the 2019 Wildfire Safety Inspection Program (WSIP) resulted in essential findings about components in HFTD areas that could pose a risk of fire ignition. The cutting-edge use of aerial technology in combination with visual inspections resulted the ability to address potential areas of failure in a timely fashion. In addition to PG&E's routine maintenance program, in 2019 PG&E performed new, enhanced inspections of all transmission, distribution, and substation structures in the HFTD areas within its service area. PG&E's 2019 WSIP included all approximately 750,000 poles and structures in the HFTD areas and identified needed maintenance and replacement. Building on this foundation, PG&E is incorporating the enhanced inspection processes and tools into routine compliance inspection and maintenance and using risk-informed maintenance cycles going forward. For example, in 2020, PG&E will use this methodology in conducting annual inspections of all facilities in HFTD Tier 3 areas and one-third of Tier 2 facilities.

Similarly, PG&E has modified the scope of its Enhanced Vegetation Management (EVM) Program for 2020. In 2019, PG&E's contractors and crews managed to surpass the ambitious goal of nearly 2,500 miles of EVM, while including assessments and re-work under the scrutiny of both 100% work validation and a quality assurance program. In 2020, PG&E currently plans to use EMV on approximately 1,800 line-miles in order to reflect insights gained from the 2019 WMP efforts and allow PG&E to most effectively

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1 The 2019 WMP progress report is available on the CPUC's website at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2020/R1810007%20PGE%20WMP%20Status%20Update%201-15-20.pdf.

manage resources. For example, PG&E's experience in 2019 has led PG&E to shift some EVM work from distribution to lower voltage transmission lines to reduce the impact of PSPS events. After the 2019 wildfire season, PG&E has a better understanding of the burden PSPS events place on customers. One major factor on the scope of PSPS events is the number of transmission lines included within the footprint of the event, as transmission lines have outsized impacts on downstream communities that may otherwise be outside of the PSPS area. To reduce that impact, PG&E is adding a new vegetation management program in the 2020 WMP, which will focus on expanding transmission right of way clearing for 60, 70, and 115 kV transmission lines. This will help to minimize the frequency, scope, and duration of PSPS events.

These are just two examples of how PG&E's performance against metrics in the 2019 WMP have helped inform the 2020 WMP. Each of the 2020 WMP program, including learnings from 2019, are described in more detail in Section 5. By evaluating PG&E's experience implementing wildfire mitigation measures, incorporating feedback from customers, communities, and industry experts, and building upon PG&E's programs, PG&E will continue to enhance and improve PG&E's wildfire mitigation programs to better prevent wildfires from occurring and protect the public.

## 2.2 Recent Performance on Progress Metrics, Last 5 Years

*Instructions for Table 1:*

*Report performance on the following metrics within the utility's service territory over the past five years. Where the utility does not collect its own data on a given metric, the utility shall work with the relevant state agencies to collect the relevant information for its service territory, and clearly identify the owner and dataset used to provide the response in the "Comments" column.*

## TABLE 1-1: RECENT PERFORMANCE ON PROGRESS METRICS, LAST 5 YEARS

| # | Progress metric name | Annual performance | | | | | Unit(s) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 1 | Grid condition findings from inspection – Distribution | 0.434553 | 0.580677 | 0.591185 | 0.577253 | 6.910547 | Number of Level 1, 2, and 3 findings per mile of circuit in HFTD, and per total miles of circuit for each of the following inspection types: | No Comments |
| | | 0.000118 | 0.000236 | 0.041991 | 0.009524 | 0.014522 | Number of level 1 findings (A tags) per mile of circuit in HFTD (Zone 1, Tier 2 & Tier 3 combined) | |
| | | 0.013066 | 0.009327 | 0.013656 | 0.022117 | 0.175954 | Number of level 2 findings (B tags) per mile of circuit in HFTD (Zone 1, Tier 2 & Tier 3 combined) | |
| | | 0.421370 | 0.571114 | 0.535537 | 0.545612 | 6.720071 | Number of level 3 findings (E+F tags) per mile of circuit in HFTD (Zone 1, Tier 2 & Tier 3 combined) | |
| | | 0.000984 | 0.001535 | 0.058284 | 0.234986 | 0.035931 | Number of level 1 findings (A tags) per mile of total circuit | |
| | | 0.062810 | 0.053483 | 0.070327 | 0.085006 | 0.314207 | Number of level 2 findings (B tags) per mile of total circuit | |
| | | 1.395317 | 1.704329 | 1.451082 | 1.383038 | 7.976348 | Number of level 3 findings (E+F tags) per mile of total circuit | |
| 2 | Vegetation clearance findings from inspections | 2362 | 2792 | 3217 | 4815 | 37807 | Trees identified as being currently, or at risk in the near future, of being out of compliance. | PG&E does not track the precise data requested; the closest available estimate has been provided. (See comment below tables) |
| | | 1,545,000 | 1,545,000 | 1,545,000 | 1,545,000 | 1,545,000 | Total # of Overhead Distribution Primary Spans in the system | |
| | | 0.20% | 0.20% | 0.20% | 0.30% | 2.40% | Estimated Percentage of electric distribution spans with non-compliant clearance | |
| 3 | Extent of grid modularization | N/A | N/A | N/A | N/A | 1.767 | HFTD All Devices/Mile | "Sectionalizing devices" defined as Overhead Switches, Fuses, Reclosers, Sectionalizers, TripSavers, FuseSavers.<br>"Circuit miles? Defined as all overhead primary lines and excludes underground primary lines.<br>Calculated data is defined as Overhead Devices per Overhead Mile. |
| | | N/A | N/A | N/A | N/A | 0.064 | HFTD SCADA Devices/Mile | |
| | | N/A | N/A | N/A | N/A | 3.231 | Non-HFTD All Devices/Mile | |
| | | N/A | N/A | N/A | N/A | 0.126 | Non-HFTD SCADA Devices/Mile | |
| 4 | 4 Data collection and reporting | | | | | 60.2% | Percent of data requested in SDR and WMP collected in initial submission | The 2019 percent collected is for the data provided in the WMP Tables 1-31 (submitted on 2/7/2020) and does not include the SDR. Data considered to be N/A or TBD for any reason, for example not currently available or not feasible, is included/was not removed from the calculation. |

**Item 2 Comments (1-1 Distribution)** – PG&E does not track the precise data requested as PG&E's vegetation management data is generally tracked by tree. Therefore the closest available data has been provided with an estimated translation to the "Percentage of right-of-way with noncompliant clearance" data that was requested. PG&E vegetation management pre-inspectors identify a tree that is currently violating minimum clearance distances, or may violate minimum clearance in the near future, with a special designation of being a "Hazard Notification" (HN). Not all HNs represent actively non-compliant trees, as in many cases the tree is currently compliant but may be at risk of violating minimum clearances before the normal tree work cycle can be completed. Nonetheless, HNs are the best estimate PG&E has for the number of trees that were identified as being inside or near the minimum clearance requirements and have been provided above as the "Trees identified as being currently, or at risk in the near future, of being out of compliance" data.
(1) This estimate for the number of electric overhead spans has been determined by assuming an average span length (distance between poles) of 275 feet. Therefore the ~80,560 miles of overhead distribution circuit miles (425,356,800 feet) divided by 275 feet per span results in 1,546,752 total spans, or ~1,545,000 for the purposes of this estimate.

**TABLE 1-2: RECENT PERFORMANCE ON PROGRESS METRICS, LAST 5 YEARS**

| # | Progress metric name | Annual performance | | | | | Unit(s) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 1 | Grid condition findings from inspection – Transmission | 0.523258 | 0.687421 | 0.419910 | 0.926878 | 10.638552 | Number of Level 1, 2, and 3 findings per mile of circuit in HFTD, and per total miles of circuit for each of the following inspection types: | No Comments |
| | | 0.018100 | 0.005792 | 0.009774 | 0.003620 | 0.037466 | Number of level 1 findings (A tags) per mile of circuit in HFTD (Zone 1, Tier 2 & Tier 3 combined) | |
| | | 0.037828 | 0.021357 | 0.027873 | 0.030226 | 0.873484 | Number of level 2 findings (B tags) per mile of circuit in HFTD (Zone 1, Tier 2 & Tier 3 combined) | |
| | | 0.467330 | 0.660271 | 0.382262 | 0.893032 | 9.727602 | Number of level 3 findings (E+F tags) per mile of circuit in HFTD (Zone 1, Tier 2 & Tier 3 combined) | |
| | | 0.038069 | 0.011862 | 0.014014 | 0.006179 | 0.030731 | Number of level 1 findings (A tags) per mile of total circuit | |
| | | 0.059697 | 0.057710 | 0.061683 | 0.061021 | 0.416055 | Number of level 2 findings (B tags) per mile of total circuit | |
| | | 0.565352 | 0.543614 | 0.436138 | 0.711062 | 4.011200 | Number of level 3 findings (E+F tags) per mile of total circuit | |

**Comments for Table 1:**

- **Item 1.a. Description - Grid condition findings from inspection – Transmission (T) and Distribution (D)**

  Item 1.a. Comments-The following TABLE PG&E-2-1 summarizes PG&E Distribution overhead (OH) and Transmission OH line mile data, which was used throughout this WMP, including to calculate the per line mile data:

**TABLE PG&E-2-1: PG&E OH Line Miles**

| HFTD Area | D-OH Line Miles (approx.) | T-OH Line Miles (approx.) |
|---|---|---|
| Tier 3 | 7,100 | 1,300 |
| Tier 2 | 18,200 | 4,200 |
| Zone 1 | 110 | 25 |
| Non-HFTD Area Tier 1 | 55,300 | 12,600 |
| Total | 80,710 | 18,125 |

## 2.3 Recent Performance on Outcome Metrics, Annual and Normalized for Weather, Last 5 Years

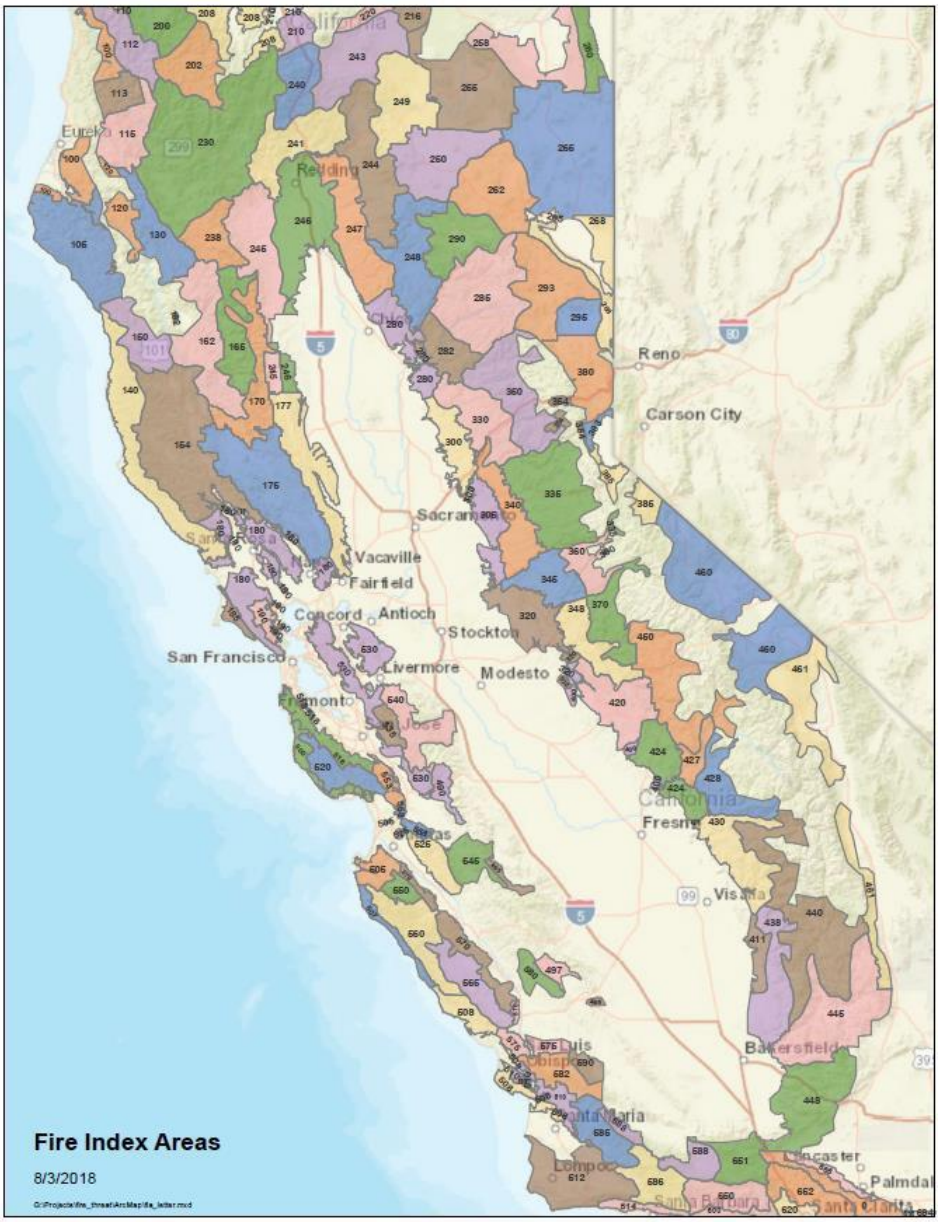
*Instructions for Table 2:*

*Report performance on the following metrics within the utility's service territory over the past five years. Where the utility does not collect its own data on a given metric, the utility shall work with the relevant state agencies to collect the relevant information for its service territory, and clearly identify the owner and dataset used to provide the response in "Comments" column.*

*Provide a list of all types of findings and number of findings per type, in total and in number of findings per circuit mile.*

Various Tables in the WMP, including Items 1.b., 1.d., 3.b., 3.d., 4.b., 7.b., 8.b., 9.b., 10.b., and 11.b., of TABLE 2 and Metrics 1A, 1B, 2A, 2B, 3A, 3BA, 5A, and 5B of Table 3-1, seek event or incident data per Red Flag Warning (RFW) Days or normalized by RFW circuit mile day per year. In order to perform these calculations, PG&E derived the RFW Day Overhead (OH) circuit miles for transmission and distribution as follows: First, PG&E identified every day when there was a RFW for a portion of PG&E's service area. Then PG&E determined whether each RFW covered one or more Fire Impact Areas (FIA). The FIAs represent geographic areas within PG&E's service area across Tier 2 and 3 of the CPUC's HFTD map where PG&E has overhead electric transmission or distribution equipment. PG&E Meteorology determines the fire potential index for each FIA based on fire weather and fuels. Figure PG&E-2-2, below, represents a map of the FIAs.

**FIGURE PG&E-2-2: FIRE IMPACT AREA (FIA) MAP**




For each FIA covered by a RFW, PG&E determined the associated overhead distribution and transmission circuit miles for each FIA and the total number of hours of that RFW. (Since the overhead system is represents a greater fire risk in comparison to an underground system, overhead T&D circuit miles were used in this calculation instead of the combined overhead and underground T&D circuit miles. In addition, this distinction allows these same values to be used when normalizing the T&D wire down event results for Item 1.d. Moreover, the area covered by a RFW may be larger than the identified FIAs. However, since the combination of FIAs is aligned with the Tier 2 and Tier 3 HFTD areas, PG&E has quantified the RFW Days for the Tier 2 and Tier 3 HFTD areas, which represent the greatest wildfire risk.) PG&E then determined the RFW day value by dividing total RFW hours by 24 hours. PG&E then multiplied the total distribution and transmission circuit miles for each FIA by the total RFW days for

that FIA and summed the totals for all FIAs to arrive at the total overhead circuit miles within HFTD Tier 2 and 3.

The resulting RFW circuit mile (within HTFD Tier 2 and Tier 3) day per year values are set forth in Table PG&E-2-2:

**TABLE PG&E-2-2: Annual Days RFW Circuit Mile**

| RFW Day - OH Circuit Miles (T&D Combined) | | | | |
|---|---|---|---|---|
| **2015** | **2016** | **2017** | **2018** | **2019** |
| 63,304 | 89,832 | 471,375 | 522,855 | 360,281 |

PG&E supports this methodology to determine the RFW circuit mile day per year values. However, to most accurately use this data and metrics to evaluate changes in wildfire risk, this data should not be applied against system-wide, annual data. Instead the appropriate, consistent data to be normalized against RFW Days or circuit mile day per year comprises data for events or incidents within the wildfire threat areas, as reflected by the CPUC's HFTD map (Figure PG&E-2-1, above), and data for events or incidents that occur during RFW hours. Otherwise the evaluation risks capturing inapplicable events and throwing off the calculation. Wildfire risks are differentiated across California. PG&E's 2020 WMP reflects that differentiation by tailoring its wildfire mitigation programs to reduce the fire risks within the areas identified as having the most significant fire risks in the CPUC's HFTD map, the HFTD Tier 2 and Tier 3 areas (as shown in Figure PG&E-2-1, above). Therefore, the effectiveness of these programs should be based on both the past and future performance within the HFTD Tier 2 and Tier 3 areas.

Likewise, since weather will vary, these results should also be normalized based on the weather, such as by using the hours involved with RFW Days. Otherwise the calculation will include events that do not reflect or affect wildfire risk. For example, wires down events that occur in Tier 1 areas, such as cities, would not likely increase wildfire risk. Likewise, wires down events that occur in the middle of a wet winter due to a major rainstorm also would not increase wildfire risk. In other words, when normalizing the result by RFW Days, the measured events should be those that occur during RFW hours within the HFTD Tier 2 and Tier 3 areas, not rather than normalizing for all events that occur within the entire service territory. While PG&E has attempted to perform the RFW calculations and normalizations, as required by the tables, PG&E cautions against using these calculations without further limiting the data to be normalized to events or incidents within the HTFD areas that occur during RFD hours.

**TABLE 2: RECENT PERFORMANCE ON OUTCOME METRICS, LAST 5 YEARS**

| Metric type | # | Outcome metric name | Annual performance | | | | | Unit(s)[1] | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 1. Near misses | 1.a. | Number of all events (such as unplanned outages, faults, conventional blown fuses, etc.) that could result in ignition, by type according to utility-provided list (total) | D = 37,072<br>T = 1,178 | D = 36,244<br>T = 835 | D = 49,442<br>T = 1,269 | D = 33,122<br>T = 944 | D = 44,568<br>T = 1,537 | Number per year<br><br>**Note**: The D indicates the Distribution events and the T indicates Transmission events. The total below the double lines represent the total T&D events. | See comments section. |
| | | | 38,250 | 37,079 | 50,711 | 34,066 | 46,105 | | |
| | 1.b. | Number of all events (such as unplanned outages, faults, conventional blown fuses, etc.) that could result in ignition, by type according to utility-provided list (normalized) | 0.6042 | 0.4128 | 0.1076 | 0.0652 | 0.1280 | Number per RFW circuit mile day per year | See comments section. |
| | 1.c. | Number of wires down (total) | D = 3,788<br>T = 65 | D = 4,285<br>T = 70 | D = 7,244<br>T = 44 | D = 3,532<br>T = 96 | D = 6,280<br>T = 47 | Number of wires down per year<br><br>**Note**: The D indicates the Distribution events and the T indicates Transmission events. The total below the double lines represent the total T&D events. | See comments section. |
| | | | 3,853 | 4,355 | 7,288 | 3,628 | 6,327 | | |
| | 1.d. | Number of wires down<br><br>(normalized) | 0.06087 | 0.04848 | 0.01546 | 0.00694 | 0.01756 | Number per RFW circuit mile day per year | See comments section. |

**TABLE 2: RECENT PERFORMANCE ON OUTCOME METRICS, LAST 5 YEARS (CONTINUED)**

| Metric type | # | Outcome metric name | Annual performance | | | | | Unit(s) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 2. Utility inspection findings | 2.a. | Number of Level 1 findings that could increase the probability of ignition discovered per circuit mile inspected | EC 3<br>LC 0 | EC 6<br>LC 3 | EC 1007<br>LC 46 | EC 172<br>LC 25 | EC 339<br>LC 140 | Average number of Level 1 findings that could increase the probability of ignition discovered by all inspections per circuit mile per year | EC represents Distribution notifications, and LC represents Transmission notifications.<br><br>Level 1 = Priority A notifs<br><br>HFTD Notifs only, for FDAs that have been identified as time-based deterioration field conditions. |
| | 2.b. | Number of Level 2 findings that could increase the probability of ignition discovered per circuit mile inspected | EC 6513<br>LC 12 | EC 10395<br>LC 281 | EC 9104<br>LC 787 | EC 10578<br>LC 2580 | EC 173229<br>LC 32177 | Average number of Level 2 findings that could increase the probability of ignition discovered by all inspections per circuit mile per year | Level 2 = B & E Priority notifs.<br><br>HFTD Notifs only, for FDAs that have been identified as time-based deterioration field conditions. |

**TABLE 2: RECENT PERFORMANCE ON OUTCOME METRICS, LAST 5 YEARS (CONTINUED)**

| Metric type | # | Outcome metric name | Annual performance | | | | | Unit(s) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| | 2.c. | Number of Level 3 findings that could increase the probability of ignition discovered per circuit mile inspected | EC 4526<br>LC 6 | EC 4354<br>LC 20 | EC 4851<br>LC 68 | EC 3848<br>LC 491 | EC 1999<br>LC 343 | Average number of Level 3 findings that could increase the probability of ignition discovered by all inspections per circuit mile per year | Level 3 = Priority F notifs.<br><br>HFTD Notifs only, for FDAs that have been identified as time-based deterioration field conditions. |
| 3. Customer hours of PSPS and other outages | 3.a. | Customer hours of planned outages including PSPS (total) | 1,400,185 | 1,390,308 | 1,513,383 | 4,015,315 | 101,222,207 | Total customer hours of planned outages per year | See comments section. |
| | 3.b. | Customer hours of planned outages including PSPS (normalized) | 22.12 | 15.48 | 3.21 | 7.68 | 280.95 | Total customer hours of planned outages per RFW circuit mile day per year | See comments section. |
| | 3.c. | Customer hours of unplanned outages, not including PSPS (total) | 11,961,889 | 9,745,978 | 32,897,043 | 24,597,247 | 28,981,976 | Total customer hours of unplanned outages per year | See comments section. |
| | 3.d. | Customer hours of unplanned outages, not including PSPS (normalized) | 188.96 | 108.49 | 69.79 | 47.04 | 80.44 | Total customer hours of unplanned outages per RFW circuit mile day per year | See comments section. |
| | 3.e. | Increase in System Average Interruption Duration Index (SAIDI) | - 2.1 | - 25.2 | 252.4 | - 64.9 | 1,088.3 | Change in minutes compared to the previous year | See comments section. |

**TABLE 2: RECENT PERFORMANCE ON OUTCOME METRICS, LAST 5 YEARS (CONTINUED)**

| Metric type | # | Outcome metric name | Annual performance | | | | | Unit(s) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 4. Utility ignited wildfire fatalities | 4.a. | Fatalities due to utility-ignited wildfire (total) | 2 | 0 | 22 | 85 | 0 | Number of fatalities per year | See comments section. |
| | 4.b. | Fatalities due to utility-ignited wildfire (normalized) | 0.000032 | 0 | 0.000047 | 0.000163 | 0 | Number of fatalities per RFW circuit mile day per year | See comments section. |
| 5. Accidental deaths resulting from utility wildfire mitigation initiatives | 5.a. | Deaths due to utility wildfire mitigation activities (total) | – | – | – | 0 | 1 | Number of fatalities per year | Fatality represents a contractor accident during WSIP work. |
| 6.OSHA-reportable injuries from utility wildfire mitigation initiatives | 6.a. | OSHA-reportable injuries due to utility wildfire mitigation activities (total) | – | – | – | 0 | 28 | Number of OSHA-reportable injuries per year | |
| | 6.b. | OSHA-reportable injuries due to utility wildfire mitigation activities (normalized) | – | – | – | 0 | 0.894 | Number of OSHA-reportable injuries per year per 1000 line miles of grid | Per 1000 miles of HFTD grid |
| 7. Value of assets destroyed by utility- ignited wildfire, listed by asset type | 7.a. | Value of assets destroyed by utility-ignited wildfire (total) | $895.5M | $880k | $25.5B | $36k | $39k | Dollars of damage or destruction per year | See comments section. |
| | 7.b. | Value of assets destroyed by utility-ignited wildfire (normalized) | $14,146 | $9.79 | $54.01k | $0.69 | $0.11 | Dollars of damage or destruction per RFW circuit mile day per year | See comments section. |
| 8. Structures damaged or destroyed by utility- ignited wildfire | 8.a. | Number of structures destroyed by utility-ignited wildfire (total) | 965 | 0 | 2,299 | 18,805 | 374 | Number of structures destroyed per year | See comments section. |
| | 8.b. | Number of structures destroyed by utility-ignited wildfire (normalized) | 0.015244 | 0 | 0.004877 | 0.035966 | 0.0010381 | Number of structures destroyed per RFW circuit mile day per year | See comments section. |

**TABLE 2: RECENT PERFORMANCE ON OUTCOME METRICS, LAST 5 YEARS (CONTINUED)**

| Metric type | # | Outcome metric name | Annual performance | | | | | Unit(s) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 9. Acreage burned by utility-ignited wildfire | 9.a. | Acreage burned by utility-ignited wildfire (total) | 1,690 | 1,102 | 170,455 | 167,162 | 79,950 | Acres burned per year | See comments section. |
| | 9.b. | Acreage burned by utility-ignited wildfire (normalized) | 0.026697 | 0.012267 | 0.361612 | 0.319710 | 0.221910 | Acres burned per RFW circuit mile day per year | See comments section. |
| 10. Number of utility wildfire ignitions | 10.a. | Number of ignitions (total) according to existing ignition data reporting requirement | 12 | 9 | 35 | 20 | 21 | Number per year | See comments section. |
| | 10.b. | Number of ignitions (normalized) | 0.0001896 | 0.0001002 | 0.0000743 | 0.0000383 | 0.0000583 | Number per RFW circuit mile day per year | See comments section. |
| | 10.c. | Number of ignitions in HFTD (subtotal) | 4 | 6 | 18 | 20 | 5 | Number in HFTD per year | See comments section. |
| | 10.c.i. | Number of ignitions in HFTD Zone 1 | 0 | 0 | 0 | 13 | 0 | Number in HFTD Zone 1 per year | See comments section. |
| | 10.c.ii. | Number of ignitions in HFTD Tier 2 | 2 | 5 | 14 | 6 | 5 | Number in HFTD Tier 2 per year | See comments section. |
| | 10.c.iii. | Number of ignitions in HFTD Tier 3 | 2 | 1 | 4 | 1 | 0 | Number in HFTD Tier 3 per year | See comments section. |
| | 10.d. | Number of ignitions in HFTD (subtotal, normalized) | 0.0000632 | 0.0000668 | 0.0000382 | 0.0000383 | 0.0000139 | Number in HFTD per RFW circuit mile day per year | See comments section. |
| | 10.d.i. | Number of ignitions in HFTD Zone 1 (normalized) | 0 | 0 | 0 | 0.0000249 | 0 | Number in HFTD Zone 1 per RFW circuit mile day per year | See comments section. |
| | 10.d.ii. | Number of ignitions in HFTD Tier 2 (normalized) | 0.0000316 | 0.0000557 | 0.0000297 | 0.0000115 | 0.0000139 | Number in HFTD Tier 2 per RFW circuit mile day per year | See comments section. |

**TABLE 2: RECENT PERFORMANCE ON OUTCOME METRICS, LAST 5 YEARS (CONTINUED)**

| Metric type | # | Outcome metric name | Annual performance | | | | | Unit(s) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| | 10.d.iii. | Number of ignitions in HFTD Tier 3 (normalized) | 0.0000316 | 0.0000111 | 0.0000085 | 0.0000019 | 0 | Number in HFTD Tier 3 per RFW circuit mile day per year | See comments section. |
| | 10.e. | Number of ignitions in non-HFTD (subtotal) | 8 | 3 | 17 | 0 | 16 | Number in non-HFTD per year | See comments section. |
| | 10.f. | Number of ignitions in non-HFTD (normalized) | 0.0001264 | 0.0000334 | 0.0000361 | 0 | 0.0000444 | Number in non-HFTD per RFW circuit mile day per year | See comments section. |
| 11. Critical infrastructure impacted | 11.a. | Critical infrastructure impacted by PSPS | 0 | 0 | 0 | 23,257 | 577,060 | Number of critical infrastructure (in accordance with D.19-05-042) locations impacted per hour multiplied by hours offline per year | |
| | 11.b. | Critical infrastructure impacted by PSPS (normalized) | 0 | 0 | 0 | < 0.01 | 1.60 | Number of critical infrastructure (in accordance with D.19-05-042) locations impacted per hour multiplied by hours offline per RFW circuit mile day per year | |

Notes for Table 2:

1. The chart in the excel files will include the totals only, no the individual T and D numbers.

**Comments for Table 2: Item 1 - Near Misses**

- **Item 1.a. Description -** Number of all events (such as unplanned outages, faults, conventional blown fuses, etc.) that could result in ignition, by type according to utility-provided list (total) – Number per year

  **Item 1.a. Comments** – Determining whether a specific event could result in an ignition depends upon a wide variety of factors, including the nature of the event itself and prevailing environmental conditions (e.g., weather, ground moisture level, time of year). As PG&E does not have complete information to make this determination for each event, PG&E relies upon the following proxy to derive these numbers. Most distribution outages (momentary and sustained) and transmission line path interruptions typically involve a fault condition. Thus, for purposes of this response, PG&E assumes all distribution outages and transmission interruptions could potentially result in an ignition, regardless of other prevailing conditions. PG&E has utilized its historical outage event information to provide the results used for item 1.a., which includes all distribution momentary and sustained outages and transmission line path interruptions for each year. The following should also be noted:

  - Planned/Wildfire Mitigation outages and PSPS events generally do not involve fault conditions and have been excluded from these results for distribution. However, the numbers for transmission in Table 2 do include PSPS events, and as needed can be excluded using Table 11.2 where these PSPS events are itemized as “Other-safety clearance.”

  - Further details of these events are outlined in Tables 11.1 (distribution) and 11.2 (transmission).

  - Since the distribution outage data was downloaded in early January 2020, all 2019 outage results do not have the benefit of PG&E’s electric outage review process that is typically performed a few weeks after the year end, so the final reviewed numbers may vary from the numbers reported here. However, the transmission data have been reviewed and no further changes are anticipated at the time of this submittal.

- **Item 1.b. Description** - Number of all events (such as unplanned outages, faults, conventional blown fuses, etc.) that could result in ignition, by type according to utility-provided list (total) – Number per Red Flag Warning (RFW) circuit mile day per year

  **Item 1.b. Comments** –The provided data for Item 1.b. was derived by taking the annual data provided in Item 1.a. and dividing by a corresponding/calculated number of RFW circuit mile day per year value as summarized in Table PG&E-2-2 below. As discussed above in the introduction to Table 2, however, PG&E does not recommend normalizing the data in Item 1.a., which covers PG&E’s entire service area across the entire year, by the numbers in Table PG&E-2-2.

**TABLE PG&E-2-2: ANNUAL RFW DAYS – OH CIRCUIT MILES (T&D COMBINED)**

| RFW Day - OH Circuit Miles (T&D Combined) | | | | |
|---|---|---|---|---|
| **2015** | **2016** | **2017** | **2018** | **2019** |
| 63,304 | 89,832 | 471,375 | 522,855 | 360,281 |

- **Item 1.c. Description** - Number of wires down (total)

  **Item 1.c. Comments** - PG&E has utilized its historical outage event information to provide the results used for item 1.c., which includes both distribution and transmission wire down events and which represents a subset of the Item 1.a. results. By PG&E's current definition, distribution wire down events result in an actual outage event on the primary distribution system. However, for the purpose of providing the data used for this item, PG&E has also included secondary and service related wire down events reported within its Integrated Logging Information System-Operations Data Base (ILIS-ODB) outage database.

- **Item 1.d Description** - Number of wires down (normalized)

  **Item 1.d. Comments** - The provided data for Item 1.d. was derived by taking the annual results noted as Item 1.c. and dividing by the corresponding/calculated annual number of RFW circuit mile day per year values as summarized in Table PG&E-2-2 above. As mentioned, these values are based on the T&D overhead circuit miles and are therefore better aligned with the provided T&D overhead wire down events.

**Comments for Table 2: Item 3 – Customer hours of PSPS and other outages**

- **Item 3.a. Description** - Customer hours of planned outages including PSPS (total)

  **Item 3.a. Comments** – PG&E's ILIS-ODB outage database was used to provide the combined customer hours of both planned and PSPS outage events in the table. It should be noted that these results are a summary of the entire year and that the planned outages are not related to the RFW Days.

- **Item 3.b. Description** - Customer hours of planned outages including PSPS (normalized)

  **Item 3.b. Comments** - The provided data for Item 3.b. was derived by taking the annual results noted as Item 3.a. and dividing by a corresponding/calculated annual number of RFW circuit mile day per year values as summarized in Table PG&E-2-2 above. As previously mentioned, the Table PG&E-2-2 values are based on the T&D overhead circuit miles.

- **Item 3.c. Description** - Customer hours of unplanned outages, not including PSPS (total)

**Item 3.c. Comments** - PG&E's ILIS-ODB data base was used to provide the customer hours of unplanned outages, not including PSPS outage events (total). It should be noted that these results are a summary of the entire year and that not all of the unplanned outages are related to the RFW Days.

- **Item 3.d. Description** - Customer hours of unplanned outages, not including PSPS (normalized)

  **Item 3.d. Comments** - The provided data for Item 3.d. was derived by taking the annual results noted as Item 3.c. and dividing by a corresponding/calculated annual number of RFW circuit mile day per year values as summarized in Table PG&E-2-2 above. As mentioned, the Table PG&E-2-2 values are based on the T&D overhead circuit miles.

- **Item 3.e. Description** - Increase in System Average Interruption Duration Index (SAIDI)

  **Item 3.e. Comments** - Since the overall "Metric type" noted for this metric is noted as, "Customer hours of PSPS and other outages, this group of questions was interpreted as asking for the SAIDI values based on all T&D unplanned and planned outages combined and including Major Event Days (MEDs). As such, PG&E's ILIS-ODB was used to show the annual SAIDI difference compared from each prior year from 2014 to 2019. In addition, the following should be noted:

  - System reliability performance metrics typically exclude Major Events Days as defined per the IEEE Standard 1366, titled, "IEEE Guide for Electric Power Distribution Reliability Indices."

  - PSPS events are typically large enough to meet the Major Event Day threshold as defined in the IEEE 1366 standard.

**Comments for Table 2, Items 4a, 4b, 7-10f**

The data in Table 2 is derived from ignitions that are linked to a wildfire, which is defined as a fire greater than 10 acres in size**.**

The statistics were normalized by dividing the 2015, 2016, 2017, 2018, and 2019 counts by the "RFW Circuit Mile Day Per Year" totals of 159,160; 175,945; 812,989; 850,940; 584,319, respectively, per Table PG&E-2-2, above.

- **Items 4.a and 4.b** - PG&E is providing in the above table data for 2015 through 2019 for wildfires that CAL FIRE concluded were caused by PG&E equipment.

- **Items 7.a. and 7.b.** - PG&E is providing in the above table data for all 2015-2019 wildfires that involve disputes regarding destroyed assets that have settled. These settlements are lump sum settlements that do not break out the settlement dollars by damage category. In addition, the settlements reached related to the 2017 North Bay Fires and the 2018 Camp Fire (other than the settlement with the cities and counties) do not break out the settlement dollars by fire. Any attempt to break out the dollars by fire and/or damage category would be speculative and inaccurate. The settlements are totaled based on the year of the fire. The one

exception is the 2018 Camp Fire which is reported with the 2017 North Bay Fires for the reasons described above. The chart does not include 2015-2019 wildfires that have not settled, which remain under investigation and/or civil discovery on causation issues, damages issues, or both.

- **Items 8.a., 8.b., 9.a, and 9.b. and 10** - The 2015 through 2018 ignition data is primarily based on fire incident reports filed with the CPUC annually in accordance with D.14-02-015. These reports include fire incidents that may be associated with PG&E facilities and meet the following conditions: (1) a self-propagating fire of material other than electrical and/or communication facilities (2) the resulting fire traveled greater than one linear meter from the ignition point, and (3) PG&E has knowledge that the fire occurred. Where not already included as part of the CPUC fire incident report data, PG&E also included data for 2015 through 2018 wildfires that CAL FIRE concluded were caused by PG&E equipment and 2019 wildfires that CAL FIRE is currently investigating where the point of ignition may be located near PG&E overhead electric facilities. As of the time of the 2020 WMP filing, 2019 ignition data is being reviewed by PG&E in preparation for its 2019 fire incident report that will be submitted by April 1, 2020 per D.14-02-015. The 2019 data in this table is preliminary and may be revised by the time that report is submitted.

## 2.4 Description of Additional Metrics

*Instructions for Table 3:*

*In addition to the metrics specified above, list and describe all other metrics the utility uses to evaluate wildfire mitigation performance, the utility's performance on those metrics over the last five years, the units reported, the assumptions that underlie the use of those metrics, and how the performance reported could be validated by third parties outside the utility, such as analysts or academic researchers. Identified metrics must be of enough detail and scope to effectively inform the performance (i.e., reduction in ignition probability or wildfire consequence) of each preventive strategy and program.*

PG&E is providing a completed Table 3 below, followed by comments regarding specific information in Table 3.

**TABLE 3: LIST AND DESCRIPTION OF ADDITIONAL METRICS, LAST 5 YEARS**

| Metric | Performance | | | | | Units | Underlying assumptions | Third-party validation |
|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | | | |
| Metric 1A - Number of Equipment Failure Caused Outages within the HFTD areas on RFW Days | 14 | 13 | 199 | 109 | 71 | Number of sustained and momentary outage events | See comments below. | See Note 1 |
| Metric 1B - Total of Number of Equipment Failure Caused Outages within the HFTD areas on RFW Days (normalized) | 0.00028 | 0.00018 | 0.00052 | 0.00025 | 0.00024 | Sustained and momentary outage events per RFW Day-Mile / year | See comments below. | See Note 1 |
| Metric 2A - Number of Vegetation Caused Outages within the HFTD areas on RFW Days | 22 | 4 | 187 | 79 | 53 | Number of sustained and momentary outage events | See comments below. | See Note 1 |
| Metric 2B - Number of Vegetation Caused Outages within the HFTD areas on RFW Days (normalized) | 0.00044 | 0.00006 | 0.00049 | 0.00018 | 0.00018 | Sustained and momentary outage events per RFW Day-Mile / year | See comments below. | See Note 1 |
| Metric 3A - Number of Other/Animal Caused Outages within the HFTD areas on RFW Days | 69 | 19 | 715 | 702 | 106 | Number of sustained and momentary outage events | See comments below. | See Note 1 |
| Metric 3BA - Number of Other/Animal Caused Outages within the HFTD areas on RFW Days (normalized) | 0.00139 | 0.00027 | 0.00187 | 0.00164 | 0.00036 | Sustained and momentary outage events per RFW Day-Mile / year | See comments below. | See Note 1 |

**TABLE 3: LIST AND DESCRIPTION OF ADDITIONAL METRICS, LAST 5 YEARS (CONTINUED)**

| Metric | Performance | | | | | Units | Underlying assumptions | Third-party validation |
|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | | | |
| Metric 4 – Number of non-exempt fuse devices in Tier 2 and 3 HFTD that operate due to faults | 2,425 | 2,233 | 3,785 | 2,194 | 3,965 | Number of sustained outages | See comments below. | See Note 1 |
| Metric 5A - Number of T&D Wires Down Events within the HFTD areas that occur on RFW Days | D = 11<br>T = 0 | D = 1<br>T = 0 | D = 186<br>T = 4 | D = 59<br>T = 2 | D = 31<br>T = 2 | Number of T&D Wire Down Events in HFTD on RFW Days | See comments below. | See Note 1 |
| | 11 | 1 | 190 | 61 | 33 | | | |
| Metric 5B - Number of T&D Wires Down Events within the HFTD areas that occur on RFW Days (normalized) | 0.000174 | 0.000011 | 0.000403 | 0.000117 | 0.000092 | T&D Wire Down Events in HFTD areas per RFW Day-Mile / year | See comments below. | See Note 1 |

**Note 1** – These metrics have not been validated by a third party and are only intended as general indicators to measure trends in performance and to help guide the WMP programs until a more formal measurement is agreed upon by the stakeholders. It should also be noted that in order to provide these metrics on the required timeframe, the data presented is based on simple data extractions without additional analysis to validate that the appropriate events are actually being included. Since the data extracted likely include events that should not be included (such as multiple instances of damage due to an actual fire event), the actual events should be thoroughly reviewed before normalizing the data or used for more than general indicators of trends.

**Background Comments for Table 3 – Description of Additional Metrics**

When normalizing the result by RFW Days, the measured events should also be those that occur during the hours of the RFW within the HFTD Tier 2 and Tier 3 areas, rather than normalizing for all events that occur within the entire service territory. In other words, events that may occur during rainy conditions or in the non-Tier 2 and Tier 3 areas should not be included. As discussed in the introduction to TABLE 2 above, it is may not be appropriate to normalize the "Near Hit" events noted in Table 2 Item 1.a. (that are based on all events within the entire service territory) with the calculated RFW Day - OH Circuit Miles (T&D Combined) values as shown in TABLE PG&E-2-2 (as shown in Table 2). Therefore, it is recommended that only the events that occur during the hours of the RFW within the Tier 2 and Tier 3 areas be normalized with those values in TABLE PG&E-2-2 and not those events that occur in the entire service territory. For convenience, TABLE PG&E-2-2 is repeated in this section.

**TABLE PG&E-2-2: ANNUAL RFW DAYS - OH CIRCUIT MILES (T&D COMBINED)**

| RFW Day - OH Circuit Miles (T&D Combined) | | | | |
|---|---|---|---|---|
| **2015** | **2016** | **2017** | **2018** | **2019** |
| 63,304 | 89,832 | 471,375 | 522,855 | 360,281 |

PG&E utilizes the FIAs, which are noted in Figure 2 and align with the Tier 2 and Tier 3 HFTD areas. Although approximated, PG&E can assign all distribution level outage events by hour to an individual FIA and can quantify the circuit miles within each FIA during the hours of the RFW. Although PG&E cannot currently assign all transmission events to an FIA, it can estimate the circuit transmission miles in an FIA during a RFW. In addition, it has and will continue to identify the transmission wire down events involving the Tier 2 and Tier 3 HFTD areas.

For the distribution system, TABLE PG&E-2-3 shows the estimated RFW Day - OH Distribution Circuit Miles. The values in TABLE PG&E-2-3 were derived similarly as described for Table PG&E-2-2 with the exception that only the OH Distribution circuit line miles were used.

**TABLE PG&E-2-3: ANNUAL RFW DAY - OH DISTRIBUTION CIRCUIT MILES**

| RFW Day - OH Distribution Circuit Miles | | | | |
|---|---|---|---|---|
| **2015** | **2016** | **2017** | **2018** | **2019** |
| 49,573 | 70,375 | 383,067 | 428,486 | 296,210.3 |

Due to the data limitations between PG&E's Transmission and Distribution systems, PG&E has proposed to use Table PG&E-2-2 to normalize T&D events that occur within the HFTD events during the hours of the RFW and Table PG&E-2-3 to normalize the Distribution events that occur within the HFTD events during the hours of the RFW. It should be noted this is an interim proposal and may change in the future since PG&E is also reviewing alternatives of using different methodologies to normalize the data, including using weather thresholds beyond the RFW criterion.

### Planned Additional Metrics

In addition to the metrics already covered throughout this 2020 WMP, PG&E is also planning to use the following metrics to assess the various programs intended to reduce wildfire risk.

### Distribution System Metrics

- Metric 1A - Number of Equipment Failure Caused Outages within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW. This metric is intended to measure the effectiveness of asset repair, replacement and hardening work in reducing outages. This metric has been normalized by the values noted in TABLE PG&E-2-3.

- Metric 1B - Number of Equipment Failure Caused Outages within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW and normalized by the values noted in TABLE PG&E-2-3.

- Metric 2A - Number of Vegetation Caused Outages within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW. This metric will measure the effectiveness of vegetation work in reducing contact with energized facilities.

- Metric 2A - Number of Vegetation Caused Outages within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW and normalized by the values noted in TABLE PG&E-2-3.

- Metric 3A - Number of Other/Animal Caused Outages within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW. This metric will measure the effectiveness of animal abatement work and track the balance of outages that are not specifically related to Equipment Failure and Vegetation causes.

- Metric 3B - Number of Other/Animal Caused Outages within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW and normalized by the values noted in TABLE PG&E-2-3.

- Metric 4 - Number of non-exempt fuse devices located in the Tier 2 and Tier 3 HFTD that operate faults and result in sustained outages with the expectation that this number will decline as future outage events are mitigated and the units are replaced. This topic is also discussed in the Table 11A section.

**T&D Wire Down Metrics**

- Metric 5A - Number of Wires Down Events within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW. Although the distribution wire down events are basically a subset of the three outage cause categories above, this metric will separately measure the T&D wire down events, which represents a higher risk condition due to its potential proximity to the public. The chart in the excel files will include the totals only, not the individual T and D numbers.

- Metric 5B - Number of Wires Down Events within the HFTD areas based on the events that occur in the corresponding FIAs during the hours of the RFW but normalized by the values noted in TABLE PG&E-2-3.

**Other Additional Metrics**

PG&E has also enhanced the information collected regarding its Fire Incident Data Collection Plan as required under Decision 14-02-015 and has expanded the information collected in support of Item 20 of Decision 19-05-037. Most of the additional information is available starting in 2019 but a few fields will require process changes or a substitution of the original reporting requirement. In addition, if the Wildfire OII Corrective Actions multi-party settlement agreement is approved, PG&E will provide "near miss" information[2] on a quarterly basis to SED and other Settling Parties in accordance with Item 19 of the settlement.

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[2] Documentation of "Near Hit" Potential Fire Incidents. PG&E will document "near hit" potential fire incidents, such as arcing or parking, that could have resulted in an ignition but did not, as well as fire ignitions that travelled one meter or less from the ignition point. This documentation will include the following categories of data: (1) Data from PG&E's Field Automation System ("FAS"), to the extent such data is collected in FAS as of the Effective Date, for events categorized with specific existing FAS codes to be agreed upon among PG&E, OSA, and SED. This data will include information related to "near hit" incidents from customer and service calls (inclusive of incidents detected by Smart meters), as well as "near hit" incidents data concerning secondary facilities and service drops; (2) All unplanned momentary and sustained outage data associated with PG&E's primary distribution facilities (inclusive of outages detected by Smart meters); (3) All unplanned outage data and path interruptions associated with PG&E's facilities operating at a transmission voltage level, whether or not customers were affected; and (4) Any fire ignitions that travelled one meter or less from an ignition point.

## 2.5 Description of Program Targets

*Instructions for Table 4:*

*In addition to the metrics specified above, list and describe all program targets the electrical corporation uses to track utility WMP implementation, the utility's performance on those metrics over the last five years, the units reported, the assumptions that underlie the use of those metrics, and how the performance reported could be validated by third parties outside the utility, such as analysts or academic researchers. Identified metrics must be of enough detail and scope to effectively inform the performance (i.e., reduction in ignition probability or wildfire consequence) of each preventive strategy and program.*

*Each program target shall be associated with a percent completeness and based upon the contents of the WMP.*

The 2019 WMP describes the enhanced, accelerated, and new programs that PG&E has implemented to mitigate and reduce the growing risk of wildfires faced by the communities it serves, in 2019 and beyond. There were 53 commitments made as part of the 2019 WMP; a comprehensive EOY performance has been provided to the CPUC. The below table contains a subset of the 53 commitments which have quantitative targets. The "third-party validation" column includes documents or records that support the commitment completion.



**TABLE 4: LIST AND DESCRIPTION OF PROGRAM TARGETS, LAST 5 YEARS**

| Program target | 2019 performance | Units | Underlying assumptions | Third-party validation |
|---|---|---|---|---|
| Complete WSIP enhanced inspection of all Transmission structures (49,715) | 49,715 (100.0%) | structures | Aerial inspections (drone or helicopter) and either ground or climbing inspection of transmission towers and poles. | Inspections are documented in Pronto Forms. |

**TABLE 4: LIST AND DESCRIPTION OF PROGRAM TARGETS, LAST 5 YEARS (CONTINUED)**

| Program target | 2019 performance | Units | Underlying assumptions | Third-party validation |
|---|---|---|---|---|
| Complete all high priority corrective actions (A and B tags) identified during Transmission inspections (5,839) | 5,215 (89.3%) | tags | (1) Only high priority tags identified from WSIP enhanced inspections by 5/31<br><br>(2) Corrective actions are assumed complete when closed in SAP, meaning work was completed in the field and proper documentation has been verified and indicated as such in SAP<br><br>(3) some of the "open" tags are on de-energized lines where there is no risk present and these tags will be repaired or resolved before the line would be returned to service. | Completion report generated from the SAP system |
| Complete WSIP enhanced inspection of all Distribution poles in the HFTD areas (694,250) | 694,250 (100.0%) | poles | Perform enhanced ground inspections of all Tier 2 and Tier 3 HFTD poles, and some additional "buffer zone" poles | Inspections are documented using Pronto enhanced inspection forms |
| Complete all high priority corrective actions (A and B tags) identified during Distribution inspections (5,046) | 4,881 (96.7%) | tags | (1) Only high priority tags identified from WSIP enhanced inspections by 5/31<br><br>(2) Corrective actions are assumed complete when closed in SAP, meaning work was completed in the field and proper documentation has been verified and indicated as such in SAP | Completion report generated from the SAP system. |
| Complete WSIP enhanced inspection of all substations (222) | 222 (100.0%) | substations | Perform enhanced ground inspections of all Tier 2 and Tier 3 HFTD stations by May 1, 2019 | Inspections are documented using Pronto enhanced inspection forms |

**TABLE 4: LIST AND DESCRIPTION OF PROGRAM TARGETS, LAST 5 YEARS (CONTINUED)**

| Program target | 2019 performance | Units | Underlying assumptions | Third-party validation |
|---|---|---|---|---|
| Complete all high priority corrective actions (A and B tags) identified during Substation inspections. (746) | 745 (100.0%)[3] | tags | Complete priority A and priority B corrective notifications (tags) created by April 30, 2019. | Completion report generated from the SAP system. |
| System hardening in HFTD areas (150 miles) | 171 (114.1%) | miles | 1) Convert overhead circuit to underground where feasible<br><br>2) Retire/remove overhead assets where customers can be served by other means (distributed generation, micro-grid, etc.) | PG&E's Internal Audit reviewed and validated work completion results. |
| Perform enhanced vegetation management work in HFTD areas<br><br>(2,450 circuit miles) | 2,498 (102.0%) | miles | Reduce wildfire through (1) overhang clearing 4ft vertical from conductor to Sky for particular trees, (2) 12 ft radial clearing around the conductor, and (3) hazard tree mitigation. | PG&E's Internal Audit reviewed and validated work completion results. |
| Remove/work all dead or dying trees ("CEMA trees") identified by October 1 of the current year | 48,374<br><br>(including 100% of CEMA trees identified before 10/1/19) | trees | 100% of trees before 10/1 excludes trees where tree work where an approved exception was identified due to third party delays, including environmental permitting requirements, owner refusals, and agency approval or review. | Data tracked and downloaded from the Vegetation Management Database (VMD) |

[3] The one remaining B tag is an approved exception under the standard exception process as that repair is being bundled with additional notifications that need to be completed at the same substation and a single clearance has been scheduled to limit the impact on our system and customers

**TABLE 4: LIST AND DESCRIPTION OF PROGRAM TARGETS, LAST 5 YEARS (CONTINUED)**

| Program target | 2019 performance | Units | Underlying assumptions | Third-party validation |
|---|---|---|---|---|
| SCADA enable all remaining line reclosers in Tier 2 and Tier 3 HFTD areas (287) | 287 (100.0%) | line reclosers | Install Supervisory Control and Data Acquisition (SCADA) functionality on all line reclosers which currently lack SCADA functionality and are operated manually. | CWSP Recloser Database |
| Operationalize resilience zone (1) | 1 (100.0%) | resilience zone | (1) Installation of sectionalizing devices to enable isolation of the intended area from the rest of the distribution grid during PSPS (2) Installation of a pre-installed interconnection hub to enable the rapid connection of mobile generation during PSPS (3) Completion of any necessary hardening treatment(s) to enable safe energization of the intended area during PSPS weather conditions | Declaration document of Operational Readiness of the pilot resiliency zone with multiple functional leader's signoff. |
| Operate heavy-lift helicopters to aid in fire suppression and restoration efforts (4) | 4 (100.0%) | helicopters | Operate 4 heavy-lift helicopters to respond to 100% of the agency (e.g., CAL-Fire) requests for PG&E to operate under agency's control to support in the 2019 fire season. | US Department of Transportation FAA Operating Certificate authorizing the operation of 4 heavy-lift helicopters. |
| Operationalize and install high-definition cameras (71) | 133 (187.3%) | cameras | New installations of HD cameras that are used to identify, confirm and track wildfires. | The data from the operationalized PG&E HD Cameras is available at: http://www.alertwildfire.org |
| Install weather stations (400) | 426 (106.5%) | weather stations | New physical installation of weather stations on a pole, tower or other asset in HFTD areas. | The data from the PG&E Weather Stations is available at: https://mesowest.utah.edu/cgi-bin/droman/stn_mnet.cgi?mnet=227 |

## 2.6 Detailed Information Supporting Outcome Metrics

*Instructions for Table 5:*

*Enclose detailed information as requested for the metrics below. Report numbers of accidental deaths attributed to any utility wildfire mitigation activities, as listed in the utility's 2019 WMP filing or otherwise, according to the type of activity in column one, and by the relationship to the utility, for each of the last five years. For fatalities caused by activities beyond these categories, add rows to specify accordingly. The relationship to the utility statuses of full-time employee, contractor, and member of public are mutually exclusive, such that no individual can be counted in more than one category, nor can any individual fatality be attributed to more than one activity.*

*Report subtotals calculated for each row and column.*

**TABLE 5: ACCIDENTAL DEATHS DUE TO UTILITY WILDFIRE MITIGATION INITIATIVES, LAST 5 YEARS**

| Activity | Victim | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full-time employee | | | | | Contractor | | | | | Member of public[1] | | | | | |
| Year | 2015 | 2016 | 2017 | 2018[2] | 2019 | 2015 | 2016 | 2017 | 2018[2] | 2019 | 2015 | 2016 | 2017 | 2018[2] | 2019 | |
| Wildfire Safety Inspection Program (WSIP) - Distribution | – | – | – | 0 | 0 | – | – | – | 0 | 0 | – | – | – | 0 | 0 | 0 |
| Wildfire Safety Inspection Program (WSIP) - Transmission | – | – | – | 0 | 0 | – | – | – | 0 | 1 | – | – | – | 0 | 0 | 1 |
| Vegetation management/fuel reduction | – | – | – | 0 | 0 | – | – | – | 0 | 0 | – | – | – | 0 | 0 | 0 |
| System Hardening | – | – | – | 0 | 0 | – | – | – | 0 | 0 | – | – | – | 0 | 0 | 0 |
| PSPS | – | – | – | 0 | 0 | – | – | – | 0 | 0 | – | – | – | 0 | 0 | 0 |
| Total | – | – | – | 0 | 0 | – | – | – | | 1 | – | – | – | 0 | 0 | |

Notes for Table 5:

1. Data for “Member of public” was derived from review of PG&E’s “Riskmaster” database, which tracks third party claims.
2. PG&E’s Community Wildfire Safety Program, under which PG&E tracks its wildfire mitigation activities, was developed in 2018, with the above activities implemented in late 2018. Therefore, the “Year 2018” data above represents data from late 2018.

*Instructions for Table 6:*

*Report numbers of OSHA-reportable injuries attributed to any utility wildfire mitigation initiatives, as listed in the utility's 2019 WMP filing or otherwise, according to the type of activity in column one, and by the identity of the victim, for each of the last five years. For members of the public, all injuries that meet OSHA-reportable standards of severity (i.e., injury or illness resulting in loss of consciousness or requiring medical treatment beyond first aid) shall be included, even if those incidents are not reported to OSHA due to the identity of the victims.*

*For OSHA-reportable injuries caused by activities beyond these categories, add rows to specify accordingly. The victim identities listed are mutually exclusive, such that no individual victim can be counted as more than one identity, nor can any individual OSHA-reportable injury be attributed to more than one activity. Report subtotals calculated for each row and column.*

PG&E is providing a completed Table 6 below, followed by comments regarding specific information in Table 6.

**TABLE 6: OSHA-REPORTABLE INJURIES DUE TO UTILITY WILDFIRE MITIGATION INITIATIVES, LAST 5 YEARS**

| Activity | Victim | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full-time employee | | | | | Contractor[1] | | | | | Member of public[2] | | | | | |
| Year | 2015 | 2016 | 2017 | 2018[3] | 2019 | 2015 | 2016 | 2017 | 2018[3] | 2019 | 2015 | 2016 | 2017 | 2018[3] | 2019 | |
| Inspection-Distribution | – | – | – | 0 | 0 | – | – | – | 0 | 13 | – | – | – | 0 | 0 | 13 |
| Inspection-Transmission | – | – | – | 0 | 0 | – | – | – | 0 | 12 | – | – | – | 0 | 0 | 12 |

**TABLE 6: OSHA-REPORTABLE INJURIES DUE TO UTILITY WILDFIRE MITIGATION INITIATIVES, LAST 5 YEARS (CONTINUED)**

| Activity | Victim | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full-time employee | | | | | Contractor[1] | | | | | Member of public[2] | | | | | |
| Year | 2015 | 2016 | 2017 | 2018[3] | 2019 | 2015 | 2016 | 2017 | 2018[3] | 2019 | 2015 | 2016 | 2017 | 2018[3] | 2019 | |
| Enhanced Vegetation management/fuel reduction | – | – | – | 0 | 0 | – | – | – | N/A[1] | 25 | – | – | – | 0 | 0 | 25 |
| System Hardening | – | – | – | 0 | 0 | – | – | – | 0 | 3 | – | – | – | 0 | 0 | 3 |
| PSPS | – | – | – | 0 | 0 | – | – | – | 0 | 0 | – | – | – | 0 | 0 | 0 |
| **Total** | – | – | – | 0 | 0 | – | – | – | N/A | 53 | – | – | – | 0 | 0 | |



Notes for Table 6:

1. PG&E does not generally and centrally track OSHA reportable incidents for contractors. Contractors are responsible for complying with OSHA reportable notification requirements. The data in Table 6 reflects all OSHA recordables, including any reportable incidents, that PG&E tracks for internal purposes.
2. Data for "Member of public" was derived from review of PG&E's "Riskmaster" database, which tracks third party claims.
3. PG&E's Community Wildfire Safety Program, under which PG&E tracks its wildfire mitigation activities, was developed in 2018, with the above activities implemented in late 2018. Therefore, the "Year 2018" data above represents data from late 2018.

*Instructions for Table 7:*

*Report details on methodology used to calculate or model potential impact of ignitions, including list of all input used in impact simulation; data selection and treatment methodologies; assumptions, including Subject Matter Expert (SME) input; equation(s), functions, or other algorithms used to obtain output; output type(s), e.g., wind speed model; and comments.*

PG&E is providing a completed Table 7 below, followed by comments regarding specific information in Table 7.

**TABLE 7: METHODOLOGY FOR POTENTIAL IMPACT OF IGNITIONS**

| List of all data inputs used in impact simulation | Sources of data inputs | Data selection and treatment methodologies | Assumptions, including SME input | Equation(s), functions, or other algorithms used to obtain output | Output type(s), e.g., wind speed model | Comments |
|---|---|---|---|---|---|---|
| PG&E Ignitions 2015-2019<br><br>CALFIRE Incidents<br><br>Fire weather warning data | PG&E<br><br>CALFIRE<br><br>National Weather Service | Model uses the S-MAP aligned bowtie framework.<br><br>See details in Section 4.2 for treatment of data for the left and right side of the bowtie. | See details in Section 4.2 | See Section 4.2 for details about Multi Attribute Value Function (MAVF) to combine all potential consequences of a risk event in a single value | Risk Score per Tranche (See Section 4.2 for modeled Consequences and Outcomes) | Inputs utilized in Wildfire Risk S-MAP conforming bowtie |
| Surface Fuels | LANDFIRE Remap 2016 (LF 2.0.0) | Data was extracted for these layers using the PG&E domain boundary with a buffer of 20 miles. | Fuel Models updated consistent with CPUC HFTD Map modification approach. “Sapsis, D., Brown, T., Low, C., Moritz, M., Saah, D., and Shaby,B.,“Mapping Environmental Influences on Utility Fire Threat. A Report to the California Public Utilities Commission Pursuant to R.08 – 11-005 AND R.15-05-006,” Final Report, 16 February 2016.” | CalFire supported in 2016. Systematic errors identified in LANDFIRE led to use of alternative statewide vegetation data (CALVEG 2015) as a fuel system overlay onto LANDFIRE fuels for determination of mismatched fuel typing. | Modified LANDFIRE Fuels dataset | Details provided in Reax source report |
| Canopy Fuels | LANDFIRE Remap 2016 (LF 2.0.0) | Data was extracted for these layers using the PG&E domain boundary with a buffer of 20 miles. | See details in “Surface Fuels” above | CalFire supported in 2016. Systematic errors identified in LANDFIRE led to use of alternative statewide vegetation data (CALVEG 2015) as a fuel system overlay onto LANDFIRE fuels for determination of mismatched fuel typing. | Modified LANDFIRE Fuels dataset | Details provided in Reax source report |

**TABLE 7: METHODOLOGY FOR POTENTIAL IMPACT OF IGNITIONS (CONTINUED)**

| List of all data inputs used in impact simulation | Sources of data inputs | Data selection and treatment methodologies | Assumptions, including SME input | Equation(s), functions, or other algorithms used to obtain output | Output type(s), e.g., wind speed model | Comments |
|---|---|---|---|---|---|---|
| Terrain | USGS Geospatial Data Abstraction Library (GDAL) | USGS Geospatial Data Abstraction Library (GDAL) command line utilities were used to calculate slope, aspect, and terrain ruggedness rasters at 1/3 arcsecond resolution. | N/A | N/A | N/A | Approach utilized by Reax |
| Climatology | Numerical Weather Prediction (NWP) | NWP model Weather Research and Forecasting (WRF) was used to generate high-resolution wind and weather fields from ~200 historical fire weather days. | ~200 historical fire weather days identified are acceptable proxy for fire spread modeling | N/A -Output is list of dates for each 32 km by 32 km NARR pixel in California where the most severe fire weather conditions occurred since 1979 | List of dates to derive weather conditions for Monte Carlo simulations | Details provided in Reax source report |
| Fosberg Fire Weather Index (FFWI) | Weather fields from ~200 historical fire weather days | Fire weather index created to measure the potential influence of weather on a wildfire based on model output of temperature, wind and relative humidity. | ~200 historical fire weather days identified are acceptable proxy for fire spread modeling | FFWI = $\eta\sqrt{(1+U^2)}$ | N/A | Details provided in Reax source report |
| Modified Fosberg Fire Weather Index (MFFWI) | Weather fields from ~200 historical fire weather days | MFFWI is used to identify wind events that occur simultaneously with low relative humidities and high temperatures | ~200 historical fire weather days identified are acceptable proxy for fire spread modeling | MFFWI=FFWI x P ign/100 | 204 days corresponding to highest MFFWI in NARR dataset across California | Details provided in Reax source report |

**TABLE 7: METHODOLOGY FOR POTENTIAL IMPACT OF IGNITIONS (CONTINUED)**

| List of all data inputs used in impact simulation | Sources of data inputs | Data selection and treatment methodologies | Assumptions, including SME input | Equation(s), functions, or other algorithms used to obtain output | Output type(s), e.g., wind speed model | Comments |
|---|---|---|---|---|---|---|
| Buildings | Microsoft Building Data Source and 2010 US Census data for California were in GIS (shapefile) format | Housing density (structures/mi2) was calculated for each of 710,145 census blocks in California by dividing the housing count for each census block by its area. | Census data is acceptable proxy for structure quantification | N/A | Housing density a raster having the same projection and resolution (30 m) as the underlying fuels inputs. | 2010 Census tract data was utilized by Reax |
| Population | LandScan 2016 and 2010 US Census data for California were in GIS (shapefile) format | Population density (people/mi2) density was calculated for each of 710,145 census blocks in California by dividing the population for each census block by its area. | Census data is acceptable proxy for quantification of population impacts | N/A | Population density a raster having the same projection and resolution (30 m) as the underlying fuels inputs. | 2010 Census tract data was utilized by Reax |
| PG&E Assets | EDGIS and ET GIS | N/A | N/A | N/A | N/A | |



**TABLE 7: METHODOLOGY FOR POTENTIAL IMPACT OF IGNITIONS (CONTINUED)**

| List of all data inputs used in impact simulation | Sources of data inputs | Data selection and treatment methodologies | Assumptions, including SME input | Equation(s), functions, or other algorithms used to obtain output | Output type(s), e.g., wind speed model | Comments |
|---|---|---|---|---|---|---|
| Fire Escape Probability | Reax Engineering "Wildland Fire Risk Model for Establishing Fire Threat Zones: | Modeling assumed ignitions in 100 meter buffered area surrounding overhead electric transmission and distribution facilities within Fire Index Areas. | The ignition routines function by igniting a user-specified fraction (e.g., 50%) of the 30 m pixels contained within the rasterized ignition mask | $Pe \propto Vf \times (0+f(Pr) \times f(Ds) \times f(T))$ | Five model outputs by percentile.<br><br>Probability: Relative probability of fire escaping initial attack efforts | ***Pe*** - Probability of a fire escaping initial containment efforts<br><br>***Vf*** - Fire volume (acre-ft) after 6 hours of spread from |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Methodology and Results" | | | | Consequence homes: Impacted number of homes<br><br>Consequence timber: Impacted acres of timber<br><br>Risk homes: Overall risk to homes (probability times homes consequence)<br><br>Risk timber: Overall risk to timber (probability times timber consequence) | Monte Carlo simulation<br><br>**0**–Calibration constant<br><br>***f*** (*x*) Dimensionless function normalized between 0 and 1<br><br>***Pr*** - Road density (mi/mi2)<br><br>***Ds*** - Distance to closest fire station (mi)<br><br>*T* - Topographical slope or ruggedness<br><br>***f****(Ds)* =min(*ds*/*d***s*,1)<br><br>***f****(Pr)*<br><br>=max(1-*Pr*/*P***r*,0)<br><br>***f****(T)*=max(*T*-*T**/*90*$^{o}$,0) |



Notes for Table 7:

PG&E currently utilizes two models to calculate the impact of potential ignitions. One model was developed to assess ignition based drivers and consequence outputs, conforming with the S-MAP settlement agreement. The second utilizes computational wildfire spread modeling developed by Reax Engineering to assist risk assessments on overhead electric facilities in PG&E's service territory. The data inputs listed in Table 7 represent the current set of data sets used by these models. The output of these models estimate acreage and/or volume of a potential fires spread based on assumption that ignitions occur.

For the S-MAP conforming model, potential outcomes are measured by the impacted structures and safety consequences. In the Reax model, risk and consequence outputs are quantified by the simulated fire volume and the impact to homes and/or timber resources through computational fire spread. Outputs are comparative by percentile.

A third model has been developed by Technosylva for PG&E in 2019.

## 2.7 Mapping Recent, Modelled, And Baseline Conditions

*Instructions for Table 8:*

*Report underlying data for recent conditions (over the last five years) of the utility service territory in a downloadable shapefile GIS format, to include the following layers of data plotted on the utility service territory map as specified below, at a minimum. Provide information for each year; calculate and provide a five-year average. Name and attach files according to the table below.*

**TABLE 8: MAP FILE REQUIREMENTS FOR RECENT AND MODELLED CONDITIONS OF UTILITY SERVICE TERRITORY, LAST 5 YEARS**

| Layer name | Measurements | Units | Attachment location |
|---|---|---|---|
| Recent weather patterns | Average annual number of Red Flag Warning days per square mile across service territory | Area, days, square mile resolution | 6.1 |
| | Average 95$^{th}$ and 99$^{th}$ percentile wind speed and prevailing direction (actual) | Area, miles per hour, at a square mile resolution or better, noting where measurements are actual or interpolated | |
| Recent drivers of ignition probability | Date of recent ignitions categorized by ignition probability driver | Point, GPS coordinate, days, square mile resolution | 6.2 |
| Recent use of PSPS | Duration of PSPS events and area of the grid affected in customer hours per year | Area, customer hours, square mile resolution | 6.3 |

Notes for Table 8:

1. Weather data is provided with 3 km resolution as a raster data set.

*Instructions for Table 9:*

*Report underlying data for recent conditions (over the last five years) of the utility service territory in a downloadable shapefile GIS format, to include the following layers of data plotted on the utility service territory map as specified below, at a minimum. Provide information for each year; calculate and provide a five-year average. Name and attach files according to the table below.*

**TABLE 9: MAP FILE REQUIREMENTS FOR BASELINE CONDITION OF UTILITY SERVICE TERRITORY PROJECTED FOR 2020**

| Layer name | Measurements / variables | Units | Appendix location |
|---|---|---|---|
| Current baseline state of service territory and utility equipment | Non-HFTD vs HFTD (Zone 1, Tier 2, Tier 3) regions of utility service territory | Area, square mile resolution per type | 6.4 |
| | Urban vs. rural vs. highly rural regions of utility service territory | Area, square mile resolution per type | |
| | WUI regions of utility service territory | Area, square mile resolution | |
| | Number and location of critical facilities[1] | Point, GPS coordinate | |
| | Number and location of customers[2] | Area, number of people, square mile resolution | |
| | Number and location of customers belonging to access and functional needs populations[2] | Area, number of people, square mile resolution | |
| | Overhead transmission lines | Line, quarter mile resolution | |
| | Overhead distribution lines | Line, quarter mile resolution | |
| | Location of substations | Point, GPS coordinate | |
| | Location of weather stations | Point, GPS coordinate | |
| | All utility assets by asset type, model, age, specifications, and condition | Point, GPS coordinate | |

**TABLE 9: MAP FILE REQUIREMENTS FOR BASELINE CONDITION OF UTILITY SERVICE TERRITORY PROJECTED FOR 2020 (CONTINUED)**

| Layer name | Measurements / variables | Units | Appendix location |
|---|---|---|---|
| Location of planned utility equipment additions or removal | Non-HFTD vs HFTD (Zone 1, Tier 2, Tier 3) regions of utility service territory | Line, quarter mile resolution | 6.5 |
| | Urban vs. rural vs. highly rural regions of utility service territory | Line, quarter mile resolution | |
| | WUI regions of utility service territory | Line, quarter mile resolution | |
| | Circuit miles of overhead transmission lines | Line, quarter mile resolution | |
| | Circuit miles of overhead distribution lines | Line, quarter mile resolution | |
| | Location of substations | Point, GPS coordinate | |
| Planned 2020 WMP initiative activity per year | Location of 2020 WMP initiative activity for each activity as planned to be completed by the end of each year of the plan term | Line, quarter mile resolution | 6.6 |



Notes for Table 9:

1. All data provided in Appendices 6.4 through 6.6 in response to Table 9-1 is from PG&E's January 2020 EDGIS data base.
2. The number of medical baseline customers is provided in lieu of the number of customers belonging to access and functional needs populations.
3. PG&E is working to finalize GIS shapefiles identifying the number of customers, critical facilities, and medical baseline customers per square mile. In the meantime, PG&E has provided Excel files which will enable a CA Grid Shapefile to be created for the number of customers per square mile; the number of critical facilities per square mile; and the number of medical baseline customers per square mile:
   a. cpucGrid_CriticalCusts.xlsx
   b. cpucGrid_AllCusts,xlsx
   c. cpuc_Grid_medicalCusts.xlsx
4. Customer locations and critical facilities locations, including the excel files identified above, are not included in the publicly posted data sets as this information is protected by customer personal data privacy requirements.

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# SECTION 3

# BASELINE INGNITION PROBABILITY AND WILDFIRE RISK EXPOSURE

# 3 Baseline Ignition Probability and Wildfire Risk Exposure

## 3.1 Recent Weather Patterns, Last 5 Years

*Instructions for Table 10:*

*Report weather measurements based upon the duration and scope of NWS Red Flag Warnings and upon proprietary Fire Potential Index (or other similar fire risk potential measure) for each year. Calculate and report 5-year historical average. Ensure underlying data is provided per Section 2.7.*

Table 10 and other tables seek information regarding weather patterns over the last five years, including a 5-year historical average. PG&E has provided the requested data, but cautions against using the 5-year historical average to assess wildfire risks. California has experienced dramatic environmental changes in recent years, resulting in record drought, unprecedented tree mortality, record rainfall, record heat waves, and extremely strong wind events. These climate-related factors have contributed to the increasing risk of wildfires. Therefore PG&E views the trend in weather conditions to be more relevant to assessing wildfire risk than historical averages.

**TABLE 10: WEATHER PATTERNS, LAST 5 YEARS**

| Weather measurement | 2015 | 2016 | 2017 | 2018 | 2019 | 5-year historical average[a,b] | Unit(s) |
|---|---|---|---|---|---|---|---|
| Red Flag Warning days[d] | 63,304 | 89,832 | 471,375 | 522,855 | 360,281 | 301,529 | RFW circuit mile days per year |
| Days rated at the top 30% of proprietary fire potential index or similar fire risk index measure[e] | 757,738 | 1,753,176 | 2,336,959 | 1,553,760 | 2,329,476 | 1,746,222 | Circuit mile days where proprietary measure rated above top 30% threshold[1] per year |
| 95th percentile wind conditions[a] | 1,033,719 | 1,324,577 | 1,790,954 | 1,026,773 | TBD[a] | 1,294,006[c] | Circuit mile days with wind gusts over 95th percentile historical (meaning the prior 10 years, 2005-2014) conditions per year |
| 99th percentile wind conditions[a] | 162,809 | 179,614 | 480,997 | 131,966 | TBD[a] | 238,847[c] | Circuit mile days with wind gusts over 99th percentile historical (meaning the prior 10 years, 2005-2014) conditions per year |
| Offshore (e.g., Diablo, Mono, Santa Ana) wind conditions[a] | 14,830 | 2,867 | 96,643 | 106,652 | TBD[a] | 55,248[c] | Circuit mile days that experience offshore (e.g., Diablo, Mono, Santa Ana) wind conditions (offshore wind events characterized as PG&E FPI >0.14 [filter for dry conditions], Wind Direction (N to ESE): 350°—112.5°, Sustained Wind Speeds ≥ 20 mph, Relative Humidity ≤ 25%, ≥3 consecutive hour duration, ≥0.5% areal coverage of conditions over model domain) |

Notes for Table 10:

A. Analysis is based on PG&E's 30-year weather and fuels climatology at 3 km spatial and hourly temporal resolution from 1989 – 2018. Data for 2019 in a similar format will not be available until late Q2 2020.

B. 5-year historical average is based on PG&E's 30-year weather and fuels climatology at 3 km spatial and hourly temporal resolution from 1989 – 2018 and has been computed from 2014-2018.

C. Average based on 2015 – 2018 data.

D. Based on forecast data from the National Weather Service for HFTD areas as explained in the introduction to Section 2.2.

E. Based on PG&E FPI forecasts of R4 (very high) fire danger or greater

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1 Threshold here defined as top 30% of FPI or equivalent scale (e.g., “Extreme” on SCE’s FPI; “extreme”, 15 or greater, on SDG&E’s FPI; and 4 or above on PG&E’s FPI)

## 3.2 Recent Drivers of Ignition Probability, Last 5 Years

*Instructions for Table 11:*

*Report recent drivers of ignition probability according to whether or not near misses of that type are tracked, the number of incidents per year (e.g., all instances of animal contact regardless of whether they caused an outage, an ignition, or neither), the rate at which those incidents (e.g., object contact, equipment failure, etc.) cause an ignition in the column, and the number of ignitions that those incidents caused by category, for each of last five years.*

*Calculate and include 5-year historical averages. This requirement applies to all utilities, not only those required to submit annual ignition data. Any utility that does not have complete 2019 ignition data compiled by the WMP deadline shall indicate in the 2019 columns that said information is incomplete. List additional drivers tracked in the "other" row and add additional rows as needed. Ensure underlying data is provided per Section 2.7.*

### Comments for Table 11: Key Recent Drivers of Ignition Probability, Last 5 Years

Table 11 (with data responses set forth in Tables 11-1, 11-2, 11-3, and 11-4) purports to seek "average percentage probability of ignition per incident," which are derived by dividing the number of ignitions per year by the total number of incidents per year. However, this calculation does not result in an average percentage probability, but a frequency. A frequency is the measure of how often an event occurs on average during a unit of time. In comparison, probability is a number between 0 and 1 that measures the chance some event may or may not happen. As a result, this calculation of number of ignitions per year divided by the total number of incidents per year indicates the number of ignitions per incidents. Moreover, it is inappropriate to average across historical years to derive future probability, because the fire threat conditions have changed over time as climate change has affected California. Instead of averaging these numbers, the numbers should be treated as a trend.

Since the categories vary between the Distribution and Transmission systems, a separate table is provided for each. In each case, unplanned outages are provided as the incidents. Table 11-1 covers the distribution system and Table 11-2 covers the transmission system. These summaries exclude all planned/wildfire mitigation outages and PSPS events since these events generally do not involve fault conditions.

In Table 11-1 and 11-2, PG&E has indicated that near misses are tracked by marking the respective column as Y. For the purpose of this exercise, PGE has taken the approach that an outage is a proxy for a near miss. Further, near misses in this context are only limited to outages.

### Comments for Table 11-1: Distribution System

To the extent available, PG&E's ILIS-ODB data base was used to provide the level of detail as noted in Table 11-1 that includes both the sustained and momentary outages experienced on its distribution system. The following comments should be noted:

- The “All types” row noted in the “All types of Equipment/facility failure” group includes all outages related to equipment failure events. The additional dub categories listed below the “All types” category each represent a distinct subset of this overall total and provides a more detailed description of the failed equipment.

- Additional failed equipment line items (such as pole, insulator/bushing, crossarm, voltage regulator/booster, recloser, anchor/guy, and sectionalizer) were added to this table and will be discussed further relative to the ignition drivers.

- Similar to Table 11-2, the distribution wire down events related to the equipment failures include secondary related wire down events as contained within its ILIS-ODB.

- PG&E was unsure what was intended by use of the term “Fuse failure – all” since when a fuse isolates a fault condition, it will become permanently damaged and by design will no longer conduct electricity. For this subcategory, PG&E has interpreted it as only those outage events with a fuse reported as the actual failed equipment.

- In addition, it’s unclear what was intended by the description of, “Fuse failure-conventional blown fuse”. PG&E has interpreted this term as asking for information related to the operation of non-exempt fuses located in HFTD areas, which pose a potential fire risk since these fuses may release molten metal when isolating a fault. However, these fuses will operate due to all faults and is therefore not specifically reported as an equipment failure. As such, the operation of this equipment is discussed below, outside of the equipment failure section of Table 11-1.

- PG&E does not have an outage cause classification that specifically matches the term, “Wire-to-wire contact / Contamination” and has assumed that persistent conditions of these events would be reported as equipment failures. As such, PG&E has assumed this refers to outage causes reported due to unknown causes, which are typically related to temporary fault conditions with the cause not determined at the time of the outage event.

- The overall “Other” category represents all outages not reported as due to Vegetation, 3rd Party, Animal, Equipment Failure, or Unknown causes.

The 2015 through 2018 ignition data is based on fire incident reports filed with the CPUC annually in accordance with D.14-02-015. These reports include fire incidents that may be associated with PG&E facilities and meet the following conditions: (1) a self-propagating fire of material other than electrical and/or communication facilities (2) the resulting fire traveled greater than one linear meter from the ignition point, and (3) PG&E has knowledge that the fire occurred. At the time of this report, 2019 ignition data is being reviewed by PG&E in preparation for its 2019 fire incident report that will be submitted by April 1, 2020 per D.14-02-015. The data in this table is preliminary and may be revised by the time that report is submitted. The following comments should be noted regarding the ignition data:

- The note regarding the subcategories “Conductor failure— wires down” and “Wire-to-wire contact / contamination” for the outage data also applies to the ignition driver data. As a result, data is not input into these fields in Table 11.

- The note regarding the categories “Fuse failure – all” and the “Fuse failure-conventional blown fuse” for the outage data also applies to the ignition data.

### Operation of Non-Exempt Fuses

PG&E estimates it has roughly over 15,000 non-exempt fuse devices located in the Tier 2 and Tier 3 HFTD areas. As mentioned above, the operation of these fuses pose a potential fire risk and PG&E has a plan to replace these units over the next several years. Listed below are the estimated number of times these devices operated/isolated faults each year, with an average of 2,920 outages/year.

**TABLE PG&E-3-1: NON-EXEMPT FUSE DEVICES IN HFTD TIERS 2 AND 3**

| Year | 2015 | 2016 | 2017 | 2018 | 2019 | Average |
|---|---|---|---|---|---|---|
| **Sustained Outages** | 2,425 | 2,233 | 3,785 | 2,194 | 3,965 | 2,920 |

PG&E plans to track the number of future operations in these devices as noted in the additional metric section shown in Table 3, Metric 4.

**TABLE 11-1: KEY RECENT DRIVERS OF IGNITION PROBABILITY, LAST 5 YEARS – DISTRIBUTION SYSTEM**

| Incident type by ignition probability driver | | Near misses tracked (y/n)? | Number of incidents per year | | | | | | Average percentage probability of ignition per incident | | | | | | Number of ignitions per year from this driver | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average |
| Contact from object | All types of object contact | Y | 9185.00 | 10029.00 | 13693.00 | 9171.00 | 13434.00 | 11102.40 | 2.46% | 1.86% | 1.86% | 2.84% | 1.88% | 2.13% | 226.00 | 187.00 | 255.00 | 260.00 | 253.00 | 236.20 |
| | Animal contact | Y | 2346.00 | 2242.00 | 2197.00 | 2447.00 | 2072.00 | 2260.80 | 1.66% | 1.47% | 2.09% | 2.21% | 3.19% | 2.11% | 39.00 | 33.00 | 46.00 | 54.00 | 66.00 | 47.60 |
| | Balloon contact | Y | 473.00 | 526.00 | 526.00 | 647.00 | 464.00 | 527.20 | 4.23% | 2.47% | 1.90% | 2.47% | 3.02% | 2.77% | 20.00 | 13.00 | 10.00 | 16.00 | 14.00 | 14.60 |
| | Veg. contact | Y | 3734.00 | 4432.00 | 8277.00 | 3285.00 | 8167.00 | 5579.00 | 2.65% | 2.10% | 1.57% | 3.56% | 1.44% | 2.00% | 99.00 | 93.00 | 130.00 | 117.00 | 118.00 | 111.40 |
| | Vehicle contact | Y | 1793.00 | 2041.00 | 1917.00 | 1915.00 | 1835.00 | 1900.20 | 2.62% | 1.67% | 2.76% | 2.35% | 2.02% | 2.27% | 47.00 | 34.00 | 53.00 | 45.00 | 37.00 | 43.20 |
| | 3rd party Contact Other | Y | 839.00 | 788.00 | 776.00 | 877.00 | 896.00 | 835.20 | 2.50% | 1.78% | 2.06% | 3.19% | 2.01% | 2.32% | 21.00 | 14.00 | 16.00 | 28.00 | 18.00 | 19.40 |
| All types of equipment / facility failure | All types | Y | 11099.00 | 11506.00 | 14700.00 | 10164.00 | 13031.00 | 12100.00 | 1.49% | 1.23% | 1.46% | 1.28% | 1.07% | 1.31% | 165.00 | 141.00 | 214.00 | 130.00 | 140.00 | 158.00 |
| | Capacitor bank failure | Y | 56.00 | 65.00 | 83.00 | 55.00 | 70.00 | 65.80 | 17.86% | 16.92% | 12.05% | 18.18% | 10.00% | 14.59% | 10.00 | 11.00 | 10.00 | 10.00 | 7.00 | 9.60 |
| | Conductor failure—all | Y | 2409.00 | 2661.00 | 3827.00 | 2395.00 | 3382.00 | 2934.80 | 3.57% | 2.82% | 2.69% | 3.22% | 2.25% | 2.84% | 86.00 | 75.00 | 103.00 | 77.00 | 76.00 | 83.40 |
| | Conductor failure—wires down | Y | 1134.00 | 1241.00 | 1996.00 | 1182.00 | 1593.00 | 1429.20 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

**TABLE 11-1: KEY RECENT DRIVERS OF IGNITION PROBABILITY, LAST 5 YEARS – DISTRIBUTION SYSTEM (CONTINUED)**

| Incident type by ignition probability driver | | Near misses tracked (y/n)? | Number of incidents per year | | | | | | Average percentage probability of ignition per incident | | | | | | Number of ignitions per year from this driver | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average |
| | Fuse failure—all | Y | 372.00 | 352.00 | 479.00 | 305.00 | 345.00 | 370.60 | 1.88% | 1.14% | 1.88% | 3.28% | 0.58% | 1.73% | 7.00 | 4.00 | 9.00 | 10.00 | 2.00 | 6.40 |
| | Fuse failure—conventional blown fuse | Y | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Lightning arrestor failure | Y | 144.00 | 145.00 | 139.00 | 135.00 | 130.00 | 138.60 | 4.17% | 1.38% | 4.32% | 0.74% | 3.08% | 2.74% | 6.00 | 2.00 | 6.00 | 1.00 | 4.00 | 3.80 |
| | Switch failure | Y | 136.00 | 156.00 | 178.00 | 187.00 | 189.00 | 169.20 | 2.21% | 0.64% | 1.69% | 0.00% | 2.12% | 1.30% | 3.00 | 1.00 | 3.00 | 0.00 | 4.00 | 2.20 |
| | Trans-former failure | Y | 4213.00 | 3947.00 | 4977.00 | 3136.00 | 3962.00 | 4047.00 | 0.36% | 0.25% | 0.42% | 0.32% | 0.53% | 0.38% | 15.00 | 10.00 | 21.00 | 10.00 | 21.00 | 15.40 |
| | Pole | Y | 498.00 | 628.00 | 1111.00 | 669.00 | 1162.00 | 813.60 | 1.20% | 0.80% | 1.17% | 0.60% | 0.34% | 0.79% | 6.00 | 5.00 | 13.00 | 4.00 | 4.00 | 6.40 |
| | Insulator and bushing | Y | 249.00 | 295.00 | 384.00 | 273.00 | 374.00 | 315.00 | 2.41% | 1.02% | 2.08% | 1.83% | 1.07% | 1.65% | 6.00 | 3.00 | 8.00 | 5.00 | 4.00 | 5.20 |
| | Crossarm | Y | 572.00 | 717.00 | 777.00 | 769.00 | 1001.00 | 767.20 | 0.52% | 0.56% | 1.42% | 0.52% | 0.20% | 0.63% | 3.00 | 4.00 | 11.00 | 4.00 | 2.00 | 4.80 |
| | Voltage regulator/ Booster | Y | 59.00 | 62.00 | 60.00 | 52.00 | 59.00 | 58.40 | 1.69% | 1.61% | 5.00% | 3.85% | 5.08% | 3.42% | 1.00 | 1.00 | 3.00 | 2.00 | 3.00 | 2.00 |
| | Recloser | Y | 54.00 | 57.00 | 92.00 | 69.00 | 106.00 | 75.60 | 0.00% | 5.26% | 3.26% | 0.00% | 0.00% | 1.59% | 0.00 | 3.00 | 3.00 | 0.00 | 0.00 | 1.20 |

**TABLE 11-1: KEY RECENT DRIVERS OF IGNITION PROBABILITY, LAST 5 YEARS – DISTRIBUTION SYSTEM (CONTINUED)**

| Incident type by ignition probability driver | | Near misses tracked (y/n)? | Number of incidents per year | | | | | | Average percentage probability of ignition per incident | | | | | | Number of ignitions per year from this driver | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average |
| | Anchor/Guy | Y | 36.00 | 41.00 | 47.00 | 47.00 | 58.00 | 45.80 | 2.78% | 2.44% | 2.13% | 0.00% | 0.00% | 1.31% | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.60 |
| | Sectionalizer | Y | 4.00 | 3.00 | 2.00 | 4.00 | 3.00 | 3.20 | 0.00% | 33.33% | 0.00% | 0.00% | 0.00% | 6.25% | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.20 |
| | Other Equipment | Y | 2297.00 | 2377.00 | 2544.00 | 2068.00 | 2190.00 | 2295.20 | 0.91% | 0.84% | 0.90% | 0.34% | 0.59% | 0.73% | 21.00 | 20.00 | 23.00 | 7.00 | 13.00 | 16.80 |
| Wire-to-wire contact / contamination (See notes section) | | Y | 14595.00 | 13424.00 | 18889.00 | 12002.00 | 16357.00 | 15053.40 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Other | | Y | 2193.00 | 1285.00 | 2160.00 | 1785.00 | 1746.00 | 1833.80 | 1.46% | 1.40% | 0.60% | 1.18% | 2.23% | 1.34% | 32.00 | 18.00 | 13.00 | 21.00 | 39.00 | 24.60 |

**TABLE 11-2: KEY RECENT DRIVERS OF IGNITION PROBABILITY, LAST 5 YEARS – TRANSMISSION SYSTEM**

| Incident type by ignition probability driver | | Near misses tracked (y/n)? | Number of incidents per year | | | | | | Average percentage probability of ignition per incident | | | | | | Number of ignitions per year from this driver | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average |
| Contact from object | All types of object contact | Y | 155.00 | 136.00 | 232.00 | 138.00 | 150.00 | 162.20 | 3.87% | 8.82% | 4.31% | 7.97% | 8.67% | 6.41% | 6.00 | 12.00 | 10.00 | 11.00 | 13.00 | 10.40 |
| | Animal | Y | 41.00 | 43.00 | 43.00 | 49.00 | 32.00 | 41.60 | 14.63% | 20.93% | 11.63% | 10.20% | 18.75% | 14.90% | 6.00 | 9.00 | 5.00 | 5.00 | 6.00 | 6.20 |
| | Vegetation | Y | 50.00 | 41.00 | 122.00 | 26.00 | 64.00 | 60.60 | 0.00% | 0.00% | 0.00% | 0.00% | 1.56% | 0.33% | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.20 |
| | Mylar balloon | Y | 9.00 | 5.00 | 12.00 | 14.00 | 9.00 | 9.80 | 0.00% | 20.00% | 8.33% | 0.00% | 0.00% | 4.08% | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.40 |
| | Car pole | Y | 27.00 | 29.00 | 38.00 | 37.00 | 25.00 | 31.20 | 0.00% | 3.45% | 2.63% | 8.11% | 16.00% | 5.77% | 0.00 | 1.00 | 1.00 | 3.00 | 4.00 | 1.80 |
| | 3rd Party (foreign object /aircraft/ vandalism) | Y | 28.00 | 18.00 | 17.00 | 12.00 | 20.00 | 19.00 | 0.00% | 5.56% | 17.65% | 25.00% | 10.00% | 9.47% | 0.00 | 1.00 | 3.00 | 3.00 | 2.00 | 1.80 |
| Equipment / Facility Failure | All types of Equipment Failure | Y | 97.00 | 122.00 | 145.00 | 123.00 | 132.00 | 123.80 | 3.09% | 3.28% | 5.52% | 4.07% | 6.06% | 4.52% | 3.00 | 4.00 | 8.00 | 5.00 | 8.00 | 5.60 |
| | Arrestor | Y | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.40 | N/A | 0.00% | 0.00% | N/A | N/A | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Insulator or Bushing | Y | 32.00 | 48.00 | 54.00 | 56.00 | 33.00 | 44.60 | 3.13% | 0.00% | 3.70% | 1.79% | 9.09% | 3.14% | 1.00 | 0.00 | 2.00 | 1.00 | 3.00 | 1.40 |
| | Circuit breaker | Y | 6.00 | 3.00 | 4.00 | 7.00 | 8.00 | 5.60 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Conductor | Y | 7.00 | 19.00 | 16.00 | 12.00 | 35.00 | 17.80 | 14.29% | 15.79% | 25.00% | 8.33% | 2.86% | 11.24% | 1.00 | 3.00 | 4.00 | 1.00 | 1.00 | 2.00 |

**TABLE 11-2: KEY RECENT DRIVERS OF IGNITION PROBABILITY, LAST 5 YEARS – TRANSMISSION SYSTEM (CONTINUED)**

| Incident type by ignition probability driver | | Near misses tracked (y/n)? | Number of incidents per year | | | | | | Average percentage probability of ignition per incident | | | | | | Number of ignitions per year from this driver | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average |
| | Connector/ hardware | Y | 11.00 | 21.00 | 19.00 | 10.00 | 13.00 | 14.80 | 0.00% | 0.00% | 0.00% | 0.00% | 7.69% | 1.35% | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.20 |
| | Other station | Y | 21.00 | 17.00 | 18.00 | 14.00 | 20.00 | 18.00 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Structure line | Y | 7.00 | 7.00 | 27.00 | 20.00 | 18.00 | 15.80 | 0.00% | 0.00% | 3.70% | 5.00% | 0.00% | 2.53% | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.40 |
| | Switch (line+station) | Y | 13.00 | 4.00 | 6.00 | 4.00 | 2.00 | 5.80 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Transformer | Y | 0.00 | 2.00 | 0.00 | 0.00 | 5.00 | 1.40 | N/A | 0.00% | N/A | N/A | 20.00% | 28.57% | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.40 |
| | Other Equipment | N/A | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | N/A | N/A | N/A | N/A | N/A | N/A | 0.00 | 1.00 | 1.00 | 2.00 | 2.00 | 1.20 |
| Contamination | All types of contamination | Y | 14.00 | 18.00 | 20.00 | 36.00 | 11.00 | 19.80 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Disaster | All Types of Disaster (all but 2 Fire) | Y | 37.00 | 22.00 | 66.00 | 35.00 | 13.00 | 34.60 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other | All types of Other (e.g., customer or IPP caused) | Y | 17.00 | 5.00 | 11.00 | 19.00 | 24.00 | 15.20 | 23.53% | 0.00% | 54.55% | 42.11% | 25.00% | 31.58% | 4.00 | 0.00 | 6.00 | 8.00 | 6.00 | 4.80 |
| Unknown | Patrol Found No Cause, No Damage | Y | 125.00 | 139.00 | 156.00 | 160.00 | 138.00 | 143.60 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**TABLE 11-2: KEY RECENT DRIVERS OF IGNITION PROBABILITY, LAST 5 YEARS – TRANSMISSION SYSTEM (CONTINUED)**

| Incident type by ignition probability driver | | Near misses tracked (y/n)? | Number of incidents per year | | | | | | Average percentage probability of ignition per incident | | | | | | Number of ignitions per year from this driver | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average | 2015 | 2016 | 2017 | 2018 | 2019 | Average |
| Weather | All types of Weather | Y | 278.00 | 84.00 | 202.00 | 38.00 | 204.00 | 161.20 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Lightning | Y | 226.00 | 58.00 | 72.00 | 30.00 | 109.00 | 99.00 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Rain | Y | 5.00 | 12.00 | 47.00 | 0.00 | 23.00 | 17.40 | 0.00% | 0.00% | 0.00% | N/A | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Snow/ Ice | Y | 7.00 | 1.00 | 38.00 | 8.00 | 61.00 | 23.00 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Wind | Y | 40.00 | 13.00 | 45.00 | 0.00 | 11.00 | 21.80 | 0.00% | 0.00% | 0.00% | N/A | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Work Procedure Error (WPE) | All types of WPE | Y | 20.00 | 16.00 | 18.00 | 26.00 | 21.00 | 20.20 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

## 3.3 Recent Use of PSPS, Last 5 Years

*Instructions for Table 12:*

*Report use of PSPS according to the number and duration of PSPS events in total and normalized across weather conditions each year (by dividing by the number of RFW circuit mile days). List additional PSPS characteristics tracked in the "other" row and additional rows as needed.*

**TABLE 12: RECENT USE OF PSPS, LAST 5 YEARS**

| PSPS characteristic | 2015 | 2016 | 2017 | 2018 | 2019 | Unit(s) |
|---|---|---|---|---|---|---|
| Frequency of PSPS events (total) | N/A | N/A | N/A | 1 | 9 | Number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability, per year |
| Frequency of PSPS events (normalized) | N/A | N/A | N/A | 0.0000019 | 0.000025 | Number of instances where utility operating protocol requires de-energization of a circuit or portion thereof in order to reduce ignition probability, per RFW circuit mile day per year |
| Scope of PSPS events (total) | N/A | N/A | N/A | 41 | 16,506 | Circuit-events, measured in number of events multiplied by number of circuits de-energized per year |
| Scope of PSPS events (normalized) | N/A | N/A | N/A | 0.000078 | 0.046 | Circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization per RFW circuit mile day per year |
| Duration of PSPS events (total) | N/A | N/A | N/A | 1,517,371 | 98,617,112 | Customer hours per year |
| Duration of PSPS events (normalized) | N/A | N/A | N/A | 3 | 274 | Customer hours per RFW circuit mile day per year |
| RFW circuit mile day per year | 63,304 | 89,832 | 471,375 | 522,855 | 360,281 | Aligns with CPUC WSD provided definition: “Sum of miles of utility grid subject to Red Flag Warning each day, with day being defined as a 24 hour period. |

## 3.4 Baseline State of Equipment and Wildfire and PSPS Event Risk Reduction Plans

### 3.4.1 Current Baseline State of Service Territory and Utility Equipment

*Instructions for Table 13:*

*Provide summary data for the current baseline state of HFTD and non-HFTD service territory in terms of circuit miles; overhead transmission lines, overhead distribution lines, substations, and critical facilities located within the territory; and customers by type, located in urban versus rural versus highly rural areas and including the subset within the Wildland-Urban Interface (WUI).*

*The totals of the cells for each category of information (e.g., "circuit miles" or "circuit miles in WUI") would be equal to the overall service territory total (e.g., the total of number of customers in urban, rural, and highly rural areas of HFTD plus those in urban, rural, and highly rural areas of non-HFTD would equal the total number of customers of the entire service territory). Ensure underlying data is provided per Section 2.7.*

Table 13 seeks information regarding the current baseline state of HFTD and non-HFTD service territory, as located in urban versus rural versus highly rural areas, including a subset with the Wildland-Urban Interface (WUI). The WUI is defined as areas where homes are built near or among lands prone to wildland fires. PG&E identifies WUI areas within PG&E's service territory based upon data provided by the University of Wisconsin-Madison SILVIS Lab. Figure PG&E-3-1, which downloaded from an Esri feature service created by SILVIS Labs of University of Wisconsin, *available here*: http://silvis.forest.wisc.edu/data/wui-change/, shows the WUI areas within California as of 2010.

**FIGURE PG&E 3-1: WUI AREAS WITHIN CALIFORNIA (2010)**

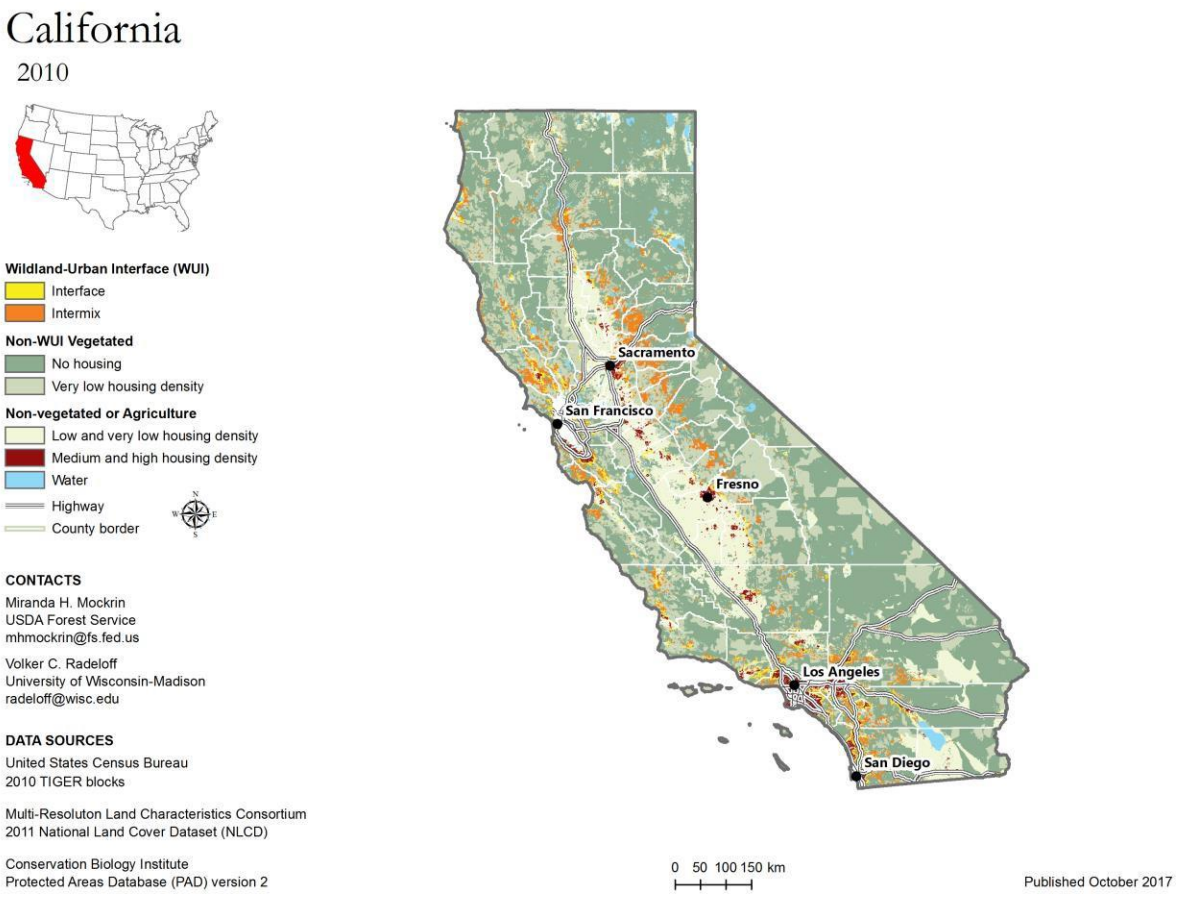


**TABLE 13: CURRENT BASELINE STATE OF SERVICE TERRITORY AND UTILITY EQUIPMENT**

| Land use | Characteristic tracked | In non-HFTD | In HFTD Zone 1 | In HFTD Tier 2 | In HFTD Tier 3 |
|---|---|---|---|---|---|
| In urban areas | Circuit miles | 15,604 | 9 | 996 | 395 |
| | Circuit miles in WUI | 4,195 | 8 | 721 | 340 |
| | Number of critical facilities | 17,009 | 7 | 442 | 204 |
| | Number of critical facilities in WUI | 4,213 | 5 | 402 | 172 |
| | Number of customers | 3,966,386 | 2,172 | 76,068 | 29,274 |
| | Number of customers in WUI | 1,165,448 | 1,943 | 66,452 | 27,165 |
| | Number of customers belonging to access and functional needs populations | 120,605 | 45 | 2,084 | 727 |
| | Number of customers belonging to access and functional needs populations in WUI | 38,384 | 39 | 1,895 | 688 |
| | Circuit miles of overhead transmission lines | 2,048 | 0 | 208 | 53 |
| | Circuit miles of overhead transmission lines in WUI | 64 | 0 | 82 | 36 |
| | Circuit miles of overhead distribution lines | 13,556 | 9 | 789 | 341 |
| | Circuit miles of overhead distribution lines in WUI | 4,130 | 8 | 638 | 304 |
| | Number of substations | 314 | 0 | 18 | 0 |
| | Number of substations in WUI | 94 | 0 | 14 | 0 |

**TABLE 13: CURRENT BASELINE STATE OF SERVICE TERRITORY AND UTILITY EQUIPMENT (CONTINUED)**

| | | | | | |
|---|---|---|---|---|---|
| In rural areas | Circuit miles | 45,119 | 87 | 17,020 | 7,229 |
| | Circuit miles in WUI | 7,962 | 57 | 9,479 | 4,671 |
| | Number of critical facilities | 10,134 | 42 | 1,857 | 1,009 |
| | Number of critical facilities in WUI | 2,532 | 29 | 1,153 | 690 |
| | Number of customers | 1,051,321 | 3,877 | 249,888 | 130,048 |
| | Number of customers in WUI | 483,462 | 3,493 | 116,821 | 210,802 |
| | Number of customers belonging to access and functional needs populations | 37,116 | 158 | 11,161 | 5,530 |
| | Number of customers belonging to access and functional needs populations in WUI | 18,815 | 149 | 10,055 | 5,217 |
| | Circuit miles of overhead transmission lines | 8,866 | 13 | 2,872 | 1,071 |
| | Circuit miles of overhead transmission lines in WUI | 915 | 6 | 815 | 286 |
| | Circuit miles of overhead distribution lines | 36,253 | 74 | 14,149 | 6,158 |
| | Circuit miles of overhead distribution lines in WUI | 7,047 | 51 | 8,664 | 4,386 |
| | Number of substations | 289 | 0 | 35 | 7 |
| | Number of substations in WUI | 67 | 0 | 27 | 18 |

**TABLE 13: CURRENT BASELINE STATE OF SERVICE TERRITORY AND UTILITY EQUIPMENT (CONTINUED)**

| | | | | | |
|---|---|---|---|---|---|
| In highly rural areas | Circuit miles | 7,302 | 39 | 4,539 | 825 |
| | Circuit miles in WUI | 563 | 9 | 1,035 | 331 |
| | Number of critical facilities | 649 | 8 | 326 | 104 |
| | Number of critical facilities in WUI | 108 | 4 | 144 | 60 |
| | Number of customers | 39,611 | 1,303 | 33,739 | 9,840 |
| | Number of customers in WUI | 14,576 | 1,068 | 22,200 | 7,919 |
| | Number of customers belonging to access and functional needs populations | 878 | 7 | 1,098 | 231 |
| | Number of customers belonging to access and functional needs populations in WUI | 475 | 4 | 813 | 188 |
| | Circuit miles of overhead transmission lines | 1,704 | 12 | 1,144 | 169 |
| | Circuit miles of overhead transmission lines in WUI | 50 | 0 | 102 | 31 |
| | Circuit miles of overhead distribution lines | 5,598 | 27 | 3,395 | 656 |
| | Circuit miles of overhead distribution lines in WUI | 513 | 9 | 933 | 300 |
| | Number of substations | 51 | 0 | 22 | 6 |
| | Number of substations in WUI | 3 | 0 | 7 | 3 |



Notes for Table 13**:**

1. The WUI data were downloaded from an Esri feature service created by SILVIS Labs of University of Wisconsin. Metadata for the layer are available here.
2. The population density layer was derived by 'dissolving' US Census Tract population density data by the criteria defined by the CPUC:
   - Urban: Greater than or Equal to 1000 persons per square mile

- Rural: Less than 1000 persons per square mile but Greater that 7 persons per square mile
- Highly rural: Less than or equal to 7 persons per square mile.

3. Circuit miles = Circuit miles of overhead transmission lines + Circuit miles of overhead distribution lines
4. Circuit miles in WUI = Circuit miles of overhead transmission lines in WUI + Circuit miles of overhead distribution lines in WUI
5. Critical facility data was sourced using customer billing data by intersecting the result with both the population density layer as well as the WUI layer.
6. Existing ETGIS and EDGIS data (overhead lines, substations) were intersected with the population density layer and the WUI layer, respectively.

*Instructions for Table 14:*

*Input summary data on number of utility weather stations located in utility service territory by type.*

**TABLE 14: SUMMARY DATA ON WEATHER STATION COUNT**

| Weather station count type | Current count | Unit(s) |
|---|---|---|
| Number of weather stations (total) | 630 | Total number located in service territory and operated by utility |
| Number of weather stations (normalized) | 0.0063 | Total number located in service territory and operated by utility, divided by total number of circuit miles in utility service territory |
| Number of weather stations in non-HFTD (total) | 75 | Total number located in non-HFTD service territory and operated by utility |
| Number of weather stations in non-HFTD (normalized) | 0.0011 | Total number located in non-HFTD service territory and operated by utility, divided by total number of circuit miles in non-HFTD service territory |
| Number of weather stations in HFTD Zone 1 (total) | 0 | Total number located in HFTD Zone 1 service territory and operated by utility |
| Number of weather stations in HFTD Zone 1 (normalized) | NA | Total number located in HFTD Zone 1 service territory and operated by utility, divided by total number of circuit miles in HFTD Zone 1 service territory |
| Number of weather stations in HFTD Tier 2 (total) | 372 | Total number located in HFTD Tier 2 service territory and operated by utility |
| Number of weather stations in HFTD Tier 2 (normalized) | 0.0165 | Total number located in HFTD Tier 2 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 2 service territory |
| Number of weather stations in HFTD Tier 3 (total) | 183 | Total number located in HFTD Tier 3 service territory and operated by utility |
| Number of weather stations in HFTD Tier 3 (normalized) | 0.0217 | Total number located in HFTD Tier 3 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 3 service territory |

Notes for Table 14:

1. PG&E currently employs one mobile weather station which is not reflected in the above table.

*Instructions for Table 15:*

*Input summary data on number of utility fault indicators located in utility service territory by type.*

**TABLE 15: SUMMARY DATA ON FAULT INDICATOR COUNT**

| Fault indicator count type | Distribution Current count | Transmission Current count | Unit(s) |
|---|---|---|---|
| Number of fault indicators (total) | 19,651 | 63 | Total number located in service territory and operated by utility |
| Number of fault indicators (normalized) | 0.2438 | .0035 | Total number located in service territory and operated by utility, divided by total number of circuit miles in utility service territory |
| Number of fault indicators in non-HFTD (total) | 15,293 | 28 | Total number located in non-HFTD service territory and operated by utility |
| Number of fault indicators in non-HFTD (normalized) | 0.2781 | 0.0035 | Total number located in non-HFTD service territory and operated by utility, divided by total number of circuit miles in non-HFTD service territory |
| Number of fault indicators in HFTD Zone 1 (total) | 46 | 0 | Total number located in HFTD Zone 1 service territory and operated by utility |
| Number of fault indicators in HFTD Zone 1 (normalized) | 0.4182 | 0 | Total number located in HFTD Zone 1 service territory and operated by utility, divided by total number of circuit miles in HFTD Zone 1 service territory |
| Number of fault indicators in HFTD Tier 2 (total) | 2,978 | 28 | Total number located in HFTD Tier 2 service territory and operated by utility |
| Number of fault indicators in HFTD Tier 2 (normalized) | 0.1624 | 0.0064 | Total number located in HFTD Tier 2 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 2 service territory |

**TABLE 15: SUMMARY DATA ON FAULT INDICATOR COUNT (CONTINUED)**

| Fault indicator count type | Distribution Current count | Transmission Current count | Unit(s) |
|---|---|---|---|
| Number of fault indicators in HFTD Tier 3 (total) | 1,334 | 7 | Total number located in HFTD Tier 3 service territory and operated by utility |
| Number of fault indicators in HFTD Tier 3 (normalized) | 0.1864 | 0.0053 | Total number located in HFTD Tier 3 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 3 service territory |

### 3.4.2 Planned Additions, Removal, and Upgrade of Utility Equipment by End of 3-Year Plan Term

*Instructions for Table 16:*

*Input summary information for the planned additions or removal of utility equipment to be completed by the end of the 3-year plan term in 2022. Report net additions using positive numbers and net removals and undergrounding using negative numbers for circuit miles and numbers of substations.*

For transmission and distribution overhead line additions and removals for 2021 and 2022, project prioritization and timing have yet to be fully determined or mapped. Table 16 represents all fully developed and mappable work for 2020-2022.

**TABLE 16: LOCATION OF PLANNED UTILITY EQUIPMENT ADDITIONS OR REMOVAL BY END OF 3-YEAR PLAN TERM**

| Land use | Characteristic tracked | Changes by end-2022 | | | |
|---|---|---|---|---|---|
| | | In non-HFTD | In HFTD Zone 1 | In HFTD Tier 2 | In HFTD Tier 3 |
| In urban areas | Circuit miles of overhead transmission lines | 0 | 0 | 0 | 0 |
| | Circuit miles of overhead distribution lines | -9.27 | 0.00 | -0.76 | -0.15 |
| | Circuit miles of overhead transmission lines in WUI | 0 | 0 | 0 | 0 |
| | Circuit miles of overhead distribution lines in WUI | -0.78 | 0.00 | -0.45 | -0.11 |
| | Number of substations | 0 | 0 | 0 | 0 |
| | Number of substations in WUI | 0 | 0 | 0 | 0 |
| | Number of weather stations | N/A | N/A | N/A | N/A |
| | Number of weather stations in WUI | N/A | N/A | N/A | N/A |

**TABLE 16: LOCATION OF PLANNED UTILITY EQUIPMENT ADDITIONS OR REMOVAL BY END OF 3-YEAR PLAN TERM (CONTINUED)**

| Land use | Characteristic tracked | Changes by end-2022 | | | |
|---|---|---|---|---|---|
| | | In non-HFTD | In HFTD Zone 1 | In HFTD Tier 2 | In HFTD Tier 3 |
| In rural areas | Circuit miles of overhead transmission lines | -0.47 | 0 | -2.09 | -1.48 |
| | Circuit miles of overhead distribution lines | -77.10 | -0.19 | -13.18 | -5.15 |
| | Circuit miles of overhead transmission lines in WUI | | | -0.38 | -0.21 |
| | Circuit miles of overhead distribution lines in WUI | -9.06 | -0.19 | -8.76 | -4.50 |
| | Number of substations | 0 | 0 | 0 | 0 |
| | Number of substations in WUI | 0 | 0 | 0 | 0 |
| | Number of weather stations | N/A | N/A | N/A | N/A |
| | Number of weather stations in WUI | N/A | N/A | N/A | N/A |
| In highly rural areas | Circuit miles of overhead transmission lines | 0 | 0 | 0 | 0 |
| | Circuit miles of overhead distribution lines | -12.69 | 0.00 | -4.17 | -0.47 |
| | Circuit miles of overhead transmission lines in WUI | 0 | 0 | 0 | 0 |
| | Circuit miles of overhead distribution lines in WUI | -0.95 | 0.00 | -1.70 | -0.14 |
| | Number of substations | -1 | 0 | 0 | 0 |
| | Number of substations in WUI | 0 | 0 | 0 | 0 |
| | Number of weather stations | N/A | N/A | N/A | N/A |
| | Number of weather stations in WUI | N/A | N/A | N/A | N/A |

Transmission lines refer to all lines 60 kV and above, and distribution lines refer to all lines below 60 kV.

*Instructions for Table 17:*

*Referring to the program targets discussed above, report plan for hardening upgrades in detail below. Report plan in terms of number of circuit miles or substations to be upgraded for each year, assuming complete implementation of wildfire mitigation activities, for HFTD and non-HFTD service territory for circuit miles of transmission lines, circuit miles of transmission lines located in Wildland-Urban Interface (WUI), circuit miles of distribution lines, circuit miles of distribution lines in WUI, number of substations, and number of substations in the WUI.*

*Include a list of the hardening initiatives included in the calculations for the below table.*

This table identifies miles related to PG&E's distribution system hardening and Butte Rebuild programs as described in the program targets. PG&E has not established dedicated transmission line or substation wildfire hardening programs and has marked the table with N/A for those cells.

Of the 241 miles forecasted for 2020, 183.1 total miles of distribution system hardening projects have been fully mapped to enable sorting into characteristics requested for this table. While PG&E has determined program targets for 2021 and 2022, project prioritization and timing have yet to be fully determined or mapped. Thus, cells for 2021 and 2022 have been marked as To Be Determined (TBD).

**TABLE 17: LOCATION OF PLANNED UTILITY INFRASTRUCTURE UPGRADES**

| Land use | Characteristic tracked | In non-HFTD | | | In HFTD Zone 1 | | | In HFTD Tier 2 | | | In HFTD Tier 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 |
| Total circuit miles planned for hardening each year, all types and locations | | 0 | TBD | TBD | 0 | TBD | TBD | 3.6 | TBD | TBD | 179.5 | TBD | TBD |
| Total number of substations planned for hardening each year, all locations | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| In urban areas | Circuit miles planned for grid hardening of overhead transmission lines | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Circuit miles of overhead transmission lines in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Circuit miles of overhead distribution lines to harden | 0 | TBD | TBD | 0 | TBD | TBD | 2.2 | TBD | TBD | 3.8 | TBD | TBD |
| | Circuit miles of overhead distribution lines in WUI to harden | 0 | TBD | TBD | 0 | TBD | TBD | 2.2 | TBD | TBD | 3.8 | TBD | TBD |
| | Circuit miles of overhead transmission lines in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Number of substations to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Number of substations in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| In rural areas | Circuit miles of overhead transmission lines to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Circuit miles of overhead transmission lines in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Circuit miles of overhead distribution lines to harden | 0 | TBD | TBD | 0 | TBD | TBD | 1.4 | TBD | TBD | 175.7 | TBD | TBD |
| | Circuit miles of overhead distribution lines in WUI to harden | 0 | TBD | TBD | 0 | TBD | TBD | 1.4 | TBD | TBD | 174.5 | TBD | TBD |
| | Circuit miles of overhead transmission lines in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Number of substations to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

**TABLE 17: LOCATION OF PLANNED UTILITY INFRASTRUCTURE UPGRADES (CONTINUED)**

| Land use | Characteristic tracked | In non-HFTD | | | In HFTD Zone 1 | | | In HFTD Tier 2 | | | In HFTD Tier 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 |
| | Number of substations in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| In highly rural areas | Circuit miles of overhead transmission lines to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Circuit miles of overhead transmission lines in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Circuit miles of overhead distribution lines to harden | 0 | TBD | TBD | 0 | TBD | TBD | 0 | TBD | TBD | 0 | TBD | TBD |
| | Circuit miles of overhead distribution lines in WUI to harden | 0 | TBD | TBD | 0 | TBD | TBD | 0 | TBD | TBD | 0 | TBD | TBD |
| | Circuit miles of overhead transmission lines in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Number of substations to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Number of substations in WUI to harden | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

Transmission lines refer to all lines at or above 60kV, and distribution lines refer to all lines below 60kV.

### 3.4.3 Status Quo Ignition Probability Drivers by Service Territory

*Instructions for Table 18:*

*Report 5-year historical average drivers of ignition probability according to:*

- *the average number of incidents per year*
- *the likelihood of ignition per incident, meaning, the rate at which those incidents (e.g., object contact, equipment failure, etc.) would be expected to cause an ignition (e.g., if 50% of vegetation contacts result in ignition, then the value for the "Likelihood of ignition per incident" column would be "50%" in that row); and*
- *the 5-year historical average of the number of ignitions from this driver by location in non-HFTD, HFTD Zone 1, HFTD Tier 2, and HFTD Tier 3. List additional risk drivers tracked in the "other" row and additional rows as needed. If changes would be expected for plan years 2 and 3, describe.*

**Comments for Table 18**

Similar to Table 11, Table 18 purports to seek "ignition probability drivers," which are derived by dividing the number of ignitions per year by the total number of incidents per year. However, as explained in the introduction to Table 11, this calculation does not result in an average percentage probability, but a frequency. A frequency is the measure of how often an event occurs on average during a unit of time. In comparison, probability is a number between 0 and 1 that measures the chance some event may or may not happen. As a result, this calculation of number of ignitions per year divided by the total number of incidents per year indicates the number of ignitions per incidents. Moreover, it is inappropriate to average across historical years to derive future probability, because the fire threat conditions have changed over time as climate change has affected California. Instead of averaging these numbers, the numbers should be treated as a trend.

Likewise, as with Table 11, the categories vary between the Distribution and Transmission systems and a separate table is provided for each. In each case, unplanned outages are provided as the incidents. Table 18-1 covers the distribution system and Table 18-2 covers the transmission system. These summaries exclude all planned/wildfire mitigation outages and Public Power Shut-off events since these events generally do not involve fault conditions.

**TABLE 18-1: KEY DRIVERS OF IGNITION PROBABILITY – DISTRIBUTION**

| Ignition probability drivers | | Number of incidents per year (according to 5-year historical average) | Average likelihood of ignition per incident | Ignitions from this driver (according to 5-year historical average) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Total | In non-HFTD | In HFTD Zone 1 | In HFTD Tier 2 | In HFTD Tier 3 |
| Contact from object | All types of object contact | 11,102.40 | 2.13% | 236.20 | 146.00 | 0.40 | 61.80 | 28.00 |
| | Animal contact | 2,260.80 | 2.11% | 47.60 | 37.80 | 0.00 | 8.00 | 1.80 |
| | Balloon contact | 527.20 | 2.77% | 14.60 | 12.80 | 0.00 | 1.80 | 0.00 |
| | Vegetation contact | 5,579.00 | 2.00% | 111.40 | 50.60 | 0.40 | 39.00 | 21.40 |
| | Vehicle contact | 1,900.20 | 2.27% | 43.20 | 31.40 | 0.00 | 9.80 | 2.00 |
| | Contact from Object - Other | 835.20 | 2.32% | 19.40 | 13.40 | 0.00 | 3.20 | 2.80 |
| All types of equipment / facility failure | All types | 12,100.00 | 1.31% | 158.00 | 125.00 | 0.40 | 24.60 | 8.00 |
| | Capacitor bank failure | 65.80 | 14.59% | 9.60 | 8.20 | 0.00 | 0.80 | 0.60 |
| | Conductor failure— all | 2,934.80 | 2.84% | 83.40 | 64.80 | 0.20 | 13.60 | 4.80 |
| | Conductor failure— wires down | 1,429.20 | N/A | N/A | N/A | N/A | N/A | N/A |
| | Fuse failure—all | 370.60 | 1.73% | 6.40 | 4.80 | 0.00 | 1.40 | 0.20 |
| | Fuse failure—conventional blown fuse | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Lightning arrestor failure | 138.60 | 2.74% | 3.80 | 3.60 | 0.00 | 0.20 | 0.00 |
| | Switch failure | 169.20 | 1.30% | 2.20 | 1.80 | 0.00 | 0.40 | 0.00 |
| | Transformer failure | 4,047.00 | 0.38% | 15.40 | 12.60 | 0.20 | 2.20 | 0.40 |

**TABLE 18-1: KEY DRIVERS OF IGNITION PROBABILITY – DISTRIBUTION (CONTINUED)**

| Ignition probability drivers | | Number of incidents per year (according to 5-year historical average) | Average likelihood of ignition per incident | Ignitions from this driver (according to 5-year historical average) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Total | In non-HFTD | In HFTD Zone 1 | In HFTD Tier 2 | In HFTD Tier 3 |
| | Pole | 813.60 | 0.79% | 6.40 | 5.40 | 0.00 | 0.80 | 0.20 |
| | Insulator and bushing | 315.00 | 1.65% | 5.20 | 4.40 | 0.00 | 0.60 | 0.20 |
| | Crossarm | 767.20 | 0.63% | 4.80 | 3.60 | 0.00 | 0.80 | 0.40 |
| | Voltage regulator/ Booster | 58.40 | 3.42% | 2.00 | 1.40 | 0.00 | 0.60 | 0.00 |
| | Recloser | 75.60 | 1.59% | 1.20 | 1.20 | 0.00 | 0.00 | 0.00 |
| | Anchor/Guy | 45.80 | 1.31% | 0.60 | 0.40 | 0.00 | 0.20 | 0.00 |
| | Sectionalizer | 3.20 | 6.25% | 0.20 | 0.20 | 0.00 | 0.00 | 0.00 |
| | Other Equipment | 2,295.20 | 0.73% | 16.80 | 12.60 | 0.00 | 3.00 | 1.20 |
| Wire-to-wire contact / contamination | | 15,053.40 | N/A | N/A | N/A | N/A | N/A | N/A |
| Other | | 1,833.80 | 1.34% | 24.60 | 19.20 | 0.00 | 3.40 | 2.00 |

**TABLE 18-2: KEY DRIVERS OF IGNITION PROBABILITY – TRANSMISSION**

| Ignition probability drivers | | Number of incidents per year (according to 5-year historical average) | Average likelihood of ignition per incident | Ignitions from this driver (according to 5-year historical average) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Total | In non-HFTD | In HFTD Zone 1 | In HFTD Tier 2 | In HFTD Tier 3 |
| Contact from object | All types of object contact | 162.20 | 6.41% | 10.40 | 5.40 | 0.00 | 3.60 | 1.40 |
| | Animal | 41.60 | 14.90% | 6.20 | 2.80 | 0.00 | 2.80 | 0.60 |
| | Vegetation | 60.60 | 0.33% | 0.20 | 0.00 | 0.00 | 0.20 | 0.00 |
| | Mylar balloon | 9.80 | 4.08% | 0.40 | 0.20 | 0.00 | 0.00 | 0.20 |
| | Car pole | 31.20 | 5.77% | 1.80 | 1.80 | 0.00 | 0.00 | 0.00 |
| | 3rd Party (foreign object/ aircraft/ vandalism) | 19.00 | 9.47% | 1.80 | 0.60 | 0.00 | 0.60 | 0.60 |
| Equipment / Facility Failure | All types of Equipment Failure | 123.80 | 4.52% | 5.60 | 2.80 | 0.00 | 2.20 | 0.60 |
| | Arrestor | 0.40 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Insulator or Bushing | 44.60 | 3.14% | 1.40 | 0.80 | 0.00 | 0.60 | 0.00 |
| | Circuit breaker | 5.60 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Conductor | 17.80 | 11.24% | 2.00 | 0.80 | 0.00 | 1.20 | 0.00 |
| | Connector/ hardware | 14.80 | 1.35% | 0.20 | 0.20 | 0.00 | 0.00 | 0.00 |
| | Other station | 18.00 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Structure line | 15.80 | 2.53% | 0.40 | 0.40 | 0.00 | 0.00 | 0.00 |
| | Switch (line+station) | 5.80 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**TABLE 18-2: KEY DRIVERS OF IGNITION PROBABILITY – TRANSMISSION (CONTINUED)**

| Ignition probability drivers | | Number of incidents per year (according to 5-year historical average) | Average likelihood of ignition per incident | Ignitions from this driver (according to 5-year historical average) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Total | In non-HFTD | In HFTD Zone 1 | In HFTD Tier 2 | In HFTD Tier 3 |
| | Transformer | 1.40 | 28.57% | 0.40 | 0.20 | 0.00 | 0.20 | 0.00 |
| | Other Equipment | 0.00 | N/A | 1.20 | 0.40 | 0.00 | 0.20 | 0.60 |
| Contamination | All types of contamination | 19.80 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Disaster | All Types of Disaster (all but 2 Fire) | 34.60 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other | All types of Other (e.g., customer or IPP caused) | 15.20 | 31.58% | 4.80 | 3.80 | 0.00 | 0.80 | 0.20 |
| Unknown | Patrol Found No Cause, No Damage | 143.60 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Weather | All types of Weather | 161.20 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Lightning | 99.00 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Rain | 17.40 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Snow/ Ice | 23.00 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Wind | 21.80 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Work Procedure Error (WPE) | All types of WPE | 20.20 | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

The ignition data used to populate the tables is in Section 3.2. See the notes regarding the data in that section.

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# SECTION 4

# INPUTS TO THE PLAN AND

# DIRECTIONAL VISION FOR WILDFIRE RISK EXPOSURE

# 4 Inputs to the Plan and Directional Vision for Wildfire Risk Exposure

## 4.1 The Objectives of the Plan

*The objectives of the plan shall, at a minimum, be consistent with the requirements of California Public Utilities Code §8386(a). Describe utility WMP objectives, categorized by each of the following timeframes:*

1. *Before the upcoming wildfire season, as defined by the California Department of Forestry and Fire Protection (CAL FIRE),*

2. *Before the next annual update,*

3. *Within the next 3 years, and*

4. *Within the next 10 years.*

The objective of PG&E's Wildfire Mitigation Plan (WMP) for 2020 and beyond is to reduce the risk and consequences of wildfires associated with utility electrical equipment, and thereby avoid catastrophic wildfires across central and northern California. PG&E is investing in many wildfire mitigation measures including enhanced vegetation management, asset inspection and repair, situational awareness, system hardening, and system automation.

As climate change and associated fire risk worsens, the only certain way to prevent an ignition during high wind weather patterns is to deenergize utility equipment through a Public Safety Power Shut-off (PSPS). However, these PSPS events cause significant and serious disruptions to the customers and communities we serve. Therefore PG&E's 2020 WMP also focuses on reducing the scope (number of customers affected), frequency (number of events) and duration (length of outage) of PSPS events. We will mitigate PSPS impacts to our customers in 2020 and beyond by using advanced meteorology tools to forecast wildfire risk conditions more granularly, applying improved analysis of which parts of the system face high fire risk, and improving switching and sectionalization such that PSPS events affect smaller portions of the grid. PG&E believes these measures can shrink by one-third the number of customers affected by future PSPS events.**1** We have also adopted a new goal of conducting safety patrols and restoring service to 98% of PSPS-affected customers within 12 hours of the "weather all-clear" declaration. PG&E is also working to improve its coordination with state, local, and community agencies, and to provide extensive information and support to customers before, during and after PSPS events.

These objectives are summarized below and detailed in Section 5 of this WMP.

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**1** As compared to the 2019 PSPS events, i.e. if the exact same weather patterns were seen in 2020 as experienced during the largest PSPS events in 2019 our mitigation efforts should reduce the number of customers impacted by those PSPS events by approximately one-third.

***Progress Timeline***

***1. Before the upcoming wildfire season:***

- Continue to reduce wildfire risk through mitigation programs including system hardening and enhanced vegetation management
- Implement PSPS impact mitigation activities to make each 2020 PSPS event affect one-third fewer customers than it would have in 2019 and to shorten restoration time after high-risk weather clears to 12 daylight hours for nearly all impacted customers.
- Further improve situational awareness and meteorology tools to increase weather forecast granularity and improve targeting of fire risk forecasts and PSPS events

***2. Before the next annual update:***

- Continue to modify wildfire mitigation programs by incorporating lessons learned throughout the 2020 wildfire season and in response to new regulations, requirements, guidelines or other changes.
- PG&E will work towards gathering data and performing the analysis necessary to establish modified PSPS criteria for distribution facilities that have been hardened.

***3. Within the next 3 years:***

- Track and assess performance of implemented wildfire risk mitigation activities to validate effectiveness and inform program adjustments. Evolve and implement wildfire mitigation programs, including increased annual pace of system hardening deployment.
- Continue to drive PSPS events to be smarter, smaller and shorter based on further improved tools, processes and understanding of wildfire risk and weather patterns.

***4. Within the next 10 years:***

- Track and assess performance of implemented wildfire risk mitigation activities over an extended period of time to validate effectiveness. Based on observed performance, continue using, modifying and improving elements of wildfire mitigation programs.
- Incorporate improving research, information, data, technologies and other tools into wildfire risk reduction efforts including PSPS targeting and minimization activities to continue to drive PSPS events to be smarter, smaller and shorter.

PG&E's Community Wildfire Safety Program (CWSP) is evolving rapidly as we gain experience on how various measures and technologies work to reduce the threat and

actuality of catastrophic wildfires. Actions such as vegetation management, equipment repairs, and line hardening are expected to materially reduce the risk, number and extent of wildfires – but at the same time, climate change-driven factors such as drought, wind patterns, bark beetles and others may increase that risk and counteract our efforts. PG&E seeks to study and learn about the impact and cost-effectiveness of the measure we take. We will work with our customers, communities and partners to learn how to serve their needs better and reduce wildfire and wildfire mitigation consequences in the future.

## 4.2 Understanding Major Trends Impacting Ignition Probability and Wildfire Consequence

*Describe how the utility assesses wildfire risk in terms of ignition probability and estimated wildfire consequence, including use of Multi-Attribute Risk Score (MARS) and Multi-Attribute Value Function (MAVF) as in the Safety Model and Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Phase (RAMP). Include description of how the utility distinguishes between these risks and the risks to safety and reliability. List and describe each "known local condition" that the utility monitors per GO 95, Rule 31.1, including how the condition is monitored and evaluated. In addition:*

In this section, PG&E describes its use of the Multi-Attribute Value Function (MAVF) to assess wildfire ignition probabilities and estimated consequences. The MAVF was developed as a part of the California Public Utilities Commission's (CPUC or Commission) Safety Model and Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Proceeding (RAMP). This section also describes how it distinguishes between wildfire risk and other safety and reliability risks and lists and describes "known local conditions" as that term is used in General Order (GO) 95, Rule 31.1.

Section 4.2 is followed by Section 4.2(A) which addresses how PG&E monitors and accounts for the contribution of weather to ignition probability and estimated wildfire consequence in its decision-making, including describing any utility-generated Fire Potential Index (FPI) or other measure. Then, in Section 4.2(B), PG&E describes how it monitors and accounts for fuel conditions with regard to ignition probability and estimated wildfire consequence. Finally, in Section 4.2.1, PG&E provides a discussion of the fire-threat evaluation of its service territory to determine whether an expanded HFTD area is warranted. This section also includes Table 19. Naming and numbering conventions (e.g., Sections 4.2(A), 4.2(B), and 4.2.1) are consistent with the outline in the WMP Guidelines.

### Implementation of the Multi-Attribute Value Framework (MAVF)

Pursuant to Decision (D.) 18-12-014, PG&E implemented the S-MAP Settlement Agreement in 2019, including the development of a MAVF and Risk Bowtie for Wildfire analysis. PG&E employs an MAVF to combine all potential consequences of the

occurrence of a risk event and create a single measurement of value.[2] An MAVF consists of the following components:

- Attributes / Ranges / Natural Units
- Weights
- Scaling Function

D.18-12-014 also provides six principles to use in determining the MAVF components: Attribute Hierarchies, Measured Observations, Comparison, Risk Assessment, Scaled Units, and Relative Importance.

The key components of the MAVF that PG&E used for assessing wildfire-related risks, and how they adhere to the principles, are shown Table PG&E-4-1 below and are described in the discussion following the table.

**TABLE PG&E 4-1: KEY COMPONENTS OF MAVF**

| Attribute | Range | Natural Units | Weight | Scaling Function |
|---|---|---|---|---|
| **Safety** | 0 - 100 | Equivalent Fatalities (EF)/event | 50% | Non-Linear |
| **Electric Reliability** | 0 – 4 Billion | Customer Minutes Interrupted (CMI)/event | 20% | Non-Linear |
| **Gas Reliability** | 0 – 750,000 | Customers affected/event | 5% | Non-Linear |
| **Financial**[3] | 0 - $5 Billion | $/event | 25% | Non-Linear |

- Ranges: Pursuant to D.18-12-014, the smallest observable value of an Attribute is the low end of the range, and the largest observable value is the high end of the range. PG&E interprets the largest observable value to be a reasonable value informed by historical events and plausible large-consequence scenarios. In PG&E's analysis and risk framework, event consequences are not capped at

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[2] D.18-12-014, p. 17, 2018 S-MAP Revised Lexicon: *Multi-Attribute Value Function (MAVF).*

[3] Pursuant to D.18-12-014 and D.16-08-018, utility shareholders' financial interests are to be excluded from the GRC and RAMP risk evaluation and risk mitigation considerations.

the high end of the range, but rather, the range is a specification required in the scaling function.

- The high end of the Safety Attribute Range, set to 100, is an order-of-magnitude value informed by recent events.
- The high end of the Electric Reliability Range (4 Billion CMI) was based on the most severe reliability impact from a single event of 3.6 billion CMI from the October 26, 2019 PSPS event.
- The Gas Reliability high end is based on a scenario of an outage at a critical gas facility.
- The Financial Attribute's high end represents a financial loss commensurate with an Energy Crisis-type event.

- Natural Units: EF is defined as the sum of Public, Employee and Contractor Fatalities and Serious Injuries per event occurrence. Serious Injuries are defined as situations that require hospitalization of an individual pursuant to existing Federal and State reporting guidelines.[4,5] Fatalities and Serious Injuries are converted to EFs using the multiplicative factors 1.00 and 0.25, respectively. The conversion rate from Serious Injury to EF is based on information available from Federal sources.[6]

- Scaling Function: The Non-Linear Scaling Function is used to convert each Attribute from its Natural Unit to Scaled Units.[7] It consists of the following segments, with each segment intended to represent events that are either operational (i.e., encountered in the course of regular operations), critical or catastrophic.
  - For natural units from 0 to 1% of the Range (operational/moderate events): Linear function from 0 to 0.1 Scaled Units.

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4 Pipeline and Hazardous Materials Safety Administration (PHMSA) §191.3 Definitions: Incident (see also: https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-facility-incident-report-criteria-history).

5 D.98-07-097 (Amended April 27, 2006), Findings of Fact 3 and Appendix B, Accident Report Requirements 3 (see also: https://www.cpuc.ca.gov/General.aspx?id=2090).

6 See "Treatment of the Values of Life and Injury in Economic Analysis", Table 2-3, Federal Aviation Administration (FAA) Office of Aviation Policy and Plans, Updated September 2016, (available at: https://www.faa.gov/regulations_policies/policy_guidance/benefit_cost/media/econ-value-section-2-tx-values.pdf).

7 D.18-12-014, pp. 17-18; 2018-S-MAP Revised Lexicon: *Scaled Unit of an Attribute: a value that varies from 0 to 100.*

- For natural units from 1% to 10% of the Range (critical events): Quadratic function from 0.1 to 5 Scaled Units.

- For natural units from 10% to 100+% of the Range (catastrophic events): Linear function from 5 to 100 Scaled Units.

D.18-12-014 directs utilities to use Expected Value (EV) when calculating the Consequence of Risk Event (CoRE) and use the scaling function to capture aversion to extreme outcomes or indifference over a range of outcomes. Under PG&E's Non-Linear scaling function, the risk score, as measured by Scaled Units, will be low for operational events, but increases exponentially as critical events approach catastrophic (but low probability) levels. Once catastrophic levels are attained the function assigns 10 times higher score for each potential increase in Natural Units when compared to operational events. This captures aversion to critical and catastrophic outcomes and gives higher priority to controls and mitigations that affect them.

When PG&E evaluates potential event consequences, it does not cap them at the Range high end per se, but pursuant to D.18-12-014[8], PG&E places a ceiling of 100 on converted Scaled Units, i.e., if a modeled risk event's consequence in Natural Units goes above the Attribute Range, the converted Scaled Unit will be 100. This provides a way to compare the relative importance of different Attributes using Attribute Weights, consistent with the Relative Importance principle.[9] Also, by capping, PG&E recognizes that catastrophic risks must be mitigated, and it is immaterial to consider one risk to be "more" or "less" catastrophic than another (e.g., a financial loss of $5 billion or $5.2 billion) when evaluating alternatives.

Environmental consequences of an event are accounted for financially (i.e., as part of the Financial consequences) because there is a lack of commonly accepted ways to measure non-monetary environmental consequences. This makes the use of non-monetary environmental Attributes inconsistent with the principle of Measured Observations.

In PG&E's risk modeling, Attribute levels (e.g. the financial consequence of a risk event) are assumed to be uncertain and are represented by well-defined probability distributions. PG&E uses Monte-Carlo simulations of risk events based on these probability distributions to calculate MAVF consequence levels (in Scaled Units) and thus Risk Scores, consistent with the Risk Assessment principle.

**Wildfire Risk Assessment**

Consistent with D.18-12-014, PG&E assesses wildfire risk and estimated wildfire consequences in a bowtie analysis.

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***8*** *Id.*

**9** D.18-12-014, Attachment A, Step 1A, No 7. MAVF Principle 6 – Relative Importance. pp A-6.

**FIGURE PG&E 4-1: WILDFIRE RISK "BOWTIE" ANALYSIS**



1. Below, PG&E provides a summary of wildfire bowtie analysis elements. Ignition Probability in the current S-MAP conforming bowtie is derived from normalizing the ignitions by Transmission and Distribution overhead line miles of exposure reported annually to the CPUC. In accordance with D.14-02-015, PG&E annually reports to the CPUC fire incidents that may be associated with PG&E facilities and that meet the following conditions: (a) a self-propagating fire of material other than electrical and/or communication facilities; (b) the resulting fire traveled greater than one linear meter from the ignition point; and (c) PG&E has knowledge that the fire occurred. The S-MAP conforming model currently has ignitions reported to the CPUC for years 2015 through 2018. Though PG&E is still reviewing the 2019 data in preparation for its annual report, preliminary 2019 data is also used in the model.[10]

2. Total Exposure across all Tranches: 98,965 miles covering PG&E's service territory

3. Ignitions are broken down to Six Tranches to reflect similar risk profiles within each Tranche:

    - HFTD – Ignition Associated with Distribution: Ignitions in HFTDs associated with Distribution assets.
    - HFTD – Ignition Associated with Transmission: Ignitions in HFTDs associated with Transmission assets.
    - HFTD – Ignition Associated with Substation: Ignitions in HFTDs associated with Substation.
    - Non HFTD – Ignition Associated with Distribution: Ignitions in non-HFTDs associated with Distribution assets.
    - Non HFTD – Ignition Associated with Transmission: Ignitions in non-HFTDs associated with Transmission assets.
    - Non HFTD – Ignition Associated with Substation: Ignitions in non-HFTDs associated with Substations.

4. Wildfire Consequences are modeled by analyzing fire incidents from CAL FIRE database from 2015 - 2019. CAL FIRE dataset provides location, size, number of destroyed/damaged structures and fatalities/injuries. This information is used to estimate financial and safety consequences. Reliability consequences are estimated by using distribution customer minutes interrupted for outages that were associated with CPUC reportable ignitions as well as outages associated with PG&E known fires.

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[10] PG&E's 2019 fire incident data will be submitted to the CPUC by April 1, 2020 per D.14-02-015. As such, PG&E's 2019 fire incident data report may contain data that has been revised from the data used in this risk analysis.

5. Outcomes – Consequences are categorized into eight outcomes to account for the severity of the fire as well as whether a fire weather warming was in place at the time of the start of the fire:

    - Fire Weather Warning* – Catastrophic Fire (Destroyed +100 structures and resulted in serious injury / Fatality)
    - Fire Weather Warning – Destructive Fire (Destroyed +100 structures but not Catastrophic)
    - Fire Weather Warning – Large Fire (Greater than 300 acres but not Catastrophic/Destructive)
    - Fire Weather Warning – Small Fire (Smaller than 300 acres)
    - Non-Fire Weather Warning – Catastrophic Fire (Destroyed +100 structures and resulted in serious injury / Fatality)
    - Non-Fire Weather Warning – Destructive Fire (Destroyed +100 structures but not Catastrophic)
    - Non-Fire Weather Warning – Large Fire (Greater than 300 acre but not Catastrophic/Destructive)
    - Non-Fire Weather Warning – Small Fire (Smaller than 300 acre)

**Wildfire Risk Assessment Compared with Other Safety and Reliability Risks**

All Enterprise Risks on PG&E's Risk Register might have safety and reliability consequences. The consequences are modeled separately for each risk. In developing probabilities and consequences for wildfire risks, PG&E uses a mix of internal and external data to model wildfire drivers and consequences (safety and reliability impacts on the risk). Safety and Reliability consequences/attributes (per S-MAP terminology) are also modeled separately and combined into a risk score using the MAVF.

**List and Description of "Known Local Conditions" as That Term is Used in GO 95, Rule 31.1**

GO 95, Rule 31.1 directs PG&E to design, construct and maintain a facility in accordance with accepted good practice for the intended use and known local conditions. For the purposes of risk assessment, PG&E utilized HFTD and non-HFTD areas as its known local conditions. PG&E developed its S-MAP conforming bowtie for the wildfire risk by creating separate tranches for HFTD and non-HFTD areas. The higher risk scores and Risk Spend Efficiency values for mitigations in the HFTD areas enables a clear case for prioritization of wildfire mitigation initiatives in HFTD areas. See Section 4.2.1 for additional information on PG&E's evaluation of HFTD areas.

### 4.2.A Contribution of Weather to Ignition Probability and Estimated Wildfire Consequences

*A. Describe how the utility monitors and accounts for the contribution of weather to ignition probability and estimated wildfire consequence in its decision-making, including describing any utility-generated Fire Potential Index or other measure (including input variables, equations, the scale or rating system, an explanation of how uncertainties are accounted for, an explanation of how this index is used to inform operational decisions, and an explanation of how trends in index ratings impact medium-term decisions such as maintenance and longer-term decisions such as capital investments, etc.).*

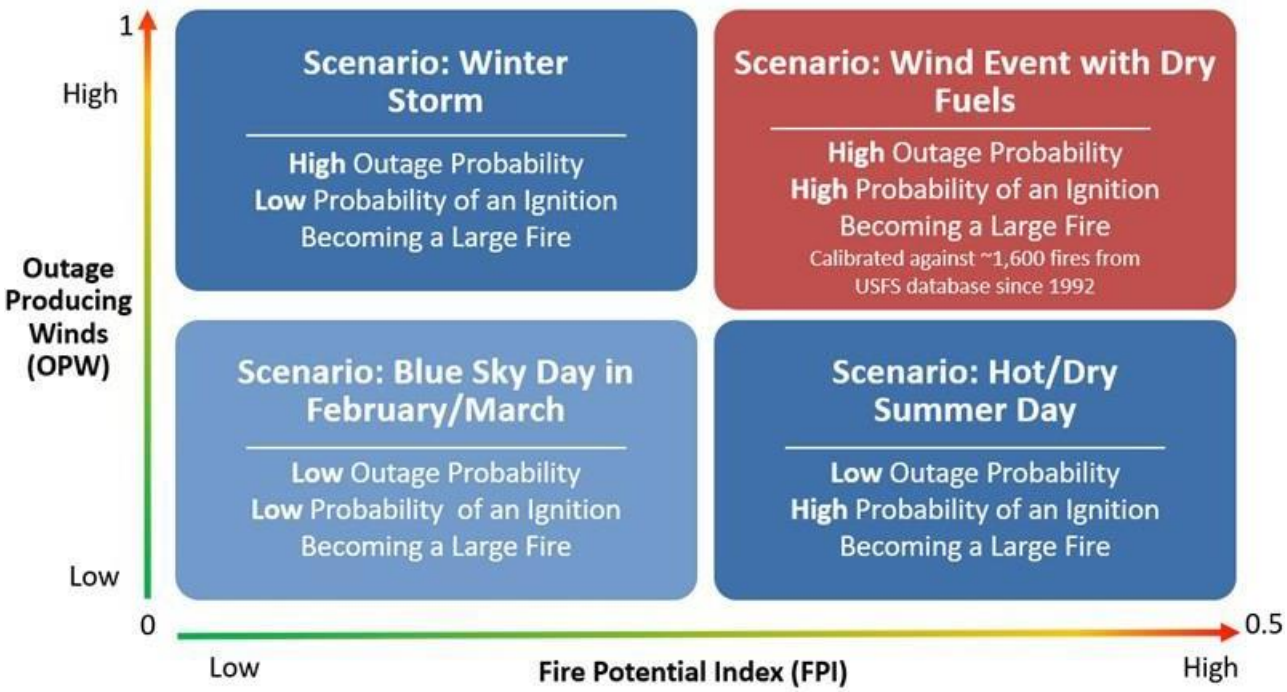
PG&E currently evaluates the risk of fires caused by a utility source as the product of the probability of an event occurring and the event consequence. The probability of a utility-caused fire ignition is related to a power outage from any source (e.g., vegetation failure, equipment failure, animal contact, car-pole). To better understand and forecast the potential of an outage, PG&E developed and then operationally deployed the Outage Producing Wind (OPW) model. The OPW model is incorporated into PG&E's high-resolution weather model and runs 4 times daily, and has also been computed hourly across PG&E's 30-year climatological dataset for historical analysis. PG&E's OPW model is discussed in detail in Section 5.3.2.

In order to evaluate the potential for fires, PG&E significantly enhanced the Fire Potential Index (FPI) model in 2019 building upon utility best-practices. The FPI model was built and calibrated using a United States Forest Service (USFS) dataset containing approximately 1,600 fires in PG&E's service territory from 1992 – 2018. PG&E built and evaluated over 4,000 combinations of the FPI model using numerous weather components, fire weather indices (Fosberg Fire Weather index, the Hot-Dry-Windy Index, the Santa Ana Wildfire Threat weather index), outputs from the National Fire Danger Rating System (NFDRS), Nelson Dead Fuel Moisture (DFM) model, a machine-learning derived Live Fuel Moisture (LFM) model, and 'containment' and 'land characteristic' features such as road density, distance to nearest fire station, land-use type among several others. PG&E evaluated dozens of variables to determine the most powerful predictors of fire size. The enhanced PG&E FPI, which was operationally deployed in 2019, combines weather (wind, temperature, and relative humidity) and fuels (10-hour dead fuel moisture, live fuel moisture, and fuel type [grass, shrub/brush, timber]) into an index that represents the probability for large fires to occur. The FPI is discussed in more detail in Section 5.3.2. The FPI is also produced 4 times daily from PG&E's high-resolution weather model, DFM and LFM models and was also computed hourly across PG&E's 30-year climatological dataset for historical analysis.

The FPI and OPW models are used in unison to analyze the risk of large fires caused by utility outages. For example, when the potential for outages is high (high OPW) and the potential for large fires is high (high FPI), a PSPS event should be considered. PG&E leveraged a robust 30-year weather and fuels dataset to determine the OPW and FPI conditions during each historical fire in the USFS fire occurrence dataset. The results showed the vast majority of rapidly moving, catastrophic fires occurred during high wind and high FPI conditions; thus, PG&E currently considers PSPS when there is a concurrence of high OPW and FPI. See the illustrative example below. PG&E currently has the ability to forecast FPI and OPW at 3 kilometer (km) spatial resolution

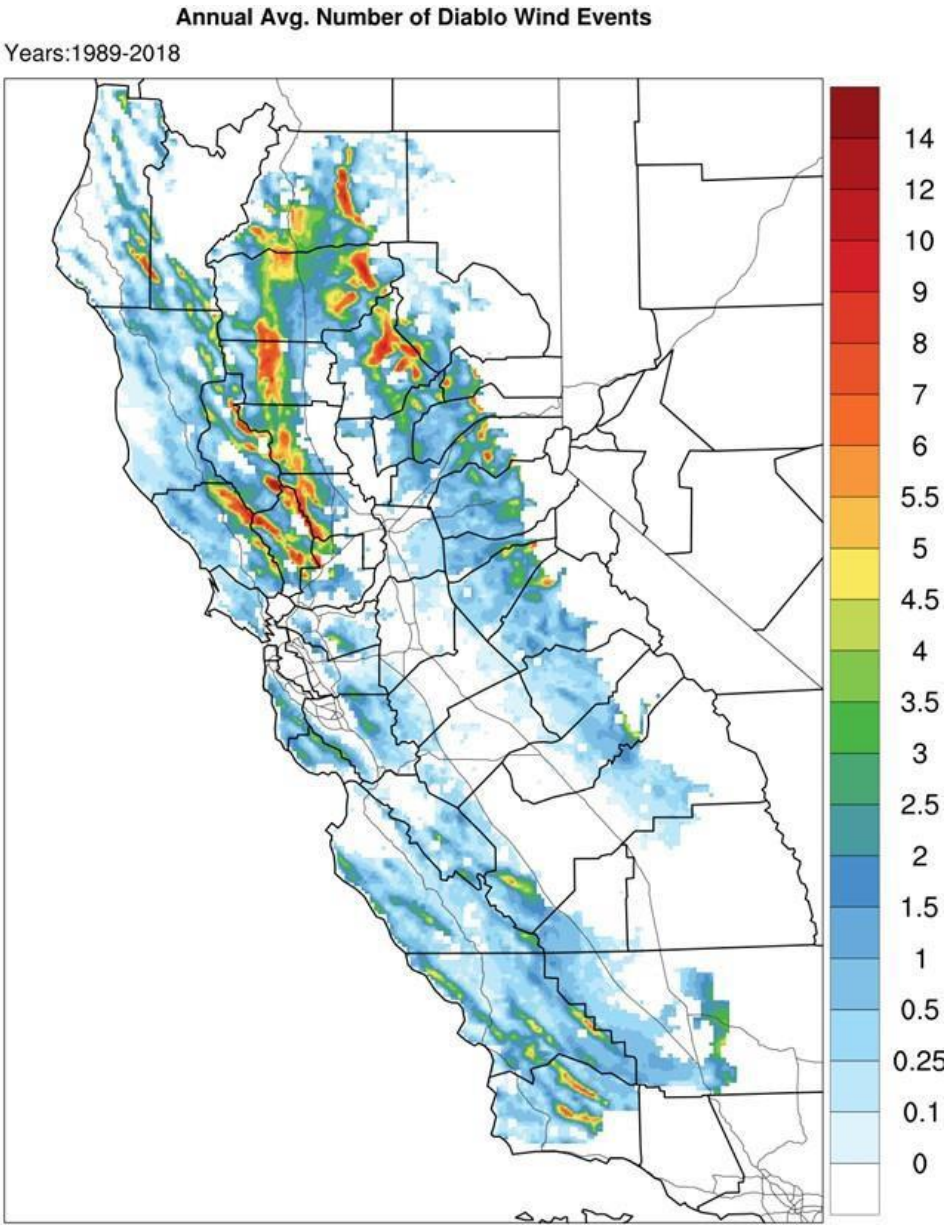
and 1-hour temporal resolution using PG&E's high-resolution weather model that has a forecast lead time of 80 hours. This modeling capability informs operational decisions in the short term. Beyond 80 hours, PG&E leverages global forecast models (discussed in Section 5.3.2) to help inform any operational and preparedness actions over the next two weeks.

**FIGURE PG&E 4-2: FIRE RISK MODEL INTERACTION: OUTAGE PRODUCING WINDS AND FIRE POTENTIAL INDEX**




PG&E Meteorology has a robust 30-year weather and fuels climatology that is being utilized to study past weather patterns across the PG&E service territory. One application is to determine where dry offshore wind events most frequently occur and when. These offshore wind events are commonly known as Diablo or Santa Ana wind events. The Diablo wind is a dry, northeast wind that occurs over northern California and is comparable to Santa Ana winds. These events are critical to consider as the vast majority of destructive fires in California history have occurred during dry, offshore wind events. The image below presents the average frequency of offshore (Diablo) wind events across the PG&E territory. For this analysis, a dry, Diablo wind event was defined as an event lasting at least 3 hours, having sustained winds >20 mph, wind direction from the north to northeast (offshore), and a PG&E FPI indicating dry conditions. This analysis shows the relative frequency of these events is higher in the North Bay Area and northern Sierra than in other portions of the PG&E territory. This study also revealed dry, offshore wind events are most common in Autumn. These patterns generally held true in 2019 as the majority of PSPS events occurred during autumn across the northern half of PG&E's territory. This analysis as well as other historical analyses are currently being considered for longer term projects such as grid hardening, enhanced vegetation management, and others.

**FIGURE PG&E 4-3: 30-YEAR HISTORICAL ANNUAL AVERAGE OF "DIABLO WIND EVENTS" GEOGRAPHICALLY**




PG&E monitors and accounts for the contribution of weather to ignition probability and estimated wildfire consequences in the S-MAP conforming bowtie by separating out the risk into separate outcomes based on historical fire weather watch data. See Section 4.2 above for the eight outcome categories. PG&E's risk analysis is then used to inform medium- and long-term decisions to address wildfire mitigation, such as inspections, maintenance, and capital investments. PG&E is also using historical PSPS events and their calculated expected risk to develop mitigations through either repairs, replacements, or sectionalizing plans. The calculated risk is a combination of the Asset Health predictive failure with the event FPI and REAX model.

### 4.2.B Contribution of Fuel Conditions

*B. Describe how the utility monitors and accounts for the contribution of fuel conditions to ignition probability and estimated wildfire consequence in its decision-making, including describing any proprietary fuel condition index (or other measures tracked), the outputs of said index or other measures, and the methodology used for projecting future fuel conditions. Include discussion of measurements and units for live fuel moisture content, dead fuel moisture content, density of each fuel type, and any other variables tracked. Describe the measures and thresholds the utility uses to determine extreme fuel conditions, including what fuel moisture measurements and threshold values the utility considers "extreme" and its strategy for how fuel conditions inform operational decision-making.*

PG&E's FPI, Dead Fuel Moisture, and Live Fuel Moisture modeling and tracking is discussed in detail in Section 5.3.2.

### 4.2.1 Service Territory Fire-Threat Evaluation and Ignition Risk Trends

*Discuss fire-threat evaluation of the service territory to determine whether an expanded High Fire Threat District (HFTD) is warranted (i.e., beyond existing Tier 2 and Tier 3 areas). This section shall include a discussion of any fire threat assessment of its service territory performed by the electrical corporation. In the event that the electrical corporation's assessment determines the fire threat rating for any part of its service territory is insufficient (i.e., the actual fire threat is greater than what is indicated in the CPUC Fire Threat Map and High Fire Threat District designations), the corporation shall identify those areas for consideration of HFTD modification, based on the new information or environmental changes. To the extent this identification relies upon a meteorological or climatological study, a thorough explanation and copy of the study shall be included.*

PG&E believes that the current HFTD map appropriately identifies areas within its service territory requiring additional actions to reduce wildfire risk. However, as a result of experience gained and feedback received in 2019, PG&E believes that elements of the HFTD map may warrant refinement. In addition, development and completion of a re-analysis of 30-year climatology and completion of the first phase of industry and agency accepted modeling provided by Technosylva can also be used to refine the HFTD map. As a result of this updated data, PG&E plans to perform additional evaluations of the HFTD map. These evaluations will help refine the scope of areas subject to PSPS, as well as, identify areas where adjustment to the HFTD map may be recommended by the utility.

In early 2020, PG&E plans to implement the first phase of this evaluation process. PG&E will execute an internal workplan much like the plan that helped develop the CPUC's HFTD map. This will rely on local expertise, defined data, and developed models to be utilized by regional leads to review and refine recommendations. These recommendations will be evaluated by a centralized review team and consolidated by these internal experts.

Following the first phase, PG&E will share outputs and recommendations with external stakeholders and public safety partners. This second phase is a critical step to ensure

any map revisions are vetted and socialized before proposing formal changes to the HFTD map to the CPUC. PG&E anticipates a significant amount of external engagement regarding these critical and potentially impactful adjustments. Refining and minimizing the impacts of potential PSPS events is an expectation in 2020. It is also anticipated that this process will clearly identify opportunities for future HFTD map refinement should the CAL FIRE and the CPUC endorse the changes.

PG&E will continue to evaluate the inclusion of additional areas requiring wildfire reduction activity in future plans based upon information obtained during the implementation and evaluation of PG&E's annual plan. In addition, PG&E will continue to mature its tools to analyze wildfire risk using available data, climatology and fire spread modeling to inform potential adjustments to the HFTD. These analytics may lead to additional future recommendations.

*Instructions for Table 19:*

*In the "Rank" column, numerically rank the trends anticipated to exhibit the greatest change and have the greatest impact on ignition probability and estimated wildfire consequence (be it to increase or decrease ignition probability and estimated wildfire consequence) in ten years. Rank in order from 1 to 8, where 1 represents the greatest anticipated change or impact on ignition probability and estimated wildfire consequence and 8 is the least anticipated change or impact.*

*In the "Comments" column, provide a narrative to describe the expected change and expected impact on the utility's network, including whether the trend is expected to significantly increase risk, moderately increase risk, have limited or no impact, moderately decrease risk, or significantly decrease risk. Use quantitative estimates wherever possible. Also outline any programs being implemented to specifically address this trend.*

**TABLE 19: MACRO TRENDS IMPACTING IGNITION PROBABILITY AND/OR WILDFIRE CONSEQUENCE**

| Rank | Macro trends impacting utility ignited ignition probability and estimated wildfire consequence by year 10 | Comments |
|---|---|---|
| 1 | Change in ignition probability and estimated wildfire consequence due to climate change | Several key climate change trends are influencing variable periods of extreme wildfire risks in Northern California. These trends significantly increase wildfire ignition risks around utility networks.<br><br>Warmer winters are causing increases in rainfall rather snow, resulting in a decrease to the snowpack. This reduces available water resources earlier in summer months, stressing vegetation and increasing available fuels. Compounding the shift from snow to rain are extended dry periods following summer months deeper into fall and early winter. Northeast winds are more common in fall and winter months in Northern California and if not accompanied by rainfall or other atmospheric moisture wildfire risks continue to increase despite the presence of lower temperatures. Ignitions that occur under these conditions can result in large conflagrating wildfires that can further promote risk associated with Northern California's abundant fuel and extreme terrain resulting in fires that develop their own devastating weather.<br><br>Reference OEHHA:<br>https://oehha.ca.gov/epic/changes-climate/precipitation<br><br>"Extremely dry and extremely wet years have become more common in California. On average, the state receives 75 percent of its annual precipitation from November through March, with 50 percent occurring from December through February. As the winter months have become warmer in recent years, more precipitation has been falling as rain instead of snow over the watersheds that provide most of the state's water supplies." "The last decade also includes the driest consecutive four-year period, from 2012 to 2015." "Warming temperatures, declining snowpack, and earlier spring snowmelt runoff can create stresses on vegetation"<br><br>Reference National Geographic :<br>https://www.nationalgeographic.com/science/2019/10/climate-change-california-power-outage/ |

**TABLE 19: MACRO TRENDS IMPACTING IGNITION PROBABILITY AND/OR WILDFIRE CONSEQUENCE (CONTINUED)**

| Rank | Macro trends impacting utility ignited ignition probability and estimated wildfire consequence by year 10 | Comments |
|---|---|---|
| 3 | Change in ignition probability and estimated wildfire consequence due to relevant invasive species, such as bark beetles | Invasive species create landscape level concerns that have significant potential to impact areas within utility right-of-ways (ROW). Effects can extend well beyond the ROW making effective mitigation challenging for utilities without more holistic engagement and support from surrounding stakeholders.<br><br>Of concern to utilities are both invasive plant species and insect species.<br><br>Invasive insect species, such as bark beetles, can exacerbate forest health concerns and result in hazardous tree conditions that require repetitious monitoring and mitigation by utilities. Native species can impose the same impacts and challenges.<br><br>Invasive plant species in California tend to thrive in disturbed environments, often displacing native species. There is evidence that these invasions can change and intensify fire regimes. Landscape disturbance can be presented following fires, as well as during ROW maintenance and enhancements. Regardless of disturbance origin utilities are continually compelled to perform additional monitoring and mitigation to identify and control detrimental impacts associated with invasive species.<br><br>References<br><br>Emergency Proclamation – Office of Governor<br><br>https://www.ca.gov/archive/gov39/2015/10/30/news19180/index.html<br><br>PNAS- *Invasive grasses increase fire occurrence and frequency*<br><br>*across US ecoregions*<br><br>“Fire-prone invasive grasses create novel ecosystem threats by increasing fine-fuel loads and continuity, which can alter fire regimes.” “the existence of an invasive grass-fire cycle is well known, evidence of altered fire regimes is typically based on local scale studies or expert knowledge.” “As concern about US wildfires grows, accounting for fire-promoting invasive grasses will be imperative for effectively managing ecosystems.” |

**TABLE 19: MACRO TRENDS IMPACTING IGNITION PROBABILITY AND/OR WILDFIRE CONSEQUENCE (CONTINUED)**

| Rank | Macro trends impacting utility ignited ignition probability and estimated wildfire consequence by year 10 | Comments |
|---|---|---|
| | | CalFire – https://www.readyforwildfire.org/forest-health/bark-beetle-information/about-bark-beetles/ |
| 2 | Change in ignition probability and estimated wildfire consequence due to other drivers of change in fuel density and moisture | PG&E's service territory has experienced noteworthy changes in both fuel density and moisture over the last several decades. These trends significantly increase wildfire ignition risks around utility networks.<br><br>Fuel density is increasing while available moisture in critical wildfire risk periods is decreasing. This has been accompanied by increases in large tree mortality and overall changes in forest structure. Contributing factors cover a wide range of influences, including but not limited to; climate change, land use patterns, fire suppression and variable forest management practices.<br><br>Forests are becoming denser with decreased presence of large trees and significant tree mortality over the last decade. Lands that are left unmanaged are subject to increases in accumulated dead and downed fuels that can be annually influenced by surrounding finer, flashier fuels following periods of sufficient rain or snowfall.<br><br>Reference PNAS: https://www.pnas.org/content/112/5/1458<br><br>Reference California Energy Commission: https://www.energy.ca.gov/sites/default/files/2019-07/Projections_CCCA4-CEC-2018-014.pdf |

**TABLE 19: MACRO TRENDS IMPACTING IGNITION PROBABILITY AND/OR WILDFIRE CONSEQUENCE (CONTINUED)**

| Rank | Macro trends impacting utility ignited ignition probability and estimated wildfire consequence by year 10 | Comments |
|---|---|---|
| 5 | Population changes (including Access and Functional Needs population) that could be impacted by utility ignition | Population in California and PG&E's territory continue to show projections for growth in decades to come. A fair amount of this growth continues in lands previously undeveloped and bordering fire prone wildland areas. Many utility customers have left the urban environment in favor of more fire prone areas for reasons beyond the associated risk. Current estimates suggest that at least 25% of California's residents already have residence in areas subject to significant wildfire risk. With projection of upward population trends continuing, it is likely that Wildland Urban Interface (WUI) and/or the CPUC HFTD areas will not be exceptions to increases. The available space and desire to live in safer urban areas in the PG&E territory are realistic factors that must be considered in reaching these conclusions. Variable portions of these increases will include customer with supplemental access and other functional needs.<br><br>Utilities will need to engage in programs and education campaigns that inform and prepare all customers to mitigate consequence of these eminent risks.<br><br>References<br><br>LCAU - https://lcau.mit.edu/project/cataloguing-interface-wildfire-and-urban-development-california<br><br>PPIC - https://www.ppic.org/content/pubs/report/R_116HJ3R.pdf<br><br>CNBC - Warming climate, population sprawl threaten California's future with more destructive wildfires - https://www.cnbc.com/2019/11/09/why-californias-wildfires-are-going-to-get-worse.html |
| 6 | Population changes in HFTD that could be impacted by utility ignition | See response item ranked "5". Given the overall area of the HFTD as a percentage of PG&E's service territory, it is likely that population growth in the HFTD areas will not be an exception to anticipated trends. |

**TABLE 19: MACRO TRENDS IMPACTING IGNITION PROBABILITY AND/OR WILDFIRE CONSEQUENCE (CONTINUED)**

| Rank | Macro trends impacting utility ignited ignition probability and estimated wildfire consequence by year 10 | Comments |
|---|---|---|
| 7 | Population changes in WUI that could be impacted by utility ignition | See response item ranked "5". Given the overall area of the WUI as a percentage of PG&E's service territory, it is likely that population growth in WUI will not be an exception to anticipated trends. The HFTD map was informed by WUI data and tremendous overlap between the two categories exists within PG&E service territory. |
| 4 | Utility infrastructure location in HFTD vs non-HFTD | Location of utility infrastructure in the HFTD areas needs to be considered as a risk mitigating factor by utilities. Siting decisions associated with infrastructure placement should complement other resiliency and hardening programs continually over the decades to come. Position of infrastructure and imposed risk can vary tremendously in the HFTD areas based on a multitude of terrain, aspect and exposure factors which are in many cases also realistic limitations. For these reasons the location of infrastructure in the HFTD areas will realize more significant changes in the HFTD areas compared to Non-HFTD areas. |
| 8 | Utility infrastructure location in urban vs rural vs highly rural areas | See response to item ranked "4". There is high correlation between the HFTD areas and rural communities. There is similar correlation between urban areas and non-HFTD areas. |

*List and describe any additional macro trends impacting ignition probability and estimated wildfire consequence within utility service territory, including trends within the control of the utility, trends within the utility's ability to influence, and externalities (i.e., trends beyond the utility's control, such as population changes within the utility's territory).*

**Macro Trends Impacting Ignition Probability and Wildfire Consequences Within PG&E's Control:**

- Enhanced Vegetation Management (EVM) – Maintaining additional clearances through highly variable annual conditions and vegetation responses to increased pruning and clearances. New failure patterns can arise when previously unmanaged trees are trimmed, pruned or modified well outside regulatory compliance clearance areas.
- Asset Inspection and Repair – Inspecting facilities, especially in HFTDS areas, and performing necessary maintenance and repair

- System Hardening – Identifying the most effective hardening and system resilience mitigation combinations to compliment enhanced vegetation management practices.

- System Automation – Electrical equipment such as sectionalization switches and SCADA-enable reclosers that can prevent and mitigate wildfires.

- PSPS – Use of PSPS events to mitigate fire risk under extremely high-risk conditions.

- Situational Awareness – Weather and fire monitoring through tools such as weather stations, high-definition cameras, wires-down detection, automated rapid earth fault current limiters, satellite monitoring, and other tools to enhance situational awareness.

- Wildfire Safety Operations Center – coordination of fire detection and mitigation activities through PG&E's Wildfire Safety Operations Center.

- Meteorology – Monitoring and integration of weather information through PG&E's meteorology department in coordination with external partners.

- Safe Distributed Generation – Ensuring distributed generation is safely installed and coordinates with designed distribution scheme

- Qualified Workforce -- Maintaining a safe and qualified workforce. Qualified Electrical Workers and Vegetation Management Professionals are all in high demand inside and outside California.

**Macro Trends Impacting Ignition Probability and Wildfire Consequences with PG&E's Ability to Influence:**

- Effective Regulation – Work with agencies and regulators on solutions that better align with utility infrastructure and risks that conflict with other regulations and/or land-use

- Fuel Reduction – Work with agencies to ensure utilizes are involved in pre-planning and execution of prescribed burning to maximize safety in operations and reduce wildfire fuel

- Safe Backup Generation – Ensuring customer that install backup generation do so in compliance with electric code

- Fire Safe Planning: Customer – Coordinate and find ways to collaborate with individual customers and property owners to maximize wildfire prevention and safety measures

- Fire Safe Planning: Community - Coordinate and find ways to collaborate with community-partners and organizations to maximize wildfire prevention and safety measures

- Point of Service Termination Electric Load Monitoring – Ability to monitor and measure use that exceeds design or use capacity as built and serviced

- Working to reduce 3rd party caused utility ignitions – Identify specific mitigation or educational opportunities to reduce 3rd party caused utility ignitions

**Macro Trends Impacting Ignition Probability and Wildfire Consequences with Externalities (i.e., Beyond PG&E's Control):**

- Climate Change – Warmer winters less snow pack, longer dry periods extending into fall and winter months

- Development and population increase in High Risk Areas – Continued urban expansion/sprawl into Wildland Urban Interface and HFTD areas. Potential for increase in vulnerable populations as well as general populations

- Environmental Restrictions and Work Approval Delays or Limitations – Limitations on timing and/or ability to perform critical fire safety related work and mitigation. Limited Operating Periods, limitations on utilization of EPA approved herbicides. Delays in reviews, complex permitting process, etc.

- Land Management Practices Private and Public – Variable levels of fire safe/prudent land management

- Substandard or minimal defensible space around improvements – Hazardous conditions present adjacent to ROWs that meet and exceed regulatory compliance requirements can still impose hazards associated with utility related ignitions

*List and describe all relevant drivers of ignition probability and estimated wildfire consequences and the mitigations that are identified in the Risk Assessment Mitigation Phase (RAMP) and not included in the above, including how these are expected to evolve. Rank these drivers from highest to lowest risk and describe how they are expected to evolve.*

See the S-MAP Aligned Risk Bowtie in Section 4.2 above for the relevant drivers of ignitions and estimated wildfire consequences Section 3.2, Table 11 also list the drivers of ignition probability.

See Section 4.3 below for information on how these drivers are expected to evolve, and their ranking.

## 4.3 Change in Ignition Probability Drivers

*Based on the implementation of the above wildfire mitigation initiatives, explain how the utility sees its ignition probability drivers evolving over the 3-year term of the WMP. Focus on ignition probability and estimated wildfire consequence reduction by ignition probability driver, detailed risk driver, and include a description of how the utility expects to see incidents evolve over the same period, both in total number (of occurrence of a given incident type, whether resulting in a near miss or in an ignition) and in likelihood of causing an ignition by type. Outline methodology for determining ignition probability from events, including data used to determine likelihood of ignition probability, such as past ignition events, number of near misses, and description of events (including vegetation and equipment condition).*

PG&E estimates a 10% reduction in vegetation-caused, equipment failure and animal-caused ignitions from the 2019 level due to planned System Hardening, Enhanced Vegetation Management and tag repair work that is planned for 2020 onwards. The 10% reduction is derived from the risk prioritization of work and an estimation of the combined CWSP mitigation effectiveness and associated ignition risk reductions. The same reduction trend of 10% is anticipated in 2021 and 2022.

PG&E assumes that in each of the years 2020- 2022, the ignition to incident ratio remains as same as that in 2019 in Table 11. PG&E utilizes the 2019 ignition to incident ratio along with the estimated mitigated ignitions (10% reduction for the abovementioned drivers) in each of the years 2020-2022 in order to calculate the incident frequencies in each of the years 2020-2022.

In total, based on this analysis, PG&E estimates an ~8% reduction for all HFTD ignitions, year over year, for 2020, 2021 and 2022.

See Section 5.6.1, Table 31 for the analysis of the ignition change for each of the drivers. Drivers may be ranked based on the metrics provided in the Table.

## 4.4 Directional Vision for Necessity of PSPS

*Describe any lessons learned from PSPS since the utility's last WMP submission and expectations for how the utility's PSPS program will evolve over the coming 1, 3, and 10 years. Be specific by including a description of the utility's protocols and thresholds for PSPS implementation. Include a quantitative description of how the circuits and numbers of customers that the utility expects will be impacted by any necessary PSPS events is expected to evolve over time. The description of protocols must be sufficiently detailed and clear to enable a skilled operator to follow the same protocols.*

*When calculating anticipated PSPS, consider recent weather extremes, including peak weather conditions over the past 10 years as well as recent weather years and how the utility's current PSPS protocols would be applied to those years.*

### Lessons Learned from the PSPS Events

Since the 2019 WMP submission, PG&E executed a number of PSPS events on a widespread scale ranging from approximately 10,000 customers to nearly 1 million customers.[11] In comparison, at the time of the 2019 WMP submission, PG&E had executed one PSPS event impacting 60,000 customers. The PSPS events in 2019 provided PG&E with insight for improvement going forward, including experience with the significant scale and consecutive nature in which PSPS events can materialize. Following the 2019 PSPS events, in addition to the focus of eliminating catastrophic wildfire risk, a critical objective of the 2020 WMP is to accelerate measures to dramatically reduce customer impacts of PSPS events *without* compromising safety. Actions planned to achieve this objective following the execution of PSPS in 2019 are described further below in the subsection entitled *Evolutions of the PSPS Program*.

In addition, the extensive implementation of PSPS events in 2019 resulted in the identifications of key focus areas to improve internal PSPS execution processes and tools. PG&E staff and contractors documented real-time observations from participants involved in the PSPS process throughout the entirety of each PSPS event, and after-action review workshops were conducted following events. The key lessons learned were summarized in each PG&E De-energization Report submission to the CPUC in compliance with Resolution ESRB-8. Based on the cumulative lessons learned, PG&E has identified the following seven priority areas for internal process improvement, including scaling of web and call operations which was identified and addressed during 2019 PSPS execution as opposed to identification through after-action reviews. This list is not intended to be comprehensive of all lessons learned, but rather reflects priority corrective action areas to immediately address for improved process execution in the upcoming 2020 wildfire season.

1. **External Communication and Coordination:** Understand and address the

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[11] PG&E's measure of customers is based on customer accounts, *i.e*. active service points. A single customer account can serve multiple individuals. PG&E does not have visibility to the number of individuals that each account holder represents, and therefore, refers to and quantifies each customer account as a "customer" in normal business operations and throughout this report.

information needs of customers and state, local, and tribal partners. Improve the communication processes for sharing relevant information, including accuracy and timeliness.

2. **Scaling of Web and Call Center Operations:** Prepare and scale for significant increases in customers contacting PG&E during PSPS events. Plan for both website and call center operations to meet maximum potential traffic requirements including contingency so that both web and call services are available at all times.

3. **Data Quality:** Improve the quality and governance of PSPS-related data throughout PG&E's internal databases to support more efficient, timely, and accurate internal execution processes and provide more accurate stakeholder communications.

4. **Map Accuracy and Availability:** Better assist external stakeholders with their PSPS planning and preparations by providing additional customer detail and increasing the precision and timeliness of scoping maps provided during PSPS events.

5. **Scoping Process and Tool Enhancements:** Improve the agility and accuracy of scoping tools and processes to increase the efficiency and limit the disruption of scope changes as weather conditions change during an event.

6. **Estimated Time of Restoration:** Improve the accuracy and timeliness of generating and externally communicating estimated times for restoration following de-energization.

7. **Staffing Model:** Develop strategies to increase the flexibility of staffing models and number of trained and expert PSPS personnel to limit the mental and physical fatigue of employees across multiple sustained PSPS events.

## Evolution of the PSPS Program

To address the critical objective of reducing PSPS impacts without compromising safety, PG&E is working to identify and develop mitigation strategies for near-term and long-term implementation. The key initiatives identified to both reduce the scope, duration, and frequency of future PSPS events as well as to mitigate impacts on de-energized customers in future events are summarized below and detailed in subsequent sections. These initiatives and strategies may be adjusted as PG&E continues to evaluate viable opportunities and there may be additional ways in which the PSPS program evolves, including stakeholder input and Commission direction through the Order Instituting Investigation (I.) 19-11-013 and Rulemaking (R.) 18-12-005.

### *Distribution Segmentation and System Hardening*

PG&E's plan is to enhance its distribution segmentation strategies including: a) adding sectionalizing devices, b) circuit reconfiguration / pre-PSPS event switching, and c) additional system hardening to support PSPS switching. PG&E has identified various distribution lines where additional switching devices coupled with targeted system hardening can be utilized to further sectionalize

distribution feeders to minimize the number of customers being impacted by PSPS outages. Additional information can be found in Section 5.3.3.8.

### *Transmission Line Sectionalizing*

PG&E plans to enhance transmission segmentation strategies including installation of additional SCADA-controlled switches. PG&E has identified various transmission lines where additional switching devices will be utilized to further sectionalize transmission lines to be able to minimize the number of customers impacted by PSPS outages. Additional information can be found in Section 5.3.3.8.

### *Transmission Line Exclusions*

Prior to next fire season, PG&E is evaluating all 552 transmission lines in the HFTD areas to determine which lines can be removed from future PSPS event scope via: supplemental inspections, below-grade inspections and repairs, increased VM (expand ROW), accelerated repairs or replacement of assets. Additional information can be found in Section 5.3.3.8.

### *Establishing PSPS Criteria for Hardened Distribution Facilities*

PG&E plans to assess and develop decision making criteria for the potential exclusion of “safe-to-operate” hardened distribution facilities from PSPS de-energization during high fire threat weather conditions. Similar to PG&E’s current risk-based transmission line assessment used during the event scoping process, distribution line criteria would be based on the wildfire risk reduction associated with the hardened assets. Additional information can be found in Section 5.3.3.8.

### *Microgrids for PSPS Mitigation*

PG&E is proposing to pursue resiliency and reliability improvements to mitigate the customer impacts of PSPS through permanent and temporary front-of-the-meter microgrid solutions. Microgrids can reduce the number of customers de-energized during PSPS events, as well as provide additional impact mitigation by energizing shared community resources that support the surrounding population. Additional information can be found in Section 5.3.3.8.

### *Increased Model Granularity*

PG&E weather modeling used for PSPS execution will increase weather and fuel model granularity from 3 km to 2 km. On-demand simulations will also be available at 0.67 km. Additional information can be found in Section 5.3.2.

### *PSPS Guidance Review*

PSPS decision making guidance will continue to be assessed, including the evaluation of systematic incorporation of outputs from fire spread and consequence modeling and calibrating outage and FPI models with new data as it becomes available. Additional information can be found in Section 5.3.2.

***Restoration Time***

In 2019, PG&E's target was to restore service after a PSPS within 24 hours after the weather conditions clear. For 2020, PG&E is aiming for a 50% improvement in daylight restoration time, restoring power for 98% of customers within **12** daylight hours from the time the weather conditions clear. PG&E plans to increase aerial and ground resources and evaluate night patrol capabilities to reduce PSPS restoration time. Additional information can be found in Sections 5.3.6 and 5.3.9.

***Backup Power Support for Societal Continuity***

PG&E will continue to encourage customers to have a plan which may include backup power in the event of de-energization, and in exceptional cases, deploy backup generation support. Additional information can be found in Section 5.6.2.

***Customer Services and Programs***

PG&E will continue promoting and refining services and programs to customers that can assist in limiting the disruption of a PSPS-related outage before, during and after a PSPS event. These programs apply broadly to all types of customers and include providing the following: 24/7 information updates, experienced and knowledgeable business teams, continuous power programs, Community Resource Centers (CRCs), Third-Party Partnerships and Grant Programs, and coordination with Critical Facilities and Third-Party Commodity Suppliers. Additional information can be found in Section 5.6.2

As a result of these initiatives and ongoing efforts, PG&E expects the PSPS program to evolve in the following ways in the 1-year, 3-year, and 10-year timeframe.

- In the 1-year timeframe, PG&E expects to see measurable reductions in the extent of PSPS impacts based on additional switching device installations, enhanced segmentation strategies, operationalized microgrid solutions, enhanced patrol and restoration approaches to reduce daylight restoration time, and other efforts described above to be implemented in 2020. PG&E expects customer programs and offerings continuing from 2019 and further refined in 2020 will provide ongoing mitigation of PSPS-related outage disruption. PG&E also expects to improve PSPS execution based on the after-action review lessons learned improvement workstreams identified in 2019, including more timely, accurate, and effective communication with customers and state, local, and tribal partners.
    - While initiatives are designed to reduce PSPS impact on a weather normalized basis, the absolute number and duration of customers impacted is largely weather event dependent in the 1-year timeframe.
- In the 3-year timeframe, PG&E expects to refine, evolve, and expand implementation of the opportunities identified above. PG&E expects to advance on longer-term efforts currently identified, such as behind-the-meter customer solutions and sectionalization. These ongoing efforts are expected to result in

fewer relative customers impacted in the 3-year timeframe beyond the reduction achieved in the 1-year timeframe.

    - The absolute number and duration of customers impacted during the 3-year timeframe is unknown and will be dependent on the evolution of fuels, the amount of snow and rain received during the rain-season and number of high-risk weather events.

- In the 10-year timeframe, PG&E expects a significant reduction in PSPS impacts. In addition to ongoing PSPS program efforts, the long-term completion of PG&E's other wildfire mitigations described in this plan will create a more hardened system over time with the expected result of less extensive PSPS execution over time.

    - Although it is widely anticipated that average temperatures will increase over the next decade due to climate change in the 10-year timeframe, the number of offshore wind events and acute droughts that last one to several years is not certain. For example, a large and prolonged drought coupled with an increase in offshore wind events could necessitate more PSPS events in the future. In addition, urban expansion in the wildland urban interface, fuels treatment programs performed by state and federal agencies, changes in bark-beetle damage, tree mortality (e.g., sudden oak death), fuel loading, and general population growth are other external factors that may influence the scope of future PSPS events.

PG&E continues to recognize the commitment outlined in D.19-05-042 that while de-energization is a valuable tool to promote public safety, it must be deployed as a measure of last resort and the utility should continue to strengthen infrastructure to minimize the need for and size of de-energization events. However, it should be noted that mitigation activities such as system hardening and EVM are not expected to completely eliminate the use of PSPS in the interest of public safety if extreme conditions are forecasted. PSPS addresses a specific type of risk and, while other measures mentioned above help reduce the need to de-energize, PSPS remains a unique tool at the utility's disposal to help prevent catastrophic fire.

**Protocols and Thresholds for PSPS implementation**

See Section 5.6.2 Protocols on Public Safety Power Shutoff

*Instructions for Table 20:*

*Rank order the characteristic of PSPS events (in terms of numbers of customers affected, frequency, scope, and duration) anticipated to change the most and have the greatest impact on reliability (be it to increase or decrease) over the next ten years. Rank in order from 1 to 9, where 1 means greatest anticipated change or impact and 9 means minimal change or impact on ignition probability and estimated wildfire consequence. To the right of the ranked magnitude of impact, indicate whether the impact is to significantly increase reliability, moderately increase reliability, have limited or no impact, moderately decrease reliability, or significantly decrease reliability. For each, include comments describing expected change and expected impact, using quantitative estimates wherever possible.*

**TABLE 20: ANTICIPATED CHARACTERISTICS OF PSPS USE OVER NEXT 10 YEARS**

| Rank order 1-9 | PSPS characteristic | Significantly increase; increase; no change; decrease; significantly decrease | Comments |
|---|---|---|---|
| 1 | Duration of PSPS events in customer hours (normalized by fire weather, e.g., Red Flag Warning line mile days) | Significant Decrease | Directionally, there is the most opportunity to reduce customer hours per fire weather event through microgrids, segmentation, restoration time, and more granular weather forecasting in the short term, and system hardening and enhanced vegetation management in the long term. The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |
| 2 | Scope of PSPS events in circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization (normalized by fire weather, e.g., Red Flag Warning line mile days) | Significant Decrease | Proportionally, this is the next largest change, based on the reasons described above (1). While a significant reduction is expected, there still may be many circuits impacted, but much smaller portions of each circuit. The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |
| 3 | Number of customers affected by PSPS events (normalized by fire weather, e.g., Red Flag Warning line mile days) | Significant Decrease | There should be a significant reduction in the number of customers impacted per fire weather event for the reasons described above (1) and (2), and due to the potential for “drop and pick-up” nature of micro-grids and resiliency zones, those customers will still be impacted, but for only a short duration during switching operations. The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |

**TABLE 20: ANTICIPATED CHARACTERISTICS OF PSPS USE OVER NEXT 10 YEARS (CONTINUED)**

| Rank order 1-9 | PSPS characteristic | Significantly increase; increase; no change; decrease; significantly decrease | Comments |
|---|---|---|---|
| 4 | Frequency of PSPS events in number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability (normalized by fire weather, e.g., Red Flag Warning line mile days) | Potential decrease | A potential relative decrease in the frequency of events compared to all fire weather days or red flag warnings could occur as PSPS may not be required for marginal weather events based on reasons described above (1) and (2). However, changes in how red flag warnings are issued by the NWS may impact this evaluation as red flag warnings are not totally objective at this time. The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |
| 5 | Duration of PSPS events in customer hours (total) | Potential Decrease | While an absolute decrease is expected in customer hours for the reasons described above (1), long term climate models point to higher probability of more frequent fire weather conditions. The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |
| 6 | Scope of PSPS events in circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization (total) | Potential Decrease | While an absolute decrease is expected in circuit events for the reasons described above (2), long term climate models point to higher probability of more frequent fire weather conditions. The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |
| 7 | Number of customers affected by PSPS events (total) | Potential Decrease | While an absolute decrease is expected in the number of customers affected for the reasons described above (3), long term climate models point to a higher probability of more frequent fire weather conditions. The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |

**TABLE 20: ANTICIPATED CHARACTERISTICS OF PSPS USE OVER NEXT 10 YEARS (CONTINUED)**

| Rank order 1-9 | PSPS characteristic | Significantly increase; increase; no change; decrease; significantly decrease | Comments |
|---|---|---|---|
| 8 | Frequency of PSPS events in number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability (total) | Possible Increase | Given that long term climate models point to a higher probability of more frequent fire weather conditions, it is expected that the absolute number of PSPS events may increase, while impacting fewer customers based on reasons described above (1) and (2). The absolute number and duration of customers impacted during this timeframe is unknown and dependent of numerous external factors.* |
| 9 | Other | N/A | N/A |

Notes for Table 20:

1. *External factors include but are not limited: urban expansion in the wildland urban interface, fuels treatment programs performed bystate and federal agencies, changes in bark-beetle tree damage and tree mortality (e.g., sudden oak death), fuel loading, general population changes, changes in regulatory requirements, climate change, droughts, frequency and duration of dry wind events.

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# SECTION 5

# WILDFIRE MITIGATION STRATEGY AND PROGRAMS FOR 2019 AND FOR EACH YEAR OF THE 3-YEAR WMP TERM

# 5 Wildfire Mitigation Strategy and Programs for 2019 and for Each Year of the 3-Year WMP Term Wildfire Mitigation Strategy

## 5.1 Wildfire Mitigation Strategy

*Describe organization-wide wildfire mitigation strategy and goals for each of the following time periods:*

1. *Before the upcoming wildfire season, as defined by the California Department of Forestry and Fire Protection (CAL FIRE),*

2. *Before the next annual update,*

3. *Within the next 3 years, and*

4. *Within the next 10 years.*

PG&E's approach to wildfire risk reduction, which has continued to evolve since the October 2017 North Bay wildfires and the 2018 Camp Fire, starts with the drivers of wildfire risk exposure (details are provided in Table 11 of Section 3.2). As seen in that data, contacts from vegetation and equipment failures are the largest drivers of historic ignitions, in the High Fire Threat District (HFTD) areas. Therefore PG&E's wildfire risk mitigation efforts have included, and will continue to include, vegetation management, inspections of electric distribution and transmission facilities, system hardening, and an improving Public Safety Power Shut-off (PSPS) program supported by situational awareness capabilities and PSPS mitigation activities. Informing all of these approaches has been PG&E's regular benchmarking with other utilities including within California and Australia, alongside engagement with academia, government agencies, technology providers and others. The understanding of climate change impacts to wildfire risk and potential solutions to mitigate that risk continues to evolve at a Global level, as we have unfortunately seen in Australia in the last several months.

In deploying wildfire risk mitigation efforts, which are focused on those drivers of wildfire risk exposures, PG&E continues to refine its understanding of geographic, meteorological and other considerations as to where the greatest wildfire risk exists. These efforts seek to optimize the deployment of wildfire mitigation activities to reduce the most risk as quickly as possible. To do so PG&E is attempting to incorporate all the latest information and best insights available. However, PG&E does not presume to be the expert on every topic or technology that may contribute to wildfire risk reduction. PG&E continues to look forward to engaging with those, including the parties to this proceeding, who may have insights, ideas or tools that can help further reduce wildfire risk and protect the customers and communities we serve. This 2020 Wildfire Mitigation Plan (WMP) is a snapshot in time and our plans will continuously improve towards our goal of preventing catastrophic wildfires caused by electrical equipment.

While the programs outlined in Section 5 represent PG&E's intended plans and targets, several programs presented here are subject to ongoing proceedings before the CPUC or other review or approval processes that may materially change PG&E's plans, requirements or guidelines within the WMP period or even before the upcoming wildfire season. Two key examples, though not the only initiatives subject to ongoing

proceedings are (1) efforts related to microgrids, which are subject to the Microgrid and Resilience Strategies Rulemaking (R.19-09-009) and (2) PSPS operations and customer support efforts, which are subject to outcomes of the Order Instituting Rulemaking to Examine Electric Utility De-Energization of Power Lines in Dangerous Conditions (R. 18-12-005). As these proceedings move forward PG&E's plans and activities may have to adjust relative to the plans presented in this 2020 WMP.

In the remainder of Section 5, PG&E describes in detail its wildfire mitigation strategies for this upcoming wildfire season, before the next annual update, within the next three years, and within the next 10 years. Note, however that evolution of the plan details is likely over the 3-year timeframe and certainly when considering the 10-year outlook as PG&E gains experience and additional data and information is developed. At a high level, PG&E's wildfire mitigation strategy and goals are focused on (1) reducing the potential for fires to be started by utility assets, (2) reducing the potential for fires to spread, and (3) minimizing the frequency, scope and duration of PSPS events. Highlights in working toward these goals will include:

***Progress Timeline***

***1. Upcoming wildfire season:***

- Continue to implement routine and enhanced vegetation management programs in order to reduce the risk of trees, limbs and branches coming into contact with power lines and equipment.

- Continue to identify and fix actual and potential equipment problems that could contribute to wildfire risk through the asset inspection, repair and replacement programs.

- Continue to harden the electrical distribution system by replacing or eliminating higher risk distribution lines and other assets in high-risk areas with equipment that is less likely to contribute to an ignition.

- Continue system automation and sectionalization upgrades that will allow PG&E to remotely control and operate field equipment to more precisely deenergize sections of the grid at times of high fire risk.

- Continue to improve understanding of weather and fire conditions through improved situational awareness and sophisticated meteorology operations in order to identify the highest-risk fire locations.

- Continue to improve the PSPS program through use of analytical and operational tools, tighter understanding of geographic fire risk and improving customer and community coordination and information sharing before, during and after outages. Focus on smarter, smaller and shorter PSPS events when weather conditions require the use of this tool.

***2. Before the next annual update:***

- Continue to implement the key wildfire mitigation programs and strategies described above – routine and enhanced vegetation management, asset

inspection and repair/replacement, system hardening, system automation, improved situational awareness and PSPS.

- Continue to modify wildfire mitigation programs by incorporating lessons learned throughout the 2020 wildfire season and in response to new regulations, requirements, guidelines or other changes.

***3. Within three years:***

- Continue to implement wildfire mitigation programs, including increased annual pace of system hardening deployment. Track and assess performance of implemented wildfire risk mitigation activities to validate effectiveness and inform program adjustments.

- Continue to drive PSPS events to be smarter, smaller and shorter based on further improved tools, processes and understanding of wildfire risk and weather patterns.

- Identify, evaluate and test new technology and tools to bolster operational capabilities, increase the flexibility of the grid and enable greater system resiliency. Develop and implement new wildfire mitigation programs using promising new technology and tools. (See Section 5.1D below for some of the technologies currently being explored.)

***4. Within ten years:***

- Track and assess performance of implemented wildfire risk mitigation activities over an extended period of time to validate effectiveness. Based on observed performance, continue using, modifying and improving elements of wildfire mitigation programs for as long as these measures are cost-effective in reducing the risk (frequency, scope and consequences) of wildfires, given the evolving threat of climate change in California.

- Incorporate improving research, information, data, technologies and other tools into wildfire risk reduction efforts including PSPS targeting and minimization activities.

### 5.1.A PG&E's Approach to Managing Wildfire Risk

*A. Discuss the utility's approach to determining how to manage wildfire risk (in terms of ignition probability and estimated wildfire consequence) as distinct from managing risks to safety and/or reliability. Describe how this determination is made both for (1) the types of activities needed and (2) the extent of those activities needed to mitigate these two different groups of risks. Describe to what degree the activities needed to manage wildfire risk may be incremental to those needed to address safety and/or reliability risks.*

When performing a risk analysis of a single, specific risk, like wildfire, PG&E focuses narrowly on the mitigations that benefit (reduce) that risk, either by reducing likelihood of an event or by reducing consequences of an event. Therefore, mitigations identified to reduce wildfire risk may or may not also benefit other risks that have safety and/or reliability impacts, such as asset failure. Each risk is assessed using a "bowtie analysis" (the wildfire risk bowtie analysis is provided in Section 4) with the mitigation activities that benefit a risk identified in those analyses. The risk bowtie analyses conform to requirements in the S-MAP settlement; risk bowties for risks that are deemed a RAMP risk will be presented in PG&E's 2020 RAMP Report, which will be submitted to the Commission in June.

A risk mitigation activity may appear in the bowtie analysis for more than one risk driver. This is often seen with wildfire risk reduction activities as tactics like vegetation management, bare conductor replacement (AKA system hardening) or equipment inspections and repairs benefit multiple risks with safety and reliability consequences beyond just wildfire. These activities and their RSE will be discussed in the appropriate risk bowtie analyses with the risk quantification (RSE) being exclusively focused on the risk being addressed in that analysis.

### 5.1.B Major Investments and Implementation of Wildfire Mitigation Initiatives

*B. Include a summary of what major investments and implementation of wildfire mitigation initiatives achieved over the past year, any lessons learned, any changed circumstances for the 2020 WMP term (i.e., 2020-2022), and any corresponding adjustment in priorities for the upcoming plan term. Organize summaries of initiatives by the wildfire mitigation categories listed in Section 5.3*

PG&E's Community Wildfire Safety Program (CWSP) is evolving rapidly as we gain experience on how various measures and technologies work to reduce the threat of catastrophic fires. A summary of the actions being taken to reduce wildfire risk and minimize PSPS event impact is provided below. The 2020 WMP activities, highlighted here, with additional detail provided in the relevant parts of Section 5.3, have evolved based on learnings to date, including the experience of the 2019 wildfire season. Based on what we learned from the 2019 PSPS events, PG&E is working to make any future PSPS events smaller in scope, shorter in duration and smarter in performance while working to keep customers and communities safe during times of severe weather and high wildfire risk. In addition to the PSPS impact reduction activities referenced below, including Microgrids, Temporary Generation and Distribution Sectionalization, PG&E is focused on improving support to impacted customers before and during PSPS events, as discussed in Section 5.6.2. Additionally, PG&E is making adjustments to mitigation programs based on the work conducted in 2019. With regard to the vegetation management program for 2020 and beyond, we are assessing the impacts of the 2019 EVM efforts to be sure that we use our resources most effectively in the years ahead; for instance, we plan to shift some EVM work from distribution to lower voltage transmission lines to expand rights-of-way and remove incompatible species, to reduce wildfire risk, and reduce the footprint of future PSPS events. In the case of asset inspections, PG&E's 2019 wildfire safety inspection program (WSIP) covered all 750,000 poles and structures in HFTDs and identified needed maintenance and replacement. Building on this foundation, PG&E is incorporating the enhanced inspection processes and tools into our routine inspection and maintenance program and will use risk-informed maintenance cycles in the years ahead—for instance, PG&E will initially conduct annual inspections of all facilities in HFTD Tier 3 areas and use three-year inspection cycles for Tier 2 facilities.

**TABLE PG&E 5-1: MAJOR INVESTMENTS AND IMPLEMENTATION OF WILDFIRE MITIGATION – INITIATIVES CATEGORY**

| | Wildfire Mitigation Activity | 2019 Actual Units | 2019 Actual Spend (Preliminary) | 2020 Targeted Units | 2020 Target Spend | % Unit change | Notes |
|---|---|---|---|---|---|---|---|
| Situational Awareness and Forecasting | Weather Stations | 426 | $6.9M | 400 | $8.1M | -6% | |
| | HD Cameras | 133 | $2.1M | 200 | $3.5M | +50% | |
| Grid Design and System Hardening | System Hardening (line miles) | 171 | $335M | 221 | $367M | +41% | Butte County UG embedded in 2019 program, will be tracked separately in 2020 |
| | Sys. Hard. (Butte County Underground Rebuild) | | | 20 | $213M | | |
| | Microgrids for PSPS mitigation (operationalized units) | 1 (pilot Resilience Zone) + 3 temporary | $3.3M | Additional operationalized units | $11M | TBD | We intend to establish additional PSPS-mitigating microgrids and distributed generation resources in 2020. These Microgrid activities are subject to the ongoing regulatory approval processes. |
| | Distribution Sectionalization | 298 | $50M | 592 | $83M | +99% | |

**TABLE PG&E 5-1: MAJOR INVESTMENTS AND IMPLEMENTATION OF WILDFIRE MITIGATION – INITIATIVES CATEGORY (CONTINUED)**

| | Wildfire Mitigation Activity | 2019 Actual Units | 2019 Actual Spend (Preliminary) | 2020 Targeted Units | 2020 Target Spend | % Unit change | Notes |
|---|---|---|---|---|---|---|---|
| Asset Management and Inspections | Transmission HFTD Enhanced Inspections (structures) | 49,715[1] | $68M | ~22,000 | $46M | -56% | There is no separate WSIP in 2020, the program is shifting to risk-/tier-based inspection cycles, primarily Tier 3 assets inspected annually and Tier 2 assets inspected on a 3-year cycle |
| | Distribution HFTD Enhanced Inspections (poles) | 694,250 | $160M | ~344,000 | $88M | -50% | |
| | Substation HFTD Enhanced Inspections | 222 | $22M | ~105 | $16M | -53% | |
| Vegetation Management and Inspection | Enhanced Vegetation Management (line miles) | 2,498 | $443M | 1,800 | $495M | -28% | Some resources will be redeployed from EVM to targeted fuels reduction and T-Line 60/70 kV right-of-way clearance work |



1 Some (~10,000) transmission enhanced visual inspections were completed in late 2018 but are included in this count to reflect the completion of a dedicated program (the Wildfire Safety Inspection Program) to inspect all assets in HFTD Tier 2 & Tier 3 areas.

### 5.1.C Challenges Associated With Limited Resources

***C.*** *List and describe all challenges associated with limited resources and how these challenges are expected to evolve over the next 3 years**.***

As discussed in Section 5.5, limited resources are a significant, but far from the only, execution risk facing WMP implementation. PG&E learned a number of lessons from the execution of the 2019 WMP including the challenge created by a significant peak of work to be performed over a limited window of time and the limited ability to scale up skilled resources to support such a peak in a short amount of time. PG&E has incorporated a number of changes into its work planning for wildfire mitigation activities for 2020 and beyond. Nonetheless, resource limitations may still be a challenge in a few key areas, including Vegetation Management where the volume of work remains high, the hazards inherent in that work remain significant (requiring skilled and experienced resources to be carefully sourced) and evolving regulations (including Senate Bill 247 passed in 2019) may influence changes in the available California resources, both in terms of vegetation management companies and their employees. Given the rapid evolution in this space in the last twelve months, it is difficult to forecast how the labor market and resource capacity/availability within California will change over the next three years. However, PG&E appreciates that getting more talented individuals into the field now and moving these individuals up the learning and training curve, is likely a universal benefit. Therefore, PG&E has kicked off efforts, including with community colleges and in partnership with the IBEW, to establish training programs to increase the size of the skilled workforce.

The vegetation management, line worker and other labor markets will continue to evolve over the next three years. To meet resource challenges, PG&E's operations, human resources, and sourcing teams will continue to partner closely to identify solutions to match available, qualified, and safe resources with the critical wildfire risk mitigation work that needs to be completed.

### 5.1.D New or Emerging Technologies

*D. Outline how the utility expects new technologies and innovations to impact the utility's strategy and implementation approach over the next 3 years, including the utility's program for integrating new technologies into the utility's grid.*

### 5.1.D.1 Impact on Strategies

PG&E continues to actively explore technologies that can mitigate ignition risk and associated potential impact on public safety. Section 5.1.D details mitigations that are currently being pursued and use new or emerging technologies consistent with the following definitions:

- New: Technologies or analytical methods enabled through technology that were new to PG&E after the release of its 2019 WMP (*i.*e., February 6, 2019), exclusive of 'emerging' technologies

- Emerging: Pre-commercial technologies, including Technology Demonstration & Deployment projects[2]

These technologies hold significant promise to advance PG&E's wildfire risk mitigation, bolster operational capabilities, increase the flexibility of the grid, and allow for greater system resiliency. Capabilities targeted through new or emerging technologies include, but are not limited to:

- Situational awareness and forecasting: New or emerging technologies can enable more accurate forecasting and identification of environmental events and operating conditions that pose a risk to the grid so that critical issues may be dealt with as quickly as possible to avoid the risk of catastrophic wildfires.

- Grid design and hardening: New or emerging technologies can enable innovative system hardening techniques to mitigate the risk of fire ignition and potential impacts on public safety.

- Asset management and inspections: New or emerging technologies can enable automated and improved methods to identify asset or system issues so that high risk items can be addressed prior to failure.

- Vegetation management and inspections: New or emerging technologies can enable more timely and accurate insights on vegetation health, density and proximity to assets allowing PG&E to implement risk-based vegetation management work practices to further ensure high risk areas are efficiently addressed.

- Asset Analytics and Grid Monitoring: New or emerging technologies can leverage data to enable greater insights on asset health to optimize system maintenance and reduce the risk of asset failure.

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**2** The Technology Demonstration and Deployment (TD&D) demonstration project definition was approved by the CPUC in D.12-05-037: "The installation and operation of pre-commercial technologies at a scale sufficiently large and in conditions sufficiently reflective of anticipated actual operating environments, to enable the financial community to effectively appraise the operational and performance characteristics of a given technology and the financial risks it presents."

- Foundational Enablement: New or emerging technologies, including grid communication tools and control networks, can enable greater exchange of information required to provide real or near-real time operational visibility across the grid for enhanced decision-making. These foundational items can also increase the flexibility of the grid, providing fundamental capabilities to advance system resiliency.

The impacts of new or emerging technologies on utility strategy will vary by project. Information on the strategic enablement of these technologies is detailed further in Sections 5.1.D.2 and 5.1.D.3 below. The scope and implementation of these projects are subject to change due to the evolving nature of technology and business needs. There will likely be technologies that develop or mature over the reporting timeframe (2020-2022) which PG&E may pursue that are not described in Section 5.1.D.3.

### 5.1.D.2 Implementation Approach and Integration of Emerging Technologies – Electric Program Investment Charge

The Electric Program Investment Charge (EPIC) portfolio provides PG&E with an opportunity to demonstrate the value of emerging technologies that hold promise in furthering system resiliency. Through EPIC, PG&E develops and demonstrates innovative technologies that advance a broad array of objectives including grid safety, resiliency and reliability as well as customer enablement, and integration of renewable and DERs. PG&E implements project governance over its EPIC demonstration projects to ensure a clear path to production if the technology is proven ready to scale. Various criteria are assessed that may impact a technology's successful implementation, including the following: (i) project hypothesis; (ii) dependencies or alternatives; (iii) obstacles to implementation; (iv) project success metrics at demonstration and full deployment stages (v) potential benefits at full deployment. PG&E assesses alignment to utility strategies and customer needs to help ensure that project deliverables provide a pathway towards improvements and enables PG&E (and potentially other utilities) to better serve its customers and deliver on program objectives, including enhancements to safety and grid resiliency.

EPIC demonstrations aid in identifying key requirements and insights to inform full deployment in a manner that strategically aligns the integration of technologies with existing operations. Given the rapidly evolving energy landscape and the impact of climate change in California, the continuation of technology innovation programs like EPIC is critical to the continued advancements of grid capabilities to enable advancements on safety and resiliency.

### 5.1.D.3 New or Emerging Technologies – Project Summaries

This section provides an overview of select mitigations that leverage new or emerging technologies. These projects are summarized in the table below.

**TABLE – 5.1.D.3: SELECT NEW OR EMERGING TECHNOLOGIES**

| Section | Title | Program Area | Wildfire Mitigation Maturity Assessment - Primary Category Impacted | Approximate 2020 Financial ($K) Forecast[3] |
|---|---|---|---|---|
| 5.1.D.3.1 | Wildfire Spread Models | Situational Awareness & Forecasting | A. Risk mapping and simulation | $3,300 |
| 5.1.D.3.2 | Satellite Fire Detection | Situational Awareness & Forecasting | B. Situational awareness and forecasting | $500 |
| 5.1.D.3.3 | Weather Model and Fire Potential Index - Model Expansions | Situational Awareness & Forecasting | B. Situational awareness and forecasting | $1,500 |
| 5.1.D.3.4 | SmartMeter™ Partial Voltage Detection (formerly known as Enhanced Wires Down Detection) | Situational Awareness & Forecasting | C. Grid design and system hardening | $900 |
| 5.1.D.3.5 | Line Sensor Devices | Situational Awareness & Forecasting | C. Grid design and system hardening | $6,900 |
| 5.1.D.3.6 | Proactive Wires Down Mitigation Demonstration Project (Rapid Earth Fault Current Limiter) | Grid Design & System Hardening | C. Grid design and system hardening | $8,900 |

**3** Financial forecasts for emerging technology assessment or deployment projects are highly tentative as uncertainty regarding costs and functionality is very high for new technologies. Costs shown reflect estimates as of late January 2020 and are subject to change, including several that remain TBD at this time. Costs beyond 2020 have not yet been defined given this level of uncertainty.

**TABLE – 5.1.D.3: SELECT NEW OR EMERGING TECHNOLOGIES (CONTINUED)**

| Section | Title | Program Area | Wildfire Mitigation Maturity Assessment - Primary Category Impacted | Approximate 2020 Financial ($K) Forecast[3] |
|---|---|---|---|---|
| 5.1.D.3.7 | Distribution, Transmission, and Substation: Fire Action Schemes and Technology (DTS-FAST) | Grid Design & System Hardening | C. Grid design and system hardening | $10,500 |
| 5.1.D.3.8 | Remote Grid | Grid Design & System Hardening | C. Grid design and system hardening | $943 |
| 5.1.D.3.9 | Multi-Use Microgrid | Grid Design & System Hardening | C. Grid design and system hardening | $664 |
| 5.1.D.3.10 | Enhanced Asset Inspections - Drone/AI (Sherlock & Waldo) | Asset Management and Inspections | D. Asset Management and Inspections | $6,900 |
| 5.1.D.3.11 | Ultrasonic Technology | Asset Management and Inspections | D. Asset Management and Inspections | TBD |
| 5.1.D.3.12 | Below Ground Inspection of Steel Structures | Asset Management and Inspections | D. Asset Management and Inspections | TBD |
| 5.1.D.3.13 | Mobile LiDAR for Distribution Inspections | Vegetation Management and Inspections | E. Vegetation management and inspections | TBD |
| 5.1.D.3.14 | Transformer Monitoring via Field Area Network (FAN) | Asset Analytics & Grid Monitoring | C. Grid design and system hardening | $443 |
| 5.1.D.3.15 | Maintenance Analytics | Other - Asset Analytics & Grid Monitoring | C. Grid design and system hardening | $989 |
| 5.1.D.3.16 | System Harmonics for Power Quality Investigation | Other - Asset Analytics & Grid Monitoring | C. Grid design and system hardening | $653 |
| 5.1.D.3.17 | Sensor IQ | Other - Asset Analytics & Grid Monitoring | C. Grid design and system hardening | $1,339 |
| 5.1.D.3.18 | Wind Loading Assessments | Other - Asset Analytics & Grid Monitoring | C. Grid design and system hardening | $3,405 |

**TABLE – 5.1.D.3: SELECT NEW OR EMERGING TECHNOLOGIES (CONTINUED)**

| Section | Title | Program Area | Wildfire Mitigation Maturity Assessment - Primary Category Impacted | Approximate 2020 Financial ($K) Forecast[3] |
|---|---|---|---|---|
| 5.1.D.3.19 | Predictive Risk Identification with Radio Frequency (RF) Added to Line Sensors (Distribution Fault Anticipation Technology) | Other - Asset Analytics & Grid Monitoring | C. Grid design and system hardening | $1,126 |
| 5.1.D.3.20 | Advanced Distribution Energy Resource Management System | Foundational | Not Applicable | $2,318 |
| 5.1.D.3.21 | Advanced Distribution Management System (ADMS) | Foundational | Not Applicable | $1,500 |

The descriptions below are divided by program areas.

Program Area: Situational Awareness and Forecasting – New and Emerging Technologies

PG&E is deploying a powerful set of complementary tools to better assess and more accurately locate, often in near real time, environmental events that pose a danger to the grid so that critical issues may be dealt with as quickly as possible to avoid the risk of catastrophic wildfires. In addition, PG&E is exploring the use of situational awareness technologies that provide insights on grid conditions. Below are mitigations leveraging new or emerging technologies – for additional information, reference Section 5.3.2.

### 5.1.D.3.1 Wildfire Spread Models

Type: New Technology (Commercially Available Offering)

Description: This project is described in Section 5.3.2.1.3: Situational Awareness & Forecasting – Wildfire Spread Models

### 5.1.D.3.2 Satellite Fire Detection

Type: New Technology (Commercially Available Offering)

Description: This project is described in Section 5.3.2.1: Situational Awareness & Forecasting – Advanced Weather Monitoring and Weather Stations

#### 5.1.D.3.3 Weather Model and Fire Potential Index – 2019 Model Expansions

Type: New Technology (Commercially Available Offering)

Description: This project is described in Section 5.3.2: Situational Awareness & Forecasting – Forecast of a fire risk index**,** fire potential index, or similar

#### 5.1.D.3.4 SmartMeter™ Partial Voltage Detection (Formerly Known as Enhanced Wires Down Detection)

Type: Emerging (Pre-commercial) Technology

Description: This project is described in Section 5.3.2: Situational awareness and forecasting - SmartMeter™ Partial Voltage Detection (Formerly Known as Enhanced Wires Down Detection)

#### 5.1.D.3.5 Line Sensor Devices

Type: New Technology (Commercially Available Offering)

Description: This project is described in Section 5.3.2: Situational Awareness & Forecasting – Line Sensor Devices

Program Area: Grid Design and System Hardening – New and Emerging Technologies

PG&E is reducing the risk of fire ignition and potential impacts on public safety through the adoption of system hardening methods enabled through innovative technologies. Mitigations leveraging new or emerging technologies include the following:

#### 5.1.D.3.6 Proactive Wires Down Mitigation Demonstration Project

Type: Emerging (Pre-commercial) Technology

Description: The EPIC 3.15, Proactive Wires Down Mitigation demonstration project, seeks the ability to automatically and rapidly reduce the flow of current and risk of ignition in single phase to ground faults through the use of Rapid Earth Fault Current Limiter (REFCL). The REFCL Technology has been shown by the Victoria State Government (Australia) to directly reduce the risk of wildfires for single line to ground faults.[4] REFCL works by moving the neutral line to the faulted phase during a fault, which significantly reduces the energy available for the fault. This significantly lowers the energy for single line to ground faults by reducing the potential for arcing and fire ignitions, as well as better detection of high impedance faults / wire on ground. REFCL technology is only feasible for three-wire uni-grounded circuits, which make up the majority of PG&E's distribution circuits within high fire threat areas. Successful implementation of REFCL technology has potential to more reliably detect high impedance ground faults and energized wire down events and minimize this risk to public safety. PG&E began planning the project in early 2019; demonstrations are planned to begin in 2020 on operational assets to test its capabilities and applications within PG&E's system.

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**4** Marxen Consulting / Victoria State Government. "REFCL Trial: Ignition Tests." 4 August 2014. Accessible at: https://www.energy.vic.gov.au/safety-and-emergencies/powerline-bushfire-safety-program/network-assets-program/rapid-earth-fault-current-limiter-refcl.

### 5.1.D.3.7 Distribution, Transmission, and Substation – Fire Action Schemes and Technology (DTS-FAST)

Type: Emerging (Pre-commercial) Technology

Description: The Distribution Transmission Substation—Fire Action Scheme and Technology (DTS-FAST) system is designed to reduce fire risks associated with energized power lines. DTS-FAST was developed internally at PG&E and is currently in pilot phase. This technology aims to use fraction-of-a-second technologies to detect objects approaching energized power lines and responds quickly to shut off power, before object impact. In addition, DTS-FAST may detect elevated fire risk conditions associated with energized power lines, quickly shutting off power when such risks occur, including:

1. Downed Power lines
2. Downed and leaning towers and poles
3. Jumper cable and insulator hook failures
4. Vegetation encroachment and vegetation optimization
5. Fire and smoke detection at towers or poles
6. Power line sag
7. Hot spot detection from tower to tower

This technology could allow PG&E to reduce PSPS events and expedite restoration times. It could also provide PG&E the ability to pin point the location of potential fire risks. If proven, scaling this technology across PG&E's system will be complex, but offers significant benefits as detailed above.

### 5.1.D.3.8 Remote Grid

Type: New Technology (Commercially Available Offering)

Description: Remote Grid is a new utility service concept using decentralized energy sources for permanent energy supply to remote customers as an alternative to energy supply through hardened traditional utility infrastructure. Throughout PG&E's service territory, there are pockets of isolated small customer loads that are currently served via long electric distribution feeders, or until recently have been served by such feeders (but are now disconnected due to damage from recent wildfires). In many circumstances, these feeders traverse through HFTDs areas. If these long feeders were removed and the customers served from a local and decentralized energy source, the resulting reduction in overhead lines could reduce fire ignition risk as an alternative to or in conjunction with system hardening. In addition to reducing wildfire risk, Remote Grid could be a cost-effective solution against expense and capital costs for the rebuild of fire-damaged infrastructure or for HFTD hardening infrastructure jobs to meet new HFTD build standards.

PG&E's Remote Grid Initiative will validate and develop Remote Grid solutions as standard offerings such that they can be considered alongside or in lieu of other service arrangements and/or wildfire risk mitigation activities such as system hardening. In 2020, PG&E plans to deploy at least 4-8 initial sites to validate use cases, design standards, deployment processes and commercial arrangements. Based on the results of the initial projects, PG&E will deliver recommendations for scale up and/or further development for consideration in 2021 and beyond.

### 5.1.D.3.9 Multi-Use Microgrid

Type: Emerging (Pre-commercial) Technology

Description: The EPIC 3.11, Multi-use Microgrid demonstration project, seeks to enable a multi-customer microgrid within the Arcata-Eureka Airport business community and will incorporate four PG&E and Redwood Coast Energy Authority customers. The project will design and develop control specifications and provide SCADA integration to maintain visibility and operational control of the microgrid in grid-connected and islanded modes. This project will test capabilities to integrate third party controlled microgrids into PG&E's distribution system. The findings of this project will help support microgrid growth to support resiliency (e.g., remote grid configurations) and enhanced customer choice.

Program Area: Asset Management and Inspections – New and Emerging Technologies

PG&E is developing new inspection tools and methods to quickly identify issues and proactively manage asset and system maintenance. This in turn reduces the risk of asset failure and potential impacts on our customers. PG&E is leveraging existing technologies, including remote sensing technologies such as LiDAR data and drone imagery capture,[5] to accurately identify risks, including encroachment clearance and vegetation health. Combined with machine learning software, remote sensing data are being evaluated to identify dead or dying trees that could pose wildfire hazards or contribute to a wires-down situation. Mitigations leveraging new or untested technologies include the following:

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**5** Future drone technology adoptions are dependent upon FAA regulations for Line of Sight requirements. If exceptions are granted to these requirements, PG&E will have the opportunity to consider new or untested drone technology use cases such as: (i) extended line of sight operations for greater crew efficiency; (ii) autonomous flight paths to expedite drone inspections; (iii) new charging methods that leverage existing asset infrastructure to minimize charging time and increase flight time.; and (iv) new data processing techniques that minimize data hand off processes by capturing and processing data in-air, allowing for greater in-air operation.

### 5.1.D.3.10 Enhanced Asset Inspections – Drone/AI (Sherlock & Waldo)

Type: New Technology (Not Widely Commercialized)

Description: Sherlock is a web application that allows inspectors to view and inspect photographs of assets along with associated data. It also allows for pre-inspection review of data coming in from drone pilots, helicopter photographers, and other means of data capture, to ensure that only quality-assured data is viewed by inspectors, and further by others such as engineers, estimators and investigators who need the photos for their work. In addition, inspectors can file corrective requests within the Sherlock application itself by marking up photographs and selecting the appropriate failure and severity rating of identified issues. Sherlock is designed in a flexible manner such that remote inspections of transmission, distribution, substation, and any other asset can be performed via the application.

The corrective requests identified by inspectors inside Sherlock feed Waldo, a computer vision API (Application Programming Interface), where computer vision models are trained to identify issues using Artificial Intelligence (AI), in an automated fashion. Waldo's predictions can then be surfaced in Sherlock to be confirmed as correct or incorrect by inspectors, creating a positive feedback loop which then improves the models further. Other applications (e.g., mobile applications) can send/receive data and images to/from Waldo to train/retrain models, and/or to receive predictions to help automate their processes.

Additionally, Sherlock also has a search feature which allows access to organized images and other asset data, with a map to show the location of the photos in relation to the asset, and the ability to view photos of an asset by date taken. This allows for visibility into a historical view of the asset, expanded understanding of the specific asset location, increased visibility into data quality, and ease of access to asset information with a simple search.

Future features in Sherlock may allow for automated tracking of flights and inspections, inspector bias detection, automated inspection and photo quality checks, inspector performance measurement, enhanced pre-inspection quality assurance, easy upload and verification of photographs by field workers, search by AI-provided metadata (e.g., search for "porcelain insulators" will return photos of assets with porcelain insulators), and AI-assisted asset inventory.

### 5.1.D.3.11 Ultrasonic Technology

Type: New Technology (Commercially Available Offering)

Description: This project is described in Section 5.3.4, Asset Management and Inspections – Initiative: 'Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations'

### 5.1.D.3.12 Below Ground Inspection of Steel Structures

Type: New Technology (Commercially Available Offering)

Description: PG&E is assessing broader use of below ground inspection of steel structures, to evaluate structural and environmental corrosion of foundations, and design mitigation and restoration solutions to ensure transmission structure resilience. PG&E piloted this solution in 2015 (Sobrante Station) and 2017 (Moraga-Oakland Line) in conjunction with reconductoring transmission circuits. PG&E is assessing a follow up pilot that will regularly inspect steel assets below groundline to detect steel corrosion and concrete degradation that may compromise structural integrity, with the goal of reducing risk of steel assets in the transmission plant and substations. Foundation degradation of steel structures has the potential to introduce risk - this is especially true with older structures. To inspect below ground, the foundations/footings of steel towers and poles are excavated and evaluated for structural integrity, including measuring steel member material section loss, and collecting environmental and soil data (soil resistivity, pH, structure to soil potential/VDC, REDOX). Repairs and mitigations are prioritized, based on the field evaluations and soil samples, in combination with other evaluations of tower/structure and overhead assets. Advanced analytics can also be applied to the data, helping to inform a risk ranking of structures. Foundations that don't require repair or mitigation are treated with an engineered coating system to extend the life of the asset.

Program Area: Vegetation Management and Inspections – New and Emerging Technologies

PG&E is using a variety of technologies to enable vegetation related insights. For instance, physical ground inspections are being augmented by the capture of LiDAR and related, remote sensing, data that can be thoroughly and consistently analyzed to take measurements, reveal patterns and identify risks. Vegetation Management has benefited from better intelligence of vegetation density and can leverage this data to strategically deploy resources where vegetation is near the electrical assets. Mitigations leveraging new or emerging technologies include the following:

### 5.1.D.3.13 Mobile LiDAR for Distribution Inspections

Type: New Technology (Commercially Available Offering)

Description: In 2019, PG&E began collecting LiDAR point cloud and high-resolution data in areas of interest with CycloMedia technology mounted to vehicles and off road systems. Throughout 2019, up to 8 vehicles were deployed to collect (or scan) accurate and dense LiDAR point cloud and high resolution GeoCycloramas (high resolution 360-degree panoramic spherical street-level images) with CycloMedia technology. To allow PG&E to collect the data it needs for analysis, each CycloMedia system is carefully calibrated. The well-trained collection team performs quality assurance checks in the field during favorable weather conditions to help ensure optimal imagery and LiDAR is being collected. Mobile scanning tools may have the ability to consistently and repeatedly inspect miles of right-of-way. The measured results and imagery provide date-stamped documentation and a record for the basis of action and confirmation of completed actions.

Program Area: Other – Asset Analytics & Grid Monitoring – New and Emerging Technologies

PG&E is assessing new methods to optimize asset maintenance practices. Unanticipated failure of electric assets due to wear and tear can lead to customer service outages and, in the worst case, fire ignition. Proactive management of asset health can reduce this risk and enhance system resiliency. PG&E is researching new or emerging technologies, such as enhanced sensor technologies that enable real-time system monitoring and situational awareness and developing analytic strategies to coordinate data received from multiple sources (e.g., SCADA, SmartMeter™, primary line sensors, and emerging sensor technologies). Mitigations leveraging new or emerging technologies include the following:

### 5.1.D.3.14 Transformer Monitoring

Type: Emerging (Pre-commercial) Technology

Description: The EPIC 3.13, Transformer Monitoring via Field Area Network demonstration project, seeks to expand its methods for transformer monitoring by developing an accurate, automated and data-driven method for identifying transformer temperature and the associated risk of asset failure that could impact safety and resiliency. As transformers reach the end of their usable life or overload, they begin to heat up, leading to potential safety and asset risks. Currently, identification of transformer temperature change and potential risk poses challenges and requires regular checks from PG&E field teams. This demonstration project aims to increase the visibility of transformer health through the design and build of an overhead transformer temperature sensor, supplemented by analytical models that analyze temperature data. Sensor data will be communicated to PG&E's Distribution Management System. PG&E will prioritize the roll-out of this technology by developing criteria to identify the highest risk locations on the distribution grid for sensor installation. The data provided by the sensors will enable PG&E to optimize transformer maintenance practices, reducing the risk of transformer failure to mitigate potential impacts to safety and grid resiliency.

#### 5.1.D.3.15 Maintenance Analytics

Type: Emerging (Pre-commercial) Technology

Description: The EPIC 3.20, Maintenance Analytics, demonstration project aims to reduce unanticipated distribution asset failures through the development of predictive maintenance capabilities. The project will monitor for signs of failure onset through use of existing data sources including SmartMeter™ connectivity data, geolocational asset data, and weather data. The objective is to develop an analytical model in conjunction with existing PG&E data sets to predictively identify electric distribution equipment issues so that corrective action can be taken before failure occurs.

#### 5.1.D.3.16 System Harmonics for Power Quality Investigation

Type: Emerging (Pre-commercial) Technology

Description: The EPIC 3.32, System Harmonics for Power Quality Investigation demonstration project, seeks to explore the use of next generation metering technology harmonics data to help automate the investigation and resolution of harmonics issues. Excessive harmonics have been shown to reduce utility equipment life, can cause premature equipment failure due to the potential to overheat, and can interfere with the operation of protection devices. Harmonics data from next generation metering technology can enable power quality engineers to monitor harmonics levels on the circuits and proactively address harmonics issues before they create a negative impact on PG&E and customers' equipment, mitigating the chances of equipment failure to have adverse effects or safety impacts.

#### 5.1.D.3.17 Wind Loading Assessments

Type: Emerging (Pre-commercial) Technology

Description: This project will reduce risk by providing asset intelligence to identify locations that require corrective actions driven by pole safety factors or limitations for wind speeds. The project will leverage existing LiDAR data from Vegetation Management efforts to geo-correct pole locations. Objectives of this project include a greater understanding of failure modes, establishment of a common repository of data gathered, and effectively updating workflows of key asset systems to align with new data strategies. Wind loading segmentation will be performed to identify the wind loading of each asset on a support structure and integrate findings into appropriate systems.

#### 5.1.D.3.18 Predictive Risk Identification With Radio Frequency (RF) Added to Line Sensors (Distribution Fault Anticipation Technology)

Type: Emerging (Pre-commercial) Technology

Description: This project is described in Section 5.3.2, Situational Awareness and Forecasting. Technologies demonstrated through this project are summarized through the references to 'Distribution Fault Anticipation Technology' and 'Early Fault Detection.'

Program Area: Other – Alternative Technologies – Foundational Technology

PG&E continues to deploy foundational technologies that enable grid communication, including sensors, metering, maintenance, and grid asset control networks to allow the exchange of information required to provide real or near-real time operational visibility across the grid. For instance, PG&E will continue to develop Network SCADA monitoring capabilities to help monitor voltages, currents, temperature, transformer oil level, and chamber pressures. This data can trigger alarms or be used for equipment condition assessment as part of the Condition-Based Maintenance (CBM) system for O&M activities. The data is used for asset management decisions on the maintenance and replacement of network equipment. Mitigations leveraging new or emerging technologies include the following:

#### 5.1.D.3.19 Advanced Distribution Energy Resource Management System

Type: Emerging (Pre-commercial) Technology

Description: The EPIC 3.03, Advanced Distribution Energy Resource Management System demonstration project, seeks to design, procure, and deploy a prototype enterprise DER Management System. This includes development of a cost-effective non-SCADA solution for providing advanced situational awareness and control capabilities. This project is a key component of a multi-year effort to implement a full scale DER Management System. This system, if implemented, may enable operators to better manage DERs, dispatch DER Registration data requests and monitor Smart Inverter (SI)-based DERs through a head-end platform, and provide an interface to dispatch DERs as remote grid and Non-Wires Alternative (NWA) solutions. A DER Management System could become part of the core distribution operations technology tools that enable visibility, control, forecasting and analysis of a more dynamic grid.

### 5.1.D.3.20 Advanced Distribution Management System (ADMS)

Type: New Technology (Commercially Available Offering)

Description: PG&E is undertaking the first component of a multi-year effort[6] to implement an Advanced Distribution Management System (ADMS), which will integrate several mission critical distribution control center applications that are currently spread across multiple platforms. The ADMS will become part of the core distribution operations technology tools that enable the visibility, control, forecasting, and analysis of a more dynamic grid. When fully deployed, the ADMS platform will bring the capabilities of today's Distribution Supervisory, Control and Data Acquisition (D-SCADA) software, Demand Management System (DMS), and Outage Management System (OMS) into a single platform. Integrating these systems into a single, more efficient platform will reduce the potential for operator error, improve cybersecurity risk controls, and enable PG&E to run a new suite of advanced applications that enhance current capabilities associated with safety and resiliency, while responding to future needs associated with the growth of DERs and complexities from wildfire risk. Below are examples of the methods in which ADMS may impact grid resiliency:

- Distributed Energy Resource Integration: ADMS will enable distributed energy resource integrations which may be prevalent with future microgrid configurations towards enhanced resiliency.

- Switching Operations: Longer term, as additional functionalities are built out, ADMS can improve PG&E's ability to sectionalize the grid during a Public Safety Power Shutoff (PSPS) by providing more timely and accurate data to operators, allowing them to optimize switching operations and minimize associated outage impacts on customers.

- Reclosing Relay Disablement: Currently, distribution operators have the ability to block reclosing relays within fire index area zones when weather and conditions pose significant risk to the system. Doing so adds an additional layer of protection against ignition risk. This process requires SCADA technicians to redesign individual scripts to manually transition devices to their new settings. New tools enabled through ADMS hold the potential to automate this process by having ADMS identify the devices within the designated fire areas and present the potentially impacted areas to the operators for verification. This automation utilizes more accurate as switched conditions thereby decreasing the opportunity for failed commands. When commands are failed, ADMS may be able to flag issues, providing greater operator situational awareness.

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**6** ADMS developments and implementation will expand beyond the 2020-2022 timeline covered by the 2020 WMP.

Program Area: Other – Alternative Technologies – Electric Portfolio Investment Charge, Investment Plan[7]

EPIC plays a key role in the advancement of grid capabilities to enhance or enable safety, resiliency, and renewable and DER integration. PG&E is excited to embark on new technology demonstrations which build on past projects, meet emerging grid needs and California policy objectives, and ensure that customers and the state can maximize the benefits of this program. Below are select demonstration projects that PG&E may pursue (subject to funding approvals and EPIC 3 Wave 2 planning) that represent mitigations leveraging emerging technologies:

- EPIC 3.21: Advanced Vegetation Management Insights Using Prescriptive Analytics – This project will seek to demonstrate a prescriptive analytics model that predicts tree growth rates and areas at highest risk for vegetation-related outages by leveraging LiDAR, other remote sensing data, and historical vegetation-based outages for proactive and targeted mitigation. The model could be used for routine maintenance activities, reliability-focused project planning, or planning and staging – maturing the use of LiDAR data to inform operational practices.

- EPIC 3.41: Drone Enablement and Operational Use – This project will seek to develop and demonstrate a foundational utility-focused Drone enablement systems and initial use cases to form the foundation for future utility Drone operations. Several potential use cases will be explored leveraging the foundational technologies for management and operation of the drones. The use cases enabled through this project will depend on FAA regulations for Line of Sight requirements and potential for exceptions to existing regulations. Example use cases include: (i) extended line of sight operations for greater crew efficiency; (ii) autonomous flight paths to expedite drone inspections; (iii) new charging methods that leverage existing asset infrastructure to minimize charging time and increase flight time; and (iv) new data processing techniques that minimize data hand off processes by capturing and processing data in-air, allowing for greater in-air operation.

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**7** Application of Pacific Gas and Electric Company (U 39 E) for Approval of Its 2018-2020 Electric Program Investment Charge Investment Plan. A.17-04-028, Dated April 28, 2017. <https://www.pge.com/pge_global/common/pdfs/about-pge/environment/what-we-are-doing/electric-program-investment-charge/EPIC-3-Application-PGE.pdf>.

## 5.2 Wildfire Mitigation Plan Implementation

### 5.2.A Monitor and Audit WMP Implementation

*A. Monitor and audit the implementation of the plan. Include what is being audited, who conducts the audits, what type of data is being collected, and how the data undergoes quality assurance and quality control.*

PG&E has developed plans and processes to monitor and regularly audit the 2020 WMP as it is being implemented. The effort to monitor and audit elements of the 2020 WMP is supported by the WMP implementation teams, the WMP Program Management Office (PMO) and PG&E's Internal Audit (IA) organization. PG&E has developed programmatic quality and monitoring processes and protocols for individual programs within the WMP. The individual quality monitoring processes for WMP program elements are described in Section 5.3, Detailed Wildfire Mitigation Programs, Sections 5.3.1 through 5.3.10.

PG&E's WMP PMO is responsible for monitoring the progress of the individual WMP workstreams and the quality of the WMP work at the program level. The PMO provides progress tracking and status updates via a weekly dashboard. The PMO also provides both a monthly update and a comprehensive quarterly WMP report. The PMO provides on-going oversight and direction to the WMP program leaders. In addition, the status and tracking reports provide PG&E leadership, and ultimately the board of directors, visibility into the different elements of the WMP and gives them the information they need to monitor and, when needed, make adjustments to the program. See Attachment 1, Table 23 for the details and data associated with the WMP PMO.

At the individual WMP program level, PG&E has developed quality monitoring and audit plans tailored to each program. For example, the WMP quality monitoring and audit programs developed for the System Hardening and Enhanced Vegetation Management programs including 100 percent work verification. For both of these key WMP programs – no miles are recorded as complete in either program until they have been fully verified to be complete. The operating LOB generally validates that the work conducted is accurate and complete while the program data verification is validated by PG&E's Quality Assurance (QA) or IA teams. The operating lines of business that validate that the work is accurate and complete have the expertise to identify any technical issues. The IA teams have expertise in designing data validation and quality monitoring programs. Taken together, the quality monitoring and auditing program that PG&E implements validates both the physical completion of work and the quality of the program data.

Further, during 2019, PG&E provided recurring updates about the status of the 2019 WMP implementation and 2019 WMP performance measures to the Safety Enforcement Division (SED). While certain of these updates were required, PG&E provided additional, voluntary updates to SED in order to keep the Commission aware of the most recent 2019 WMP developments.

### 5.2.B WMP Deficiencies

*B. Identify any deficiencies in the plan or the plan's implementation and correct those deficiencies.*

PG&E uses the WMP monitoring and tracking reports and the quality review information to monitor both the progress and quality of the work completed and to identify any program deficiencies. PG&E's WMP PMO is primarily responsible for continually monitoring the individual WMP programs in order to identify any potential deficiencies in the plan or the plan's implementation. In addition, the IA teams or operating lines of business may also identify a deficiency during their review of different WMP program elements. PG&E's senior leaders receive regular WMP reports that they can also use to identify potential deficiencies. Regardless of who identifies a deficiency, all deficiencies are reported to the PMO and the PMO is ultimately responsible for correcting those deficiencies.

To the extent a deficiency is identified, the PMO works with the WMP program leaders to identify what is driving the deficiency and to develop plans to mitigate the underlying issue(s). The PMO carefully monitors the mitigation plan as it is implemented in order to confirm that the deficiency is corrected. Mitigation plans and corrective actions are incorporated into the status updates that the PMO provides to PG&E senior leaders, the federal monitor and the board of directors committee that is monitoring the WMP.

### 5.2.C Monitor and Audit Inspection Effectiveness

*Monitor and audit the effectiveness of inspections, including inspections performed by contractors, carried out under the plan and other applicable statutes and commission rules.*

To monitor and audit the effectiveness of inspections carried out under the plan and other applicable statutes and commission rules, PG&E uses a combination of processes, tools and other control points intended to quickly identify anomalies in inspection and/or patrol results. Once identified, PG&E's programs are designed to address the gap, determine the root cause and pursue improvement opportunities.

PG&E is developing processes to build on the methods used during the 2019 WSIP inspections and establish improved inspection processes and inspection control metrics. These improvements will include a combination of data trend analyses, representative sampling, internal audit and/or quality assurance work verification and vendor quality sampling.

Starting in 2020, PG&E will implement an inspection Process Quality function that will be responsible for establishing and monitoring process control measures and notifying responsible parties to take corrective measures when predefined inspection quality standards are not achieved. The Process Quality group exists alongside Internal Audit and Electric Quality Assurance.

PG&E is moving detailed inspection data away from paper-based processes and will be relying more and more on digital tool and technology. As results and data are recorded electronically at the time of the inspection, opportunities for analyzing inspection quality are expanded and accelerated. For example, instead of waiting until a complete plat map is returned and sampled during supervisor work verification or an audit, teams can begin to monitor in-cycle rates of inspector findings to identify potential outliers and more quickly identify areas where additional inspections or re-inspection may be required. PG&E recognizes that rates of inspection and findings will vary by location. Rather than establish a single target metric for inspection productivity and findings, PG&E can use inspection data to develop appropriate inspection metrics for individual locations and then use those metrics to evaluate inspector teams. Using targeted metrics, PG&E can better identify the need for process improvements, additional training or supervision and other corrective actions.

### 5.2.D Data Used for Wildfire-Related Decisions

*D. For all data that is used to drive wildfire-related decisions, including grid operations, capital allocation, community engagement, and other areas, provide a thorough description of the utility's data architecture and flows. List and describe 1) all dashboards and reports directly or indirectly related to ignition probability and estimated wildfire consequences and reduction, and 2) all available GIS data and products. For each, include metadata and a data dictionary that defines all information about the data. For each, also describe how the utility collects data, including a list of all wildfire-related data elements, where it is stored, how it is accessed, and by whom. Explain processes for QA/QC, cleaning and analyzing, normalizing, and utilizing data to drive internal decisions. Include list of internal data standards and cross- reference for they datasets or map products to which the standards apply.*

Section 5.3.7.1 provides an overview of PG&E's efforts to bring together critical data into a single environment, enabling data driven approaches to wildfire mitigation initiatives and efforts. That section details the integration of data platforms (repository) to advance PG&E's vision for data analytics.

At a higher level, PG&E's CWSP PMO aggregates data on workstream progress and performance in a weekly dashboard, as discussed in Sections 5.2.A and 5.2.B above. This dashboard tracks limited information on the volume of ignitions and some related measures of wildfire outcomes, but is not focused on "ignition probability and estimated wildfire consequences and reduction."

PG&E's complete GIS dataset includes hundreds of datasets and layers both internally created from company records or analysis and externally acquired from partners, regulators, vendors or government agencies. Once acquired, these datasets are stored in PG&E's GIS system and accessed as needed by system users through various front-end viewers, mapping systems or back-end analysis tools. Some datasets contain confidential information and are therefore only accessible to internal users with the appropriate credentials / login information. The below table provides a selection of GIS datasets applicable to understanding wildfire risk and conditions:

**TABLE PG&E 5-2: SELECTION OF GIS DATASETS APPLICABLE TO UNDERSTANDING WILDFIRE RISK AND CONDITIONS**

| GIS Dataset | Description | Primary Data Elements | How collected | Update frequency |
|---|---|---|---|---|
| HFTD Boundaries | CPUC-defined HFTD zones | HFTD Tiers | Acquired from CPUC website | Every 10 years |
| WUI Boundaries | Wildland Urban Interface classifications, per census.gov: a) Urban Areas; b) Urban; c) Rural; d) Highly Rural | Mapbase of WUI areas; Silvis WUI feature class | Acquired from University of Wisconsin-Madison | Created 3/19/19; updated 5/17/19 |
| Electric Transmission Asset Data | Geospatial data on Electric Transmission Assets | Assets | Collected by work management as-built processes | Real time |

**TABLE PG&E 5-2: SELECTION OF GIS DATASETS APPLICABLE TO UNDERSTANDING WILDFIRE RISK AND CONDITIONS (CONTINUED)**

| GIS Dataset | Description | Primary Data Elements | How collected | Update frequency |
|---|---|---|---|---|
| Electric Distribution Asset Data | Geospatial data on Electric Transmission Assets | Assets | Collected by work management as-built processes | Real time |
| ED work in progress | Geospatial data on planned work in progress | Planned work orders | Initiated by PG&E planning work processes | Real time |
| ET work in progress | Geospatial data on planned work in progress | Planned work orders | Initiated by PG&E planning work processes. | Real time |
| SAP notification | Geospatial data on corrective work in progress | Planned corrective work | Initiated by PG&E's preventative action programs | Real time |
| Meteorology | 1. Red Flag Warning Days per Fire Index Area (FIA)<br><br>2. Daily maximum surface windspeed percentiles (95th/99th) from PG&E's 30-yr archived weather re-analysis<br><br>3. Prevailing surface wind directions from PG&E's 30-yr archived weather reanalysis | 1. Red Flag Warning Days<br><br>2. Daily Maximum Surface Windspeed Percentiles<br><br>3. Prevailing Wind Direction | 1. Iowa State University's Archived National Weather Service Watch/Warnings<br><br>2. 30-year long-term mesoscale weather model with archived weather re-analyses downscaled to a 3-km grid<br><br>3. Same as (2) | 1. Once a day<br><br>2. One-time analysis performed in 2019<br><br>3. Same as (2) |
| Recent drivers of ignition | A self-propagating fire of material other than electrical with a size greater than 10 acres that is attributable or believed to be attributable to PG&E assets. | Electric corrective tags | Collected by electric compliance | Twice a week: Tuesday and Friday |
| Census Tracts | Federal census data | Census data | US Census | Every 10 years |
| OIS Customer Tables | Critical customer information | Customer information | Customer data management processed | Real time |
| PSPS Data | Duration of PSPS events and area of the grid affected in customer hours per year | Customer outage data from PSPS events | ILIS and CC&B records from PSPS events | After each PSPS event |
| PGE Service Territory Boundary | Organizational boundary PG&E service territory | Service boundary | NA | Static |

## 5.3 Detailed Wildfire Mitigation Programs

*In this section, describe how the utility's specific programs and initiatives plan to execute the strategy set out in Section 5.1. The specific programs and initiatives are divided into 10 categories, with each providing a space for a narrative description of the utility's initiatives and a summary table for numeric input in the subsequent tables in this section. The initiatives are organized by the following categories provided in this section:*

1. *Risk assessment and mapping*
2. *Situational awareness and forecasting*
3. *Grid design and system hardening*
4. *Asset management and inspections*
5. *Vegetation management and inspections*
6. *Grid operations and protocols*
7. *Data governance*
8. *Resource allocation methodology*
9. *Emergency planning and preparedness*
10. *Stakeholder cooperation and community engagement*

*To the extent applicable and relevant, if an electric utility has completed a Safety Model and Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Phase (RAMP) as part of its General Rate Case that identifies safety models or programs the electrical corporation has implemented to mitigate ignition probability and estimated wildfire consequence, then the models or programs identified pursuant to this section must comport with those identified in the S-MAP proceeding. Describe any differences with S-MAP and RAMP and provide rationale.*

*For each wildfire mitigation activity, report information on:*

1. *Total per-initiative spend in dollars ($);*
2. *Line miles to be treated (as applicable) 3 in miles (mi);*
3. *Spend per treated line mile (or, where initiative is not implemented on a per-line-mile basis, per total line miles of the system);*
4. *Ignition probability drivers targeted (from the list of ignition probability drivers indicated in utility SDR Table 24 Key drivers of ignition probability, or other as needed);*
5. *Risk reduction of the activity according to utility multi-attribute value function (MAVF); and*

6. *Risk-spend efficiency in dollars per unit of risk reduction; and*

7. *Other risk drivers addressed.*

*For the quantitative characteristics of the activities, six values shall be reported for each activity. These include numbers for the plan for 2019, actual activity spending and other calculations for the activity as actually implemented in 2019, the plan for year 1 of this WMP, estimates for years 2 and 3 of this WMP, and a subtotal for the 3-year WMP term ("2020-2022 plan total").*

*For each activity, also:*

1. *Identify whether the program/strategy is existing or new;*

2. *If existing, identify the proceeding where the program/strategy costs have been subjected to Commission review;*

3. *If new, identify any memorandum account where related costs are being tracked and provide an explanation of how double tracking is prevented in the comments; Where a given activity does not take place in geographic distribution across the service territory (e.g., personnel work procedures and training in conditions of elevated fire risk), input "N/A" in the corresponding cell.*

4. *Indicate whether the program/strategy is implemented in compliance with existing regulations or exceeds current regulatory requirements;*

5. *If a program/strategy is identified as meeting a current regulatory requirement, cite the associated order, rule, or code;*

6. *Include comments as needed to clarify or explain the data provided.*

The details of PG&E's wildfire mitigation programs are presented in this Section 5.3 and the associated tables are provided in Attachment 1 – *All Tables Required by the WMP Guidelines*. In an effort to create alignment between the utilities, which have some inherent differences, the Wildfire Safety Division (WSD) provided all WMP filers with a standard list of initiatives. This list of initiatives does not always map directly to PG&E's programmatic structure and therefore, some initiatives are not applicable to PG&E, while others have been added. Further, some activities—asset inspections, for example—are performed as an integrated function and cannot be feasibly separated into sub-elements as have been identified as separate initiatives in the provided template. As a result there are a number of initiatives without unique data, as the cost and details of that activity are captured in another portion of Section 5.3. For each initiative, PG&E is providing the information requested in the WMP guidelines to the extent possible. However, it is important to provide some clarifications regarding the information provided throughout Section 5.3.

**Financial and Unit Forecasts**

With regard to financial information, 2019 actual costs are provided where available and 2020-2022 forecasts are provided as well. These forecasts are subject to changes as a result of operational and regulatory events. For example, as PG&E continues to gain

experience implementing initiatives, the forecasts of cost may need to be updated. Forecasts are also subject to regulatory outcomes, such as approval of the pending settlement in PG&E's 2020 General Rate Case (GRC) Proceeding (Application 18-12-009). With regard to plans and information for the number of units that will be installed for certain initiatives, these are also subject to change. Actual unit installation and operation can be impacted by delays due to permitting, labor availability, and availability of equipment. PG&E expects that the actual unit numbers will change from forecasts, especially for future years such as 2021 and 2022.

Changes in costs and unit installation is even more likely for the 10-year outlook data, given that the initiatives identified can change significantly over the next decade as PG&E gains experience and additional data and information is developed.

**Alternatives Analysis**

In the January 15, 2020 *WMP Clarification Document*, the WSD added direction for each subsection in Section 5.3 describing the wildfire mitigation initiatives to also include "a list of alternatives considered and the utility's rationale for choosing only the initiatives outlined in the plan and not the alternatives." Due to the rapid evolution of wildfire understanding and the subsequent aggressive implementation of additional wildfire mitigation activities in 2018 and 2019, many of the initiatives were scoped through benchmarking or subject matter expertise. As explained in PG&E's 2019 WMP, PG&E used an analysis of historical ignitions in HFTDs to estimate the number of ignitions that would have been addressed through various approaches, compared to estimated program implementation costs.

For example, in developing the scope for the EVM program this analysis included options such as: (i) high risk species tree work (ultimately selected as part of EVM), (ii) ground to conductor vegetation clearing, (iii) conductor to sky clearing 12' out from conductors, (iv) conductor to sky clearing 4' out form conductors (ultimately selected as part of EVM). PG&E did not have an opportunity to perform detailed alternatives analysis for many of the initiatives included in this section. Quantitative alternatives analysis was performed, however, for some of the larger mitigation activities, such as system hardening and EVM. As PG&E continues to gather additional information, details and experience regarding wildfire risk factors (both likelihood and consequence), including through the implementation of WMP mitigations, it will inform evolution of WMP mitigation plans and increasing quantification of risk reduction and alternatives analysis.

**Effectiveness analysis**

The initiatives described in PG&E's 2020 WMP remain a work in progress. PG&E is continually learning and incorporating new information regarding wildfire risk factors and how to best mitigate both the likelihood and consequence of potential future ignitions. As such, PG&E will be continually evaluating through various means the effectiveness of these initiatives and adjusting as informed by that feedback. In particular, for asset-oriented initiatives, PG&E will be monitoring outcomes – ignitions and outages, for example – to assess the reduction in such events in areas where mitigations – like system hardening, EVM, non-exempt fuse replacement, etc. – have been applied, as applied to historical baselines and areas where no such mitigations have been applied.

PG&E will incorporate these learnings into future WMPs, including stopping, shifting or accelerating mitigation activities as appropriate.

**Risk Quantification**

With regard to risk information, the initiatives in this section have been categorized into Mitigations, Controls, Enhanced Controls, Foundational, and Exploratory Projects. These categories are defined as follows and the tables in Section 5.3 are populated accordingly:

- Mitigations: Specific additional or enhancement programs, beyond compliance, with specific start and end dates and a project budget, or an additional proposed activity not previously identified. In addition, enhancements to existing controls or newly designed controls could be considered mitigations in the first GRC period they are implemented. Individual mitigation initiatives could be "bundled" together to represent a mitigation plan, and that will be indicated in the respective cell. For mitigations, PG&E has provided data for columns 'Ignition probability drivers targeted', 'Other risk drivers addressed', 'Risk reduction', 'Risk-spend efficiency' at the mitigation plan level and not the mitigation initiative level.

- Controls and Enhanced Controls: Safety and compliance programs already in place. Individual control initiatives could be "bundled" together to represent a control program, and that will be indicated in the respective cell. For controls, PG&E has provided data for column 'Ignition probability drivers targeted" at the control program level and not the control initiative level. Columns 'Other risk drivers addressed', 'Risk reduction', 'Risk-spend efficiency' are not provided. Column 'Other risk drivers addressed' is not provided because there is no systematic way to determine which other risk driver other than already indicated in the 'Ignition probability drivers targeted' would be applicable. Columns 'Risk reduction', 'Risk-spend efficiency' are not provided because the baseline risk score already takes these initiatives into account; the risk reduction due to the control is incorporated into the risk score and cannot be confidently separated. PG&E has indicated N/A-Control or N/A-Enhanced Control in the respective cells.

- Foundational Initiatives and Exploratory Projects: Enablers to mitigations or controls. They are work needed to implement mitigations or information that would be used to better inform the execution of a control (i.e., investments in IT infrastructure or data gathering). Foundational activities generally do not result in stand-alone risk reduction. As a result, foundational initiatives and exploratory projects do not have associated Risk drivers and Risk reduction scores. For Foundational Initiatives and Exploratory Projects, PG&E has not provided data for columns 'Ignition probability drivers targeted', 'Other risk drivers addressed', 'Risk reduction', 'Risk-spend efficiency'. PG&E has indicated N/A-Foundational or N/A-Exploratory Project in the respective cells.

Finally, accurately and meaningfully measuring risk is challenging, and while PG&E has made every effort to provide the data requested, we encourage the Commission, the WSD, and stakeholders to continue to facilitate a collaborative discussion on how to most reasonably quantify this topic. In many cases, the data and measures being requested in the WMP Guideline templates are only beginning to be collected, and it will

take years to develop enough data points to determine if these approaches effectively measure risk mitigation. Therefore, a number of initiatives do not have risk reduction quantified and are instead identified as either “foundational” (meaning that this initiative contributes to the risk reduction capability of other initiatives) or “control” (meaning that this initiative is an activity that has existed for such a long time that it is difficult to assess the risk reduction associated with doing so would rather require modeling the risk increase that would occur if this activity were removed from the portfolio of ongoing programs).

**Line Miles Treated and Transmission Voltage Definition**

The tables in Section 5.3 include data on the number of “line miles treated” for each initiative. This data has been provided, including being estimated, wherever possible, however there are a few limitations that should be understood for these figures. First, a number of programs are not primarily defined by line miles but are defined by a number of assets (like a number of switches to be installed, etc.). In these cases, PG&E made high level assumptions to estimate the approximate number of line miles that could be considered “treated” by such asset-based activities. As a result of these assumptions and estimates the actual number of miles “treated” by these activities may not end up matching with the forecasts provided in Section 5.3. Second, activities at PG&E substations in HFTDs have been generally assigned as treating zero-line miles, since these activities primarily only impact assets within the substation itself and are therefore generally not exposed to the high fire threat conditions (e.g., vegetation within substations is carefully managed to mitigate for vegetation caused ignitions and limit any risk of an ignition that occurs within a substation spreading significantly).

Throughout this WMP, PG&E references Transmission assets and programs. PG&E defines transmission voltage (for this and other regulatory filings) as being 60kV or above, PG&E notes this because in some of the initiative definitions the WMP Guidelines provided referenced transmission as being “at or above 65kV.” PG&E is unable to reconfigure all of its data to align with a cut-off of 65kV instead of the historically used 60kV and therefore, when PG&E references transmission that is reflective of assets operating at or above 60kV.

**New or Existing Initiatives**

In addition to the programs or initiatives developed specifically to reduce the risk of wildfires, the WMP Guidelines and clarifications direct utilities to describe routine/standard, and emergency response programs, protocols, and initiatives, including planning, preparedness, maintenance, and inspection work streams (Non-Wildfire Programs). These Non-Wildfire Programs could, directly or indirectly, affect wildfire ignition, but have historically been part of our routine/standard or emergency programs and were not specifically created for inclusion in the PG&E WMP. PG&E described these programs and filled out the templates as directed, including providing forecast costs. Generally, inclusion of these Non-Wildfire Programs in the 2020 WMP narrative and charts does not indicate that these programs are part of PG&E’s 2020 WMP. However, some WMP programs are performed in conjunction with Non-Wildfire Programs (e.g., enhanced inspections of HFTD facilities, vegetation work in transmission rights-of-way), and the identified work is “blended” between the WMP and the Non-Wildfire Programs. For example, the enhanced inspections in HFTD

areas have and will continue to identify corrective actions, including repairs and/or replacement of distribution and transmission equipment; some of the work will be conducted through existing programs. PG&E considers the inspections, replacement, and repair work in HFTD areas that exceeds PG&E's currently-adopted forecast for such work to be part of the WMP.

As directed in the WMP Guidelines, the tables associated with Section 5.3 include columns to "1. identify whether the program/strategy is existing or new" and "2. if existing, identify the proceeding where the program/strategy costs have been subjected to Commission review." In completing the tables for Section 5.3, PG&E followed the clarification provided by the WSD on January 29, 2020, to only consider as existing programs "whose *costs* have been reviewed and approved by the Commission (such as in the GRC)." Therefore, any initiatives or programs that have only been discussed or proposed in the 2019 WMP or other pending proceedings, such as PG&E's 2020 GRC, are listed as "new" and details have been provided on the memorandum account where related costs are tracked. However, for programs identified as "new" where the programs have been discussed in proceedings like the 2019 WMP or 2020 GRC, those filings have been noted in the "proceedings" column to assist readers in understanding where program materials have been submitted previously. Non-Wildfire Programs are identified as "existing" programs on the Section 5.3 charts, even though 2020 costs are awaiting resolution of PG&E's 2020 GRC, because historical costs of these programs have been authorized in prior GRC decisions.

See Attachment 1, Tables 21-30 for the additional information associated with the initiatives discussed in this section.

### 5.3.1 Risk Assessment and Mapping

*Description of programs to reduce ignition probability and wildfire consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description for the utility's programs, the utility's rationale behind each of the elements of this program, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each program, how the utility plans to demonstrate over time whether each component is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *A summarized risk map showing the overall ignition probability and estimated wildfire consequence*
2. *along electric lines and equipment*
3. *Climate-driven risk map and modelling based on various relevant weather scenarios*
4. *Ignition probability mapping showing the probability of ignition along the electric lines and equipment*
5. *Initiative mapping and estimation of wildfire and PSPS risk-reduction impact*
6. *Match drop simulations showing the potential wildfire consequence of ignitions that occur along the electric lines and equipment*
7. *Weather-driven risk map and modelling based on various relevant weather scenarios*
8. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

*For each of the above initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season,*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

**Overview**

PG&E undertook a number of initiatives over the course of 2019 that were aimed at reducing ignition probability and wildfire consequence. Specifically, these initiatives included:

1. Failure Mode and Effects Analysis for its electric distribution, transmission and substation assets.

2. Accelerated and enhanced inspections of all its electric assets within HFTD areas in PG&E's service territory with the objective of identifying and repairing non-conformances on its facilities that pose a safety and/or reliability risk.

3. Thirty (30) year climatology analysis with high-resolution data covering ~80 billion data points to determine historical relationship between wind and electrical outages, as well as correlate historic fire records with weather conditions, topography and vegetation.

See Attachment 1, Table 21 for the additional information associated with the initiatives discussed in the section. Each of these initiatives is described in more detail below, followed by a description of the six specific initiatives identified in the WMP Guidelines. PG&E has not identified any initiatives for "Other/Not Listed."

**Failure Mode and Effects Analysis (FMEA):**

As part of PG&E's accelerated inspections of its overhead electric facilities in HFTD areas, PG&E is conducting a Failure Modes and Effects Analysis or "FMEA." The focus of the FMEA was to identify single points of failure of electric system components that could lead to fire ignition and then aid in the development of inspection methods that can most appropriately identify the condition of these respective components. PG&E performed the FMEA using the following methodology:

- Establish a cross-functional team of external professionals and PG&E subject matter experts with experience in field operations, engineering, and asset management.

- Review a list of asset components to identify potential single point failure ignition risks and categorize in asset groups.

- Where available, use published reports, internal reports and subject matter expert interviews to develop an independent list of failure modes.

- Map components to the final list of failure modes and relevant inspection methods.

- In some cases, the failure mode does not have a readily observable issue that can be identified via a visual inspection. In those cases, non-destructive and destructive examination methods may be considered.

**Accelerated and Enhanced Inspections**

After PG&E identified FMEA focus areas, field inspectors performed inspections of PG&E's facilities across PG&E's HFTD areas. When an inspector identified a

maintenance condition, the inspector either immediately corrected the condition and recorded the correction or recorded the uncorrected condition, which also was reviewed by a centralized review team. In addition, for transmission and distribution facilities, the inspector filled out the initial EC/LC notification tag. PG&E's centralized review team approved and prioritized the corrective notification tag in PG&E's SAP Work Management system. These tags are prioritized based on the risk posed by the condition and urgency of repairs. The table below describes the priority tag classification descriptions PG&E uses to comply with General Order (GO) 95, Rule 18:

**TABLE PG&E 5-3: WILDFIRE SAFETY INSPECTION PROGRAM (WSIP) TAG PRIORITY CLASSIFICATION**

| Tag Priority | Description |
|---|---|
| **A** | The condition is of immediate risk of high potential impact to safety or reliability and requires immediate response and continued action until the condition is repaired and no longer presents a potential hazard ("make safe"). |
| **B** | The condition is of moderate potential impact to safety or reliability.<br>Corrective action is required within 3 months from the date the condition is identified. |
| **E** | The condition is of moderate potential impact to safety or reliability.<br>Corrective action is required within 12 months from the date the condition is identified (or within 6 months if tag creates potential fire ignition risk within HFTD Tier 3). |
| **F** | The condition is of low potential impact to safety or reliability.<br>• Corrective actions for distribution facilities is recommended to be addressed within 5 years from the date the condition is identified.<br>• Corrective actions for transmission facilities recommended to be addressed within 2 years from the date the condition is identified. |

## 30-Year Climatology Analysis:

PG&E also performed a detailed climatology analysis using 30 years of high-resolution model data that generated ~80 billion data points. This robust dataset has been utilized for: (1) determining the historical relationships between wind and outages; (2) correlating historic fire records with weather conditions, topography, vegetation and more; and (3) determining where high risk weather patterns typically occur across the PG&E territory. Specifically, PG&E analyzed the following data sources:

- Weather data (e.g., temperature, relative humidity, wind, precipitation and atmospheric pressure);
- Dead and live fuel moisture levels; and,
- National fire danger rating system outputs

The remainder of this Section 5.3.1 describes specific initiatives PG&E is implementing relative to risk assessment and mapping.

#### 5.3.1.1 A Summarized Risk Map Showing the Overall Ignition Probability and Estimated Wildfire Consequence Along Electric Lines and Equipment

PG&E has leveraged the FMEA that was used to inform its 2019 accelerated and enhanced inspections to develop ignition probabilities for each of the various electric overhead equipment types for electric distribution, transmission and substation facilities. With this information, PG&E created a methodology to perform a wildfire risk ranking of all its electric lines that traverse HFTD areas within PG&E's service territory. The risk ranking there is based on the risk of igniting a wildfire and its associated consequence. In addition to the overall electric line wildfire risk rankings, PG&E has also developed an EC/LC Tag risk ranking methodology to rank identified EC/LC Tags by fire ignition risk potential. Both methodologies are further described below in more detail.

**Electric Line Risk Scoring**

PG&E has developed an electric line risk prioritization scoring for both its electric distribution and transmission assets to determine a wildfire risk score for each electric line based upon different components of risk. Wildfire Risk is calculated using three components: likelihood of failure, likelihood of spread and consequence, and egress that are further defined as follows and depicted in the following figure below:

1. Likelihood of failure: Relative risk of a circuit causing an outage and ensuing ignition

2. Likelihood of wildfire spread and consequence score: Relative ability ignition spread and quantity of homes or timber affected if ignition occurs

3. Egress score: Ease of access to a community exit and extent of exit, for a mass evacuation

In addition, for transmission lines, additional factors were also considered when developing a transmission line (*e.g.,* line) risk scoring. This includes the consideration of the Operational Priority list of transmission lines from PG&E's Grid Operations and Transmission Planning, the list of the Top 20 Fire Index Areas (FIAs), and the Transmission Operability Assessment (OA) model, which considers the likelihood of a specific transmission line asset failure under certain wind loading conditions. Because of these other factors to consider, transmission assets were prioritized in the following order:

1. Transmission Lines that met three critical conditions: (a) High Operational Priority (as defined by PG&E's Grid Operations and Transmission Planning); (b) High Wildfire Risk area; and (c) Within the top 20 FIAs based on weather conditions.

2. Transmission Lines with both: (a) High Operational Priority; and (b) High Wildfire Risk.

3. Transmission Lines that are within the top 20 FIAs and High Wildfire Risk areas. Ranking follows the results of the OA model by asset and wind speed percent de-rate.

4. Remaining Transmission Lines in High Wildfire Risk areas ranked by wildfire risk score.

## EC/LC Tag Risk Scoring

PG&E has developed a tag prioritization model for both distribution and transmission assets in HFTD areas to determine a wildfire risk score for each tag (e.g., identifying non-conformance on asset). Tag Risk scores are calculated using four components: Asset failure ignition risk, historical asset ignition frequency, likelihood of spread and consequence, and egress. These four components are defined as follows:

1. Asset failure ignition risk: Relative risk of an asset's failure causing an ignition

2. Historical asset ignition frequency:

    a. For distribution, PG&E's 2014-2019 ignition frequency caused by an identified asset class.

    b. For transmission, PG&E's 2013-2018 ignition frequency caused by an identified asset class.

3. Likelihood of wildfire spread and consequence score: Relative ability of ignition spread, and quantity of homes or timber affected if ignition occurs

4. Egress score: Ease of access to a community exit and extent of exit, for a mass evacuation

### *Progress Timeline*

1. ***Before the upcoming wildfire season:*** PG&E will continue to update and refine its risk assessment and mapping activities as described above. PG&E will continue to leverage these initiatives to reduce ignition probability and wildfire consequence.

2. ***Before the next annual update:*** PG&E will continue to implement the risk assessment and mapping activities described above. Additionally, PG&E will incorporate lessons learned in 2020 as part of the initiatives to reduce ignition probability and wildfire consequence.

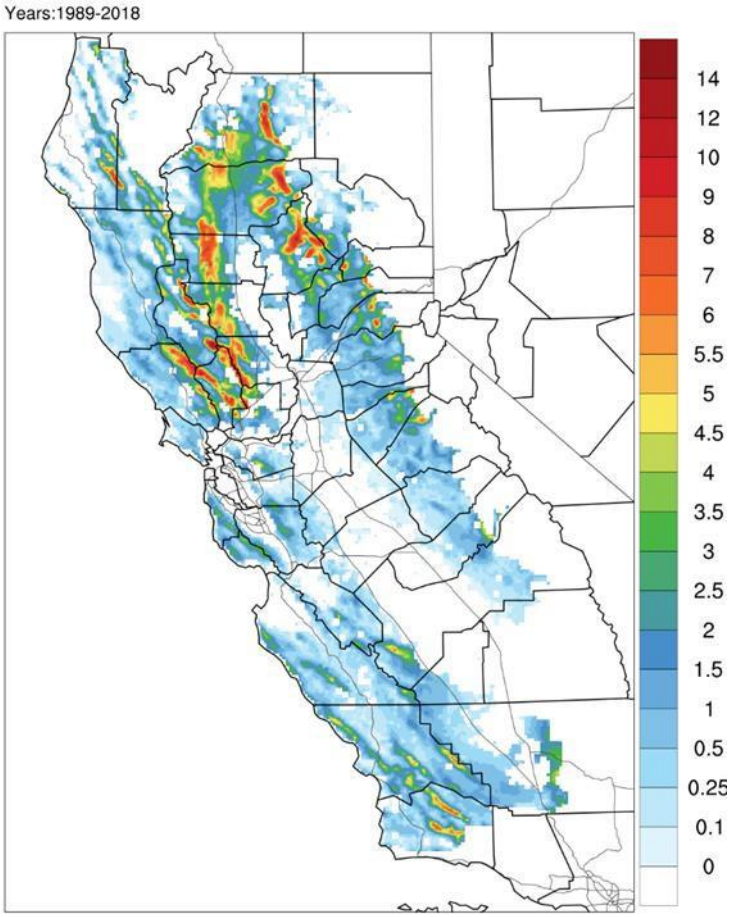
3. ***Within the next 3 years:*** PG&E will continue to update its electric line and EC/LC tag risk scoring using the best available information within the next three years. Based on this information, PG&E will continue to update its risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment.

4. ***Within the next 10 years:*** PG&E will continue to refine and update its risk scoring and risk mapping as described above within the next ten years.

### 5.3.1.2 Climate-Driven Risk Map and Modelling Based on Various Relevant Weather Scenarios

PG&E performed a detailed climatology analysis using 30 years of high-resolution model data that generated ~80 billion data points. This dataset allows PG&E to study weather patterns that have occurred over the past 30 years at an hourly resolution and correlate weather to past outage and fire events. One example is evaluating the occurrence of dry, offshore wind patterns such as Diablo wind events. The 30-year analysis revealed for example the locations across the PG&E territory where these events more commonly occur, as depicted in Figure PG&E 5-1 below.

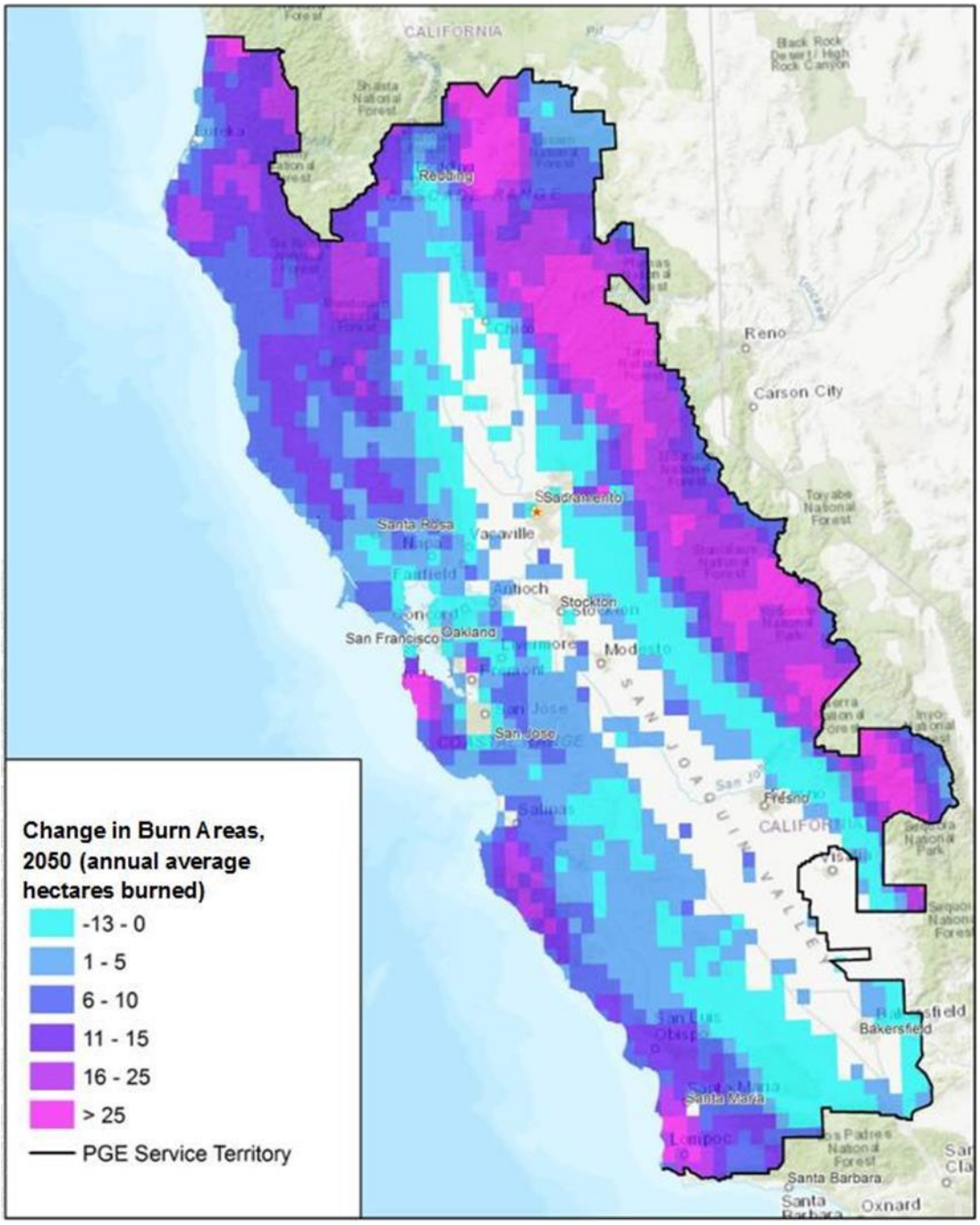
**FIGURE PG&E 5-1: AVERAGE ANNUAL NUMBER OF DIABLO WIND EVENTS**




PG&E has also partnered with climate change experts to perform a climate change wildfire deep-dive to evaluate forward-looking wildfire projections for 2025, 2035 and 2050. Projections from California's Fourth Climate Change Assessment indicate that wildfire occurrence will significantly increase overall across the PG&E territory over the coming decades. By 2050, under a business-as-usual greenhouse gas emissions scenario ("Representative Concentration Pathway 8.5"), average annual burn areas could increase by a projected 43% relative to the recent historical baseline (which runs 1986- 2005 and excludes recent extreme fires in 2017 and 2018). While wildfire occurrence is projected to increase across a wide swath of the PG&E service territory, the greatest increases are projected in and around existing high-risk areas—particularly

in the Sierra Nevada mountains and foothills. Wildfire trends are projected to continue to intensify in coming decades as a result of worsening climate change conditions. Longer fire seasons, drier summers, and increasing fuel mass will likely drive larger and more pervasive wildfires in the future. Figure PG&E 5-2 below shows the projected change in annual area burned by 2050 relative to historical baseline (areas that lack shading indicate no future wildfire projection).

**FIGURE PG&E 5-2*:* PROJECTED CHANGED IN ANNUAL AREA BURNED BY 2050 RELATIVE TO HISTORICAL BASELINE**



***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to leverage detailed climatology analyses to inform wildfire mitigation activities.

2. ***Before the next annual update:*** PG&E will continue to leverage detailed climatology analyses to inform wildfire mitigation activities. Additionally, PG&E will incorporate lessons learned in 2020 into its on-going plans.

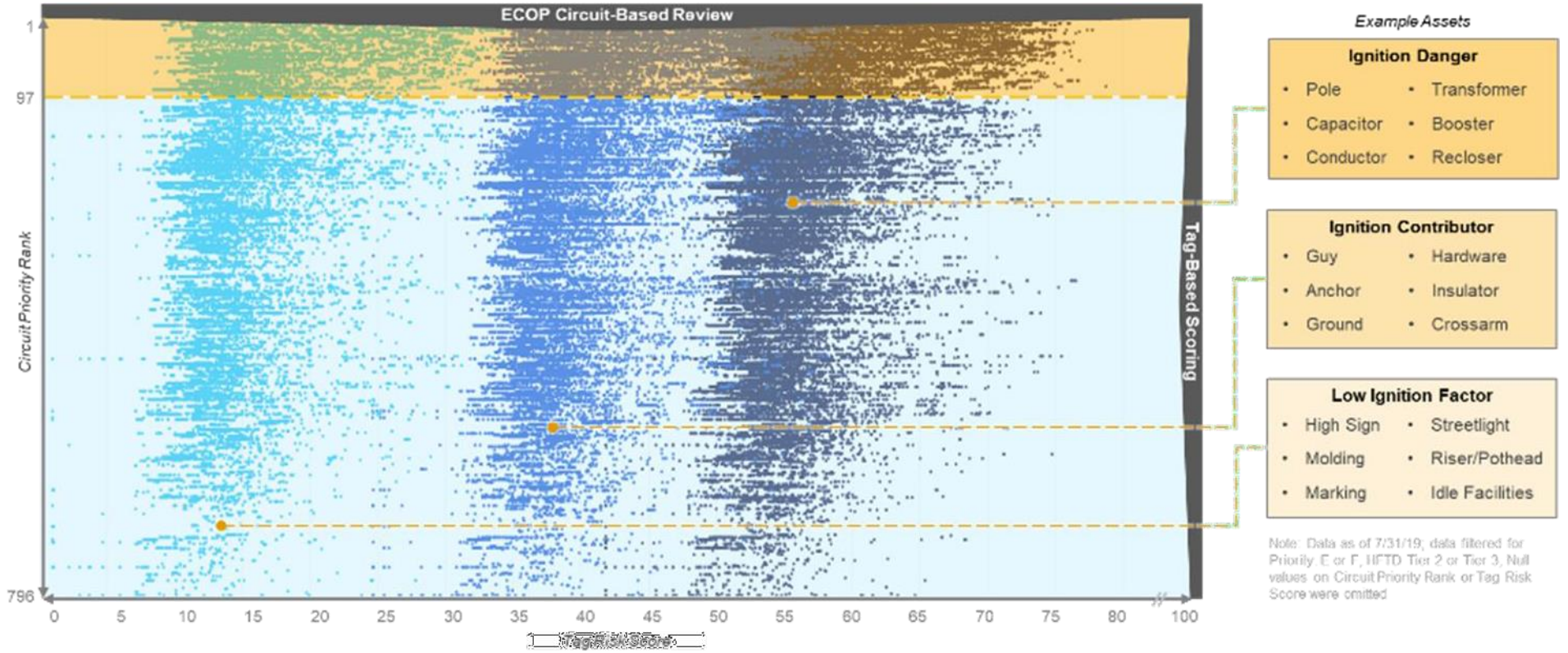
3. ***Within the next 3 years:*** PG&E will continue to evaluate and leverage detailed climatology analyses to inform wildfire mitigation activities within the next three years.

4. ***Within the next 10 years:*** PG&E will continue to evaluate and leverage detailed climatology analyses to inform wildfire mitigation activities within the next ten years.

#### 5.3.1.3 Ignition Probability Mapping Showing the Probability of Ignition Along the Electric Lines and Equipment

PG&E has also determined the probability of ignition along its electric lines and equipment that traverse HFTD areas within its service territory. For the electric distribution system, PG&E has further analyzed the probability of ignition for each piece of equipment and device on its overhead electric system. This granular information also informed the prioritization of non-conformance items identified during the 2019 accelerated and enhanced inspections. Included below as Figure PG&E 5-3 is an example of PG&E's distribution line wildfire risk ranking with the probability of ignition on line equipment that were identified using non-conformance items from inspections. This information was also used to inform PG&E's distribution system hardening priorities.

**FIGURE PG&E 5-3: PG&E'S DISTRIBUTION LINE WILDFIRE RISK RANKING WITH PROBABILITY OF IGNITION**



***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to leverage its ignition probability mapping showing the probability of an ignition along the electric lines and equipment to inform wildfire mitigation activities.

2. ***Before the next annual update:*** PG&E will continue to leverage its ignition probability mapping inform wildfire mitigation activities. Additionally, PG&E will incorporate lessons learned in 2020 into its on-going plans.

3. ***Within the next 3 years:*** PG&E will continue to update, evaluate and leverage its ignition probability mapping to inform wildfire mitigation activities within the next three years.

4. ***Within the next 10 years:*** PG&E will continue to update, evaluate and leverage its ignition probability mapping to inform wildfire mitigation activities within the next ten years.

#### 5.3.1.4 Initiative Mapping and Estimation of Wildfire and PSPS Risk-Reduction Impact

As discussed in Section 5.3.1.1, PG&E has prepared a wildfire risk ranking for each of its electric transmission and distribution lines that traverses through HFTD areas within PG&E service territory, which was used to inform its system hardening prioritization approach. In addition, PG&E has also determined a wildfire risk ranking for each of its distribution lines by circuit protection zone.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to review and refine its wildfire risk ranking and will use this analysis to inform wildfire mitigation decisions.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

#### 5.3.1.5 Match Drop Simulations Showing the Potential Wildfire Consequence of Ignitions That Occur Along the Electric Lines and Equipment

PG&E tested the capabilities offered by two leading experts of wildfire spread modeling in 2019: Technosylva and REAX. The weather and fuel moisture data needed to run these models is provided by PG&E's internal high-resolution weather, POMMS. One system PG&E deployed simulates >70 million fire spread cases daily originating near PG&E's overhead assets in HFTD areas to determine areas that have the highest risk of fire spread consequences (e.g., acres burned, homes and population at risk) through the available forecast period (currently the next 72 hours).

Both systems deployed can simulate fires on-demand to determine where fires may potentially spread in the next hour to few days. PG&E is also working with these experts to simulate millions of fires along overhead assets during the highest risk periods from PG&E's high-resolution climatology to determine areas the higher risk of wildfire exposure relative to others. More detail can be found in Section 5.3.2 – Situational Awareness and forecasting.

Prior to the next annual WMP update or earlier, PG&E plans to leverage these capabilities to inform risk management, PSPS operational decisions, and as an opportunity to further refine PG&E's method for determining potential wildfire consequences of ignitions. PG&E also plans to leverage this data to help inform prioritization of system hardening priorities.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to evaluate the wildfire spread modeling data to inform wildfire mitigation activities.

2. ***Before the next annual update:*** Prior to the next WMP update PG&E will further leverage the capabilities described above to inform risk management, PSPS operational decisions, as an opportunity to further refine PG&E's method for determining potential wildfire consequences of ignitions and to help inform prioritization of system hardening priorities.

3. ***Within the next 3 years:*** PG&E will continue to leverage the wildfire spread modeling data to inform wildfire mitigation activities within the next three years.

4. ***Within the next 10 years:*** PG&E will continue to leverage the wildfire spread modeling data to inform wildfire mitigation activities within the next three years.

#### 5.3.1.6 Weather-Driven Risk Map and Modelling Based on Various Relevant Weather Scenarios

PG&E has developed several real-time and forecast weather-driven risk maps that help inform operational decisions. Many of these maps have been informed by evaluating historic weather scenarios. For example, PG&E has performed a comprehensive meteorological analysis to determine the historical relationships between wind and outages across PG&E's electric system. Specifically, PG&E analyzed wind speeds in the vicinity of every unplanned outage (~300,000 outage data points) across 10+ years of outage history using PG&E's outage databases and PG&E's wind climatology that contains 30 years of hourly wind speeds (>5 billion data points).

As a result of this analysis, PG&E first developed location-dependent wind-outage relationships across its diverse territory to be applied against forecast data. PG&E also developed interactive application displays, based on high-resolution forecast data, when wind-related unplanned outages are more likely to occur in PG&E's electric system. This application can also display near real-time wind-outage frequencies based on the NCEP Real-Time Mesoscale Analysis (RTMA) as well as live location-specific outage data for operational awareness. This is an all-season tool that assists operational meteorologists with winter storms and PSPS events. More information about weather-driven risk maps as it relates to outage potential and fire potential can be found in Section 5.3.2.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to leverage its weather driven risk maps and modeling data to information wildfire mitigation activities.

2. ***Before the next annual update:*** PG&E will continue to leverage its weather driven risk maps and modeling data to information wildfire mitigation activities. Additionally, PG&E will incorporate lessons learned in 2020 into its programs going forward.

3. ***Within the next 3 years:*** PG&E will continue to leverage weather driven risk maps and modeling data to inform wildfire mitigation activities within the next three years.

4. ***Within the next 10 years:*** PG&E will continue to leverage weather driven risk maps and modeling data to inform wildfire mitigation activities within the next three years.

### 5.3.2 Situational Awareness and Forecasting

*Description of programs to reduce ignition probability and wildfire consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Advanced weather monitoring and weather stations*
2. *Continuous monitoring sensors*
3. *Fault indicators for detecting faults on electric lines and equipment*
4. *Forecast of a fire risk index, fire potential index, or similar*
5. *Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions*
6. *Weather forecasting and estimating impacts on electric lines and equipment*
7. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

*For each of the above initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season,*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

**Overview**

In compliance with D.19-05-037, Ordering Paragraphs 11 and 12, and as proposed in Advice Letter 4117-G/5582-E, PG&E engaged and collaborated with external stakeholders regarding situational awareness information sharing and will continue

these efforts in the future. In 2019, PG&E coordinated multiple meetings to discuss information sharing capabilities such as satellite fire detection and wildfire cameras. Participants included representatives from CAL FIRE, USFS, USDA, BLM, county OES coordinators, and multiple local fire departments. The stakeholders involved in these discussions expressed interest in further collaboration with PG&E to improve fire situational awareness. In 2020, PG&E will continue these collaborative discussions and work towards more formal agreements for information sharing. In addition, PG&E is very interested in working collaboratively with the newly established Wildland Forecast and Threat Intelligence Investigation Center defined by SB 209.

Currently PG&E is providing multiple types of information and data sharing through various platforms accessible to our public partners. Below, PG&E provides a summary of its approach to information and data sharing. More details about each data set and platform are included in the narratives throughout this Section 5.3.2.

- During high risk fire weather events, a PG&E meteorology participates in a daily interagency call hosted by Northern of Southern Geographic Area Coordination Center (GACC) and shares relevant forecast information for upcoming high-risk periods. The National Weather Service and regional weather offices are present on the call.

- PG&E operates more than 600 weather stations to obtain and utilize real-time, local weather information. All data collected from these stations are made publicly available in near-real time at www.pge.com/weather to benefit the public, federal, state, and local agencies. PG&E also continues to work with local, state, and federal agencies on where these stations should be deployed for maximum public benefit and PG&E welcomes new partnerships on this program.

- During fire season, PG&E publishes a PSPS forecast that highlights the potential for a PSPS over the next 7 days and includes a forecast discussion of current and future conditions compiled by a fire scientist or meteorologist.

- PG&E shares it's daily Fire Potential Index (FPI) forecasts with the CPUC and Cal OES. PG&E is open to sharing daily utility FPI forecast data with all stakeholders and greatly values the role of state and federal agencies play in communicating fire danger and risk to the general public.

- During PSPS events, agencies have been welcomed to participate in PG&E's Emergency Operations Center (EOC) operations to observe and provide input and feedback. During some of the 2019 PSPS events, members from the CPUC, Cal OES, and CAL FIRE were present, including at times decisions when decisions were made to de-energize for public safety.

- PG&E also developed and deployed an industry-leading satellite fire detection system in 2019 that uses remote sensing data from five geostationary and polar orbiting satellites to detect fires. PG&E is actively sharing automated email fire alerts with CAL FIRE through the California National Guard and with numerous county and local fire departments. PG&E is open to sharing this data with interested stakeholders and to the general public.

- Wildfire cameras are used by CAL FIRE, Cal OES, and PG&E to identify, confirm, and track wildfires. This allows firefighting agencies to be alerted quickly and to deploy resources directly to the areas where they can have the greatest impact. The high-definition, pan tilt zoom cameras will improve PG&E's overall situational awareness and be a valuable tool for assisting the WSOC, first responders, and fire agencies. First responders and external agencies such as CAL FIRE and the USFS currently have access to control PG&E's cameras (pan/tilt/zoom) to assist with their respective fire response efforts. Live feeds and time-lapse data from this camera network are available to the public at http://www.alertwildfire.org. Beyond 2022, PG&E plans to reassess the camera network coverage as several other agencies such as Sonoma Water, USFS, CAL FIRE, and other utilities are also installing wildfire cameras. Similar to the weather station program, PG&E welcomes input from external parties on camera deployment to maximize public safety and efficiency.

- PG&E's is expanding their Live Fuel Moisture (LFM) sampling program in conjunction with San Jose State University. Results are planned to be uploaded to the USFS National Fuel Moisture Database for public use as long as the database is maintained. This database is available here: https://www.wfas.net/index.php/national-fuel-moisture-database-moisture-drought-103. Beyond 2021, PG&E will evaluate adding additional sites based on needs of the utility and industry. PG&E is open to working with external agencies to select sampling sites for maximum benefit.

See Attachment 1, Table 22 for the details and data associated with the initiatives discussed in this section.

#### 5.3.2.1 Advanced Weather Monitoring and Weather Stations

PG&E's Meteorology team currently consists of ten full-time degreed and experienced meteorologists and five degreed contract meteorologists that are industry experts in operational meteorology, utility meteorology, outage prediction, fire science, data science, cloud computing, atmospheric modeling, application development and data systems development. Most members of the team hold advanced degrees and the team has several alumni from the SJSU Fire Weather Research Laboratory (https://www.fireweather.org/). The team's responsibilities include monitoring and forecasting weather for utility operations, as well as maintaining, developing and deploying meteorological and decision support models for utility operations.[8]

PG&E utilizes public and proprietary state-of-the-art weather forecast model data and operates an in-house, high-resolution meteorological modeling system to forecast weather conditions, outage potential, and fire potential. PG&E also has a robust history of weather data including over 500,000 images from the North American Regional Reanalysis (NARR), as well as a high-resolution 30-year, hourly climatology of weather and fuels data. These historical datasets are utilized to put forecasts into perspective. PG&E also leverages publicly available forecast information from government agencies such as the National Weather Service (NWS) and GACCs Predictive Services as well as coordinates directly with meteorologists from these agencies on daily interagency conference calls when there is an increased fire potential. PG&E acquires and processes over a terabyte of public and proprietary weather data daily from several sources including, but not limited to:

- European Centre for Medium-Range Weather Forecasts (ECMWF)
- The ECMWF Ensemble Prediction System (EPS)
- Global Forecast System (GFS)
- Global Ensemble Forecast System (GEFS)
- Canadian Meteorological Centre (CMC) Global Model
- North American Mesoscale Model (NAM)
- High Resolution Rapid Refresh (HRRR)
- High Resolution Ensemble Forecast (HREF) model suite
- NanoWeather Uncoupled Surface Layer (USL) model
- Clean Power Research, LLC solar irradiance model
- Desert Research Institute (DRI) California and Nevada Smoke and Air Committee (CANSAC) Weather Research and Forecast (WRF) model

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**8** In 2020 PG&E is equipping a Meteorology Operations Center at an existing facility. The details for the Center are in Table 22, Section 7-2, Other, Meteorology Operations Center.

- PG&E's WRF model; the PG&E Operational Mesoscale Modeling System (POMMS)
- National Center for Environmental Prediction Real-Time Mesoscale Analysis
- Satellite and Fire Detection data from GOES-16, GOES-17, MODIS-AQUA, MODIS-TERRA, and Suomi-NPP
- NOAA Radar data
- Upper air observations from NOAA soundings and various wind profilers
- Lightning Data from the TOA Systems' Global Lightning Network
- Real-time weather station data from several hundred weather stations

PG&E first deployed the high resolution in-house mesoscale forecast model, POMMS, in November of 2014 and continues to improve and build upon the model framework to generate short to medium-term weather, outage, and fire potential forecasts across the PG&E service territory. POMMS is a high-resolution weather forecasting model that generates important fire weather parameters including wind speed, temperature, relative humidity, and precipitation at a 3-kilometer (km) resolution. Outputs from POMMS are used as inputs to the National Fire Danger Rating System, the Nelson Dead Fuel Moisture (DFM) model, and a proprietary Live Fuel Moisture (LFM) model to derive key fire danger indicators such as 1hr, 10hr, 100hr, 1000hr DFM, LFM, and NFDRS outputs such as the Energy Release Component, Burning Index, Spread Component and Ignition Component.

In late 2018 to 2019, PG&E successfully completed one of the largest known high-resolution climatological datasets in the utility industry: a 30-yr, hourly, 3 km spatial resolution dataset consisting of weather, dead and live fuel moistures, NFDRS outputs, and fire weather derivative products such as the Fosberg Fire Weather Index (FFWI). The quantity of data generated at the near-surface was near 80 billion datapoints. With this robust weather and fire parameter dataset, PG&E Meteorology sought to develop outage and fire potential models in 2019 utilizing best-practices deployed in the utility industry, fire science and data science communities.

The probability of a utility-caused fire ignition is related to a power outage from any source (e.g., vegetation failure, equipment failure, animal contact, car-pole). To better understand and forecast the potential of an outage, PG&E developed and then operationally deployed the Outage Producing Wind (OPW) model. The OPW model was built using PG&E outage data from 2008 – 2018 (~300,000 outage events) and PG&E's robust wind climatology, which contains 30 years of hourly wind data at a 3 km spatial resolution (>5 billion wind data points). Each hour of the 30-year climatology was processed to determine wind speeds in the vicinity of each outage. Location-specific distributions of wind and outage data were created from this process, allowing construction of location-specific wind-outage models. Through PG&E's study and experience forecasting outage activity as part of the SOPP model for over a decade, it was understood a single wind-outage model was insufficient to represent the wind-outage relationship across PG&E's entire territory. The OPW model and construction is discussed in more detail later in this section.

In order to evaluate the potential for large fires, PG&E significantly enhanced the FPI model in 2019 building upon utility best-practices. The PG&E FPI model was built and calibrated using a USFS dataset containing fires in the PG&E territory from 1992 – 2018. PG&E built and evaluated over 4,000 combinations of the FPI model using numerous weather components, fire weather indices (Fosberg Fire Weather index, the Hot-Dry-Windy Index, the Santa Ana Wildfire Threat weather index), outputs from NFDRS, Nelson DFM model, a machine-learning derived LFM model, and 'containment' and 'land characteristic' features such as road density, distance to nearest fire station, land-use type among several others. The PG&E FPI deployed in 2019 combines weather (wind, temperature, and relative humidity) and fuels (10hr dead fuel moisture, live fuel moisture, and fuel type such as grass, shrub/brush, timber) into an index that represents the probability for large fires to occur. The FPI model is run on the same 3-km resolution dataset as the high-resolution weather and OPW model.

In 2019, PG&E surpassed 600-weather stations installed, which is the largest known utility owned and operated weather station network in the world. Each weather station deployed records and reports meteorological data every 10 minutes and all data is made publicly available. This data can be accessed in real-time through the National Weather Service weather and hazards data viewer, Mesowest, the National Center for Environmental Prediction (NCEP) Meteorological Assimilation Data Ingest System (MADIS), or at www.pge.com/weather. In 2019, PG&E meteorologists met with representatives from NWS, CAL FIRE, and others to coordinate on where deployment of weather stations would be useful to not only PG&E, but to other agencies and the public. In 2020 and beyond, PG&E plans to significantly expand this network.

PG&E also developed and deployed a state-of-the-art satellite fire detection system in 2019 that uses remote sensing data from 5 geostationary and polar orbiting spacecraft to detect fires. PG&E partnered with the Space Science and Engineering Center from the University of Wisconsin, which provides PG&E with a customized, granular feed of fire detections from the next-generation GOES satellites. PG&E also obtains polar-orbiting satellite fire detection data from NASA. PG&E developed a proprietary application and algorithms in-house to consolidate fire detections as they arrive from several satellites and disseminate alerts via the internal web application and email. The web application allows PG&E's analysts in the WSOC, meteorologists and others to track fire detections in near-real time, evaluate the intensity of fires via the Fire Radiative Power (FRP) outputs, as well as track the general spread of fires. This system is used in concert with the weather station network described above, the expansive high-resolution camera network deployed in PG&E's territory, and several other sources. PG&E is sharing fire detection alerts with the CA National Guard and with county and local fire departments and is open to sharing the data with all interested stakeholders.

#### 5.3.2.1.1 Weather Prediction Program Using High Performance Cloud Computing

PG&E is actively partnering with multiple external experts in numerical weather prediction to develop the next version of the PG&E Operational Mesoscale Modeling System, POMMS 3.0, in time for the 2020 fire season. The current version of POMMS provides 3 km weather and fuel moisture forecast data with a forecast lead time of near 80 hours. The forecast is updated 4 times daily, approximately every 6 hours. From Q4 2019 to Q1 2020, PG&E and external experts will test and validate several model configurations of the WRF system in order to deploy the most accurate version of POMMS possible in 2020. To help achieve this goal, PG&E plans to deploy the National Center for Atmospheric Research (NCAR) Model Evaluation Tools (MET) verification package on internal systems. NCAR-MET is a state-of-the-art suite of verification tools that is highly customizable. PG&E plans to increase the POMMS model resolution from 3 km to 2 km and increase the model lead time to near 96 hours. PG&E also plans to deploy 0.67 km model forecasts on demand during high risk periods to provide enhanced model granularity during high risk periods. PG&E also plans to deploy a high-resolution model ensemble package with 8 model members at 2 km resolution as well. This will significantly increase the amount of forecast data generated daily near the surface from 100 million data points in 2019 to over 1 billion in 2020. PG&E plans to keep its current 3 km POMMS model operational through at least 2020 to compare against the new 2 km version of POMMS.

PG&E plans to utilize a scalable, high-performance cloud computing environment to achieve the significant increase in computation required to run the high-resolution weather models and post-process data multiple times per day. The cloud computing environment will be disaster recovery tested and will have the ability to be run across separate geographic computing regions. This environment was selected over an *in-situ* solution (i.e., on-site high-performance computer cluster) as it provides more flexibility to scale should modeling requirements and computation demand change overtime.

PG&E also plans to reproduce the 30-year weather and fuel moisture climatology at the same 2 km resolution and model configuration as the enhanced operational POMMS model described above. Once completed, this data stack will consist of near 180 billion datapoints of weather and fuels near the surface to evaluate historical relationships of outages and fire potential. Since this dataset will cover most of California, PG&E believes it will have significant benefit to the scientific community. PG&E is open to partnering with academic institutions focused on meteorology, fire weather and fire science in order to jointly derive value from these robust data. This historical climatology is expected to be completed in late Q2 to Q3 2020.

After the historical data stack is re-created, PG&E plans to re-calibrate the OPW and FPI models using the new 2 km historical dataset, so they can be applied in forecast mode at the same resolution. PG&E also plans to deploy an improved 2 km resolution gridded LFM model potentially using two different approaches: (1) using historical and near-real-time remotely sensed data to model LFM; and (2) develop a machine-learning model trained and tested on National Fuel Moisture Database (NFMD) observations. New and old growth live fuel moisture models from multiple plant species (e.g., chamise and manzanita) are planned to be developed in Q2 to Q3 2020.

PG&E also plans to work with an external partner to develop and deploy a short to long-range (2 – 4 week) Diablo wind event forecasting system based on statistical, machine learning and/or artificial intelligence techniques by Q3 2020. A longer lead-time of an upcoming offshore, Diablo wind events would provide crucial preparation time for PG&E and potential communities impacted by these events.

Beyond 2020, PG&E Meteorology plans to evaluate the model performance of the 2 km forecasts for the 2020 fire season and apply any lessons learned for the 2021 fire season. Overtime, it is expected that weather models will continue to improve. Over the next decade, PG&E Meteorology will assess its modeling capabilities annually and seek to make improvements or utilize new modeling and data science techniques as needed.

In Figures PG&E 5-4, 5-5, and 5-6 below, PG&E provides an example product menu for the POMMS model showing a sample array of model output. Model output visualizations of wind gusts and temperature centered over the SF Bay Area below.

**FIGURE PG&E 5-4: SAMPLE PRODUCT MENU FOR THE POMMS MODEL**



**FIGURE PG&E 5-5: POMMS MODEL OUTPUT, WIND GUSTS/WIND SPEED BARBS**

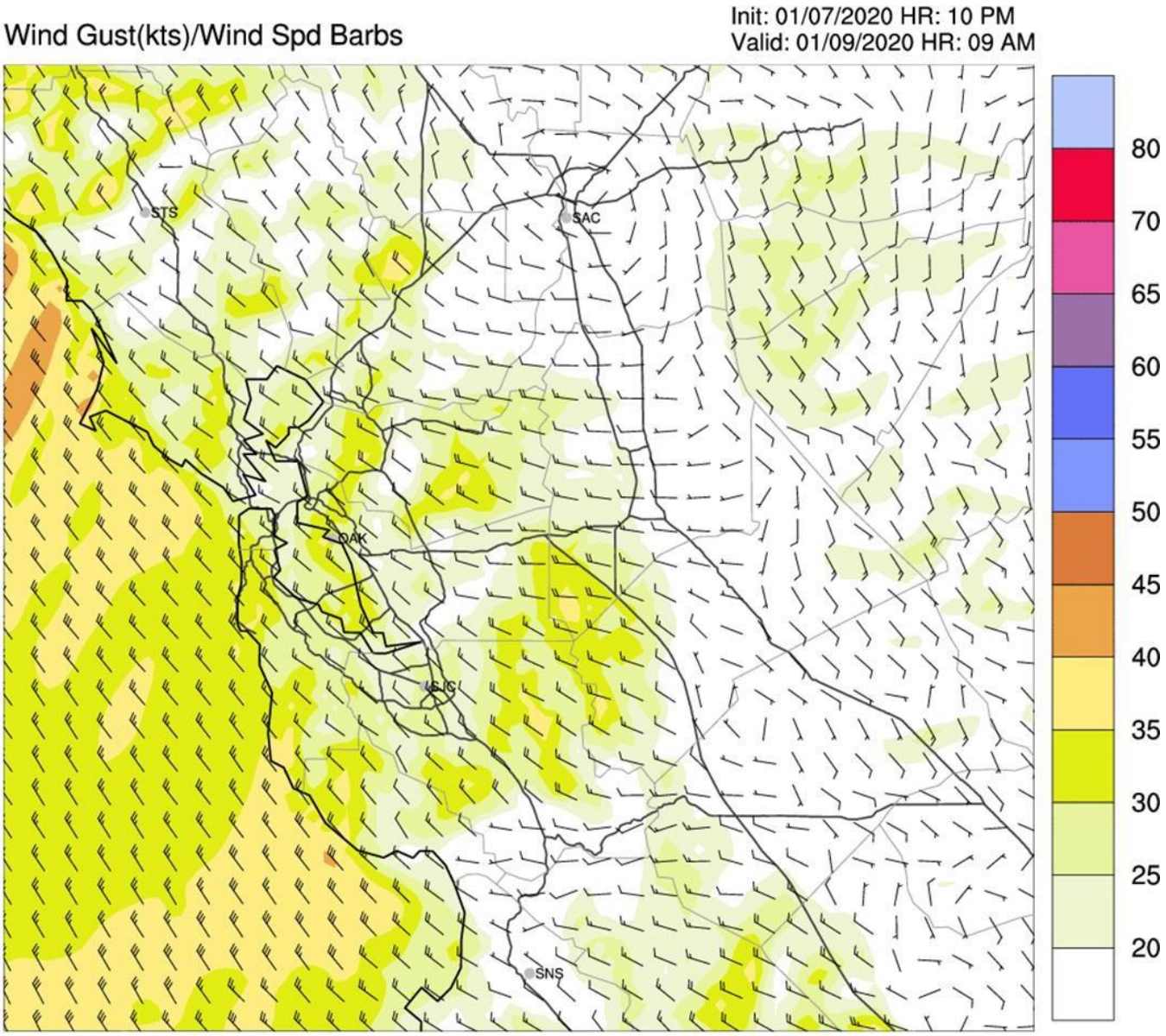
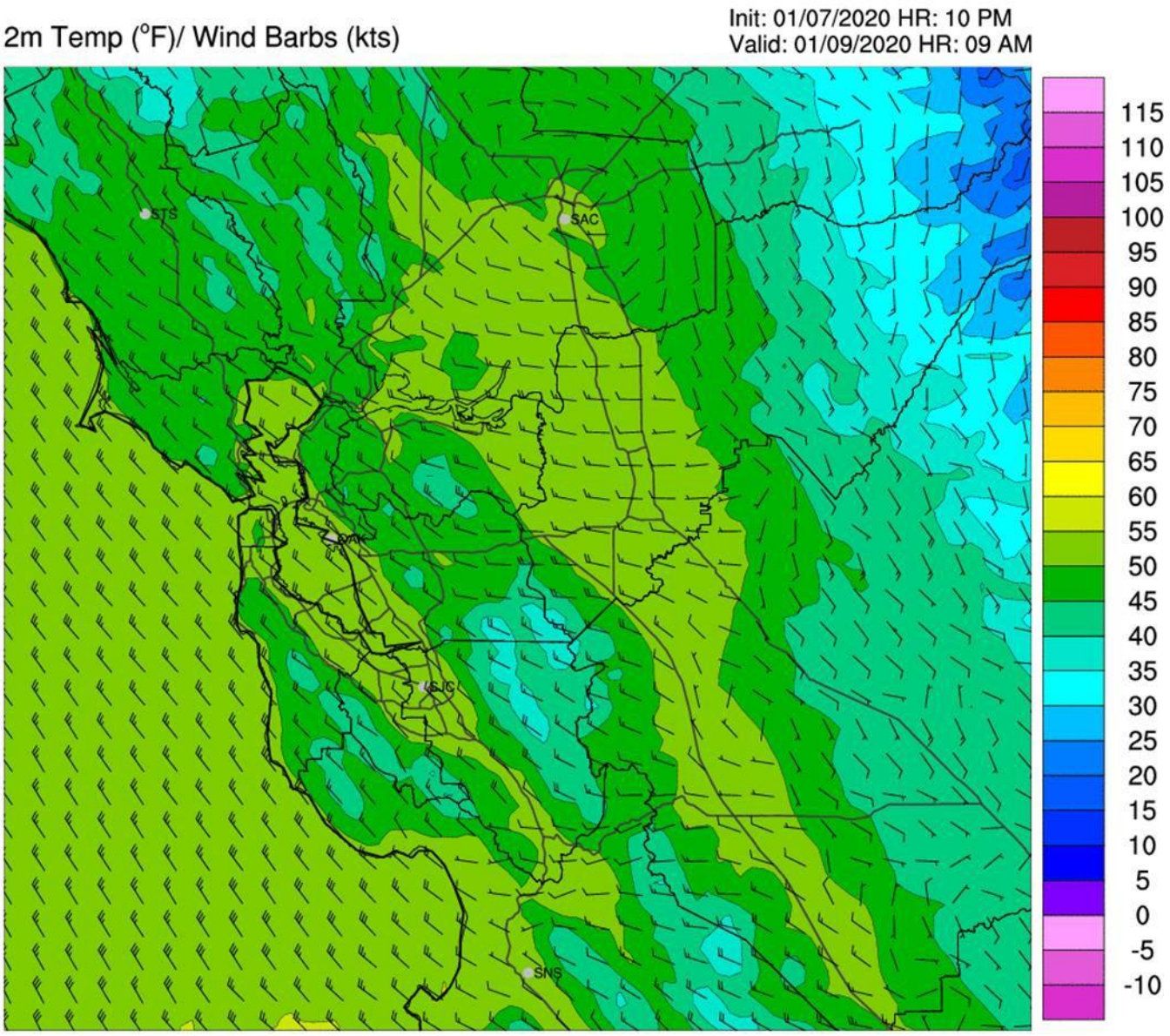


**FIGURE PG&E 5-6: POMMS MODEL OUTPUT, 2M TEMPERATURE/WIND BARB**



#### 5.3.2.1.2 Wildfire Spread Models

In late 2019, PG&E partnered with external experts in the fire modeling field to test and deploy internal and cloud-based wildfire spread model capabilities to better understand the technology and to test integration into current decision support frameworks. One system PG&E deployed simulates >70 million fire spread cases daily originating near PG&E's overhead assets in the high fire threat district. This is the largest known utilization of fire spread technology in the utility industry. The fire spread outputs (e.g., potential number of acres burned, and population impacted) can be summarized per overhead circuit and line segment in forecast mode to determine the highest risk circuits every 3 hours.

Fire simulations are driven by PG&E's high resolution POMMS weather and fuel model outputs. Fire simulation outputs are available across a 3-day forecast horizon. In Q3 2020 and beyond, PG&E plans to enhance this model framework by improving several of the input data sources and working with industry experts to enhance modeling capabilities and fire consequence outputs and metrics. The potential enhancements in 2020 include: produce territory-wide fire risk scores based on tens of million fire spread simulations daily, update and enhance the underlying fuel model layer to more accurately describe the amount, quantity and arraignment of vegetation and type of vegetation available for combustion, improving the fidelity and granularity of the high resolution weather inputs to 2 km, develop probabilistic fire spread results based on stochastic modeling techniques, evaluate remote sensing technologies to improve live fuel moisture model inputs, and integrate other sources of data into the platform including satellite-based fire detections. In addition, PG&E is also working with external experts to simulate over a billion fires across historically high fire potential days. This work is planned to be completed before the 2020 fire season and will help put daily fire spread risk scores in perspective.

In 2019, PG&E also deployed a separate fire spread model called ElmFire, that uses a Monte Carlo modeling technique to produce probabilistic fire spread results. This modeling system was also coupled with PG&E's Fire Detection and Alert system to automatically generate fire simulations.

In Q3 2020, PG&E will evaluate incorporating the fire spread model consequence into decision support frameworks including PSPS. In 2021, PG&E will assess the 2020 fire season and results of the fire spread modeling and identify areas of improvement. These may include improvements to the input weather data stream, fuel models, and further leveraging remote sensing capabilities such as LiDAR and satellite data.

In Figure PG&E 5-7 and Figure PG&E 5-8 below, PG&E provides an example output from the fire spread model application and example output from the fire spread model application.

**FIGURE PG&E 5-7: EXAMPLE OUTPUT FROM THE FIRE SPREAD MODEL APPLICATION – COLOR CODING REPRESENTS THE MAXIMUM FIRE SIZE SIMULATED FROM EACH OVERHEAD CIRCUIT**

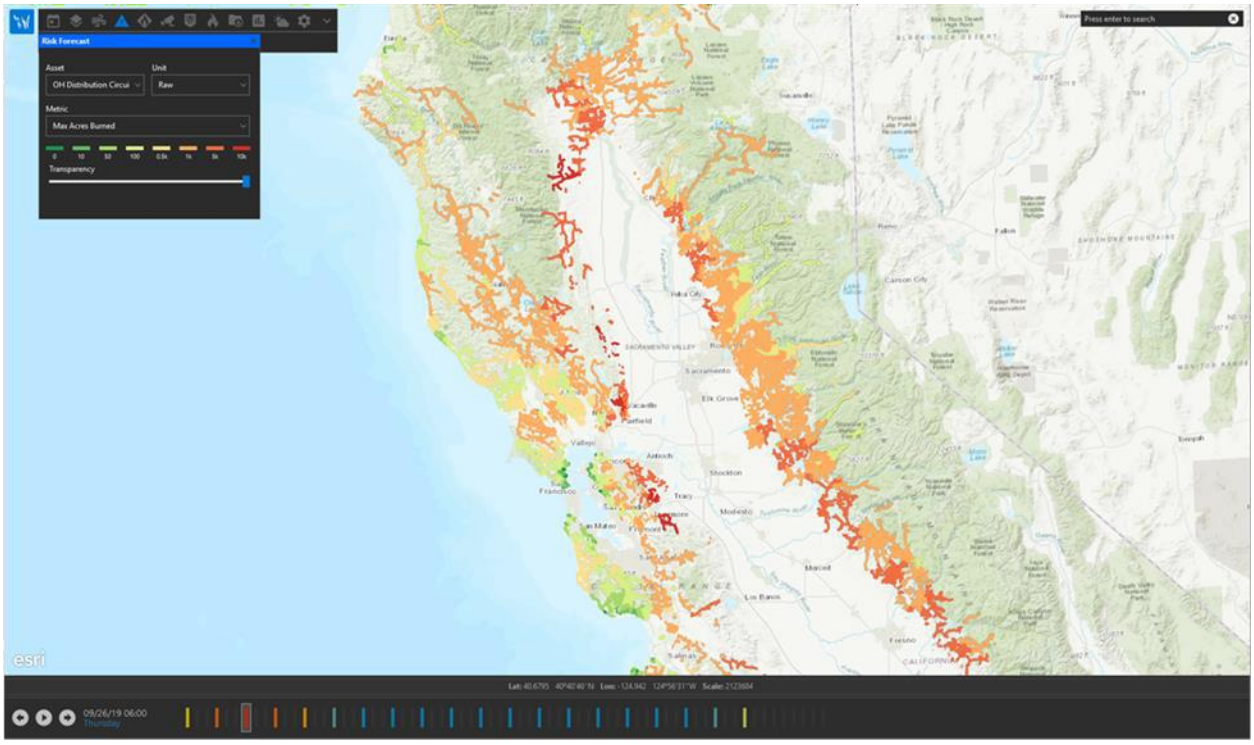
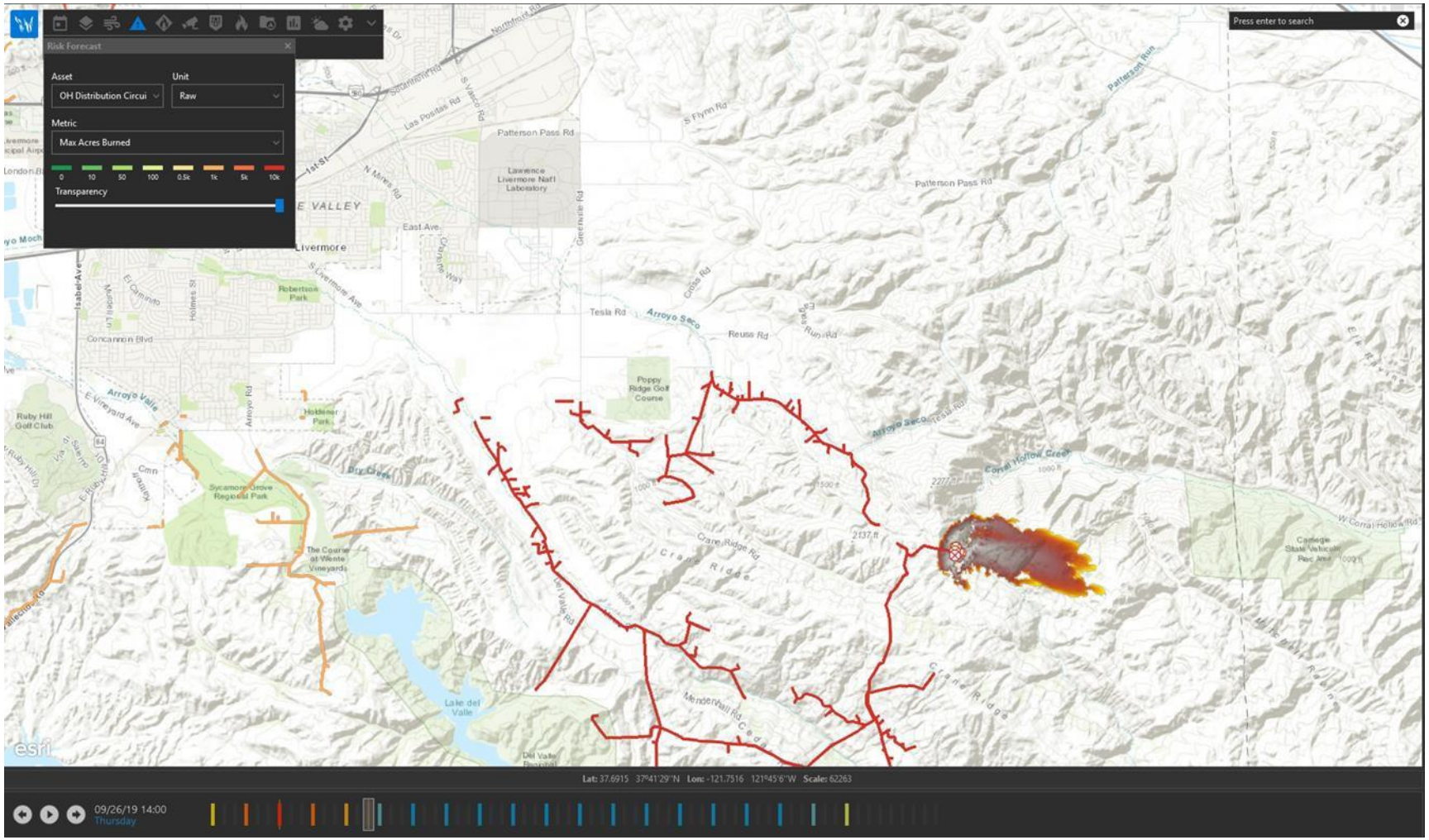


**FIGURE PG&E 5-8: EXAMPLE OUTPUT FROM THE FIRE SPREAD MODEL APPLICATION**



#### 5.3.2.1.3 Weather Stations

Data from weather stations installed in PG&E's service area are used to help forecast and monitor for high fire-risk weather conditions. This data helps inform implementation of additional precautionary measures such as PSPS.

As of January 1, 2020, PG&E operates and maintains more than 600 weather stations, the largest known utility-owned weather station network in the world. This robust weather station network is used to obtain real-time, local weather information to facilitate operational decision making and support safe operation of facilities. Weather station data is also used to validate model forecasts and to test new high-resolution model configurations. The weather stations record wind speed, temperature and humidity, which are the three most important fire weather parameters.

In 2018 into 2019, PG&E developed an internal web application that presents real-time weather station data from multiple networks (PG&E, NWS, RAWS) and color codes the observation based on the Fosberg Fire Weather Index (FFWI) being observed (see Figure 5-10 and 5-11 below). The FFWI is an index that uses wind speed, temperature and relative humidity to capture the fire weather conditions being observed. Meteorologists can interact with the data and view data from individual stations or click on a Fire Index Area (FIA) to see a summary of conditions from each weather station in the FIA over the past 24 hours. PG&E also developed the PG&E Wind Alert System (PWAS) that displays and disseminates alerts when real-time data collected from PG&E, RAWS, and NWS weather station approach or exceed defined wind thresholds. The internal web application allows users to define the areas(s) where alerts are received.

In Figures 5-9, 5-10, and 5-11 below, PG&E provides: (1) a photograph of a weather station; (2) real-time weather station data from multiple networks; and (3) a snapshot of PG&E's Wind Alert System that displays and also disseminates alerts when wind speeds exceed thresholds.

**FIGURE PG&E 5-9: PG&E WEATHER STATION AND ASSOCIATED INSTALLATION DETAIL**

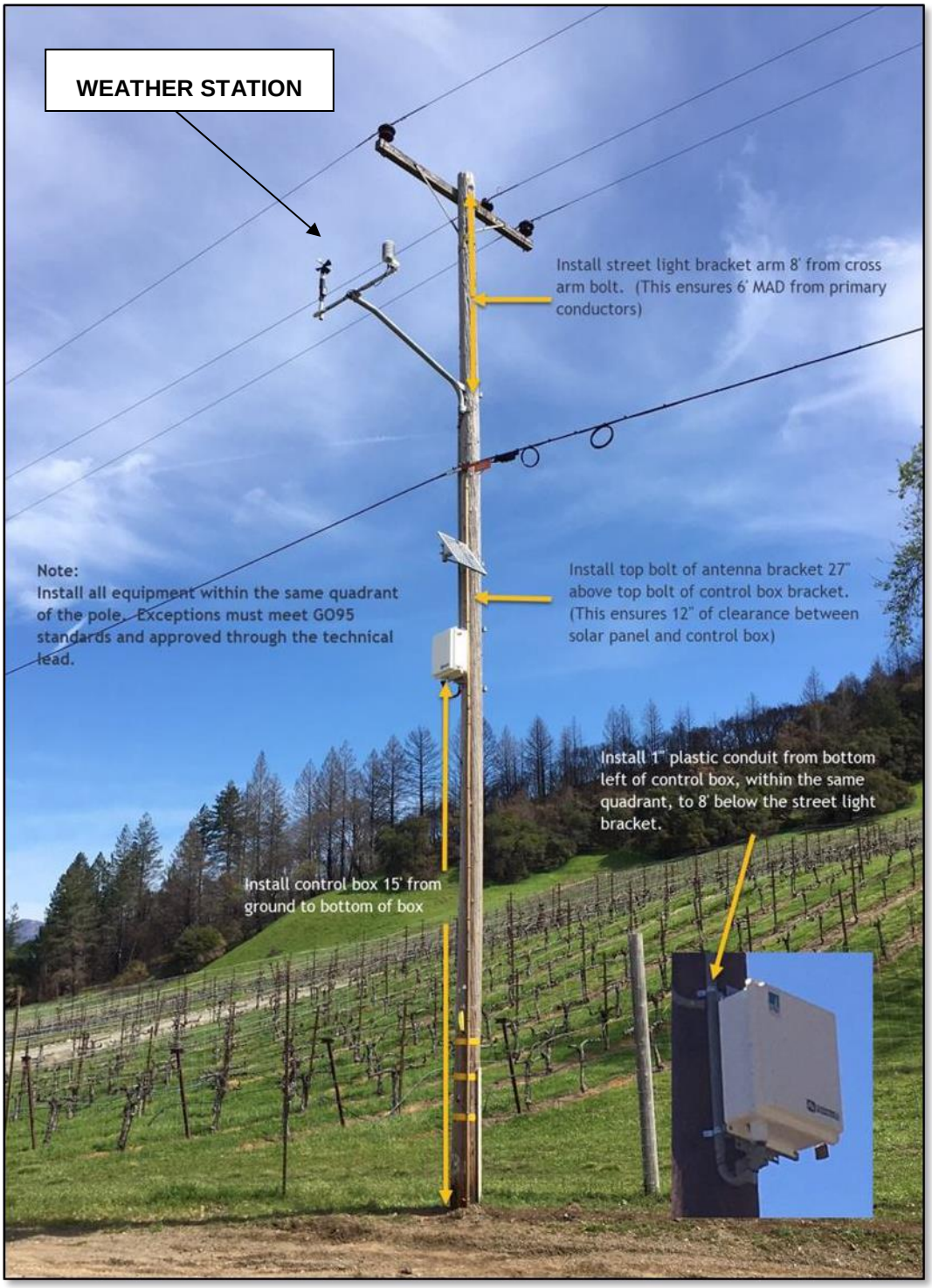


**FIGURE PG&E 5-10: INTERNAL WEB APPLICATION DEVELOP BY PG&E THAT SHOWS REAL-TIME WEATHER STATION DATA FROM MULTIPLE NETWORKS (PG&E, NWS, RAWS)**

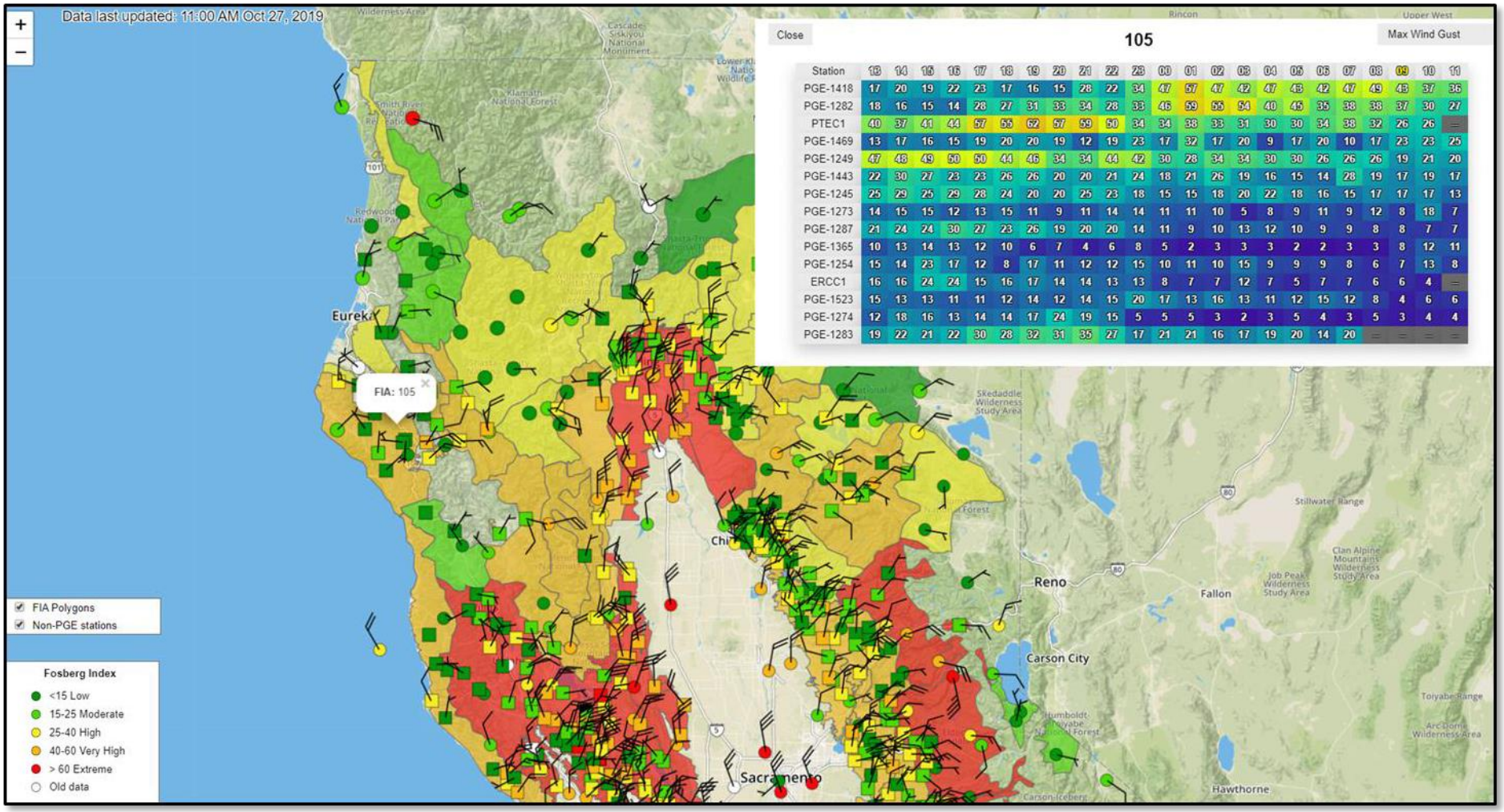
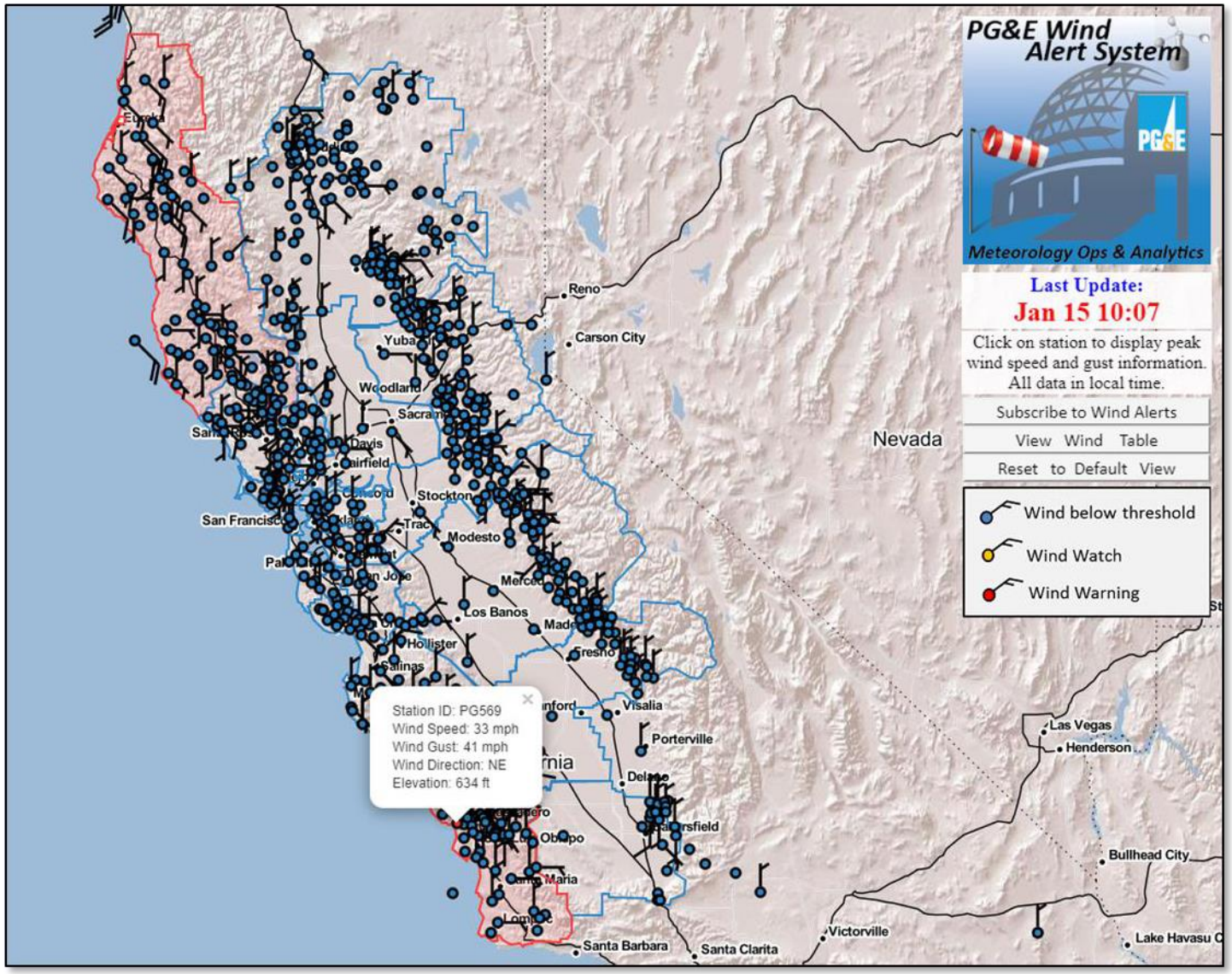


**FIGURE PG&E 5-11: THE PG&E WIND ALERT SYSTEM THAT DISPLAYS AND ALSO DISSEMINATES ALERTS WHEN WIND SPEEDS EXCEED THRESHOLDS – USERS CAN CUSTOMIZE ALERTS TO ONLY RECEIVE ALERTS FOR THE AREA(S) NEEDED**



#### 5.3.2.1.4 Wildfire Cameras

Wildfire cameras are used by CAL FIRE, Cal OES, and PG&E to identify, confirm, and track wildfires and general conditions in real-time. This allows firefighting agencies to more quickly confirm reports of fire, assess the size and spread, and ultimately help deploy resources directly to areas that can have the greatest mitigating impact.

In 2018, PG&E piloted the installation of nine cameras in the CPUC HFTD areas to test the technology. In 2019, PG&E installed over 120 more high-definition cameras and as of January 1, 2020 operates over 130 wildfire cameras. An informative camera and weather station installation video can be viewed here: https://players.brightcove.net/1691765962001/SkPAPXDi_default/index.html?videoId=6066367720001.

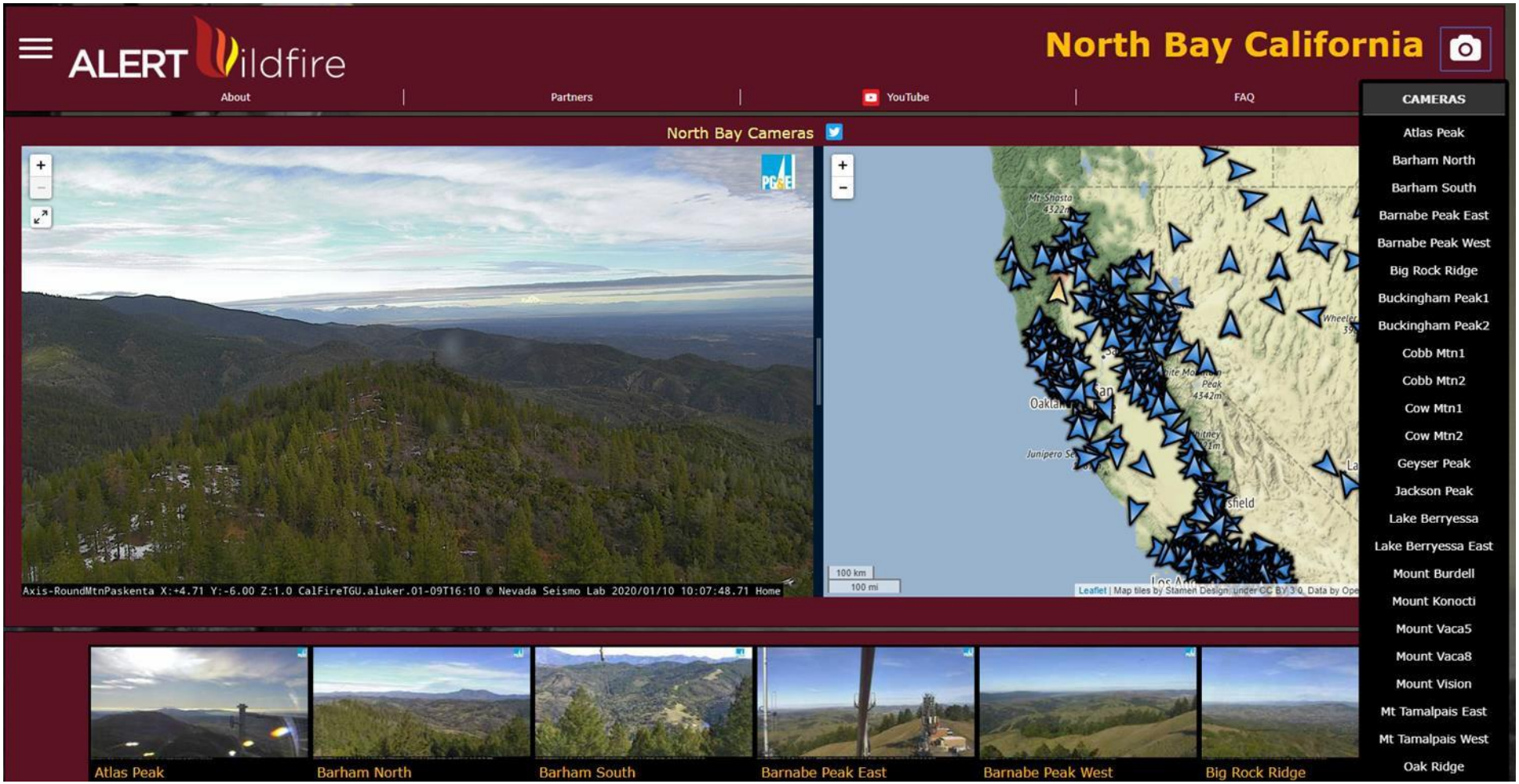
PG&E plans to deploy an additional 200 cameras by December 31, 2020. PG&E's long-term goal is to establish roughly 90 percent coverage across high fire-risk areas by 2022, which may require the installation of approximately 600 cameras. The number of cameras available has already grown beyond the capability to manually monitor each feed. PG&E leverages other technology, such as the satellite fire detection data discussed below, to help determine which camera(s) to view and where it(they) should be directed. PG&E also plans to investigate automatically rotating and zooming nearby cameras to view emerging incidents by integrating fire incident reports such as detections from the PG&E Fire Detection and Alert System. On an on-going basis, PG&E evaluates areas where camera coverage may be lacking and looks for opportunities to install cameras with a maximum viewshed.

Beyond 2022, PG&E plans to reassess the camera network coverage as several other agencies such as Sonoma Water, USFS, CAL FIRE, and other utilities are also installing wildfire cameras. Similar to the weather station program, PG&E welcomes input from external parties on camera deployment to maximize public safety and efficiency.

The high-definition, pan tilt zoom cameras have improved PG&E's overall situational awareness and have proven to be a valuable tool for assisting the WSOC, first responders, and fire agencies. Live feeds from cameras have often been featured on local newscasts. The cameras have near infrared capability to operate in low to no sunlight and are available via a web interface with time lapse functionality to assist with confirmation of fire reports, and monitoring fire progression and environmental conditions. First responders and external agencies such as CAL FIRE and the USFS have the ability to control PG&E's cameras (pan/tilt/zoom) to assist with their respective fire response efforts. Live feeds and time-lapse data from this camera network are available to the public at http://www.alertwildfire.org.

In Figure PG&E 5-12 below, PG&E provides an example camera output, web interface and camera network density.

**FIGURE PG&E 5-12: EXAMPLE CAMERA OUTPUT, WEB INTERFACE, AND CAMERA NETWORK DENSITY FROM WWW.ALERTWILDFIRE.ORG**



#### 5.3.2.1.5 PG&E Fire Detection and Alert System (FDAS)

PG&E's Meteorology team deployed a fully operational state-of-the-art satellite-based fire detection and alerting system in 2019 and will continue to operate, leverage and enhance this system in 2020. As of January 1, 2020, the system ingested and reconciled fire detection data from 2 Geosynchronous Satellites (GOES-West, GOES-East), and 3 polar orbiting satellites (MODIS-AQUA, MODIS-TERRA, SUOMI-NPP). PG&E developed the system to incorporate new fire detection data feeds as they become available. PG&E is working directly with industry-leading fire detection algorithm developers and experts from the Space Science and Engineering Center (SSEC) at the University of Wisconsin-Madison to procure a customized feed of satellite fire detection data with the lowest latency available.

The new GOES-West and GOES-East satellites scan the entire CONUS each 5 minutes and thus provide new fire detection data each 5 minutes. The data pipeline with SSEC has been optimized to reduce data transfer and processing latency. New data is available to an analyst typically less than 10 minutes after the GOES spacecraft completes a scan. In addition, each satellite has 2 mesoscale sectors that scan a smaller area every minute. Fire detection data derived from the 1-minute imagery is available to PG&E whenever a mesoscale sector views all or a portion California.

To visualize and interact with the fire detection data, PG&E developed a proprietary application in-house that combines fire detection alerts as they arrive and disseminates alerts via an internal web-app and email. The fire alert and web application displays each location where fire was recently detected and PG&E meteorologists or analysts with the WSOC can quickly review live feeds from the nearest wildfire cameras to confirm fire and/or smoke in an area. The satellite data also contains a measure of the fire intensity called Fire Radiative Power (FRP), and the web-app allows the user to retrieve an FRP timeseries in order to track the intensity of fires in a given location. The application also displays current incidents available from CAL FIRE as well as fire perimeters from federal agencies. PG&E is actively sharing fire alerts with CAL FIRE through the CA National Guard and with numerous county and local fire departments. PG&E is open to sharing this data with interested stakeholders and to the general public. This tool helps the PG&E WSOC respond to new and emerging events quickly and make faster operational decisions.

For the 2020 fire season, PG&E plans to add NOAA–20 data into the suite of fire detection data. NOAA-20 is the first spacecraft of NOAA's new generation of polar satellites and carries the Visible Infrared Imaging Radiometer Suite (VIIRS), which has proven tool for fire detection. The VIIRS instrument is currently aboard the Suomi-NPP spacecraft. Beyond 2020, NOAA plans to launch 3 additional polar orbiting satellites in this new generational fleet and PG&E will incorporate their fire detection data if proven useful. PG&E may also evaluate adding other public and proprietary data sources as they become known or available.

Below PG&E provides example of: (1) output of the PG&E Fire Detection and Alert System (FDAS) (Figure PG&E 5-13); (2) fire detection alert email distributed automatically by the PG&E Fire Detection and Alert System (Figure PG&E 5-11); and (3) integration of PG&E wildfire cameras and the PG&E FDAS (Figure PG&E 5-12).

**FIGURE PG&E 5-13: EXAMPLE OUTPUT OF THE PG&E FIRE DETECTION AND ALERT SYSTEM (FDAS) – SNAPSHOT TAKEN ~3:45 PM 9/9/2019 AND ACTIVE FIRE SHOWN IS THE WALKER FIRE – VIIRS AND MODIS FIRE DETECTIONS ARE NOT SHOWN**

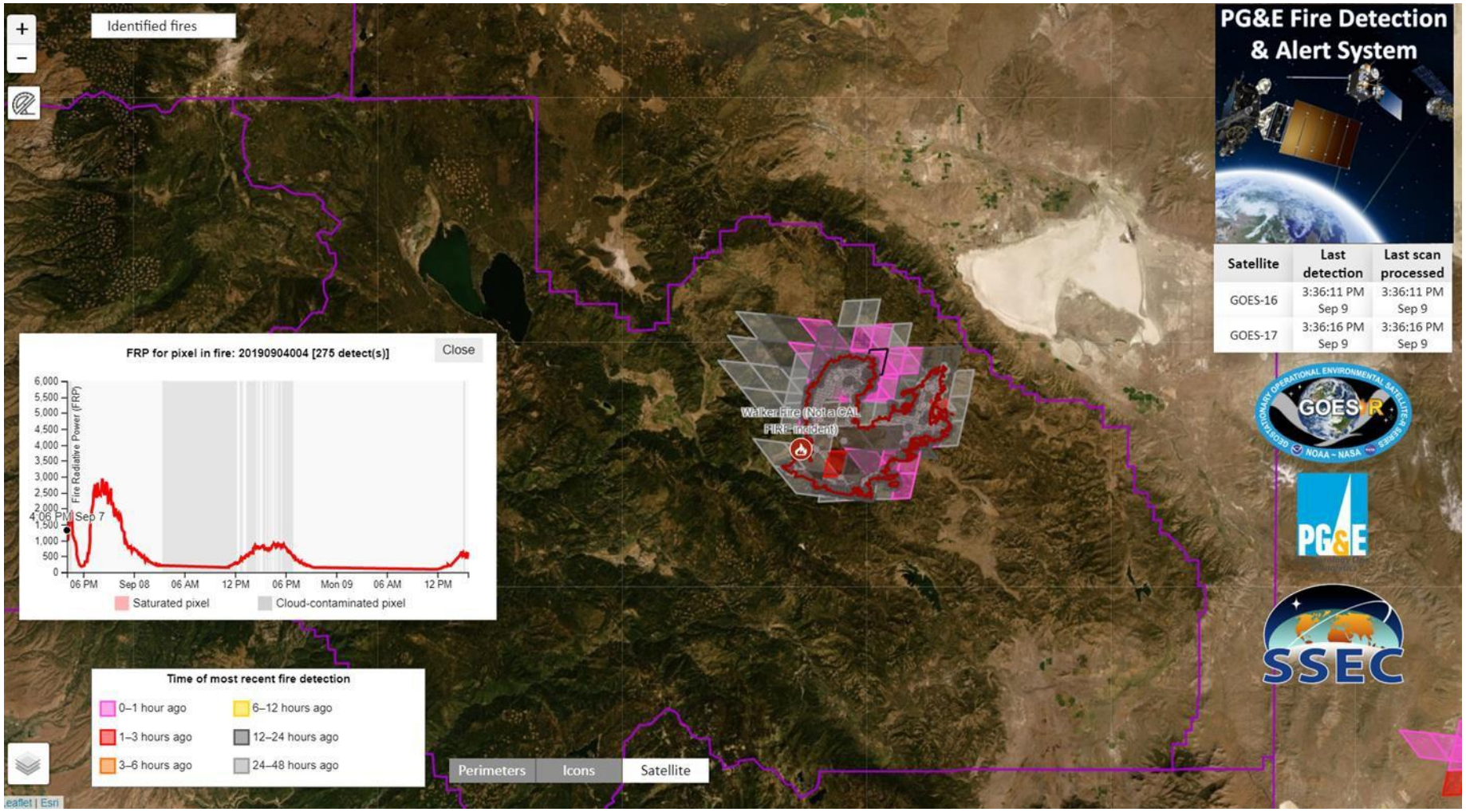


**FIGURE PG&E 5-14: EXAMPLE FIRE DETECTION ALERT EMAIL DISTRIBUTED AUTOMATICALLY BY THE PG&E FIRE DETECTION AND ALERT SYSTEM – THIS INCIDENT WAS THE MARSH FIRE THAT WAS REPORTED IN CONTRA COSTA COUNTY ON AUGUST 3, 2019.**



Sat 8/3/2019 3:31 AM

WA

Weather Alerts <wx-alerts@pge.com>

New Fire Detection in PG&E's Diablo Division (Contra Costa County)

A new GOES17 fire detection has occurred in PG&E's Diablo Division (Contra Costa County) in a Tier2-Elevated CPUC High Fire-Threat District. The possible fire has been assigned an internal ID: 20190803003

Visit the PG&E Fire Detection web page (internal PG&E only) to see a map of this detection.

Detection latitude/longitude centroid: 37.893333/-121.834908 (note fire could be up to 3 miles away from the centroid point).

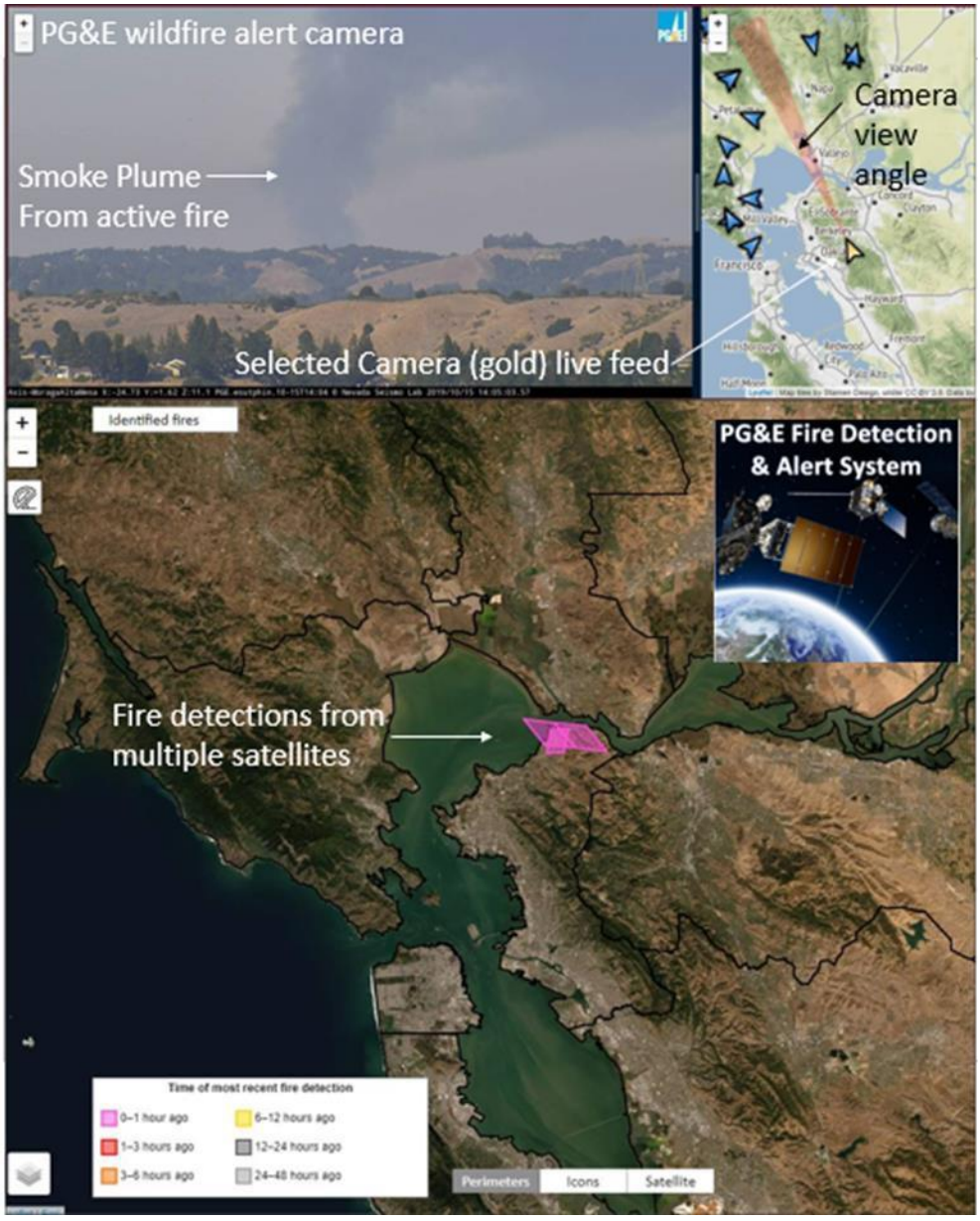
Additional Links:
Google Maps
Local Weather Station Data
Alert Wildfire Cameras

Alert Issued at: 08/03/19 3:31 (Local Pacific Time).

Please note:
These alerts are disseminated only if multiple satellite detections occur in a given space/time. No more alerts will be sent for this possible fire with internal ID: 20190803003. Note that alerts are only generated for fire detections in the PG&E service territory. In addition, no alerts are generated for fires in the agricultural and urban areas in the Central Valley due to over-alerting related to planned agricultural fire activities. This satellite-based system will not detect all fires and some false detections are possible and typically occur near bodies of water or near large solar installations.

This notice was sent by PG&E Meteorology Operations and Analytics (925-244-4630). If you have any questions, please contact WeatherDeptAdmins@pge.com.

**FIGURE PG&E 5-15: EXAMPLE INTEGRATION OF PG&E WILDFIRE CAMERAS AND THE PG&E FDAS –THIS EXAMPLE SHOWS A SMOKE PLUME VISIBLE FROM A FIRE DETECTED FROM FDAS – THIS EXAMPLE IS FROM THE FIRE THAT OCCURRED IN THE NUSTAR ENERGY FACILITY IN CROCKLETT, CA**



#### 5.3.2.1.6 Live Fuel Moisture Sampling

In 2019, PG&E worked with San Jose State University (SJSU) to sample Live Fuel Moisture (LFM) at multiple locations in the HFTD within the Bay Area. Data collected from SJSU is available here: https://www.fireweather.org/fuel-moisture. Live fuel moisture is a critical component of the FPI and fire spread modeling and is traditionally sampled in the field. The coverage of existing LFM sampling from state and federal agencies is lacking across the PG&E territory and there are many gaps in LFM data spatially and temporally. This leads to challenges in creating and calibrating LFM models that predict LFM for use in PG&E's FPI model at a granular level.

In addition to partnering with SJSU again in 2020, PG&E plans to conduct LFM sampling utilizing Safety and Infrastructure Protection Team (SIPT) resources. PG&E is targeting taking samples from an additional 10 locations by June 1, 15 additional sites by September 1, and 30 total sites by the 2021 fire season. LFM is expected to be sampled monthly at each site during fire season. The samples will be sealed and shipped to the PG&E Chemistry Laboratory (ISO 17025 accredited) for analysis. LFM results are planned to be uploaded to the USFS National Fuel Moisture Database (NFMD) for public use as long as the database is operational and maintained. The NFMD is available here: https://www.wfas.net/index.php/national-fuel-moisture-database-moisture-drought-103.

In 2020 and beyond, PG&E will attempt to obtain all LFM samples from state and federal agencies that are not being uploaded to the NFMD. Beyond 2021, PG&E will evaluate adding additional sites based on needs of the utility and industry. The goal of this program is to create a rich dataset for the fire community upon which LFM models can be constructed and calibrated. PG&E is open to working with external agencies to select sampling sites for maximum benefit.

#### 5.3.2.1.7 Addressing Weather Forecast Model Uncertainty

To address uncertainty in weather forecast modeling PG&E employs multiple methods. First, PG&E leverages several sources of forecast model data and compares results to determine forecast alignment. For example, if all weather forecast models agree a certain weather event will transpire, then confidence is generally high. In Figure PG&E 5-16 below, PG&E employs tools to quickly compare pressure gradient forecasts and wind speeds from multiple sources of forecast data. Another method applied is ensemble prediction. PG&E leverages outputs and visualizations from the ECMWF Ensemble Prediction System (EPS), which is comprised of 50 model members. Figure PG&E 5-17 below shows the forecasted Arcata, CA to Santa Barbara, CA pressure differential from every ensemble member. This Arcata to Santa Barbara pressure differential is an important predictor of outage activity during winter storms while other pressure differentials have been found to be important predictors of other weather patterns. One can generally see very good alignment (thus good confidence) in the near-term forecast, following by increased dispersion in model solutions generally farther out in time. PG&E also leverages the ECM EPS for precipitation forecasting. An example image from an internal application developed by PG&E is presented below in Figure PG&E 5-18.

In 2020, PG&E also plans to deploy an in-house high-resolution model ensemble package that is based on the POMMS model. This package will include 8 model members that provide hourly forecasts at 2 km resolution across the PG&E territory. This will significantly increase the amount of forecast data generated daily near the surface from 100 million data points in 2019 to over 1 billion in 2020.

**FIGURE PG&E 5-16: EXAMPLE OUTPUT FROM THE PG&E PRESSURE GRADIENT TRACKING TOOL THAT SHOWS OBSERVATIONS (BLACK DOTS) VERSUS PRESSURE GRADIENT FORECASTS FROM SEVERAL DETERMINISTIC FORECAST MODELS.**

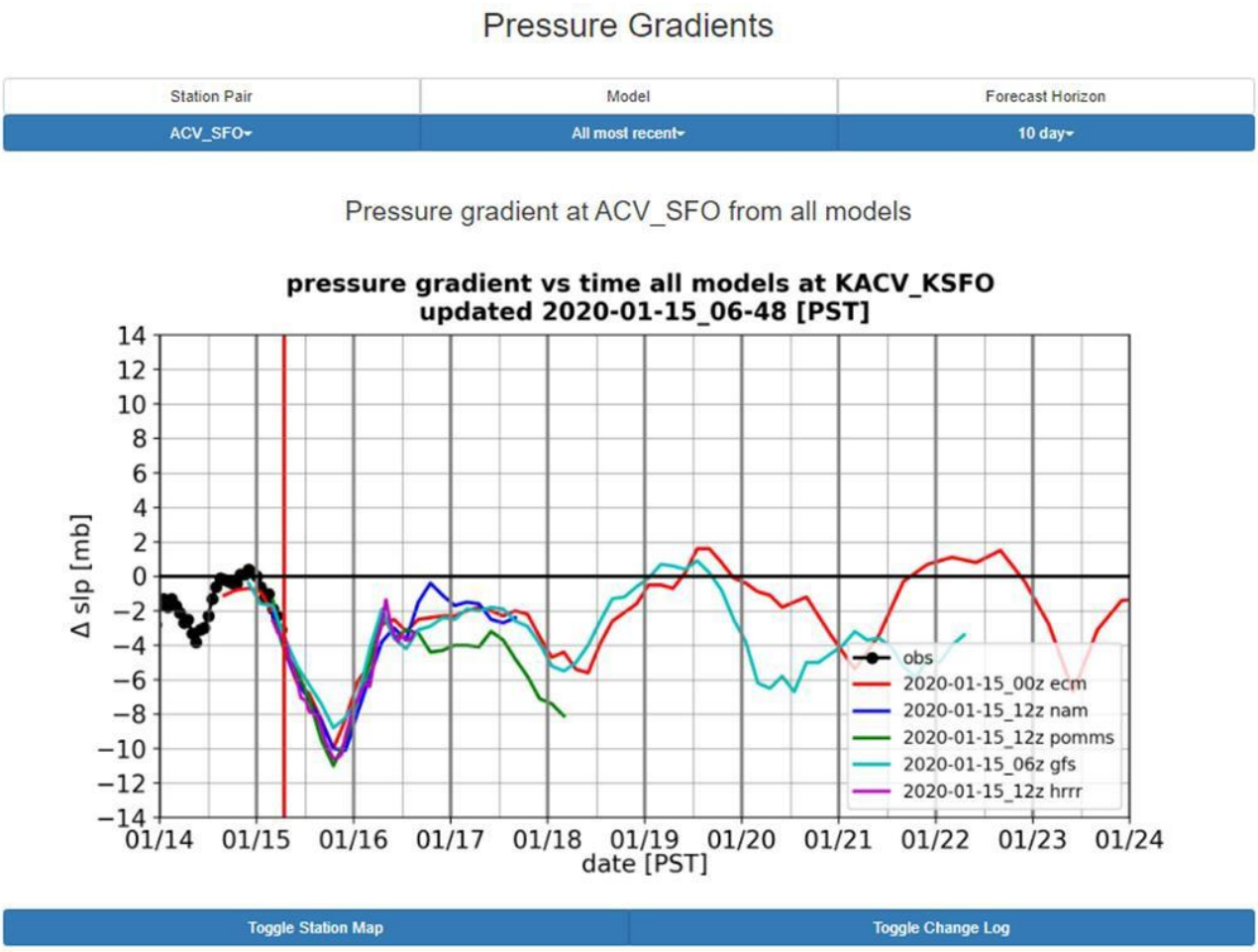


**FIGURE PG&E 5-17: EXAMPLE OUTPUT FROM THE PG&E ECMWF ENSEMBLE PREDICITON SYSTEM (EPS) GRADIENT TOOL THAT SHOWS MODEL RESULTS FROM 50 EPS MEMBERS (GRAY LINES) THE TOP AND BOTTOM 10% (LIGHT BLUE SHADING), THE EPS MEAN (BLACK LINE) AND THE DETERMINISTIC ECMWF MODEL (RED LINE).**

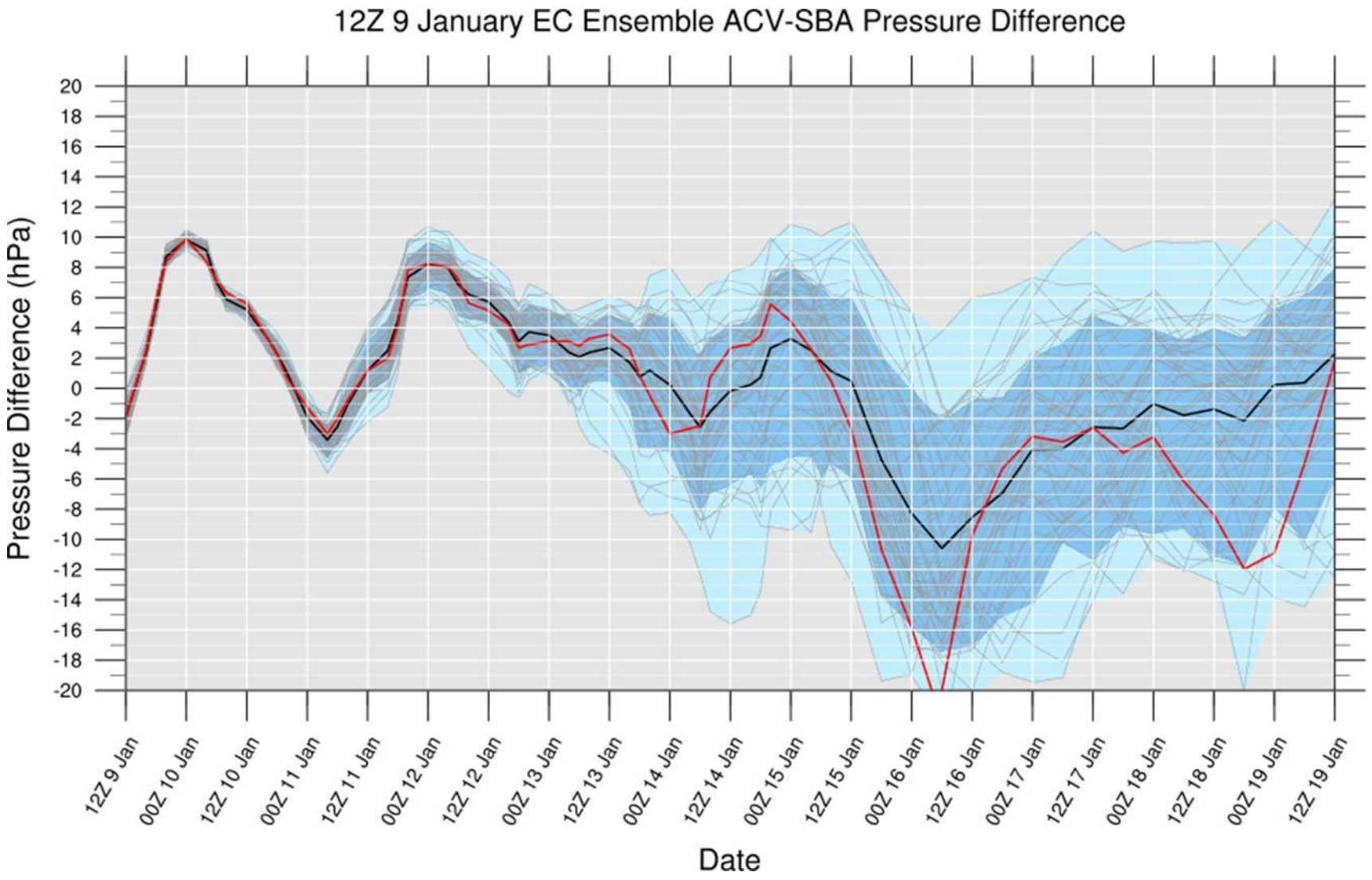
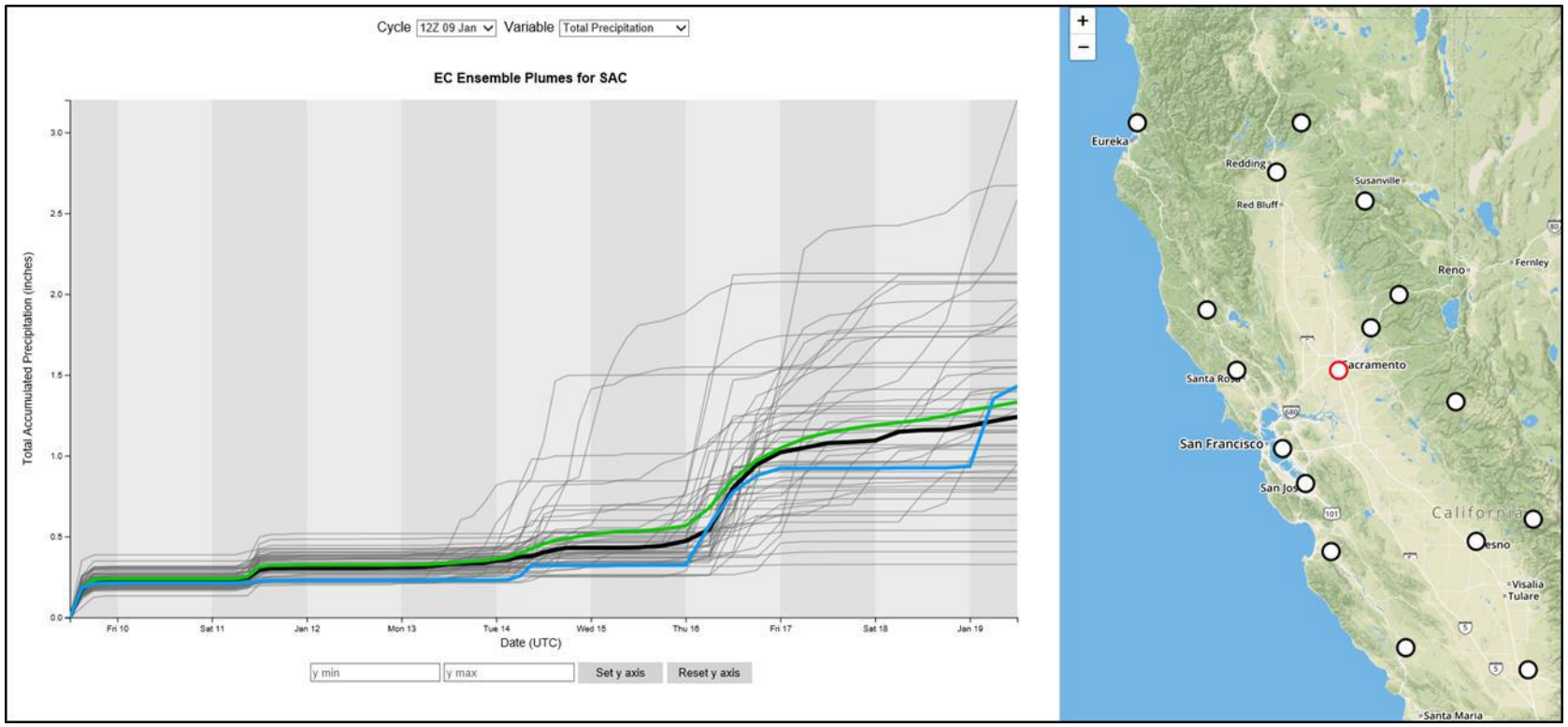


**FIGURE PG&E 5-18: EXAMPLE OUTPUT FROM THE PG&E ECMWF ENSEMBLE PREDICTION SYSTEM (EPS) PRECIPITATION TOOL THAT SHOWS MODEL RESULTS FROM 50 EPS MEMBERS (GRAY LINES) THE EPS MEAN (GREEN LINE), THE EPS MEDIAN (BLACK LINE) AND THE DETERMINISTIC ECMWF MODEL (BLUE LINE).**

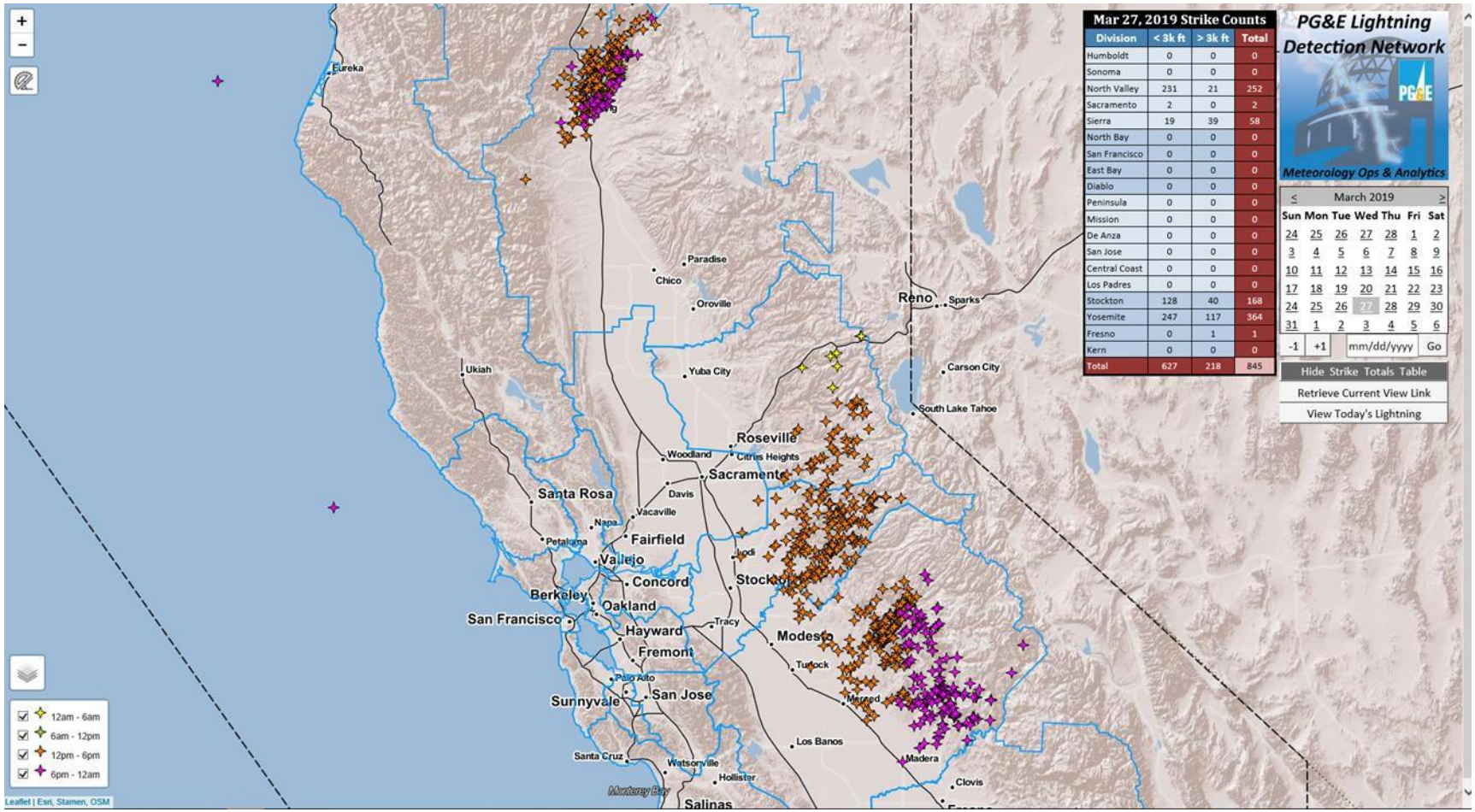


#### 5.3.2.1.8 PG&E Lightning Detection Network (PLDN)

PG&E operates several lighting detection sensors that feed into a larger network: the Global Lightning Network. Cloud to ground lightning strikes can cause utility outages as well as result in fire ignitions. For example, from June 20 to 21, 2008 more than 20,000 lightning strikes occurred resulting in more than 2,000 fires. PG&E also developed a custom internal application that displays lighting strikes in real-time and allows a user to customize alerts received for just the area they are interested in. The application also gives the user the ability to see historical lighting as well as the peak lightning stroke amperage. PG&E plans to continue operating and maintaining lightning sensors deployed across the PG&E territory in 2020 and beyond. No major changes are anticipated at this time in the next 3-10 years.

In Figure PG&E 5-19 below, PG&E provides Example output from the PG&E Lightning Detection Network (PLDN) showing historical lightning from March 27, 2019.

**FIGURE PG&E 5-19: EXAMPLE OUTPUT FROM THE PG&E LIGHTNING DETECTION NETWORK (PLDN) SHOWING HISTORICAL LIGHTNING FROM MARCH 27, 2019**



#### 5.3.2.1.9 Information Sharing

PG&E is committed to sharing weather, fire detection information, camera data and PSPS potential forecasts with stakeholders and the public. PG&E greatly values the role state, county and federal agencies (e.g., CAL FIRE, NWS, Predictive Services) play in communicating fire danger and risk to the general public. In 2019, several meetings were held with agencies and stakeholders to better align on how PG&E would share information with the public. PG&E currently shares the following information daily:

- Data collected from weather stations
- Live feeds from wildfire alert cameras
- Fire detection information with the CA National Guard, county and municipal fire agencies
- PG&E's 7-day PSPS forecast and discussion

In 2020 and beyond, PG&E expects to further participate with stakeholders to refine PG&E's data sharing practices with agencies, counties, other utilities and the public.

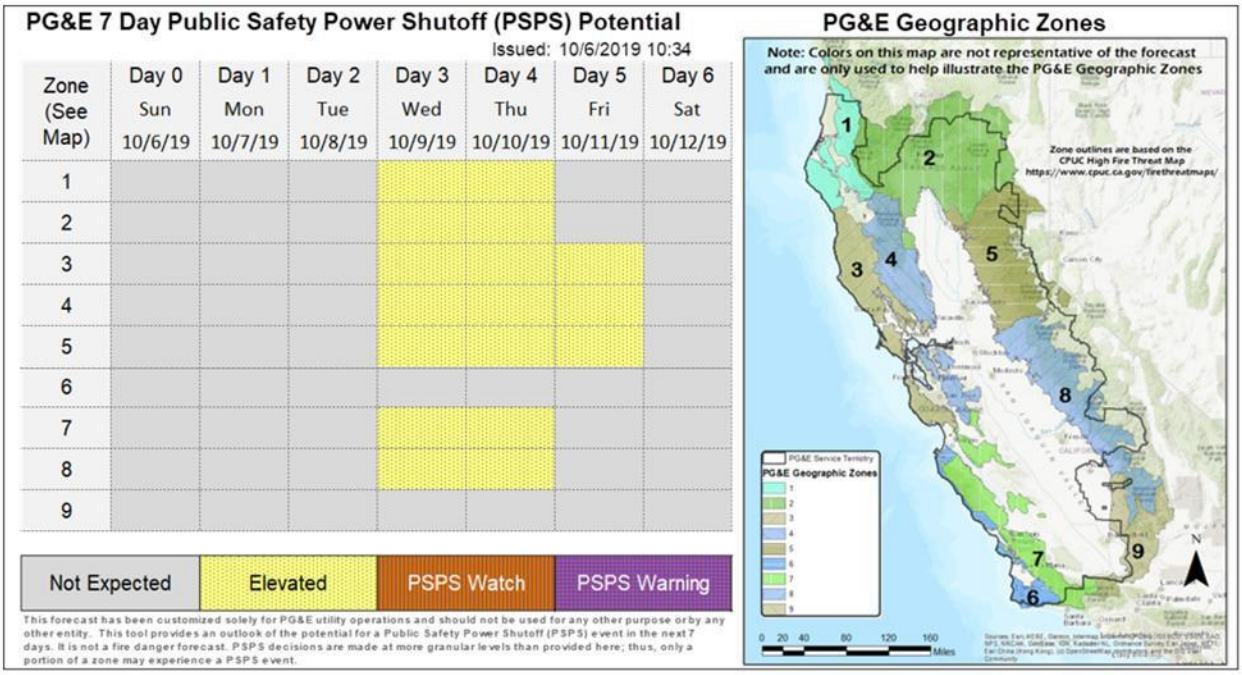
In 2019, PG&E wanted to provide the public with advanced awareness of upcoming conditions that may lead to potential for a PSPS event. PG&E developed and then operationally implemented a publicly available 7 day forecast on the potential of implementing PSPS. This forecast is published daily by an operational meteorologist or fire scientist from PG&E's Meteorology & Analytics team. The forecast is customized for PG&E utility operations and provides an overview for a potential PSPS event in the next 7 days as determined from an analysis of forecasted weather, the potential for wind-related damage, and fuel moisture content in dead and live vegetation. The forecast is broken down by broad PG&E Geographic Zones numbered 1 through 9; however, PSPS decisions are made at more granular levels with more detailed information shared with state, county and local officials as well as the public, once more detailed analysis is performed. The forecast is presented in one of four discrete categories for each geographic zone:

- Not Expected: Conditions that generally warrant a PSPS event are not expected at this time.
- Elevated: An upcoming event (typically a period of adverse weather combined with dry fuels) is being monitored for an increased potential of a PSPS event.
- PSPS Watch: The PG&E EOC is activated for a reasonable chance of executing PSPS to reduce public safety risk in a given geographic zone due to a combination of adverse weather and dry fuel conditions. A PSPS watch is typically only issued within 72 hours before the anticipated start of an event.
- PSPS Warning: The PG&E EOC is activated and customers in areas being considered for PSPS have been or are being notified. This level indicates execution of PSPS is probable given the latest forecast of weather and fuels and/or observed conditions. PSPS is typically executed in smaller and more targeted areas than the

PG&E Geographic Zones. This level does not guarantee a PSPS execution as conditions and forecasts may change.

Figure PG&E5-20 below provides an example of a PSPS forecast.

**FIGURE PG&E 5-20: EXAMPLE OF A PSPS FORECAST ISSUED ON 10/6 FOR AN UPCOMING PERIOD OF FIRE RISK ON 10/9-10/11**




In 2020 and beyond, PG&E expects to further participate with stakeholders to refine PG&E's data sharing practices with agencies, counties, municipalities, other utilities and the public.

#### 5.3.2.1.10 Collaborative Efforts to Advance Fire Science

PG&E has partnered with SDG&E and SCE in collaborative efforts to help advance fire science. The utilities are working with external experts as well as the SJSU Fire Weather Research Lab to define areas where additional research is needed in the fire science field. In 2020 and beyond, the utilities are expected to fund joint research projects with external experts as well as the SJSU Fire Weather Research Lab as well as potentially fund a post-doctoral position at SJSU focused on areas that benefit the entire utility-fire science field. These efforts are expected to yield benefit for not only utilities in California, but other utilities across the western United States and potentially the world, where there is a risk of utility-related fire risk.

In Q2 2020, PG&E plans to present to students and faculty at SJSU about utility-weather and utility-fire risk to further foster a collaborative partnership as well as hopefully energize the next generation of utility fire scientists and meteorologists. PG&E is open to hosting and participating with other universities in this regard, as well as sharing data to help catalyze fire science advancements.

***Progress Timeline***

1. ***Before the upcoming wildfire season:***

- Weather prediction using cloud computing: Develop next version of POMMS
- Wildfire spread models: Simulate over a billion fires across historically high fire potential days
- Weather stations: Use weather station data to help forecast and monitor for high fire risk weather conditions.
- Wildfire cameras: Deploy approximately 200 additional weather cameras by December 31, 2020
- PG&E fire detection and alert system: Implement fire detection and alert system operations as described above.
- Live fuel moisture sampling: Partner with SJSU to conduct LFM sampling
- Addressing weather forecasting model uncertainty: Continue to evaluate weather forecasting models and identify potential improvements.
- PG&E lightning detection network: Operate and maintain lightning sensors as described above.
- Information sharing: Continue to interact with stakeholders to improve and refine data sharing practices with agencies, counties, other utilities and the public.
- Collaborative efforts to advance fire science: Work collaboratively with other utilities and partners to advance fire science.

2. ***Before the next annual update:***

- Weather prediction using cloud computing: Create historic climatology data stack at 2km resolution
- Wildfire spread models: Enhance model framework including data inputs, fire consequence outputs and metrics
- Weather stations: Continue to use weather station data to help forecast and monitor for high fire risk weather conditions.
- Wildfire cameras: Deploy approximately 200 additional weather cameras by December 31, 2020
- PG&E fire detection and alert system: Add NOAA-20 data into the suite of fire detection data
- Live fuel moisture sampling: Partner with SJSU to conduct LFM sampling
- Addressing weather forecasting model uncertainty: Deploy an in-house high-resolution model ensemble package to significantly increase amount of forecast data generated daily.
- PG&E lightning detection network: Operate and maintain lightning sensors as described above.
- Information sharing: Continue to interact with stakeholders to improve and refine data sharing practices with agencies, counties, other utilities and the public.
- Collaborative efforts to advance fire science: Along with other utilities, fund joint research project with external experts and the SJSU Fire Weather Research lab to benefit the utility fire science field.

3. ***Within the next 3 years:***

- Weather prediction using cloud computing: Evaluate 2km model forecasts and apply lessons learned
- Wildfire spread models: Identify areas for improving models and incorporate lessons learned.
- Weather stations: Continue to use weather station data to help forecast and monitor for high fire risk weather conditions.
- Wildfire cameras: Deploy cameras to cover approximately 90 percent of the high fire-risk areas
- PG&E fire detection and alert system: Evaluate data from additional NOAA polar orbiting satellites and incorporate into fire detection data if proven useful

- Live fuel moisture sampling: Create database of LFM sampling data from state and federal agencies for the fire community

- Addressing weather forecasting model uncertainty: Continue to evaluate weather forecasting models and identify potential improvements.

- PG&E lightning detection network: Operate and maintain lightning sensors as described above.

- Information sharing: Continue to interact with stakeholders to improve and refine data sharing practices with agencies, counties, other utilities and the public.

- Collaborative efforts to advance fire science: Along with other utilities, fund joint research project with external experts and the SJSU Fire Weather Research lab to benefit the utility fire science field.

***4. Within the next 10 years:***

- Weather prediction using cloud computing: Continue to evaluate and improve modeling capabilities using state of the art technology

- Wildfire spread models: Continue to evaluate and improve modeling capabilities using state of the art technology

- Weather stations: Continue to use weather station data to help forecast and monitor for high fire risk weather conditions.

- Wildfire cameras: Reassess the camera network coverage, including coordinating coverage with other agencies.

- PG&E fire detection and alert system: Evaluate adding additional public or proprietary data sources

- Live fuel moisture sampling: Continue to update LFM database for use in constructing and calibrating LFM models.

- Addressing weather forecasting model uncertainty: Continue to evaluate weather forecasting models and identify potential improvements.

- PG&E lightning detection network: Operate and maintain lightning sensors as described above.

- Information sharing: Continue to interact with stakeholders to improve and refine data sharing practices with agencies, counties, other utilities and the public

- Collaborative efforts to advance fire science: Continue to identify ways to work with partners to advance fire science

#### 5.3.2.2 Continuous Monitoring Sensors

##### 5.3.2.2.1 Electric Transmission

Line monitoring non-tripping travelling wave relays (SEL T400L's) are being installed on selected transmission lines to capture high frequency travelling waves emitted by faults or other electric system anomalies (high corona). System Protection, along with the relay vendor, is evaluating the relay data to determine if vulnerable locations along the transmission line can be identified prior to the condition evolving into a bolted fault. This pilot effort began in the summer of 2019 and has not yet produced any actionable incipient fault data.

##### 5.3.2.2.2 Electric Distribution

PG&E is evaluating, deploying, and operating technologies/applications that provide data for real time continuous sensor monitoring and analytics of asset health and performance. The data from this sensor monitoring could be used to predict developing problems on the electric distribution system so PG&E can implement proactive maintenance, thereby reducing potential hazards and improving public safety. Expert Engineers, Data Scientists, and Field Operations are involved with several initiatives supporting wildfire mitigation efforts.

#### 5.3.2.2.3 SmartMeter™ Partial Voltage Detection (Formerly Known as Enhanced Wires Down Detection)

PG&E has enabled Single-Phase SmartMeters™ to send real-time alarms to the Distribution Management System under partial voltage conditions (25-75 percent of nominal voltage). Prior to implementation, SmartMeters™ could only provide real-time alarms for the outage state. For Three-Wire distribution systems, the partial voltage condition indicates one phase feeding the transformer has low voltage or no voltage. Energized or de-energized wires down will create a low voltage condition on transformers through the mechanism of transformer back feed from the inactive phase to the fault. This enhanced situational awareness can help detect and locate downed distribution lines more quickly to enable faster response. Faster response may not only reduce the amount of time the line is down but may also allow first responders to more quickly extinguish wire down-related ignitions if they occur. To date, partial voltage detection capability has been deployed to approximately 4.5 million SmartMeters™ covering 25,597 line miles of Tier 2 and Tier 3 HFTD areas. In 2020, PG&E has already initiated plans to continue developing this solution to extend the partial voltage detection enhancement to Three-Phase SmartMeters™ and 4-Wire distribution systems.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Before the upcoming wildfire season: No additional deployment is planned before the upcoming wildfire season this year.

2. ***Before the next annual update:*** PG&E will deploy to an additional 365,000 Three-Phase SmartMeters™ covering up to 25,597 Line-miles of Tier 2 and Tier 3 HFTD areas with 4-Wire Distribution.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

#### 5.3.2.2.4 Distribution Fault Anticipation Technology

Distribution Fault Anticipation (DFA) technology captures primary distribution disturbance current and voltage waveforms. It conducts digital signal processing locally, communicates results to a waveform classification engine which then identify both normal and abnormal events on the distribution system. The DFA technology is installed within the substation and uses existing substation bus PTs and circuit breaker CTs.

DFA technology is being evaluated on 6 distribution feeders covering 718 line miles. These installations are part of PG&E's EPIC 2.34 and have a primary objective of validating the performance of the early fault detection (EFD) sensors in capturing disturbance and arcing events. A second objective is to evaluate the DFA sensor for use with wildfire risk management and operational needs. To date there have been over 23,000 disturbance events captured. Of these events, 6.4% are considered abnormal events (overcurrent fault, capacitor restrike, arcing). Of the total number of abnormal events 11.2% have been identified as arcing. This EPIC project is to be completed in July of 2020. Prior to project completion, PG&E will conduct a full comparative and strategic assessment of the technology. Potential further deployment will be determined at that time.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** No additional deployment is planned.
2. ***Before the next annual update:*** See above.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** See above.

#### 5.3.2.2.5 Early Fault Detection

EFD Sensors are also being evaluated on one 12kV electric distribution feeder covering 120 line miles. During a July 2018 Wildfire Safety benchmarking trip, PG&E learned of EFD sensor technology from a vendor in Australia. The sensors detect Radio Frequency (RF) emissions generated by partial discharge activity on the distribution feeder. The sensors are deployed on distribution poles at up to 3-mile spacing to cover the mainline and significant branches of the feeder. The sensors work in pairs to monitor the distribution lines between them and use time-of-flight proportionality to distance to determine the location of partial discharge emissions between each sensor pair. In various use cases at PG&E and other utilities, the EFD sensors have demonstrated detection of incipient faults such as failing transformers, eminent poles fires, conductor strand breaks, and vegetation arc pruning. This pilot is also included in PG&E's EPIC 2.34 that is scheduled for completion in July of 2020. Prior to completion, PG&E will also conduct a strategic assessment of the technology. Potential further deployment will be determined at that time.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Additional part of one 21kV feeder is planned be equipped with the sensors.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

#### 5.3.2.2.6 Sensor IQ

PG&E is piloting Sensor IQ on approximately 500K SmartMeters™ in HFTD areas and customizing reads and alarms to identify service transformer failures, with other use-cases to be considered based on wildfire risk reduction and/or business value. SSN is being contracted to implement Sensor IQ, which allows for a parallel, more granular data path (outside of billing) to support distribution asset analytics use cases. Deployment enables customizable Network Interface Card (NIC) data sampling, read jobs, and alarms. The data collected through Sensor IQ is critical for a variety of other wildfire related initiatives, including: (i) Rapid Earth Fault Current Limiter which requires feeder phasing to determine the line-earth capacitive imbalance; (ii) increasing the data collected (voltage, current, power factor) and increasing the frequency of data collection will improve wires down algorithms to find faults. Prior to completion of the pilot, PG&E will conduct a strategic assessment of the technology. Potential further deployment and applications will be determined at that time.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Sensor IQ pilot will be deployed to 500K SmartMeters™ covering approximately 25,597 distribution line miles.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

#### 5.3.2.2.7 Line Sensor Devices

Building from its Smart Grid Pilot programs, PG&E began the deployment of 333 line sensing devices on 14 key circuits within PG&E's North Bay Tier 2 and Tier 3 HFTD areas with a focus on reducing wildfire risk and improving public safety by continuous, real-time monitoring of the grid, performing analytics on captured line disturbance data, identifying potential hazards, and when necessary dispatching field operations to proactively patrol/maintain/repair discovered field conditions or assets on the verge of failure.

Line sensors are primary conductor-mounted devices that continuously measure current in real-time and report events as they occur, and in some cases the current waveform of grid disturbances. These line sensors are next-generation fault indicators (covered in Section 5.3.2.3 below) with additional functionality and communication capabilities.

In 2019, PG&E began to operationalize the use of line sensors to proactively monitor and locate distribution grid disturbances and analyze when to dispatch field inspectors. PG&E is using data provided by line sensor technologies to bolster asset health and performance through a three step process: (i) Collecting line sensor data attributes on disturbances to create a database of disturbance signatures for disturbance evaluations; (ii) Detecting disturbance information from Tier 2 and Tier 3 HFTD areas on PG&E's electric distribution circuits and matching the captured disturbance data against the signature database to determine if a distribution line risk is likely to materialize as a hazard; (iii) Matching line sensor data attributes on line risks in a manner in which they

can be evaluated in the distribution network model (CYME Power Engineering software) to estimate the location of the line risk for proactive field patrol, inspection, and repair, if necessary, before failure to reduce risk and improve system safety.

Using an engineering approach, PG&E continues to identify additional circuits in Tier 2 and Tier 3 HFTD areas and will be redesigning an optimal line sensor device footprint to further support wildfire mitigation. PG&E will strategically deploy, gain further experience, and operate state-of-the-art systems and technologies to continuously monitor the grid and analyze data to prevent asset failures and reduce risk. In parallel, it will continue to benchmark other leading utilities and manufacturers to learn alternatives and/or to improve the company's predictive analytics and preventative operational practices as well as to continuously evaluate new and/or emerging technologies.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E plans to deploy line sensors to approximately 20 feeders covering up to 3,000 line miles.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** PG&E is planning and may potentially deploy line sensors to approximately 120 to 240 feeders covering up to 12,000 miles.

4. ***Within the next 10 years:*** See above.

#### 5.3.2.2.8 Distribution Arcing Fault Signature Library

PG&E is partnering with two of the national laboratories to install a high-fidelity optical sensor technology on a distribution feeder for the completion of a Distribution Arcing Fault Signature Library. The optical sensors, with immunity to electromagnetic interference and instrument transformer saturation, will provide high frequency sampling of voltage, current, temperature, pressure, vibration, and acoustic variables. The Distribution Arcing Fault Signature Library will inform PG&E about the types and resolutions of sensors needed to detect incipient fault conditions on the distribution system and intervene with proactive maintenance to reduce wildfire risks. Prior to completion, PG&E will also conduct a strategic assessment of the technology. Potential further deployment and applications will be determined at that time.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** See above.
2. ***Before the next annual update:*** PG&E plans to install at 1 distribution feeder that will cover approximately 201 Line-Miles.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** See above.

#### 5.3.2.3 Fault Indicators for Detecting Faults on Electric Lines and Equipment

##### 5.3.2.3.1 Electric Transmission

Other than the travelling wave devices referenced in “Continuous Monitor Sensors”, Transmission has no future plans to install equipment dedicated to “Fault Indication” that is not directly associated with Protective System Relays that tripped the faulted element.

##### 5.3.2.3.2 Electric Distribution

PG&E has installed nearly 4,400 overhead fault indicators throughout the distribution system to improve restoration time after an outage. Overhead fault indicators are a valuable tool that assist troubleshooters in locating the faulted section of line so the faulted section of line can be isolated and customers restored. PG&E does not have a program to install additional fault indicators in fire areas for future years. Instead, PG&E’s focus will be piloting sensor technologies with centralized advanced algorithms to detect problems before failure.

***Progress Timeline*** *(for both transmission and distribution)*

1. ***Before the upcoming wildfire season:*** See above.
2. ***Before the next annual update:*** See above.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** See above.

#### 5.3.2.4 Forecast of a Fire Risk Index, Fire Potential Index, or Similar

The PG&E FPI is used as a daily and hourly tool to drive operational decisions to reduce fire risk. FPI informs the PSPS program and informs daily operational actions to reduce the risk of fire ignition per company standards. Some of these daily actions include disabling of reclosing devices and placing restrictions on higher risk field activities such as welding. Until December 31, 2014, PG&E received daily fire danger ratings from CAL FIRE for each Fire Index Area across PG&E's service territory. CAL FIRE discontinued this support in 2015. Starting in 2015, PG&E leveraged high-resolution model outputs from POMMS and the National Fire Danger Rating System to derive fire danger ratings across the PG&E territory for daily operational actions. PG&E benchmarked and worked with other utilities and experts in fire danger rating to improve core inputs of the model in 2016, 2017 and 2018.

In 2019, PG&E leveraged a newly developed 30-year weather and fuels climatology at 3 km to recalibrate the FPI model that was eventually utilized during the 2019 fire season. PG&E's data scientists sought to capture the largest drivers of large fire growth. In order to accomplish this task, PG&E leveraged a USFS fire occurrence dataset with thousands of fires and combined these fires with the hourly climatology to determine weather and fuel conditions present during each incident. As there are many fire danger components and indices and data sources available and discussed in the academic literature and utilized by other utilities, PG&E sought to develop the most representative FPI for its service territory by testing thousands of FPI model combinations and evaluating several machine learning techniques. Ultimately, PG&E built and evaluated over 4,000 combinations of the FPI model using numerous weather components, fire weather indices (Fosberg Fire Weather index, the Hot-Dry-Windy Index, the Santa Ana Wildfire Threat weather index), outputs from NFDRS, Nelson DFM model, a machine-learning derived LFM model, and 'containment' and 'land characteristic' features such as road density, distance to nearest fire station and land-use type among several others.

The FPI that PG&E selected and deployed for operational use in the 2019 fire season combines wind speed, temperature, relative humidity, dead fuel moisture, live fuel moisture and fuel type into an index that represents the probability for small fires to become large incidents. The FPI model is run on the same 3-km resolution dataset as the high-resolution weather and OPW model. The FPI model output is available in a web application that allows an analyst to review the data hourly for any geographic area. The hourly data are also available in Google Earth, which the analyst can overlay with other asset layers. For day to day operational decisions, the FPI data are also aggregated to the Fire Index Areas. Maps and data available in GIS formats are available for the next three days via a web application. *See* Figure PG&E 5-21 below.

PG&E also developed a wildfire danger console to help track and monitor numerous components that comprise the PG&E FPI. *See* Figure PG&E 5-23 below. This gives the analyst a snapshot of the current state of weather and fuels, as well as the daily maximum outage probability and fire potential. Hourly dead fuel moisture observations are harvested and displayed from the RAWS weather network available across the state and the LFM dashboard presents the latest readings available in the National Fuel Moisture Database. PG&E has also automated Family Plus (FF+), which produces National Fire Danger Rating System (NFDRS) outputs. Family Plus (FF+) is a software

suite developed by the USFS and used to calculate fuel moistures and indices from the US NFDRS using hourly or daily fire weather observations primarily from RAWS. Family Plus (FF+) is heavily used by local, state and federal agencies to assess fire danger components compared to historical data. PG&E automatically computes several NFDRS components using FF+ for 9 geographic regions across its service territory. The FF+ outputs serve as another fire danger gauge analysts utilize to assess fire danger and the general progression of fire season but are not used directly in the PG&E FPI.

By September 1, 2020, PG&E plans to recalibrate the FPI using the new climatology at 2 km resolution. In addition, PG&E plans to improve the USFS and CAL FIRE's fire occurrence dataset used as many data quality issues and potential enhancements were noted during the 2019 analysis (e.g., wrong fire location, missing fires). PG&E is also evaluating partnering with external experts and/or utilizing remote sensing techniques to enhance the fire occurrence datasets. In addition to improving fire occurrence, PG&E is also planning to improve the quality and granularity of the input weather and dead fuel moisture data and is working with external experts to improve LFM data using remote sensing and/or machine learning capabilities. PG&E is open to sharing daily FPI data with interested stakeholders but greatly values the role state and federal agencies play in communicating fire danger and risk to the general public. As a result, PG&E's data sharing strategy centers not on communicating the fire potential, but rather the potential for executing PSPS. In 2020 and beyond, PG&E is open to working directly with external stakeholders to refine how information in this area is shared and distributed.

***Progress Timeline*** *(for both transmission and distribution)*

1. ***Before the upcoming wildfire season:*** PG&E will be in the process of recalibrating the FPI using new climatology at 2km resolution and improve the USFS and CAL FIRE occurrence datasets.

2. ***Before the next annual update:*** PG&E plans to complete recalibrating FPI and improving fire occurrence datasets.

3. ***Within the next 3 years:*** Continue to improve the quality and granularity of input weather and dead fuel data.

4. ***Within the next 10 years:*** Continue to evaluate and improve FPI models and input data.

**FIGURE PG&E 5-21: EXAMPLE OUTPUT FROM THE PG&E UTILITY FIRE POTENTIAL INDEX WEB APPLICATION**

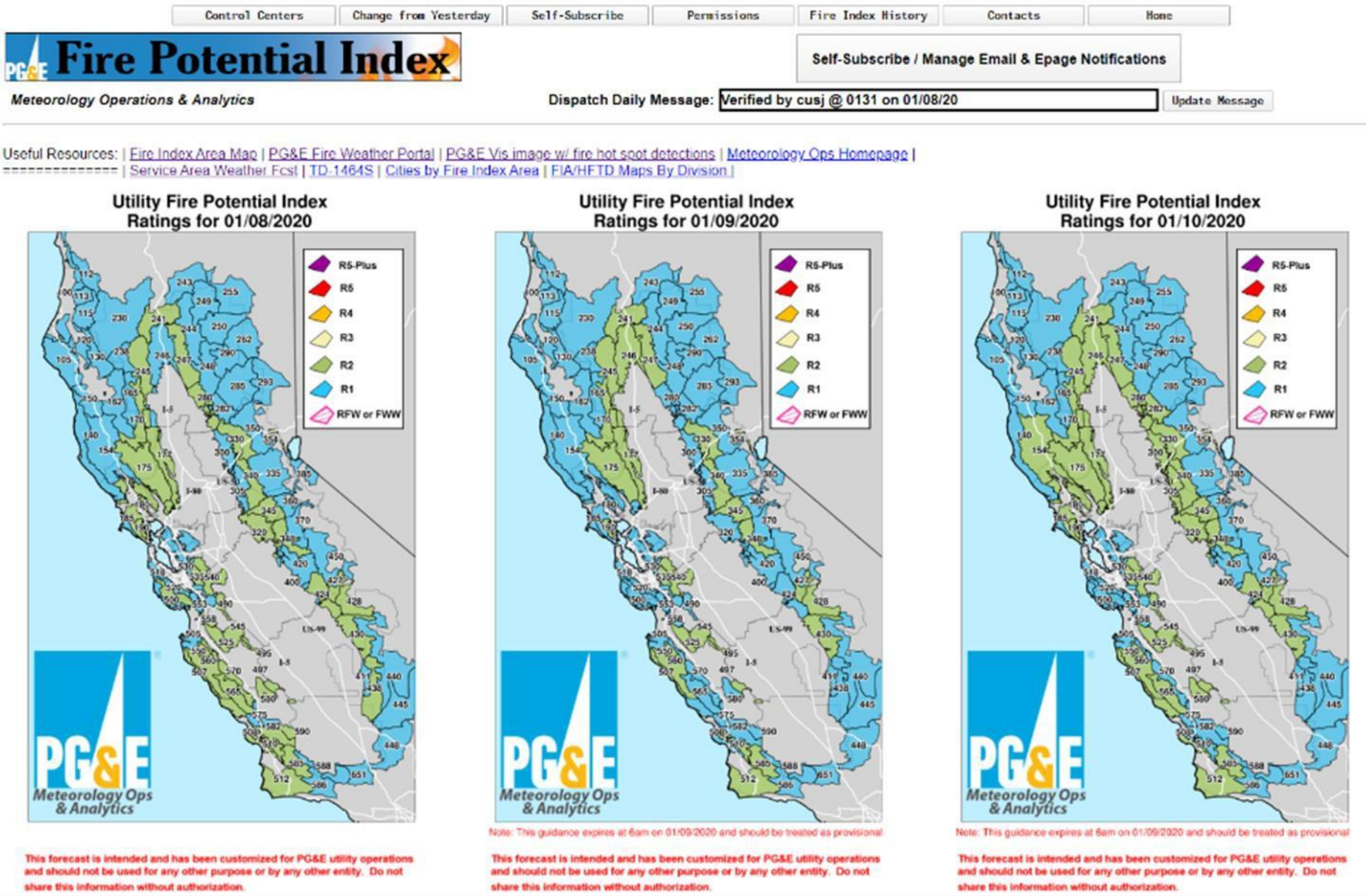


**FIGURE PG&E 5-22: EXAMPLE OUTPUT FROM THE PG&E WILDFIRE DANGER CONSOLE**

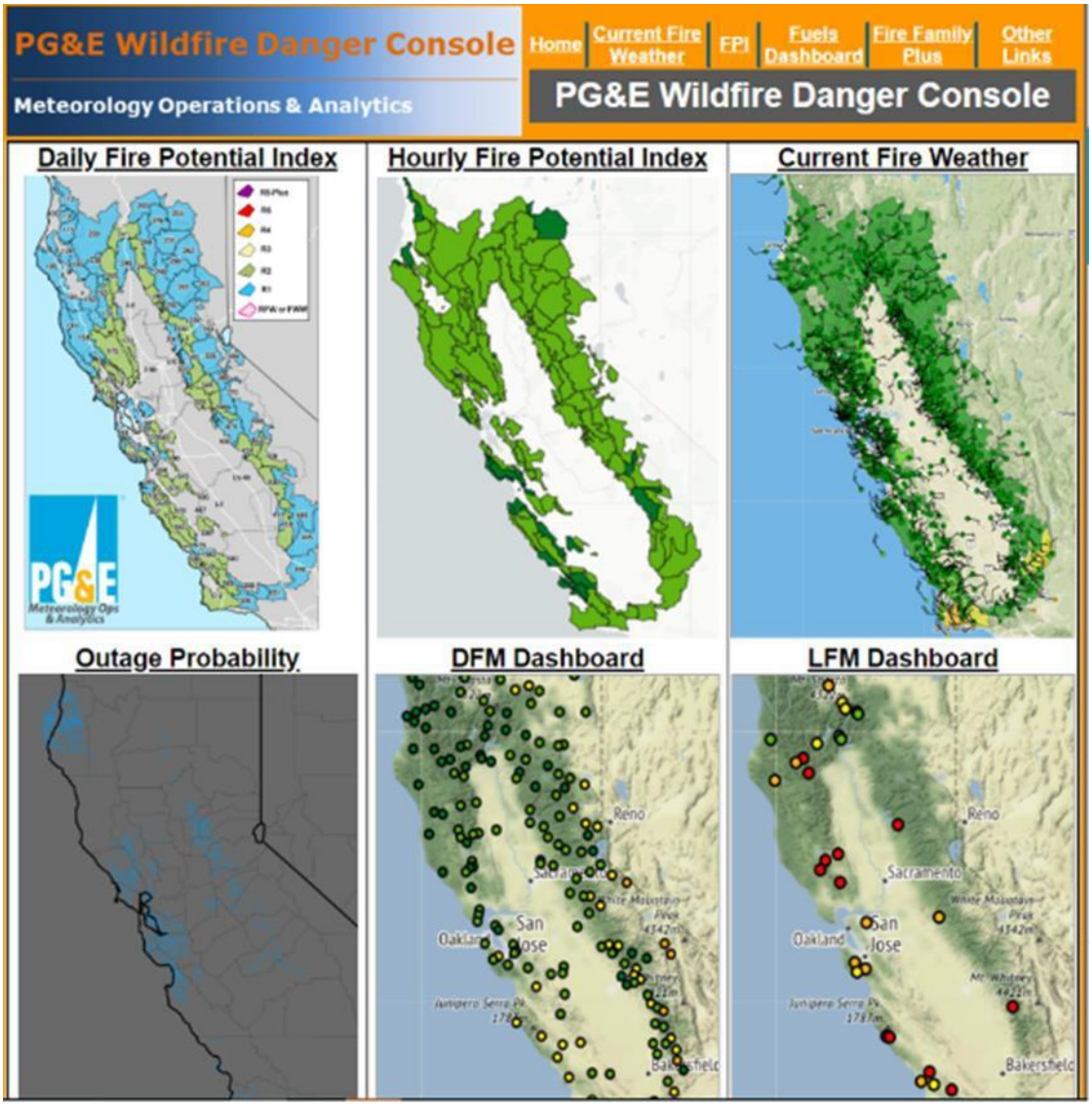
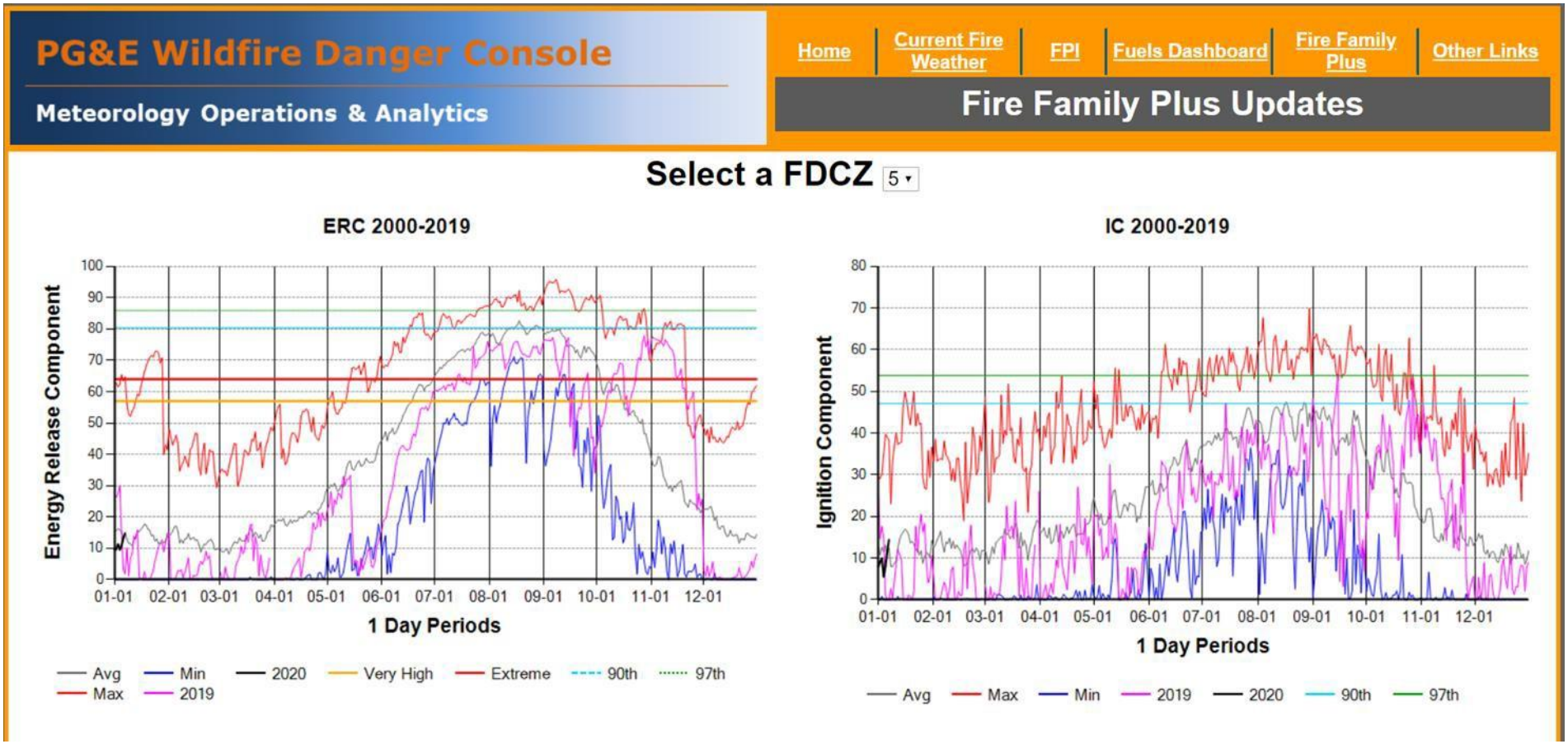


**FIGURE PG&E 5-23: EXAMPLE OUTPUT FROM THE PG&E WILDFIRE DANGER CONSOLE – FIRE FAMILY PLUS AUTOMATED UPDATES**



### 5.3.2.5 Personnel Monitoring Areas of Electric Lines and Equipment in Elevated Fire Risk Conditions

#### 5.3.2.5.1 Safety and Infrastructure Protection Team

Safety and Infrastructure Protection Teams (SIPT) consist of two-person crews composed of IBEW-represented employees who are trained and certified safety infrastructure protection personnel. They provide standby resources for PG&E crews performing work in high fire hazard areas, pre-treatment of PG&E assets during an ongoing fire, fire protection to PG&E assets, and emergency medical services.

Senate Bill 901 directed that electrical corporations:

> "…shall make an effort to reduce or eliminate the use of contract private fire safety and prevention, mitigation, and maintenance personnel in favor of employing highly skilled and apprenticed personnel to perform those services in direct defense of utility infrastructure in collaboration with public agency fire departments having jurisdiction."

As a result, PG&E elected to establish in-house fire protection services. With the assistance of the Public Safety Specialists (PSS) Team, planning for the program started in December of 2018 and the first management employee was hired in March 2019. By May 2019, the SIPT team consisted of 63 field employees, 1 Manager, 3 supervisors, and 2 clerks. During the establishment of the program, PG&E employees

- Developed a custom SIPT engine design based on existing PG&E fleet vehicle;
- Designed custom built pumps capable of applying fire retardant;
- Acquired and outfitted temporary engines;
- Specified and acquired firefighting tools, radios, and personal protective equipment;
- Developed software applications for monitoring SIPT resource locations, scheduling and documenting work activities;
- Developed a three-week new employee training program and adopted procedures to ensure maintenance of EMT certification;
- Established routine and emergency operational procedures; and,
- Implemented a comprehensive change management program to integrate SIPT team with PG&E's field operations

SIPT crews also support PSPS zone generation sites by patrolling overhead sections of re-energized lines. This responsibility is expected to grow, as PG&E expands generation capabilities.[9]

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[9] SIPT resources are also discussed in Sections 5.3.6.2 and 5.3.6.6.

#### 5.3.2.5.2 Data collection

SIPT crews are used to gather critical data to help PG&E prepare for and manage wildfire risk. When PG&E activates for a PSPS event, it deploys the SIPT teams to collect valuable weather and fuel data and report this information to the WSOC. With input from Meteorology, the WSOC makes decisions related to resourcing and location of Field Observers. The SIPT crews will be sent to specific locations within the Fire Index Area generally within a PSPS targeted zone. The number of field observers will vary depending on the total number of miles, surrounding terrain, facility attributes, and quantity of PSPS Zones within a FIA.

Real-time field observations are made to provide information about weather conditions on potentially impacted PSPS circuits. The SIPT crews will be in position prior to the forecasted PSPS event start and end times.

On-the-ground, real-time field observations are conducted to provide qualitative information (for example, flying debris, trees/branches down, conductor movement) about the presence of R5-Plus conditions potential and the possible need to trigger a PSPS event sooner than expected and provide information to support “all clear” conditions necessary to authorize patrol and restoration activities.

Observers will note hazards related to wind conditions, which may lead to outages. Field Observers record observations including date/time and location specifics about the following conditions:

- Trees / branches movement;
- Flying debris;
- Conductor movement; and,
- Wind speed.

In the EOC, the WSOC Lead and Specialist will review incoming documentation and determine if conditions warrant additional field observation or immediate consideration of PSPS.

SIPT crews are also utilized to collect localized live fuel moisture data to help PG&E make more informed operational decisions. The fuel data will inform PG&E Meteorology’s FPI model. Furthermore, SIPT will utilize weather data and local condition to calculate “Ignition Potential” based on existing firefighting standards. See Section 5.3.2.1 for further information on PG&E’s forecasting and estimating impacts (fire spread modeling, OPW model, SOPP).

***Progress Timeline*** *(for SIPT and data collection)*

1. ***Before the upcoming wildfire season:*** Update and stabilize the current technology solutions and processes and increase staffing levels to support fire prevention and mitigation activities. Targeted staffing levels and associated equipment needs: 98 SIPT Crew members, 40 Engines.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** Continue to assess effectiveness of program and develop risk informed business case to potentially increase staffing levels and equipment needs.

4. ***Within the next 10 years:*** See above.

#### 5.3.2.6 Weather Forecasting and Estimating Impacts on Electric Lines and Equipment

Unplanned outages can pose a fire ignition risk when surface fuels are extremely dry. When strong winds and dry conditions are present, the risk of fast spreading and catastrophic wildfire increases. The SOPP Model, a storm outage prediction system developed, maintained, and operated by the Meteorology team on behalf of Electric Emergency Management, is the primary tool PG&E uses to mitigate operational risk from adverse weather events that create a high volume of unplanned outages.

Functionally, the SOPP Model is a collection of tools, techniques and utility subject matter expertise that are employed to predict unplanned outage activity. In 2019, PG&E's meteorologists and data scientists developed the Dynamic Pattern and Analog Matcher (DPAM) tool that automatically matches GFS forecasts for the next 7 days against the North American Regional Reanalysis (NARR) from January 1995 through July 2019. DPAM dynamically utilizes seven atmospheric fields: 500- and 700-hPa geopotential height, 250- and 500-hPa winds, 700-hPa temperature, precipitable water, and sea-level pressure to return the top 20 historical weather days and the outage pattern on those days. These days can be studied in more detail by a PG&E meteorologist to help craft the SOPP outage forecast.

In 2019, PG&E also developed the OPW model, that is based on PG&E's outage history and 30-yr climatology. PG&E's OPW model is location specific and translates a forecasted wind speed from the PG&E POMMS model into frequency that represents the outage activity in the vicinity at that wind speed. Generally, as wind speeds increase, the historical frequency of outages increases. The OPW model was built using PG&E unplanned outage data from 2008 – 2018 and PG&E's high-resolution climatology model, which contains 30 years of hourly wind data at a 3 km spatial resolution. The wind-outage response was found to be heterogeneous across PG&E's territory due to varying vegetation, climatological wind exposure, and topography among other factors. The same OPW model and configuration used to construct the weather climatology is used in forecast mode to produce hourly and daily OPW forecasts. This consistency between historical and forecast data is key as wind outage correlations found in the historical data can be applied in forecast mode. The OPW model produces hourly forecasts at 3 km resolution. PG&E also developed an internal web application that allows the analyst to view each forecast hour in an interactive display. The application also simulates wind trajectories utilizing WebGL API. The application also has functionality to view previous forecasts as well as display an OPW time series of the latest 4 forecasts to help analyze forecast drift (i.e., weakening or strengthening). An example image is presented below in Figure PG&E 5-24. The web application can also display the FPI forecast and the product of FPI and OPW.

In 2020, once the new 30-year climatology is complete at 2 km, PG&E plans to recalibrate the OPW model to run at 2 km resolution and will also investigate methods to aggregate the model to the circuit or sub circuit level. Beyond 2020, PG&E plans to employ the latest weather models and data available to continuously improve the SOPP model.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Conduct weather forecasting and impacts on electric lines and equipment as described above.

2. ***Before the next annual update:*** Recalibrate the OPS model to run at 2km resolution.

3. ***Within the next 3 years:*** Investigate methods to aggregate the model to the circuit or sub-circuit level. Continue to employ the latest weather models and data available to continuously improve the SOPP model.

4. ***Within the next 10 years:*** Continue to employ the latest weather models and data available to continuously improve the SOPP model.

**FIGURE PG&E 5-24: EXAMPLE OUTPUT AND HOURLY VISUALIZATION OF THE PG&E OPW MODEL BASED ON POMMS**

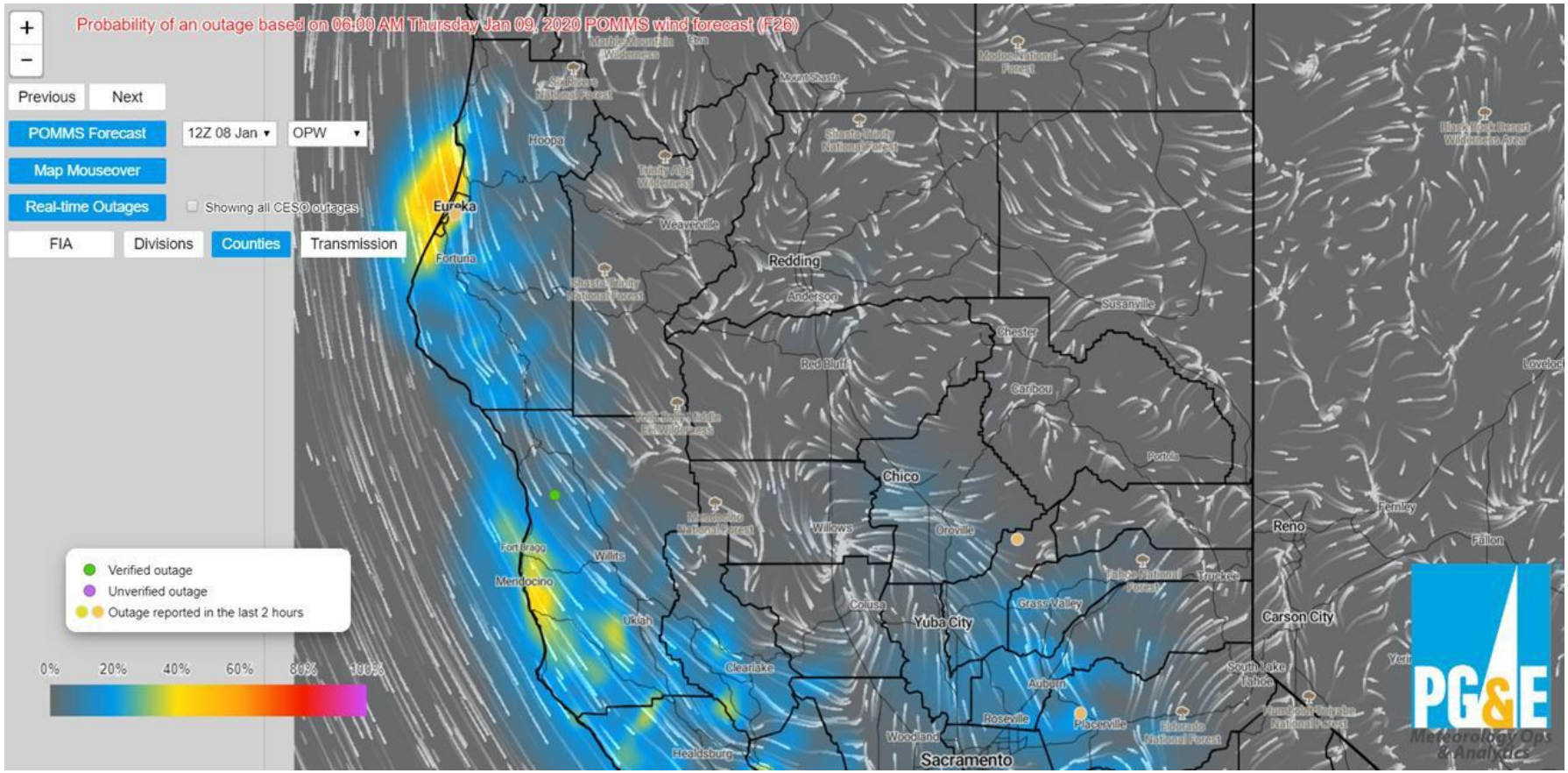
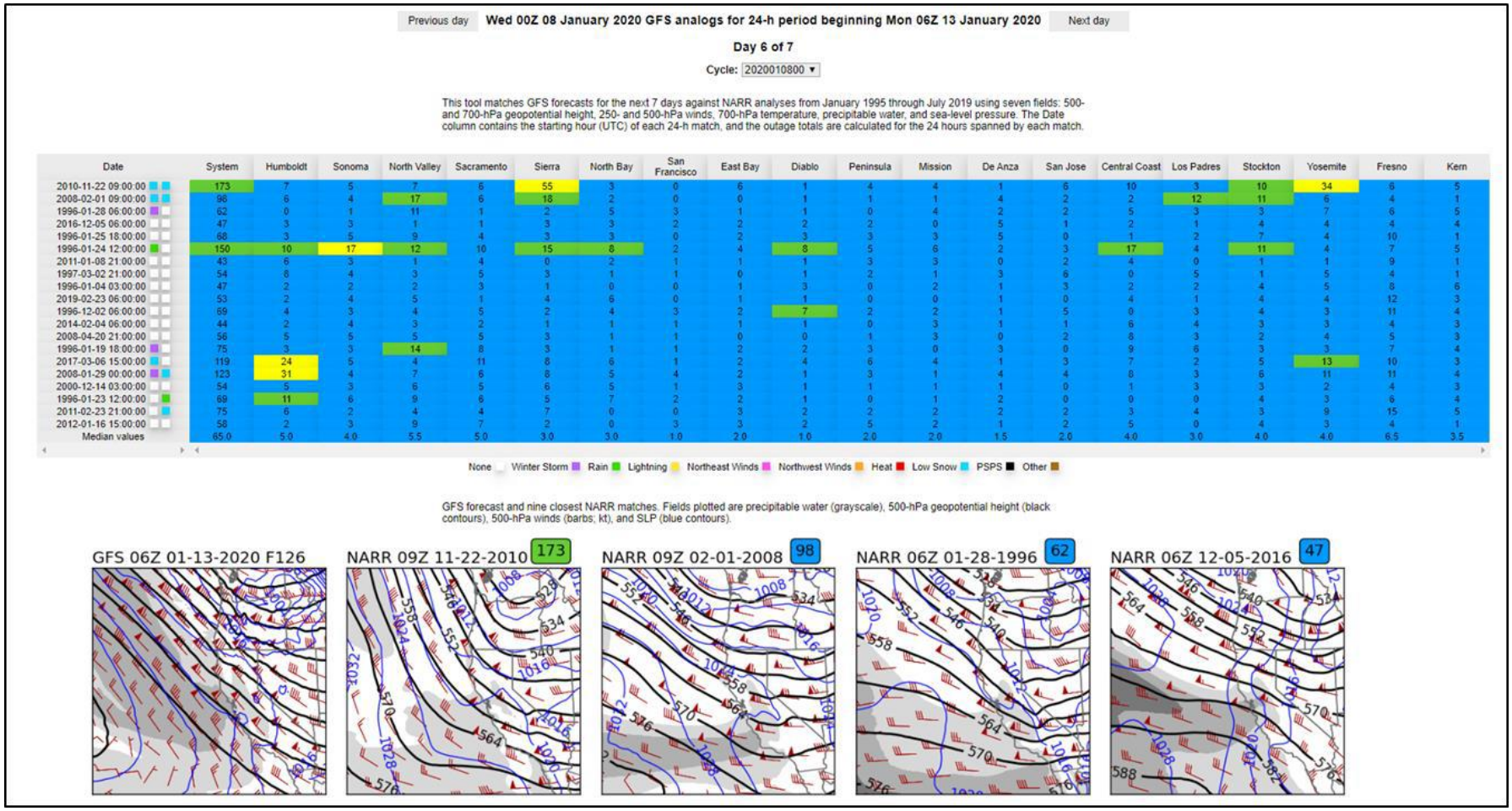


**FIGURE PG&E 5-25: EXAMPLE OUTPUT FROM THE DYNAMIC PATTERN AND ANALOG MATCHER (DPAM) TOOL DEVELOPED BY PG&E USING GRS AND NARR ARCHIVE DATA**



#### 5.3.2.7 Wildfire Safety Operations Center (WSOC):

PG&E's WSOC is a physical facility that serves as the central wildfire-related information hub for PG&E, and monitors, assesses, and directs specific wildfire prevention and response efforts throughout its service area. The WSOC interfaces and collaborates with all PG&E LOBs and to assist in the deployment of technology, processes and procedures directly related to wildfire prevention, response, and recovery. The WSOC monitors for fire ignitions across PG&E's service area in real time, leveraging PG&E weather information, wildfire camera data, and publicly available weather information, as well as first responder and local and state data. Information also comes into the WSOC from PG&E field personnel, including PSS and SIPT Crews. Based on meeting established thresholds (e.g., fire proximity to PG&E assets) the WSOC will create and distribute incident report updates via email. This email includes wildfire status, PG&E assets threatened or involved, current red flag status, and fire weather information. The WSOC will send the report to a pre-determined internal distribution list including field staff, control center personnel, executive staff, supporting LOBs and other PG&E emergency responders.

The WSOC established notification protocols for communicating fire threat information to the various operations centers within PG&E (Gas Control, Electric Grid Control, Electric Distribution Control, IT/telecom, security, power generation, etc.). The real-time risk information communicated to internal control centers enables PG&E to act swiftly to protect life and property from fires threatening PG&E assets. These notifications also facilitate sharing of critical incident information in order to effectively respond to fire threats in coordination with other PG&E lines of business and external emergency response agencies.

The broader WSOC Organization also includes the PSS Team. The WSOC coordinates with PG&E's PSS team, who interfaces with CAL FIRE, federal fire agencies and other agency having jurisdiction (AHJ) incident commanders to oversee the organizational response to wildfire threats and incidents. The PSS team is responsible for gathering and sharing critical and fire PG&E infrastructure intelligence with the AHJs and WSOC. This information is used to inform PG&E deployment of additional resources needed to support fire mitigation and asset protection activities.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Improve processes, procedures and technology based on lessons learned identified during 2019 Fire/PSPS season.

2. ***Before the next annual update:*** Identify critical elements of information and key internal and external stakeholders for the sharing of data and situational awareness information.

3. ***Within the next 3 years:*** Gain business case approval to expand to an All Hazards Monitoring Center that aligns with the State Warning Center and the State's newly forming Wildfire Forecast and Threat Intelligence Center per SB 209.

4. ***Within the next 10 years:*** See above.

### 5.3.3 Grid Design and System Hardening

*Describe utility approach to the following categories of maintenance of transmission lines, distribution lines, and equipment, respectively:*

1. *Routine maintenance programs and protocols (i.e., covering general maintenance approach and programmatic structure),*

2. *Non-routine maintenance, further delineated into:*

    a. *Emergency response maintenance/repair, and*

    b. *Inspection response maintenance/repair.*

1. Routine Maintenance:

PG&E's preventive maintenance approach aligns to Utility Operations Policy 3-7, "Gas and Electric Operation, Maintenance, and Construction," Utility Standard TD-1001S, "Electric Transmission Line Inspection and Preventive Maintenance Program" and the requirements of California Public Utilities Commission (CPUC) General Order GO 165 "Inspection Requirements for Electric Distribution and Transmission Facilities", as well as relevant portions of GO 95 "Rules for Overhead Electric Line Construction" and GO 128 "Rules for Construction of Underground Electric Supply and Communication Systems." These maintenance protocols reduce the potential for component failures and facilitate a proactive approach to repairing or replacing abnormal components.

2. Non-Routine Maintenance:

    a. Emergency Response maintenance/repair

Electric emergencies are created when outages occur and require immediate response by PG&E to restore customer service and protect the community from potential safety hazards. Equipment that fails in connection with outages is repaired/replaced immediately unless the failed equipment can be removed from service and customers restored. In the latter case, the failed equipment is then scheduled for repairs/replacement.

    b. Inspection Response maintenance/repair

Inspections are part of PG&E's routine maintenance program. Deficiencies identified during inspections are prioritized based on condition and system impact, then scheduled for repair/replacement.

*Discuss proactive replacement programs versus run-to-failure models for each group, including:*

1. *Whether there are specific line elements or equipment that are prioritized for preventive maintenance or replacement,*

2. *How those programs are established,*

3. *What data or information is utilized to make those determinations, and*

4. *What level of subjectivity is implemented in making those determinations*

PG&E has developed asset management plans for its electric assets including distribution, substation and transmission. The asset management plan is based on collecting asset condition data, analyzing the data and determining the prioritization for replacement. Some assets are very complex, such as substation transformers, while other assets are very basic, such as a wood crossarm. The level of condition monitoring varies with the complexity of the asset. For example, substation transformers conditions are monitored using test like dissolved gas analysis (DGA) and partial discharge (PD) while wood crossarms are identified for replacement through our routine patrol and inspection programs (*see* "PG&E's GO 165 Program" Section in the Electric Distribution Preventive Maintenance (EDPM) Manual) for more information on patrol and inspection programs). Once a condition triggering replacement is identified, an EC tag is created with the replacement timeline (priority level) set in accordance with the TD-2305M-JA13 Job Aid: Create, Complete, Cancel for EC Notifications – Field Employees.

While there are instances when assets fail prior to replacement, PG&E does not use a run-to-failure approach to asset replacement. Through our routine patrol and inspection programs, we leverage a run-to-condition approach for basic assets that do not lend themselves to complex monitoring (i.e. gradual deterioration of a wood crossarm). Asset conditions that trigger replacement are well defined and have associated replacement timelines for the purpose of proactively replacing the asset prior to failure.

For more information concerning PG&E's asset management strategies, including inspections and proactive replacements, *see* Section 5.3.4.

See Attachment 1, Table 23 for the details and data associated with the initiatives discussed in this section.

Description of Programs to Reduce Ignition Probability and Wildfire Consequence

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Capacitor maintenance and replacement program*

2. *Circuit breaker maintenance and installation to de-energize lines upon detecting a fault*

3. *Covered conductor installation*
4. *Covered conductor maintenance*
5. *Crossarm maintenance, repair, and replacement*
6. *Distribution pole replacement and reinforcement, including with composite poles*
7. *Expulsion fuse replacement*
8. *Grid topology improvements to mitigate or reduce PSPS events*
9. *Installation of system automation equipment*
10. *Maintenance, repair, and replacement of connectors, including hotline clamps*
11. *Mitigation of impact on customers and other residents affected during PSPS event*
12. *Other corrective action*
13. *Pole loading infrastructure hardening and replacement program based on pole loading assessment program*
14. *Transformers maintenance and replacement*
15. *Transmission tower maintenance and replacement*
16. *Undergrounding of electric lines and/or equipment*
17. *Updates to grid topology to minimize risk of ignition in HFTDs*
18. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

#### 5.3.3.1 Capacitor Maintenance and Replacement Program

PG&E's capacitor maintenance, inspections and replacements are governed by Utility Procedure: TD-2302P-05. This utility procedure classifies maintenance tasks for miscellaneous electric overhead and underground equipment, including capacitor banks, fault indicators, interrupters, reclosers, voltage regulators, SCADA and Primary Distribution Alarm and Control (PDAC) controls, sectionalizers, streetlights, and sump pumps.

Individually, capacitor banks in the distribution system, both overhead and pad-mounted, are tested and inspected annually. The visual part of the inspection includes verifying conditions on the bushings, switches, capacitor tanks, cut-outs, fuses, control cabinets. Within the control cabinet, PG&E further visually inspects the controller, controller box socket and rack to make sure it is properly grounded, as well as inspecting the potential and current transformers.

The testing entails recording a clamp-on ammeter reading on the primary jumper on each phase of the bank while the capacitor bank is energized. These values are compared to standard expected ranges based on the tank size and circuit voltage. If recorded values exceed the normal ranges, further inspection is required to determine the possibility of a failed capacitor unit or a bad connection.

The testing usually starts in the first quarter and is completed by April 1. All repairs or replacements are required by June 1. PG&E annually tests and inspects approximately 11,400 capacitors, approximately 10% of which require corrective action.

PG&E's Asset Management group has started a pilot program to review all outages as a result of fires due to Capacitor bank failures. Planning and Operations Distribution Engineering evaluates the Capacitor bank needs on that circuit for normal and emergency situations before a call is made to overhaul that capacitor bank in the same location or perhaps remove it if it is not necessary.

Costs for capacitor maintenance and replacement are not tracked separately but are included in PG&E's routine overhead maintenance program. As such, costs in the table show PG&E's non-enhanced maintenance in Tier 2 and Tier 3 HFTS areas for all overhead equipment.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As noted above, capacitor banks in the distribution system, both overhead and pad-mounted, are tested and inspected annually, with any repairs completed by June 1.

2. ***Before the next annual update:*** See above for discussion of pilot program, which may affect PG&E's plans before the next annual update and future years.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

#### 5.3.3.2 Circuit Breaker Maintenance and Installation to De-Energize Lines Upon Detecting a Fault

The maintenance of circuit breakers and reclosers used as substation circuit breakers is governed by PG&E Utility Procedure TD-3322M SM&C Manual Circuit Breakers Booklet. This procedure classifies maintenance tasks for circuit breakers from visual inspections to more involved mechanism, compressor, and hydraulic system services, as well as complete overhauls. There are varying maintenance frequencies which are maintenance type dependent. In addition to the *time-based* approach, maintenance may also be *condition-based*. An example of a time-based maintenance task is a monthly visual inspection, while on the other hand an example of a condition-based task is maintenance based on breaker oil condition.

Voltage classification within PG&E are as follows: Transmission class – operate at a system nominal voltage of 60kV or higher; Distribution class – operate at a system nominal voltage of 4kV to below 60kV. Circuit breaker interrupting mediums include air, oil, vacuum, and sulfur hexafluoride (SF6).

Reclosers are traditional Distribution equipment but used as circuit breakers in substations for limited applications. Reclosers are used in substations as a more cost-effective application in cases where non-critical customers are served and space constraint exists. They are installed at Substation Distribution nominal voltage class level. The design and electrical characteristic of reclosers are limited to low load current, low interrupting capacity, and low switching compare to vacuum circuit breakers.

Circuit breakers are installed or replaced inside substations based on their age and condition, and for reliability and capacity needs. Circuit breakers used for line protection, referred to as feeder or line beakers, are designed to operate and de-energize distribution or transmission lines upon detecting faults.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to maintain circuit breakers consistent with the procedures described above.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

#### 5.3.3.3 Covered Conductor Installation

PG&E does not have a stand-alone targeted program to replace bare conductor with covered conductor. Instead, PG&E will install covered conductor and replace existing poles, cross-arms, and other equipment as part of PG&E's System Hardening Program. PG&E System Hardening Program is discussed in Section 5.3.3.17 below. Furthermore, all new construction of more than 4 spans will require covered conductor and compliance with TD-9001B-009, excluding maintenance and emergency.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** See Section 5.3.3.17.
2. ***Before the next annual update:*** See Section 5.3.3.17.
3. ***Within the next 3 years:*** See Section 5.3.3.17.
4. ***Within the next 10 years:*** See Section 5.3.3.17.

#### 5.3.3.4 Covered Conductor Maintenance

PG&E does not contemplate creating a dedicated program for covered conductor maintenance. Instead, covered conductor will be maintained as part of routine overhead maintenance conducted through the GO 165 Program, which is focused on the identification, assessment, prioritization, and documentation of compelling abnormal conditions, regulatory conditions, and third party caused infractions that negatively impact safety or reliability. These conditions are identified during patrols and inspections of PG&E's distribution facilities, and may occur as a result of operational use, degradation, deterioration, environmental changes or third-party actions.

Costs for PG&E's non-enhanced overhead maintenance are shown in Section 5.3.3.1.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will include any areas where covered conductor has been installed in its regularly scheduled GO 165 program of patrols and inspections and will seek to timely address any maintenance conditions that are identified.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.5 Crossarm Maintenance, Repair, and Replacement

PG&E has an extensive condition monitoring program for overhead assets, including crossarms, in accordance with requirements in GO 165. PG&E conducts annual patrols in urban areas and bi-annual patrols in rural areas, visually looking for damaged equipment and other defects on the distribution overhead system. A detailed inspection is performed every 5 years, looking for any damaged or deteriorated equipment. Through these inspection programs, PG&E identifies approximately 4,700 crossarms for maintenance, including replacement and repairs, every year. Some crossarms are being replaced, in conjunction with pole and conductor replacement, as part of PG&E's System Hardening Program, discussed in Section 5.3.3.17 below.

The crossarm maintenance program is considered a fully implemented program, as crossarms have been replaced and repaired for many years and funding is part of the GRC. Crossarms identified for maintenance each year by various inspection programs are scheduled for replacement in the following 3 to 24 months, depending on condition and location. Crossarms within the Tier 2 and 3 HFTD areas are completed within 12 and 6 months of identification, respectively.

PG&E inspectors and construction supervisors conduct post-job reviews for crossarm maintenance work performed by contract and internal crews to ensure the work matches the work call for in the job order and is in compliance with GO 95 requirements. No additional metrics are tracked related to crossarm maintenance.

The crossarm maintenance program is continuing to evolve and improve annually. The current focus is to meet Tier 2 and 3 HFTD area deadlines, reducing overall system risk.

For PG&E's transmission lines, crossarm maintenance is generally performed as part of the overhead inspection program with repairs and/or replacement done as determined necessary during these inspections. Further details can be found in the maintenance and inspection Section 5.3.4. It is a fully implemented program, as crossarms have been reinforced or replaced for many years and funding is part of the Transmission Owners Tariff Rate Case. Crossarms identified for replacement or repair each year by the inspection programs are scheduled for replacement or repair in the following 3 to 24 months, depending on condition and location. Crossarms within the Tier 2 and 3 HFTD areas are completed within 12 and 6 months of identification, respectively. Crossarms may be reinforced immediately if warranted by condition and location.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to repair/replace crossarms pursuant to its existing condition-based maintenance program as described above.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.6 Distribution Pole Replacement and Reinforcement, Including with Composite Poles

PG&E has an extensive condition monitoring program for wood poles in accordance with requirements of GO 165. PG&E conducts annual patrols in urban areas and bi-annual patrols in rural areas, visually looking for damaged poles and other defects on the distribution overhead system. PG&E performs a detailed inspection every 5 years to look for external damage or deterioration, as well as an intrusive inspection approximately every 10 years to identify internal or below ground decay that may be present in the pole. Through these inspection programs PG&E identifies approximately 10,000 wood poles for replacement and 4,000 wood poles for reinforcement every year. Poles identified for reinforcement are in good condition, except for decay around the ground line. By installing a steel truss and banding it to these poles PG&E can restore the strength of the pole to 100%. In addition, the pole replacement program replaces poles that need to be upgraded to support the attachment of telecommunications or cable companies' facilities. Finally, the pole replacement program replaces poles that PG&E has determined are overloaded.

Both pole remediation programs (replacement and reinforcement) are considered fully implemented, as poles have been remediated for many years and funding is part of the GRC. Poles identified for remediation each year by the various inspection programs are scheduled for replacement in the following 3 to 24 months, depending on condition and location. Poles within the Tier 2 and 3 HFTD areas are completed within 12 and 6 months of identification, respectively.[10]

PG&E inspectors and construction supervisors conduct post-job reviews for pole replacement work performed by contract and internal crews to ensure the work matches the work called for in the job order and is in compliance with GO 95 requirements. In addition, the pole replacement program was monitored by tracking the on-time completion of pole replacements. This metric was reported weekly to Distribution Operations leadership. The on-time performance metric target is 95 percent. The 2016, 2017 and 2018 performance levels were 93, 93 and 94 percent. In 2019, PG&E transitioned to a risk-based prioritization model and discontinued tracking the on-time performance metric.

The pole reinforcement program is part of the Pole Test & Treat (PT&T) program. As such, quality control for pole reinforcement is conducted by a team of PT&T inspectors. Each week a sample of poles selected from pole reinforcement projects completed the previous week is audited for compliance with the reinforcement specification. Projects that do not meet a 95 percent compliance threshold are rejected and must be re-reinforced and re-audited. The 2016, 2017 and 2018 quality levels were 94, 95 and 97 percent.

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**10** PG&E also replaces some failed poles on an emergency basis as part of its Routine Emergency and/or Major Emergency Programs. In addition, PG&E will be replacing existing poles as part of its System Hardening program, discussed in Section 5.3.3.17 below, where such replacement is necessary to satisfy the requirements of that program.

Both pole remediation programs are continuing to evolve and improve annually, with the ultimate goal to meet 100% quality. The current focus is to meet Tier 2 and 3 HFTD area deadlines, reducing overall system risk.

PG&E believes that it may be appropriate to use non-wood (e.g., steel or composite) poles as replacement poles in at least some HFTD locations. PG&E has been evaluating both wood and non-wood poles to determine which options are the most reasonable and effective. In 2019, PG&E, along with San Diego Gas and Electric Company (SDG&E) and Southern California Edison Company (SCE), tested 11 different sets of poles (33 total) from 7 different manufacturers for fire resiliency via burn tests and fire prevention via simulated tree strikes. The poles tested include steel, ductile iron, concrete, composites with and without fire resistant coatings or coverings, and wood with fire resistant coverings. Results from the tree strike simulations yielded very similar system response for all poles tested and were comparable to typical wood poles. The burn tests similarly had relatively good results for most of the poles considered. PG&E will continue to evaluate these options, as well as considering other factors such as cost, availability, and longevity as it decides whether (and in what circumstances) it is appropriate to use composite poles as replacement poles.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to replace/reinforce poles pursuant to its existing condition-based maintenance program as described above. PG&E will continue to evaluate the reasonableness of using composite poles as replacement poles.

2. ***Before the next annual update:*** PG&E will continue to replace/reinforce poles pursuant to its existing condition-based maintenance program as described above. PG&E may adjust or refine its program based on new information or technology.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.7 Expulsion Fuse Replacement

PG&E proposes to eliminate non-exempt overhead line equipment in HFTD areas over time. Non-exempt equipment is equipment that may generate electrical arcs, sparks, or hot material during its normal operation. Due to these characteristics, PRC Section 4292 requires all utilities to maintain at least a 10-foot clearance of vegetation from the outer circumference of any pole that has non-exempt equipment. However, CAL FIRE tests and certifies some equipment as exempt from the vegetation clearance requirements of PRC Section 4292 where it is determined to be safer to use.

To address increasing wildfire risks caused by changing climate conditions, PG&E created a program to replace non-exempt fuses and cutouts to further reduce fire risk. The replacement of non-exempt equipment with exempt equipment will further reduce fire risk since the exempt equipment is considered “non-expulsion” and does not generate arcs/sparks during normal operation.

Starting in 2019, PG&E forecasts replacing approximately 625 fuses/cutouts, and other non-exempt equipment identified on the pole each year for seven years in Tier 2 and Tier 3 HFTD areas. In addition to non-exempt fuse replacement, PG&E has created a program to replace non-exempt surge arresters, which is discussed in Section 5.3.3.17.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue implementing the non-exempt fuse replacement program described above at a forecast rate of 625 fuses/cutouts per year.

2. ***Before the next annual update:*** PG&E will continue implementing the program described above. PG&E may make adjustments to the program based on lessons learned in 2020.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.8 Grid Topology Improvements to Mitigate or Reduce PSPS Events

PG&E has planned a number of initiatives to reduce and mitigate the impacts of PSPS events in 2020 and beyond. The select initiatives related to grid topology improvements are described below.

#### Transmission Line Assessments

PG&E's PSPS Program has established criteria for when overhead electric transmission line facilities can be excluded from being de-energized in PSPS events. These criteria include assessing the following for transmission line facilities within high-risk areas projected to experience PSPS weather conditions: (1) health of all assets on the transmission line facility; (2) historical operating performance; (3) vegetation risks; and (4) fire spread potential. By applying these criteria, PG&E will be able to consider whether to exclude certain transmission lines from de-energization during a PSPS event, when safe to do so which would reduce the risk of service interruptions to customers served by those transmission lines during PSPS events.

Prior to next fire season, PG&E will be evaluating all 552 transmission lines in HFTD areas to determine which lines can be removed from future PSPS Event scope.

#### Transmission Line Sectionalizing

PG&E has been installing SCADA switches on transmission lines to support faster restoration during outage events for the last few years. PG&E's plan is to enhance transmission segmentation strategies including additional SCADA-controlled switching. PG&E has identified various transmission lines where additional switching devices will be utilized to further sectionalize transmission lines to be able to minimize the number of customers being impacted by PSPS outages. In 2019, the program added 54 new SCADA transmission switches and another 23 are planned for 2020 to provide switching flexibility as well and sectionalizing for PSPS events

#### Distribution Segmentation and System Hardening

PG&E's plan is to enhance its distribution segmentation strategies including: (a) adding automated sectionalizing devices (targeting 592 such devices in 2020); (b) circuit reconfiguration / pre-PSPS Event switching; and (c) additional system hardening to support PSPS switching. PG&E has identified various distribution lines where additional switching devices coupled with targeted system hardening may be utilized to further sectionalize distribution feeders to be able to minimize the number of customers being impacted by PSPS outages.

#### Microgrids for PSPS Mitigation

PG&E is proposing to pursue resiliency and reliability improvements to mitigate the customer impacts of PSPS through permanent and temporary front-of-the-meter

microgrid solutions, also referred to as Resilience Zones.[11] Microgrids can reduce the number of customers de-energized during PSPS events, as well as provide additional impact mitigation by energizing shared community resources that support the surrounding population.

2019 Implementation: In its 2019 WMP, PG&E described its plan to operationalize one pilot mid-feeder microgrid using a pre-installed interconnection hub and temporary generation. Implementation concluded successfully when the pilot site (Angwin Resilience Zone in Napa County) reached operational readiness in September 2019. PG&E successfully utilized temporary generation at its pilot mid-feeder microgrid site as well as in three additional safe-to-energize substations in Calistoga, Grass Valley, and Placerville to safely re-energize thousands of customers during the October and November PSPS events.

Approximate Timeline for 2020 and Beyond: Building on the critical PSPS impact mitigation role that front-of-the-meter microgrids played in 2019, PG&E's goal is proposing, subject to Commission approval and receipt of additional regulatory approvals, to operationalize additional microgrids for PSPS mitigation before the next annual update. PG&E is expanding its projects to include substation-sited and mid-feeder microgrids, using a combination of mobile and permanent generation depending on the most feasible technology application. While PG&E is pursuing an aggressive acceleration of microgrid deployments in 2020, its timeline is contingent on several factors including land availability and permitting, construction resources, input from the Commission and community representatives, and bids received as part of the DGEMS Request for Offers. The microgrid deployment timeline for 2021 and future years will be informed by PG&E's near-term projects.

Site selection: These microgrids will vary in location, size, and design. In determining where to site microgrids for PSPS impact mitigation in 2020, PG&E is using a multifaceted approach that seeks to support the greatest number of customers via substation energization where possible, while supporting community resilience through the energization of shared resources in areas where large-scale substation deployments are not feasible in the near term. As a starting point in site selection, PG&E assesses the expected relative frequency of future PSPS impacts through analysis of historical meteorological data, prior PSPS event impacts, and parallel work-in-progress directed at reducing future impacts. Additionally, PG&E seeks to complement its internal location screening process for microgrids with county and local government collaboration to ensure that local priorities help shape site selection and design where technically feasible.

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**11** The targeted units and spend associated with Microgrids for PSPS mitigation in this 2020 WMP are provided for informational purposes only. Microgrids in this category may include temporary mid-feeder microgrids, temporary microgrids located at substations, temporary single-customer microgrids to power critical facilities needed to ensure societal continuity, and permanent distributed generation-enabled microgrid services (DGEMS) at substations. The actual units operationalized and spend incurred may change.

While in certain areas PG&E may be able to operationalize microgrids for PSPS mitigation without grid topology modifications, at most sites this initiative will require some of the following changes to grid infrastructure:

Substation Make-Ready Infrastructure: In January 2020, PG&E submitted testimony in the Microgrid and Resiliency Strategies Rulemaking (R.19-09-009) seeking approval of cost recovery to engineer and construct additional infrastructure at substations in order to make them ready for the integration of permanent or temporary distributed generation resources (the Make-Ready Program). This would enable PG&E to locate distributed generation resources at prioritized PG&E substations with the goal of providing continuous service to the greatest number of customers where it is projected to be safe to do so during PSPS events. While no two substations are configured the same, PG&E anticipates that the following will be required at each substation to allow the substation to operate in islanded mode when power from the broader grid is shut off: ground grids, circuit breakers or line reclosers with sync scope capabilities, fuse disconnect switchgear, additional substation bus infrastructure, and additional construction work.

Pre-Installed Interconnection Hubs: Building on its 2019 pilot project,[12] PG&E expects to expand its deployment of pre-installed interconnection hubs that energize mid-feeder microgrids by allowing for safe, rapid connection of temporary generation outside of substations. As with the 2019 pilot Resilience Zone in Angwin, mid-feeder microgrids are designed to energize islanded areas within towns impacted by PSPS events, thereby enabling some community resources to continue serving the surrounding population. Generally, pre-installed interconnection hubs (PIHs) will consist of pad-mounted transformer(s) and associated interconnection equipment, ground grid, grid isolation and protection devices (reclosers and switches), and security fencing.

Isolation Devices: These devices allow PG&E to safely isolate the section to be energized from the larger grid during a Public Safety Power Shutoff event. In some instances, PG&E may need to install new devices or replace existing devices.

**Establishing PSPS Thresholds for Hardened Distribution Facilities**

In 2019, PG&E completed over 2,500 miles of enhanced vegetation management trimming along power lines and hardened over 170 miles of electric distribution facilities within HFTDs. As a result of this effort, as well as other wildfire risk reduction efforts that PG&E undertook, ignitions attributed to PG&E's equipment in HFTDs decreased by 24% in 2019, when compared to the average of the three prior years (2016-2018).

One of the other initiatives that contributed to reduced ignitions attributed to PG&E's equipment was the execution of its PSPS Program, where PG&E proactively de-energized high-risk electric power lines to eliminate the likelihood of PG&E's electric power lines creating an ignition that could result in a catastrophic wildfire. Although PG&E's execution of its PSPS program accomplished its objectives of preventing ignition of any deadly wildfires while minimizing public safety impact, PG&E recognizes there are many opportunities to improve not only the execution of its PSPS program, but

**12** See Section 4.6.2.2 in PG&E's 2019 WMP.

to also reduce the required scope of future events and the associated customer impact (as well as to reduce overall wildfire risk from PG&E assets) through execution of its distribution asset hardening program.

**Refining Criteria for Hardened Distribution Facilities During Potential PSPS Events**

PG&E's PSPS Program has established criteria for when overhead electric transmission line facilities can be excluded from being de-energized in PSPS events. PG&E is working to develop similar operating criteria for when overhead *distribution* line facilities located within HFTDs can remain in-service during PSPS weather conditions. Although PG&E has completed over 170 miles of system hardening of its distribution facilities, due to the limited performance history of hardened overhead distribution facilities during PSPS weather conditions, PG&E will be performing additional analysis to determine under what conditions these lines can safely remain energized.

*Approach to Performance Data for Overhead Hardened Distribution Facilities*

PG&E will obtain performance data for portions of its overhead system that have been hardened through two initiatives: (1) Simulating the performance of all fire hardened overhead distribution facilities using existing failure mode data and Finite Elements Analysis (FEA); and (2) Monitoring, collection, and assessment of field performance of hardened distribution facilities.

1. Evaluate Wind and Vegetation Strike Resilience Performance via Finite Element Analysis: PG&E plans to perform Finite Element Analysis (FEA) to simulate the operating performance of overhead distribution facilities that have been hardened against various wind and vegetation strikes that these facilities could experience during extreme fire-weather events. This analysis will model the hardened distribution facilities and the current inventory of vegetation around those facilities, collected via LiDAR from the 2019 WSIP. FEA simulations will determine which trees in the vicinity of electric facilities could lead to a failure of the hardened facilities under extreme weather conditions. Specifically, this analysis will determine for each hardened facility, the location and size of tree and/or tree branches, angle of trajectory launch of tree and/or tree branches, and the magnitude of the impact of overstrikes along with the magnitude and direction of wind gusts that that could create damage on the hardened facilities where an ignition is likely.

2. Determine Safety Factor Requirements and Correlate to Historical Climatology Analysis: PG&E plans to utilize historic outage and ignition data and the most up-to-date FEA to calculate performance improvements for the distribution facilities that have been hardened and/or undergone enhanced vegetation management. The results of the system hardening improvements and FEA would be used to determine safety factors for locations where there are hardened distribution facilities. The safety factors developed would consider projected local weather conditions and vegetation risks around the hardened overhead facilities. Once safety factors are computed for the hardened distribution facilities, PG&E plans to review its OPW meteorology model for predicting future outages under various extreme wind conditions for opportunities to adjust the OPW model to reflect the additional safety factors gained for hardened distribution facilities. Since PG&E's OPW model relies

on historical PG&E operating performance information, it does not yet have enough historical data on the operating performance on hardened distribution facilities to factor in the increased strength and resiliency of those facilities. However, PG&E should be able to use historic and/or simulated performance information from the FEA to establish simulated safety factors for hardened facilities, which could then be used to draft criteria and local condition thresholds, which if not met could exclude certain hardened distribution facilities from being de-energized in PSPS events, subject to projected extreme weather conditions. In addition, PG&E will identify additional safety factors for hardened facilities, determine residual local ignition risk, and develop risk-informed local corrective action plans that could include additional inspections near time of weather events, to address specific outstanding risk drivers based on local and regional operating conditions.

3. Monitor and Collect Performance Information for Deployed Hardening Distribution Facilities: From the 2019 PSPS events, PG&E has collected and analyzed field information around the hazards and/or damage to its hardened distribution facilities to build its knowledge around the performance of hardened facilities. Over the next several years, PG&E plans to monitor and collect information on the operating performance of its hardened distribution facilities to be able to substantiate the results obtained through its FEA of its hardened facilities. As field data and industry information is obtained that validate or directionally validate the FEA results of hardened facilities, PG&E will be able to adjust its PSPS criteria for its hardened distribution facilities on a location by location basis.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will evaluate all its transmission lines located in HFTD areas to determine whether they meet PG&E's criteria for excluding them from the scope of de-energization during PSPS events. PG&E plans to install 23 additional SCADA switches on transmission lines in 2020 to provide switching flexibility as well as sectionalizing for PSPS events.

2. ***Before the next annual update:*** See above. In addition, PG&E plans to continue operationalizing microgrid installations; the precise scope and schedule for these installations will be based evaluation of the current program and best available information.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.9 Installation of System Automation Equipment

PG&E has had a robust automation program for many years. Currently, 97% of distribution substations are equipped with SCADA and nearly 10,000 automated devices (switches and reclosers) have been installed throughout the distribution system. In 2018 and 2019, the focus was adding SCADA functionality to all reclosers and distribution breakers (excluding 4 kV breakers) within the Tier 2 and 3 HFTD areas. The effort to add SCADA capability to all line reclosers (737 devices) was completed in June 2019. In addition, SCADA capability was added to 17 circuit breakers in 2019, leaving just 11 breakers within the fire areas (excluding 4kV) to complete in 2020.

In addition, in the near term, the distribution line automation program will target life cycle control replacements of legacy 4C controllers (250 reclosers) to ensure reliable operation of reclosers.

Also, in an effort to further sectionalize distribution circuits and limit the duration as well as the number of customers impacted by PSPS events, PG&E is proposing to install additional line reclosers at Tier 2 and Tier 3 HFTD boundaries. In addition to the automation programs, PG&E is also evaluating different protection schemes and equipment that may further reduce the likelihood of a fire ignition when a system failure occurs. The program includes:

- Fusesavers™: Fusesavers™ enable localized isolation of all phases of a line when a problem is detected on only one or two phases. For example, if a single wire down on a three-phase line is detected, Fusesavers™ can automatically and locally de-energize all three phases. Installing these devices can also create additional points where lines can be segmented to support other wildfire risk reduction programs such as PSPS.

- High Impedance Fault Detection: PG&E is piloting and proposes to deploy newer protection capabilities of reclosers and circuit breakers that increase the ability to detect high impedance faults.

- Increased Protection Sensitivity: PG&E is evaluating the use of more sensitive protection settings and use of fast curves set on reclosers and circuit breakers. The proposed settings and use of fast curves would reduce the amount of energy experienced when a system failure occurs. This may lower the potential for a fire ignition to occur. The proposed protection schemes, however, could reduce the ability to coordinate with protective devices downstream and will lead to an increase in the size and duration of outages.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will pursue the system automation initiatives described above including adding SCADA capability to circuit breakers, installation of transmission SCADA switches, replacement of legacy 4C controllers and installation of additional sectionalization devices. PG&E is also evaluating new proposed protection schemes that it will deploy in the future when and if appropriate.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above. PG&E will continue to monitor SCADA device and system performance. PG&E will create replacement plans when device or system failure rates exceed acceptable levels.

### 5.3.3.10 Maintenance, Repair, and Replacement of Connectors, Including Hotline Clamps

There are no specific programs associated with connector replacement in distribution. All replacements are incorporated into Distribution System Hardening (discussed in Section 5.3.3.17) and distribution maintenance. For PG&E's transmission lines, maintenance of connectors is generally performed as part of the overhead inspection program with repairs and/or replacement done as determined necessary during these inspections. Further details can be found in Section 5.3.4.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to maintain, repair and/or replace connectors pursuant to its established condition-based maintenance programs. PG&E will also replace existing connectors with new equipment on facilities that are hardened as part of the System Hardening Program.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.11 Mitigation of Impact on Customers and Other Residents Affected During PSPS Event

PG&E will work to improve access to electricity for customers and other residents during PSPS events. PG&E plans to install and operate local generation equipment at the community or household level, including by building out of microgrids to reduce the number of customers impacted in safe-to-energize areas as well. PG&E also may deploy backup generation to individual facilities in exceptional circumstances.[13] PG&E's microgrid plans are discussed in Section 5.3.3.8. PG&E's backup generation plans are discussed in Section 5.6.2.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** See discussion of microgrid/resilience zone plans in Section 5.3.3.8 and discussion of backup generation plans in Section 5.6.2.
2. ***Before the next annual update:*** See above.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** See above.

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**13** PG&E notes that backup generation does not require modification to grid design or system hardening, which is the topic of Section 5.3.3, but it does provide access to electricity at the individual customer level.

### 5.3.3.12 Other Corrective Action

Substation Animal Abatement: PG&E has been conducting an animal abatement program for its substations, with reliability (i.e., lower customer outage) as the main driver. The program was expanded in 2018 to address wildfire risks. Animal abatement was identified during the 2019 WSIP as a necessary mitigation to minimize fire ignition, specifically in Tier 2 and Tier 3 HFTD areas. The animal abatement program mitigates the risks to safety and reliability at substations prone to outages resulting from animal contacts. Animal contacts at sites that do not meet guidelines for defensible space may result in fire ignition; however, the risk of wildfire is low considering the history of substation animal contacts not resulting in wildfire and the progress of the existing capital animal abatement program. Animal contacts are more likely to be a contributing cause which can exacerbate the deterioration of existing equipment, which may result in a catastrophic failure that can project ignited materials into HFTD areas. Substations within HFTD areas requiring animal abatement were evaluated utilizing the defensible space criteria and WSIP. Thus far, 59 locations have been identified as requiring animal abatement; 18 were completed in 2019 and the remaining are being prioritized for completion.

Transmission Line Programs/Initiatives: PG&E has many corrective actions to enhance and ensure the strength of the transmission system. A few major initiatives are:

- Steel structures with the possibility of lead-based paint have been inspected to determine the actual coating type. A program has been begun in order to coat those structures identified with the lead-based paint to be recoated using non lead-based paint. This program prolongs the life expectancy and overall health of the steel structures. Over the next several years, the towers identified will be recoated in order to reduce environmental and safety risks, especially near schools, homes and agricultural areas.

- The replacement, reinforcement and PT&T program described in Section 5.3.3.6 also applies to Transmission wood poles, based on inspections further discussed in Section 5.3.4. As with the distribution program, it is a fully implemented program, as poles have been replaced and/or reinforced for many years and funding is part of the Transmission Owners Tariff Rate Case. transmission poles identified for replacement or reinforcement each year by the various inspection programs are scheduled for reinforcement in the following 3 to 24 months, depending on condition and location. Transmission poles within the Tier 2 and 3 HFTD areas are completed within 12 and 6 months of identification, respectively. Poles may be replaced or reinforced immediately if warranted by condition and location.

- Insulators in highly contaminated areas have been observed as more troublesome than their counterparts in non-contaminated areas. Insulators that are determined to have these contamination issues have been targeted in the insulator washing program, which creates subsets of insulators to be periodically washed to prolong their life expectancy and overall health.

- Existing idle transmission facilities within HFTD areas can be de-energized to mitigate risk of wildfire. Additionally, safety concerns are addressed through the inspection and maintenance process. Idle facilities are also prioritized based on risk

for either removal or future utilization, depending on system requirements for each location.

- Nearly all birds and their nests are protected by the Federal Migratory Bird Treaty Act of 1918 and California Fish and Game Code. PG&E's standards establish the requirements and responsibilities for an Avian Protection Plan that reduces the risk to migratory and threatened and endangered birds and enhances the Company's customer service and regulatory compliance.

- The NERC Alert program is necessary to comply with the October 7, 2010 NERC Recommendation to Industry for "Consideration of Actual Field Conditions in Determination of Facility Ratings." The NERC recommendation directs utilities first to determine if their Facility Ratings Methodology will produce appropriate ratings, even when considering differences between design and actual field conditions. Second, the NERC recommendation directs utilities to review their transmission facility ratings to confirm that any differences observed between design and actual field conditions are within the design tolerances as defined by the utilities Facility Ratings Methodology. Third, recipients of this recommendation were directed to submit a plan to NERC describing how an assessment of its facilities will verify that actual field conditions conform to the design tolerances in accordance with its Facility Ratings Methodology.

- Transmission System Capacity focuses on increasing the electric transmission system capacity either via system expansion or changes in system configuration and operation. The strategy for the Transmission Line Capacity and Transmission Substation Capacity programs are similar and often work in tandem. The goal of both programs is to maintain continuity of service to its customer in a cost-effective manner. Transmission system capacity needs are identified through annual transmission system assessment studies, which investigate projected transmission performance based upon forecasted load demand and resource changes over a 10-year planning horizon against applicable NERC, WECC, and CAISO reliability standards and criteria for transmission planning.

Wildfire Safety Inspection Program Distribution Repair Work: As discussed in Section 5.3.4, in 2019, PG&E began a Wildfire Safety Inspection Program or "WSIP" to expedite and expand the routine detailed inspections performed in Tier 2 and Tier 3 HFTD areas. PG&E has completed its extensive inspections of overhead electric distribution facilities and substations in High Fire-Threat District (HFTD) areas as part of the WSIP Program. As a result of these enhanced and accelerated inspections, PG&E identified a substantial amount of repair and replacement work to be completed. In 2019, PG&E completed high priority corrective actions created from deficiencies identified resulting from these enhanced inspections, and will complete the lower priority tags over the next three years. Completion of lower priority tags are prioritized based on location and potential wildfire risk. This wildfire risk is based upon a failure mode and effects analysis, historical asset ignition analysis, wildfire spread and consequence, and egress for each maintenance tag.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will pursue the substation and transmission initiatives described above.
2. ***Before the next annual update:*** See above.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** See above.

#### 5.3.3.13 Pole Loading Infrastructure Hardening and Replacement Program Based on Pole Loading Assessment Program

In 2015, PG&E started its pole loading initiative, which requires specific analysis of pole loading before setting a new pole, in response to multiple GO 95 revisions to address vertical loading due to existing assets on the poles as well as other attachments' impact on pole structure stability. To comply with the GO standards, PG&E implemented a "Tool Modernization" project which enhanced pole loading calculation quality by using Osmose "O-Calc Pro." O-Calc Pro, a software tool that can be used by personnel in the field, enables modeling the pole along with conductors, communication attachments, and guy wires. In addition, PG&E can now model percent wood strength of every pole in the loading calculation tool to provide accurate assessments based on available condition data. The percent wood strength used in the pole loading calculation is provided by PG&E's Pole Test and Treat team and must be from an inspection that has occurred in the last five years.

In 2016, PG&E performed pole loading assessments, which indicate an expected overload rate of less than 1% of PG&E's wood pole population. The poles at highest risk of being overloaded are jointly owned, Class 5 (smallest pole) with both primary and secondary conductors and multiple communication attachments.

In 2019, PG&E initiated a new pole loading assessment proof of concept, via performance of desktop reviews. PG&E is utilizing baseline pole loading calculation models, created using EDGIS data, a series of algorithms and conservative assumptions used to fill in the data gaps and is working with vendors to compare these baseline calculations to third-party imagery (e.g., google streetview/earth, field collected photographs) to either confirm or update the model. This proof of concept has been successful in the pilot population and is expanding to include analysis of poles where additional third-party imagery (e.g., LiDAR, field collected photograph, etc.) has recently been collected.

PG&E has strengthened pole loading model parameters and variables considering historical data with various meteorological factors (e.g., wind speed). Sizing for new and replacement distribution pole installations now considers historical peak wind speeds in areas where they exceed GO 95 defined wind speeds. In order to maximize the likelihood that poles are strong enough to withstand higher wind speeds, a pole loading calculation must be performed both at the loading conditions assumed by appropriate GO 95 conditions (load case) and at a summer peak wind load case (e.g., peak wind for location, 60-degree minimum temperature, no ice). Pole loading models are required to meet the safety factor requirements for both load cases.

PG&E has also increased the required setting depth of a pole in the updated Allowable Overturn Moment table by comparing the values to the ultimate potential ground-line moment for a given pole design. This more stringent requirement supersedes previous PG&E requirements for minimum setting depth and will result in a greater amount of available pole utilization at the equivalent soil overturn strength.

Since the pole loading infrastructure assessment proof of concept was performed in 2019 and the program is beginning in 2020, it is considered a new program. Initially, the program is focusing on assessment of poles in the Tier 2 and 3 HFTD areas, with

the goal to be fully implemented (100% poles analyzed) in these areas in 2024. Poles located in Tier 1 will follow, with the goal to be fully implemented (100% poles analyzed) by 2030. In addition to prioritizing by location, pole assessments are being prioritized using the baseline models and pole characteristics from EDGIS (e.g., small class, multiple circuits, treatment). Poles scheduled for potential replacement as part of the System Hardening program discussed in Section 5.3.3.17 will be assessed prior to replacement to determine whether or not the existing pole can bear the load associated with the covered conductor and other equipment that will be installed as part of the program.

PG&E's estimating and engineering personnel perform quality checks on the desktop reviewed pole loading calculations performed by the contract crews. The assessment program is monitored by tracking the volume of pole loading calculations uploaded to PG&E's database with a "desktop review" or better status (e.g., "field verification" or "issued for construction").

The pole loading assessment program is designed to be a 10-year effort, where roughly 10% of the system is analyzed annually. As PG&E has approximately 2.3 million distribution poles, it is anticipated that roughly 230,000 poles are analyzed for desktop review annually. The ultimate goal is to have analyzed all distribution poles systemwide by 2030.

PG&E is also conducting a Wind Loading Assessment emerging technology project. This project will reduce risk by providing asset intelligence to identify locations that require corrective actions driven by pole safety factors or limitations for wind speeds. The project will leverage existing LiDAR data from Vegetation Management efforts to geo-correct pole locations. Objectives of this project include a greater understanding of failure modes, establishment of a common repository of data gathered, and effectively updating workflows of key asset systems to align with new data strategies. Wind loading segmentation will be performed to identify the wind loading of each asset on a support structure and integrate findings into appropriate systems.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E plans to perform pole loading assessments as described above at a rate of approximately 230,000 poles per year in HFTD Tier 2 and 3 locations through 2024. PG&E will also perform pole loading calculations on poles identified for potential replacement as part of the System Hardening program.

2. ***Before the next annual update:*** See above. PG&E will continue to evaluate the program and may make adjustments based on any new insights gained.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above. Once PG&E has finished assessing poles in HFTD Tiers 2 and 3, it will begin to assess poles in the rest of the system. This transition is expected to take place in 2024, and PG&E currently expects to complete all assessments by 2030.

### 5.3.3.14 Transformers Maintenance and Replacement

Distribution Transformer maintenance will primarily be covered through PG&E's GO 165 program. The GO 165 Program is primarily focused on the identification, assessment, prioritization, and documentation of compelling abnormal conditions, regulatory conditions, and third party caused infractions that negatively impact safety or reliability. These conditions are identified during patrols and inspections of PG&E's distribution facilities, and may occur as a result of operational use, degradation, deterioration, environmental changes or third-party actions. Transformers may by maintained, repaired, or replaced based on their condition as assessed during the GO 165 process. Transformers that fail in connection with an outage may be replaced as part of PG&E's Routine Emergency or Major Emergency programs. PG&E is also replacing certain transformers on circuits that are included in the System Hardening program discussed in Section 5.3.3.17.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to maintain, repair, or replace transformers as warranted by their condition as part of its ongoing GO 165 maintenance program and Emergency programs. PG&E may also replace certain transformers as part of its Grid Hardening program discussed in Section 5.3.3.17.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.15 Transmission Tower Maintenance and Replacement

As with other assets in PG&E's transmission system, transmission structures[14] undergo regular maintenance involving inspections and repairs along with replacements when required. *See* Section 5.3.4 for further information regarding inspection and repairs. The transmission structure maintenance program is a fully implemented program, as structures have been reinforced or replaced for many years and funding is part of the TO Rate Case. Structures identified for replacement or repair each year by the inspection programs are scheduled for replacement or repair in the following 3 to 24 months, depending on condition and location. Structures within the Tier 2 and 3 HFTD areas are completed within 12 and 6 months of identification, respectively. Structures may be reinforced immediately if warranted by condition and location.

For risk-informed asset replacement decisions beyond inspection findings, the following process is followed. Through various models and analysis discussed in part in Section 5.3.3.18, transmission circuits were risk-ranked, and then further reviewed structure-by-structure to determine and ensure their asset through comprehensive replacement projects when necessary. The primary goal being the reduction of risk on a circuit-based level. There are multiple data sources that feed into this process, including but not limited to asset condition, location, parameters, and age as well as reference information on assets life cycle. Using this process, PG&E has identified several circuits that will undergo capital projects in the coming years.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to maintain, repair, or replace transmission towers as warranted by their condition as part of its ongoing maintenance programs.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

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**14** Please note that for the purpose of this section, a transmission tower refers to all transmission structures.

### 5.3.3.16 Undergrounding of Electric Lines and/or Equipment

PG&E plans to underground some portion of its distribution system to reduce risks associated with wildfires as part of its System Hardening program, discussed in Section **5.3.3.17** below. During the assessments of the transmission circuits mentioned in Section 5.3.3.15 regarding transmission structure maintenance and replacement, the possibility to underground certain transmission circuits or portions of circuits in feasible locations is considered as part of a high level “alternative analysis.”

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** See Section 5.3.3.17 for a discussion of undergrounding distribution circuits.

2. ***Before the next annual update:*** See Section 5.3.3.17 for a discussion of undergrounding distribution circuits.

3. ***Within the next 3 years:*** See Section 5.3.3.17 for a discussion of undergrounding distribution circuits.

4. ***Within the next 10 years:*** See Section 5.3.3.17 for a discussion of undergrounding distribution circuits.

### 5.3.3.17 Updates to Grid Topology to Minimize Risk of Ignition in HFTDs

PG&E's initiatives to update grid topology to the minimize risk of wildfire ignition in HFTDs are gathered together under the rubric of System Hardening. Based on its experience of recent wildfires in its service area, benchmarking with other utilities, and its analysis of CPUC reportable ignitions on its system, PG&E developed design guidance for System Hardening, both for rebuilding areas that have experienced wildfires and for proactively hardening facilities in HFTD areas to reduce the risks and consequences of wildfire ignitions. In addition to procedures for hardening overhead circuits in place, PG&E's System Hardening program includes some targeted undergrounding of overhead circuits (for example, in order to protect critical egress routes or dense vegetation creates an especially high risk of trees falling into overhead lines).

### 5.3.3.17.1 System Hardening Design Guidance

Utility Bulletin: TD-9001B-009 Rev 2 “Fire Rebuild Design Guidance for System Hardening,” which was first published on October 2, 2018 and continues to evolve, is based on several key foundational elements:[15]

- Primary Conductor Replacement: Replacement of bare overhead primary (high voltage) conductor and associated framing with conductor insulated with abrasion-resistant polyethylene coatings (sometimes referred to as covered conductor or tree wire). Installing covered conductor will help to further reduce the likelihood of faults due to line to line contacts, tree-branch contacts, and faults caused by animals.

- Secondary Conductor Replacement: Replacement of lower voltage (480V and below) conductor with insulated conductor. Installing covered conductor on secondary lines will have similar benefits to installing it on primary lines.

- Pole Replacements: All poles are evaluated for strength requirements to withstand new heavier covered conductor. Pole material is being evaluated for fire resiliency and strength.

- Replacement of Non-Exempt Equipment: Replacement of existing primary line equipment such as fuses/cutouts, and switches with equipment that has been certified by CAL FIRE as low fire risk. This replacement work will eliminate overhead line equipment and devices that may generate exposed electrical arcs, sparks or hot material during their operation.

- Replacement of Overhead Distribution Line Transformers: Upgrading transformers to FR3 Fluid as part of PG&E’s current equipment standards (PG&E implemented the transition from mineral oil to FR3 in 2014). The newer transformers are filled with fire resistant FR3 insulating fluid, a natural ester derived from renewable vegetable oils—providing improved fire safety, transformer life, increased load capability, and environmental benefits. In addition, new transformers are manufactured to achieve higher Department of Energy electrical efficiency standards.

- Covered Conductor: Replacement of bare conductors with three-layer design of covered conductors (also known as tree wire) will reduce the likelihood of faults due to trees, branches, animals, or birds contacting lines, and will minimize situations where wires slap together in high winds, which can generate sparks or molten metal. The HFTD areas within PG&E’s service territory have a high volume of vegetation with large overhangs and ground fuels; PG&E expects covered conductor to be an effective risk mitigation in these areas. The covered conductor will also often be higher gauge that the wire it replaces, which will reduce the potential for failures related to smaller conductors. PG&E is replacing bare

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**15** The requirements listed are current standard requirements to be used in new construction. The requirements outlined in this bulletin are not intended or required for maintenance and emergency work (unless the emergency is in follow-up to a fire event, requiring system re-build).

overhead distribution primary (high voltage) and secondary (low voltage) conductor with covered conductor in HFTD areas.

There is a limited risk that covered conductor may introduce higher impedance faults compared to bare conductor depending on how the conductor lands on the ground. However, an additional benefit of covered conductor is that it may be less likely to cause an ignition on the ground, as there is a lower potential for arc points along the line due to fewer contact points with the ground. Further, PG&E is currently piloting more sensitive protection for high impedance faults that may mitigate the additional high impedance risk. Additionally, PG&E is currently participating in two National Electric Energy Testing Research and Applications Center (NEETRAC) projects on covered conductors. One of these projects will focus on the available covered conductor technologies and point out known gaps in knowledge of covered conductor systems, outline the known advantage and disadvantages, and discuss the life cycle cost of installing covered conductors. The second project focus on the development of a fire initiation event trees from covered conductors. The purpose of this project is to codify knowledge of fire performance of the overhead distribution system including covered conductors using fault tree methodology; to establish composite industry event data, and to understand behavior and interactions.

- Pole Replacements: Due to the replacement of bare wire with heavier covered conductor, as well as the increased stringency of pole loading requirement discussed in Section 5.3.3.13 above, PG&E anticipates that most existing poles will need to be replaced in locations where System Hardening occurs. PG&E believes that it may be appropriate to use non-wood (e.g., steel or composite) poles for System Hardening applications because they may be more fire resistant/resilient. PG&E has been evaluating both wood and non-wood poles to determine which options are the most reasonable and effective. In 2019, PG&E, along with SDG&E and SCE, tested 11 different sets of poles (33 total) from 7 different manufacturers for fire resiliency via burn tests and fire prevention via simulated tree strikes. The poles tested include steel, ductile iron, concrete, composites with and without fire resistant coatings or coverings, and wood with fire resistant coverings. Results from the tree strike simulations yielded very similar system response for all poles tested and were comparable to typical wood poles. The burn tests similarly had relatively good results for most of the poles considered. PG&E will continue to evaluate these options, as well as considering other factors such as cost, availability, and longevity as it decides which poles to use in the System Hardening program.

- Undergrounding: As PG&E conducted inspections of portions of circuits planned for system hardening, it identified a number of circuits, or portions of circuits, in HFTD areas where it may be prudent and feasible to underground the overhead distribution lines. These circuits are typically in locations along main egress routes—that need to remain clear for first responders and evacuation 12 individuals—where a rebuilt overhead circuit could still pose a threat of 13 burned or downed poles blocking access in the event of a wildfire. Other circuits where undergrounding may be prudent involve areas with dense vegetation that pose an elevated risk of a tree fall onto an overhead line. PG&E has determined that in these instances, undergrounding of portions of circuits may be reasonable and prudent, and increases the safety of PG&E customers and the communities that it serves.

PG&E anticipates that only a relatively small proportion of the circuit miles included in the System Hardening Program will be undergrounded. The balance between overhead hardening and underground will be determined as the projects are scoped; the scoping process is described below.

PG&E plans use the procedures and equipment to underground facilities as part of the System Hardening program and it does for other undergrounding projects.

### 5.3.3.17.2 Distribution System Hardening

The Distribution System Hardening Program is an ongoing, long-term capital investment program to rebuild portions of PG&E's overhead electric distribution system. Under this program, PG&E is upgrading approximately 7,100 circuit miles in Tier 2 and Tier 3 HFTD areas.

In 2018, PG&E initiated construction pilots to evaluate various overhead conductor and equipment configurations, including potential undergrounding, as well as to develop best practices. In 2019, PG&E began the System Hardening Program proper, with a target of completing 150 circuit miles by the end of the year. In 2020-2022, PG&E forecasts completing approximately 1,000 distribution circuit miles (about 200 miles in 2020, approximately 350 in 2021 and 440 in 2022). PG&E ultimately intends to complete work on 7,100 distribution circuit miles.

The first work to be included in this program was certain work, such as conductor replacement projects and locations targeted by investigations by our outage review teams, that have been identified in the field prior the initiation of the program. To the extent these projects were located in Tier 2 and Tier 3 HFTD areas, PG&E updated their design consistent with the Fire Rebuild Design Guidance for System Hardening and incorporated it into the System Hardening plan.

A much larger portion of the plan is driven by fire-risk ignition modeling and a risk-informed prioritization approach for mitigation measures. This approach considered the following factors:

- Likelihood of Ignition: Ignition likelihood was determined based on a regression analysis predicting ignitions at the circuit level. This analysis considered:
  - Exposure (# of assets)
  - Failure Mode Analysis (Asset failure risk by asset type)
  - Asset condition (# of corrective notifications)
  - Historical incidents (# of outages and ignitions)
- Likelihood of Spread: Spread likelihood was determined based on a study conducted by PG&E and a third party. The fire spread analysis included:
  - Fuel type and density (grass vs. brush)
  - Topography (slope and natural fire breaks)
  - Weather/wind data
  - Distance from fire station / air suppression bases (speed to suppression)

- Consequence: Consequence focused on potential impact of a wildfire. The consequence scoring was based on:
  - Density of population
  - Density of structures
  - Potential negative impact to natural resources
- Egress: An analysis of the difficulty to access or evacuate communities. This egress analysis considered:
  - Population density of communities
  - Number and types of roads for each community.

Based on these analyses, PG&E developed an aggregated risk scoring to rank the relative risk score of different protection zones on circuits within the Tier 2 and Tier 3 HFTD. Analyzing this scoring further found that the top 26% rated protection zones cover the vast majority (98%) of the relative risk score total. These zones represent approximately 29% of the total HFTD circuit miles, consistent with PG&E's plan to address 7,100 circuit miles.

Another factor influencing the current prioritization of System Hardening projects is an analysis of the resulting Electric Corrective (EC) tags identified in the course of the WSIP. PG&E has determined that there are locations where a high density of EC tags coincide with areas that also scored highly in the risk ranking described above. To drive efficiency, reduce cost, and reduce resource demands, PG&E decided to create System Hardening projects in these areas, even if they are not the highest scoring areas in the risk ranking.

Going forward, PG&E hopes to further refine its risk modeling and prioritization in the in order to better target our work. As we review the relatively large protection zones included in the existing prioritization model, we realize that risk is not consistent within those zones. PG&E is looking for ways to create a more granular model so that with further analysis we can drive the risk scoring down to 3-5 mile sections of circuit. We hope to include other risks into the analysis including PSPS mitigation. If there are line sections that are regularly impacted by PSPS and expected to be impacted regularly in the future, what would be required in terms of hardening to exempt those lines from that risk mitigation tool? Currently, only undergrounding is exempt from PSPS. This is a very costly proposition and though these areas are not the highest risk in the system for catastrophic wildfires, when evaluated under our current risk models, they are a risk we must try to address to provide our customers the best service possible.

After determining which circuits should be included in the System Hardening program, PG&E must also determine whether those circuits should be rebuilt as hardened overhead circuits or should be undergrounded. This decision is made collaboratively as part of the initial field scoping process, which seeks to ensure a collaborative and inclusive discussion between our individual teams in an attempt to balance risk reduction, feasibility/constructability, and cost.

For each proposed System Hardening project, Distribution Engineers provide a basic scope to the team for initial review, and then a desktop meeting is scheduled to discuss the project as a team. Key questions we seek to answer in this meeting:

1. Can the overhead line be eliminated?

    a. Is this line idle? Is there a redundant tie that can be removed without sacrificing operational flexibility?

2. Can the overhead line be placed underground?

    a. Underground lines require a greater amount of space than overhead lines and are normally placed along main roadways. Considerations need to be made or the costs can inflate very quickly.

3. Can the overhead line equipment be relocated to a safer location?

    a. If the line can be moved to a location that is more accessible and/or less exposed to ignition sources, it can significantly benefit both reliability and wildfire ignition risk reduction.

4. Is Hardening in place the best option for this location?

The normal attendees to this desktop meeting include: Project Management, Distribution Engineers, Estimating, Public Safety Specialists, Construction, Operations, Technology Application Support, Land, Environmental, Electric Vegetation Management, and Local Customer Experience. This cross-functional team seeks to form consensus on risks and mitigations, timelines and schedules, recommended routes, and the appropriate hardening construction methods.

After this desk-top meeting, estimating resources will go into the field to assess the locations we hope to utilize for this work to ensure any and all assumptions that were made in our discussion are vetted. This information feeds back into the determination of whether a line should be hardened in place or undergrounded; for example, detailed examination of the site may show that undergrounding would be cost prohibitive due to soil condition or other constraints.

#### 5.3.3.17.3 Relationship Between System Hardening and Enhanced Vegetation Management

To better understand the interactions of multiple mitigations, PG&E previously performed a simple analysis of historical drivers of fire ignitions in HFTDs.[16] System hardening (covered conductor plus pole replacement, exempt equipment and transformer replacement) was identified to mitigate 56% of the historical ignitions by itself. EVM was identified to mitigate 31% of the historical ignitions by itself. When combined, system hardening and EVM were together identified to mitigate 79% of historical ignitions. Because of this projected increase in mitigation when adding EVM to system hardening in HFTDs, PG&E is continuing to perform EVM in locations where system hardening has been completed. However, PG&E will go beyond such simple relationship analysis and is in the process of evaluating data from 2018 to the present to determine if, when these drivers are combined, there is in fact an increase in mitigation which outweighs any minimal redundancies and cost-inefficiencies. Should such understanding of the relationship between system hardening and EVM change, we may change our approach to EVM on system hardened lines.

#### 5.3.3.17.4 Non-Exempt Surge Arrester Replacement Program

The replacement of non-exempt surge arresters with exempt surge arresters will further reduce fire risk since the new surge arresters are considered “non-expulsion” and do not generate arcs/sparks during normal operation. The surge arrester program is a multi-year program that forecasts to replace 8,850 surge arresters in Tier 2 and Tier 3 in 2020. Provisions are available to replace more units as material and crew resources become available throughout the year.

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16 From a total of 414 ignitions in HFTD areas in years 2015-2017.

### 5.3.3.17.5 Transmission Line System Hardening Overview and Strategy

PG&E's Transmission Line System Hardening Program includes a number of elements intended to mitigate wildfire risk by reducing the risk of potential ignitions associated with PG&E's facilities and equipment. As a part of this program, PG&E is performing full line assessments for overhead electric transmission lines in HFTD areas to effectively evaluate the need of equipment replacement based on circuit risk.

To perform full line assessments, PG&E initiated the development of an asset health Operability Assessments (OA) tool to assess individual transmission lines and asset failures in HFTD areas due to wind loads. Through these OA, PG&E is applying a risk-informed methodology to evaluate the potential risks of the line, as well as individual assets, and prioritize replacements that will be most effective in hardening an individual line and the entire transmission system against high wind events and wildfire risk.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to scope and harden select distribution circuits in HFTD areas as describe above. PG&E will also continue to replace non-exempt surge arresters in HFTD areas. PG&E will continue to conduct Operability Assessments of transmission lines in HFTD areas.

2. ***Before the next annual update:*** See above. In addition, PG&E will continue to evaluate all of its programs to incorporate lessons learned from 2020, as well as any other relevant information, and may adjust its programs accordingly.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

### 5.3.3.18 Other / Not Listed

#### 5.3.3.18.1 Evaluating New Protection Technologies

PG&E is also evaluating different protection schemes and equipment that may further reduce the likelihood of a fire ignition when a system failure occurs. Below are three pilot projects to evaluate the effectiveness of new protection technologies and features.

- High Impedance Fault Detection: PG&E is piloting and proposes to deploy newer protection capabilities in reclosers and circuit breakers that increase the ability to detect high impedance faults. For reclosers, the downed conductor detection (DCD) feature in the Form 6 recloser and Beckwith controller is currently being piloted (200 plus reclosers) to alarm only in areas subject to outages during winter storms. The experience gained from this pilot will be used to create application guidelines for use in fire areas. Based on initial pilot results, DCD will be enabled in another 100 reclosers within the Tier 2 and 3 fire areas in 2020 to gain more experience in different terrain. In addition, a high impedance fault detection algorithm for feeder relays will be evaluated at ATS in the Q1 of 2020.

- Increased Protection Sensitivity: PG&E is evaluating the use of more sensitive protection settings and use faster tripping elements on reclosers and circuit breakers. The proposed settings and use of instantaneous elements that reduce the duration and energy delivered at a fault location. This may lower the potential for a fire ignition to occur. The proposed protection schemes, however, could reduce the ability to coordinate with downstream protective devices and will lead to an increase in the size and duration of outages.

#### 5.3.3.18.2 Transmission Line Modeling

There are two ongoing modelling efforts to be highlighted regarding PG&E's transmission system.

- One aspect of that managing the operation and maintenance of transmission infrastructure is assessing the condition (health) of the components and structures and evaluating the increased risk of failure associated with known degradation mechanisms or aging in general. PG&E has developed a comprehensive, analytical framework for OA, which assesses the physical condition of overhead electrical transmission line assets. This tool informs both asset management and operability assessment decisions and incorporates elements of probabilistic risk assessment commonly used in other industries such as nuclear power generation.

Key to understanding the OA tool is the concept of fragility. In short, fragility refers to the increasing probability of failure for increasing applied load. In the context of the OA tool, fragility is the conditional probability that an asset (tower, pole, conductor, anchor, etc.) will fail at a given wind speed. While wind speed is the intensity measure used to define fragility, the OA tool considers many damage mechanisms such as corrosion, fatigue, wear and decay that can lower the capacity of the asset to resist wind loads.

The OA tool is based on assigning a fragility curve to each asset to reflect its current health relative to a newly designed and constructed, but otherwise identical, asset. This is done by first presuming a fragility associated with a new, healthy asset, and then adjusting both the strength and uncertainty to reflect the observed condition, age, environment, and historical performance of the circuit in whole. Specifically, the median strength is adjusted based on ground and drone inspection results, test and treat inspection findings (for wood poles only), and structural engineering analysis of the towers/poles, insulators, guys, foundations, anchors and conductors. The uncertainty is adjusted based on the asset age versus a notional design life, the aggressiveness of the asset environment with respect to corrosion and windiness, and the past performance of the circuit.

For OA, the fragility can be used to predict the risk that an asset (or set of assets) will underperform at a forecast wind speed. Alternately, if a risk tolerance is defined, the corresponding wind speed at which that tolerance is exceeded can be determined directly from the fragility as described earlier. The risk tolerance is an input to the OA tool, and is a function of many concerns outside the scope of the OA tool.

- The OA tool also includes a mechanism for continuous improvement of wind-based asset strength estimation. Past and on-going component failures and survivals of assets in windy conditions are incorporated into the model using Bayesian updating methodologies. Further, PG&E is undertaking a testing program to better define fragility curves for specific components. Lastly, prediction data for every structure on a given circuit (both historical and going forward) is being integrated into the OA tool for increased accuracy. The result will be a tool that assists PG&E with risk-informed decisions based on expected future strength and uncertainty of PG&E transmission assets. Individual health models to determine probability of failure were developed for major transmission asset types. The probability of failure models were developed using multiple inputs including but not limited to past

performance history, maintenance work performed, condition, age, and location. The model then outputs an expected probability of failure along with the main drivers associated with the probability. Information such as this allows PG&E to gain a more granular perspective on asset repair and replacement. These asset-based models may also be aggregated to create a circuit-based probability of failure model.

- The above-mentioned OA and asset health models are used to inform asset decision making (e.g., replacement of towers as in Section 5.3.3.15, or PSPS in Section 5.6.2.2). These existing models will continually be improved upon as new data becomes available.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** See above discussion regarding timing for review and evaluation of new protection technologies and modeling.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** See above.

4. ***Within the next 10 years:*** See above.

#### 5.3.3.18.3 Building and Sourcing Services

Building services supports the WMP initiatives in two primary ways: (1) securing office space for employees and contractors supporting the WMP initiatives; and (2) securing yards and staging areas for materials needed to complete WMP work.

Sourcing provides strategic, operational, and execution level support of PG&E's WMP. Sourcing provides sourcing program management support, develops project plans, and coordinates sourcing activities with cross functional teams. Sourcing support includes but is not limited to facilitating supplier evaluations, contract bidding and bid awards processes, and direct negotiations.

Placement in Section 5.3.3 is based on the desire to put these services within the Section 5.3 initiatives, but note the services support all the WMP initiatives.

### 5.3.4 Asset Management and Inspections

*Explain the rationale for any utility ignition probability-specific inspections (e.g., "enhanced inspections") within the HFTD as deemed necessary over and above the standard inspections. This shall include information about how (i.e., criteria, protocols, etc.) the electrical corporation determines additional inspections are necessary.*

*Describe the utility's maintenance protocols relating to maintenance of any electric lines or equipment that could, directly or indirectly, relate to wildfire ignition. Include in the description the threshold by which the utility makes decisions of whether to (1) repair, or (2) replace electric lines and equipment. Describe all electric lines and equipment that the utility "runs-to-failure", those that the utility maintains on a risk-based maintenance plan, and those that are managed by other approaches; describe each approach. Explain the maintenance program that the utility follows and rationale for all lines and equipment.*

*Description of programs to reduce ignition probability and wildfire consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description for the utility's programs, the utility's rationale behind each of the elements of this program, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each program, how the utility plans to demonstrate over time whether each component is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Detailed inspections of distribution electric lines and equipment*
2. *Detailed inspections of transmission electric lines and equipment*
3. *Improvement of inspections*
4. *Infrared inspections of distribution electric lines and equipment*
5. *Infrared inspections of transmission electric lines and equipment*
6. *Intrusive pole inspections*
7. *LiDAR inspections of distribution electric lines and equipment*
8. *LiDAR inspections of transmission electric lines and equipment*
9. *Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations*

10. *Other discretionary inspection of transmission electric lines and equipment, beyond inspections mandated by rules and regulations*

11. *Patrol inspections of distribution electric lines and equipment*

12. *Patrol inspections of transmission electric lines and equipment*

13. *Pole loading assessment program to determine safety factor*

14. *Quality assurance / quality control of inspections*

15. *Substation inspections*

16. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

PG&E's maintenance programs are described in Section 5.3.3. Below is a description of PG&E's Asset Management Program and Inspection Programs.

**Overview of PG&E's Asset Management Program and Inspection Program**

PG&E's distribution asset strategies are described in its Asset Management Plans (AMPs). PG&E employs a risk-based asset management approach for its overhead facilities, which includes criticality of the assets. Generally speaking, there are two main approaches with respect to asset replacement: Proactive Replacement and Run to Condition, which are described in more detail below. PG&E is also including below an overview of its inspection programs generally and, in particular, Wildfire Safety Inspection Program (WSIP).

Proactive Replacement

Proactive replacement is employed for those assets whose failure have a higher risk of igniting a catastrophic wildfire. This approach involves replacing assets with a higher risk of failure, but before the end of their useful life. The following are proactive replacement programs:

- System Hardening in HFTDs (including replacing existing assets with covered conductor [primary and secondary], stronger poles, non-exempt equipment, transformers with FR3 oil, as well as undergrounding)
- Pole Replacement and Reinforcement
- Primary Conductor Replacement
- Non-Exempt Equipment Replacement (Fuses and Surge Arresters)

**Run to Condition**

Run to condition repair/replacement is employed for those assets whose failure have a lower risk of igniting a catastrophic wildfire. This approach involves routine and non-

routine inspections focused on the identification, assessment, prioritization, and documentation of compelling abnormal conditions, regulatory conditions, and third party caused infractions that negatively impact safety or reliability. These conditions are identified during patrols and inspections of PG&E's distribution facilities, and may occur as a result of operational use, degradation, environmental changes or third-party actions. The following assets are subject to Run to Condition:

- Crossarms, insulators and pole hardware
- Voltage regulating equipment
- Protection equipment
- Transformers
- Switching Equipment
- Secondary Conductor

**Inspection Program**

PG&E utilizes multiple means of assessment to proactively monitor the condition of its assets in HFTD areas. The pre-2019 baseline inspection program was primarily focused on the identification, assessment, prioritization, and documentation of compelling abnormal conditions, regulatory conditions, and third-party caused infractions that negatively impacted safety or reliability. These conditions may occur as a result of operational use, degradation, deterioration, environmental changes or third-party actions. PG&E routinely assesses its distribution, transmission, and substation assets using a variety of methods, including observations when performing work in the area, periodic patrols and inspections, and targeted condition-based and/or diagnostic testing and monitoring. Some of PG&E's current inspection approaches have been in place for years, while others are newer in their implementation. Common inspection approaches used at PG&E include routine patrol inspections, detailed visual inspections, LiDAR inspections, Infrared (IR) inspections, Intrusive pole inspections, and pole loading calculations. These routine assessments of PG&E's overhead and underground electric systems, including its electric substation inspections, are designed in accordance with GOs 95, 165, and 174 requirements.

In 2019, PG&E began a Wildfire Safety Inspection Program or "WSIP" to expedite and expand the routine detailed inspections performed in Tier 2 and Tier 3 HFTD areas. Basic elements include travel to the asset, ground and or aerial visual observation documented with electronic form (checklist) and with pictures, detection and assessment of abnormal conditions, corrective notification creation, prioritization and execution of repairs, and documentation needed for safe and reliable operation. To develop the WSIP inspection checklist, PG&E used a risk-based approach including conducting a Failure Modes and Effects Analysis or "FMEA" (described in further detail in Section 5.3.1). The 2019 focus of the FMEA was to identify single points of failure of electric system components that could lead to fire ignition and then aid in the development of inspection methods that can most appropriately identify the condition of these respective components.

In the last half of 2019, PG&E worked to refine the FMEA a for each major overhead electric asset family (transmission, distribution, and substation) to create detailed inspection checklists appropriate to the failure modes which can create ignition potential as well as other negative outcomes.

Going forward, the detailed overhead inspection checklists will be consistently applied to all assets of an asset family. This means that overhead detailed compliance inspections have largely been coupled to the fire ignition evaluation protocols, rather than being separately funded and managed. Additionally, PG&E has begun evaluation and development of circuit-based asset management strategies, which seek to focus resources of various types, including inspections, on assets with higher risk profiles. As PG&E gathers additional data regarding early asset deterioration or pre-failure indicators, predictive failure modelling may improve. Such evolved predictive models could utilize data on vegetation and equipment type, age, and condition. Over time, it is possible that detailed asset inspection checklists may be customized to align with asset condition and environmental data as indicated by those models.

PG&E's detailed and supplemental inspections and patrols are guided by the inventory of electric facilities in our Geographic Information System (GIS). The overlay of facility type, asset health, geographic risk factors are considered when determining the most appropriate patrol and inspection cycle for the asset or circuit. Recognizing the importance of GIS, PG&E continues to improve its GIS data, including designating single points of contact at PG&E for all wildfire-related GIS needs. To refine PG&E's PSPS models and GIS datasets, during supplemental (enhanced) inspections, each inspector utilizes a consistent assessment checklist, validates certain asset traits, and makes a guided assessment of the asset condition. In addition, the electronic checklist captures a geolocation at the time of inspection initiation, which may be used to reaffirm the existing geoposition data in PG&E's systems of record. This data is captured in PG&E's systems of record and made available for PSPS event impact modelling, among other uses.

Expansion of data collection during post-asset failure, detail inspections, and other advanced inspection methods are expected to further refine PG&E's ability to assess equipment health. PG&E continues to build capabilities for predictive asset performance modelling via tools such as System Tool for Asset Risk (STAR). The STAR model supports decisions on when to schedule inspections or work for higher risk assets in other areas, based on factors beyond fire ignition risk. The shift towards such condition-based and risk-informed patrol and inspections is underway and will be refined as PG&E acquires additional asset performance data and refines its predictive failure models based on actual results. Further details of specific inspection protocols are provided in subsequent tables and narrative.

PG&E continues to work to enhance its ability to efficiently collect and house asset registry data, including the results of patrol and inspection activities. Detailed inspection protocols and electronic tools planned for use in 2020 and beyond, link to the inventory of electric assets in the GIS, and data collected via detail inspection will be captured in SAP. By harmonizing our core data sources (SAP and GIS, for example) the results of asset activities (installation, repair, replacement, inspection) can be made consistently available to all programs and models. Future enhancements to predictive models could include asset age, state of wear, operating history, expected lifecycle, and probability of

failure to inform patrol and inspection cycles as well as asset repair and replacement programs.

See Attachment 1, Table 24 for the details and data associated with the initiatives discussed in this section.

#### 5.3.4.1 Detailed Inspections of Distribution Electric Lines and Equipment

Detailed inspections of distribution electric lines and equipment involves careful visual examination of overhead assets by a qualified Compliance Inspector or similar Journeyman Lineman in accordance with the TD-2305M (Electric Distribution Preventive Maintenance Manual, EDPM). Before conducting patrols or inspections, PG&E Compliance Inspectors, hiring hall, and contract personnel are required to be current with their journeymen classification and pass trainings and assessment. The program is moving from a prescriptive time cycle frequency to an approach driven by risk, with the highest risk assets requiring more frequent and in-depth inspections than lower risk assets. Aligned with the overall risk-informed approach for asset management, inspection priority is driven by asset health and consequences of asset failures. As a result of this approach, it is anticipated to have selective Structures/Lines with high consequence that will require a higher degree of inspections.

For 2020, PG&E intends to perform detailed overhead inspections on 100% of HFTD Tier 3, and 33% of HFTD Tier 2 assets. Additional inspections in HFTD Tier 2 may result from operational execution and from safety field re-assessments of open corrective notifications, as outlined in the WSIP Compliance Plan and Utility Bulletin: TD-8999B-001. Future year inspection scope will be developed to align with overall asset preventive maintenance strategies and will be informed by results of the 2020 preventive and corrective maintenance activities. Future year cycles may shift toward risk-informed and condition-dependent cycles linked to PG&E predictive models. Methods and tools of inspections will continue being evaluated for potential future use depending on technology availability and effectiveness.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will expand its use of prescriptive mobile inspection checklists to overhead assets in all HFTD tiers. Additionally, PG&E will have expanded the FMEA completed for WSIP Distribution 2019, to incorporate additional asset failure indicators which are observable during visual inspection.

2. ***Before the next annual update:*** PG&E will review the results of the 2020 detailed inspections and consider modifying future inspection checklists and guidance documents to reflect lessons learned.

3. ***Within the next 3 years:*** PG&E plans to move all electric patrol and inspection activities to digital data collection platforms (e.g., mobile applications) and away from paper record keeping. PG&E will revisit the commonalities of transmission and distribution overhead asset inspections with the intent to consolidate tools, methods, and personnel qualifications. PG&E will also determine if adjusting asset inspection cycles or modalities is likely to have adverse impacts on system safety or performance.

4. ***Within the next 10 years:*** PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors. This may shift the percentage of total annual structures and line miles away from the current proposal.

#### 5.3.4.2 Detailed Inspections of Transmission Electric Lines and Equipment

Detailed inspections of transmission electric lines and equipment involves careful visual examination of overhead assets by a qualified Transmission Troubleman/Inspector or similar Journeyman Lineman in accordance with the TD-1001M (Electric Transmission Preventive Maintenance Manual, ETPM). Before conducting patrols or inspections, PG&E inspectors, hiring hall, and contract personnel are required to be current with their journeymen classification and pass trainings and assessment. In connection with WSIP, PG&E formulated certain new procedures to guide WSIP enhanced inspections and updated existing procedures. Additionally, mobile applications were developed to document the inspection activity and resulting findings.

In late 2018, PG&E conducted an FMEA of transmission assets to better understand any additional inspections and analysis that could be implemented to reduce wildfire risk in addition to the inspections required by GOs 95 and 165. Beginning in December 2018, using this risk-based approach, PG&E performed inspections of transmission structures (poles and towers) in HFTD areas, as well as nearby structures outside the HFTD in close proximity and with high risk of fire spread into adjacent HFTD areas (approximately 5,700 miles of transmission line with more than 50,000 structures). These enhanced inspections focused on the failure mechanisms identified from the FMEA based on PG&E and industry information that identified components with a fire ignition risk. The visual inspections included checklist-guided ground inspection of transmission poles and climbing inspection of transmission towers. Aerial inspections were conducted on every structure in the WSIP scope, subject to any FAA or other legal restrictions, to complement the ground and climbing visual inspections. Helicopters were also used for additional aerial inspections for collecting infrared data to determine hot spots on conductors, insulators, and connectors requiring repair.

From 2020 onward, the detailed inspection checklist for electric transmission lines and equipment has been updated to incorporate baseline compliance guidelines as well as WSIP-identified fire risk considerations, and extensions to the FMEA. Additionally, detailed inspections of electric transmission lines have been coupled with aerial inspection methods to provide the additional aloft vantage points for each structure assessed during a given cycle. The program is moving from a prescriptive time cycle frequency to an approach driven by risk, with the highest risk assets requiring more frequent and in-depth inspections than lower risk assets. Aligned with the overall risk-informed approach for asset management, inspection priority is driven by asset health and consequences of asset failures. As a result of this approach, it is anticipated to have selective Structures/Lines with high consequence that will require a higher degree of inspections. The inspection frequency of assets varies by both HFTD and line risk prioritization and will continue to evolve as models are refined. For 2020, PG&E intends to perform detailed overhead inspections on 100% of HFTD Tier 3, and 33% of HFTD Tier 2 assets. Additional inspections may result from operational execution and from safety field re-assessments of open corrective notifications, as outlined in the WSIP Compliance Plan and Utility Bulletin: TD-8999B-001. Results from these inspection cycles will be used to further refine the inspection methods and recurrence to align with their risk-spend efficiency. Methods and tools of inspections will continue being evaluated for potential future use depending on technology availability and effectiveness.

Quality checks of transmission detailed inspection tasks was previously completed via supervisor work verification and paperwork review. From 2019 onward, PG&E adopted a practice of centralized gatekeeping review of inspection findings. The centralized gatekeeper teams follow prescriptive guidance, including decision trees and use visual aids to drive consistency in their review of issues reported during inspections.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will have expanded the FMEA completed for WSIP Transmission 2019, to incorporate additional asset failure indicators which are observable during visual inspection.

2. ***Before the next annual update:*** PG&E will review the results of the 2020 detailed inspections and consider modifying future inspection checklists and guidance documents to reflect lessons learned.

3. ***Within the next 3 years:*** PG&E plans to move all electric patrol and inspection activities to digital data collection platforms (e.g., mobile applications) and away from paper record keeping. PG&E will revisit the commonalities of transmission and distribution overhead asset inspections with the intent to consolidate tools, methods, and personnel qualifications. PG&E will also determine if adjusting asset inspection cycles or modalities is likely to have adverse impacts on system safety or performance.

4. ***Within the next 10 years:*** PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors. This may shift the percentage of total annual structures and line miles away from the current proposal.

#### 5.3.4.3 Improvement of Inspections

Improvement of inspections is accomplished via review of audit and quality assurance findings, executive reviews, and internal guidance (GOV-1038S) which highlight areas of opportunity. Improvement in inspections may focus on one or more of: efficacy in proactive detection of asset anomalies, consistency in identifying or classifying asset anomalies, efficiency in providing quality inspection results. In the near-term, improvement of inspections will seek to apply internal best practices identified during WSIP 2019 consistently across the asset families (transmission, distribution, and substation). For example, the transmission approach to inspection gatekeeping via Centralized Inspection Review Team (CIRT) is being more broadly adopted for distribution. And, the use of gatekeeper decision trees and other job aids that support more consistent evaluation and prioritization of inspection findings. Improvement may also take on the form of enhancing tools and documentation that guide the activity, such as mobile electronic checklists. Concurrent with expanded deployment of mobile inspection applications and tools, PG&E will develop process control measures (data analysis) to more rapidly assess for abnormalities in patrol and inspection findings. Additionally, exploration of new or novel inspection protocols may also lead to improvements in inspection program efficacy, consistency, or efficiency.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will have expanded the FMEA completed for WSIP 2019 to incorporate additional asset failure indicators which are visible during inspection. PG&E will have established baseline inspection quality control measures to proactively highlight abnormal results and drive corrective activities.

2. ***Before the next annual update:*** PG&E will review the results of the 2020 detailed inspections and consider modifying future inspection checklists and guidance documents to reflect lessons learned. PG&E anticipates completing a pilot of new inspection protocols (Ultrasonic) to assess its efficacy and efficiency in identifying abnormal conditions as compared to detailed visual inspections.

3. ***Within the next 3 years:*** PG&E plans to move all electric patrol and inspection activities to digital data collection platforms (e.g., mobile applications) and away from paper record keeping. PG&E will revisit the commonalities of transmission and distribution overhead asset inspections with the intent to consolidate tools, methods, and personnel qualifications. PG&E will also determine if adjusting asset inspection cycles or modalities is likely to have adverse impacts on system safety or performance.

4. ***Within the next 10 years:*** PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors. PG&E may also pilot additional patrol or inspection modalities not yet in common usage at the utility.

#### 5.3.4.4 Infrared Inspections of Distribution Electric Lines and Equipment

Infrared inspections of distribution electric lines and equipment began in 2012 as means to identify system components and in-line conductor splices that require repair and/or replacement. Electric distribution preventive maintenance programs use IR imaging and temperature-measuring systems to identify faulty components and initiate repairs or replacement proactively. IR imaging systems detect and record heat being radiated in their fields of view. IR cameras use an image-scanning technique to identify heat radiated from a target and its background. IR imaging systems capture and store the heat images pictorially for immediate or future evaluation. By using IR imaging systems, the operator can pinpoint the precise location of the hottest spot on the target being observed. Distribution IR program utilizes trained contractors to identify hot spots (abnormal temperature) for corrective action. IR assessment potentially prevents wire down equipment failures and helps pinpoint areas for maintenance and conductor replacement. Any findings are coupled with the IR image and SAP corrective maintenance tags are created and prioritized in accordance with TD-2022P-01.

Going forward , infrared inspections will be deployed as appropriate alongside the suite of other inspection tools and techniques include enhanced visual inspections, drones or helicopters and other emerging technologies. PG&E does not have a discrete plan for how many circuit miles will be inspected using IR systems in HFTD areas. One of several reasons that IR inspections will be deployed in a targeted manner is that the effectiveness of IR inspections can be heavily influenced by the level of electric load in the lines being inspected. If the electric load is low, it can be more difficult to capture meaningful data through IR inspections. As such PG&E is continuing to evaluate the effectiveness of various inspection methods, when performed, IR work is tracked by line miles inspected, and findings per 100 miles inspected. In addition, to the vendor's QC program, PG&E receives the work product weekly and reviews the records prior to any invoice approvals.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Apply IR distribution inspections as determined to be appropriate as part of the overall asset inspection program as described above. No enhancements are planned before the upcoming wildfire season.

2. ***Before the next annual update:*** Continue evaluating IR alongside other inspection methods to optimize overall asset inspection approaches, particularly in HFTD Tiers 2 and 3.

3. ***Within the next 3 years:*** PG&E will begin utilizing predictive modelling to identify and schedule inspections for higher risk conductors in other areas. The model will factor in the conditions of the conductor based on the results of its last inspection and other factors such as age, weather, and loading to develop the risk profile.

4. ***Within the next 10 years:*** No specific refinements are planned aside from continued enhancements to the predictive models.

### 5.3.4.5 Infrared Inspections of Transmission Electric Lines and Equipment

Infrared (IR) inspection is an effective tool within the transmission overhead preventive maintenance program. IR inspection reduces the potential for component failures and facility damage and facilitates a proactive approach to identifying abnormal components and conductor for repair/or replacement. Electric transmission system inspections and preventive maintenance programs use IR imaging and temperature-measuring systems to identify faulty components and initiate repairs or replacement proactively. IR imaging systems detect and record heat being radiated in their fields of view. IR cameras use an image-scanning technique to identify heat radiated from a target and its background. IR imaging systems capture and store the heat images pictorially for immediate or future evaluation. By using IR imaging systems, the operator can pinpoint the precise location of the hottest spot on the target being observed.

Going forward, infrared inspections will be deployed as appropriate alongside the suite of other inspection tools and techniques which include enhanced visual inspections, drones or helicopters and other emerging technologies. PG&E does not have a discrete plan for how many circuit miles will be inspected using IR systems in HFTD areas. One of several reasons that IR inspections will be deployed in a targeted manner is that the effectiveness of IR inspections can be heavily influenced by the level of electric load in the lines being inspected. If the electric load is low, it can be more difficult to capture meaningful data through IR inspections. As such PG&E is continuing to evaluate the effectiveness of various inspection methods.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Apply IR inspections as determined to be appropriate as part of the overall asset inspection program as described above. No enhancements are planned before the upcoming wildfire season.

2. ***Before the next annual update:*** Continue evaluating IR alongside other inspection methods to optimize overall asset inspection approaches, particularly in HFTD Tiers 2 and 3.

3. ***Within the next 3 years:*** PG&E will begin utilizing predictive modelling to identify and schedule inspections for higher risk conductors in all areas. The model will factor conditions of the conductor based on factors such as condition, environment, design and age to develop the risk profile.

4. ***Within the next 10 years:*** No specific refinements are planned aside from continued enhancements to the predictive models.

#### 5.3.4.6 Intrusive Pole Inspections

Intrusive pole inspections, also called Pole Test and Treat (PT&T), intrusively inspects in-service wood poles on an approximate 10-year cycle for early detection of deterioration. PT&T prolongs the service life of wood poles through reapplication of preservative and/or restoration of structural strength through reinforcement. PT&T identifies poles that are nearing the end of their service life and recommends these poles for replacement prior to failure. PG&E's PT&T program has existed since 1994 and is fully implemented across transmission and distribution wood pole structures. PG&E contracts out the execution of intrusive pole inspections to a specialized contractor who performs this work for other utilities as well. QA is provided through sampling and reinspection by internal PG&E personnel, as well as the vendor performance reports. PT&T has its own QA program of the inspections. PG&E Internal Audits department performs audits as requested or recommended, in accordance with their requirements.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** No enhancements are planned.

2. ***Before the next annual update:*** No enhancements are planned.

3. ***Within the next 3 years:*** A mobile inspection platform aligned to other PG&E inspection programs is anticipated to be adopted.

4. ***Within the next 10 years:*** PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors, which may shift the frequency away from the current forecast.

### 5.3.4.7 LiDAR Inspections of Distribution Electric Lines and Equipment

LiDAR technology has been used to varying degrees at PG&E since 2015. See Section 5.3.5.7 for more on VM related LiDAR inspections along distribution electric lines and equipment.

For 2020, the project objective is to leverage the remote sensing data already gathered to produce more advanced analytics to proactively identify distribution circuit spans or regions where the risk from encroaching vegetation is greatest. PG&E's LiDAR acquisition and data processing vendor is performing quality control before delivery of results to PG&E. These Quality Control steps include manually reviewing the data to look for gaps in acquisition coverage, incorrect classification of assets and inconsistencies in what was delivered to the Vendor from PG&E's EDGIS data. Data Quality Control is being performed by PG&E's IT Department. In addition, samples of the deliverables are being reviewed by contract Foresters in the field. PG&E end users across the system will have the ability to "validate" the individual LiDAR tree points before prescribing work. As the implementation of LiDAR and remote sensing continues to progress, LiDAR derived Electric Asset Layers can also be utilized by all Electric Operations teams (Service Planners, Trouble teams, Emergency Operations Teams, etc.) in their planning activities.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue implementing the LiDAR inspection program on distribution lines and equipment as described above. No enhancements are anticipated before the upcoming wildfire season.

2. ***Before the next annual update:*** PG&E will begin utilizing data captured by Vegetation Management personnel for any new circuits not already having any amount of completed work within the EVM program. This data will include: (1) LiDAR derived "Strike Tree" inventory that field inspectors can then utilize as a baseline for trees that need assessments and (2) LiDAR derived Electric Asset Layer that better portrays spatially where our Electric Assets are located; and

3. ***Within the next 3 years:*** PG&E will continue to compare LiDAR data to other data points such as weather patterns and outage histories to create a deeper data set that can be updated over time. This will enable PG&E to create updated risk profiles based on circuits, regions, or even at a span by span level, to enhance our predictive models over time.

4. ***Within the next 10 years:*** PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors, which may shift the frequency away from the current forecast.

### 5.3.4.8 LiDAR Inspections of Transmission Electric Lines and Equipment

LiDAR technology is used to determine vegetation conditions, predominantly distances and clearances, in relation to the electric conductors and easement boundaries. LiDAR programs provide span-level details of vegetation encroachment and other hazards such as fall in and grow in risk. LiDAR is also used to assess conformance with Minimum Ground to Conductor Clearance (Rule 37 MGCC) – the closest the lines can sag to the ground based on clearances listed in General Order 95, Rule37, Table 1, and Case 4. The LiDAR data provided is specific to a corridor width defined by voltage, increasing with voltage. LiDAR inspections of transmission electric lines and equipment is currently performed under contract as part of the Transmission Vegetation Management for the benefit of both vegetation management programs as well as asset preventive maintenance programs. The execution of LiDAR inspections is guided by Bulletin TD-7103B-003 which outlines the types of data provided, assessments undertaken, operational tracking, and priority assignment of findings.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue implementing the LiDAR inspection program on transmission lines and equipment as described above. No enhancements are anticipated before the upcoming wildfire season.

2. ***Before the next annual update:*** PG&E will begin utilizing data captured by VM personnel for any new circuits not already having any amount of completed work within the EVM program. This data will include: (1) LiDAR derived “Strike Tree” inventory that field inspectors can then utilize as a baseline for trees that need assessments; (2) LiDAR derived Electric Asset Layer that better portrays spatially where our Electric Assets are located; and (3) Potentially an advanced reporting program that better portrays where we may have encroachment issues with our internal and external requirements for clearances.

3. ***Within the next 3 years:*** PG&E will continue to compare LiDAR data to other data points such as weather patterns and outage histories to create a deeper data set that can be updated over time. This will enable PG&E to create updated risk profiles based on circuits, regions, or even at a span by span level, to enhance our predictive models over time.

4. ***Within the next 10 years:*** PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors, which may shift the frequency away from the current forecast.

### 5.3.4.9 Other Discretionary Inspection of Distribution Electric Lines and Equipment, Beyond Inspections Mandated by Rules and Regulations

Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations currently includes Ultrasonic (UT), new to PG&E in 2020. Ultrasonic inspection technology is being piloted in 2020 for overhead Transmission and Distribution assets to validate the technology's ability to proactively identify abnormal electrical discharge in components and determine relative suitability as a complimentary inspection technique to existing methods. PG&E plans to conduct laboratory and field testing of the technology, which has been commercialized by an international firm, and used by other US-based utilities. The scope of the field pilot for transmission and distribution assets is being finalized. As more data is gathered, PG&E will assess the value of continuing these technologies as supplements to other visual inspection techniques. If determined that Ultrasonic technology provides value, then PG&E will establish process for UT inspection that can be operationalized for future production inspections and incorporate UT inspection findings into our asset risk models (FMEAs), as needed. Ultrasonic inspection is included in the details and data associated with Attachment 1, Table 24 Section 12, Patrol inspections of transmission electric lines and equipment.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will commence a pilot of Ultrasonic technology in both transmission and distribution.

2. ***Before the next annual update:*** PG&E will determine whether to adopt or expand the use of Ultrasonic technology, and in what scenarios.

3. ***Within the next 3 years:*** PG&E will benchmark other utilities to identify other emerging technologies to enhance the inspection protocols.

4. ***Within the next 10 years:*** PG&E may develop asset or component-specific examination protocols that are proactively prescribed based upon predictive asset failure modelling.

#### 5.3.4.10 Other Discretionary Inspection of Transmission Electric Lines and Equipment, Beyond Inspections Mandated by Rules and Regulations

Other discretionary inspection of transmission electric lines and equipment, beyond inspections mandated by rules and regulations currently includes aerial high-definition photo capture of asset via drone (e.g., unmanned aerial vehicles, UAV) or specially-equipped helicopters. Aerial imagery capture was piloted at scale during WSIP 2019 for transmission lines and substations in Tier 2 and Tier 3 HFTD areas. Images are captured by UAV or helicopter pilots and transferred electronically to qualified journeymen inspectors to review for anomalies in accordance to the detailed inspection checklist. The viewing angles provided by UAV and helicopter are not readily achieved via ground-based detailed inspections, even with viewing magnification.

Another approach new to PG&E in 2020 is Ultrasonic assessment of energized overhead assets. Ultrasonic inspection technology is being tested piloted in 2020 for overhead Transmission and Distribution assets to validate the technology's ability to proactively identify abnormal electrical discharge in components and determine is relative suitability as a complimentary inspection technique to existing visual inspection methods. PG&E plans to conduct laboratory and field testing of the technology, which has been commercialized by a South Korean firm. The scope of the field pilot for transmission and distribution assets is being finalized. As more data is gathered, PG&E will assess the value of continuing these technologies as supplements to other visual inspection techniques.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will commence a pilot of Ultrasonic technology in both transmission and distribution.

2. ***Before the next annual update:*** PG&E will determine whether to adopt or expand the use of Ultrasonic technology, and under what scenarios.

3. ***Within the next 3 years:*** PG&E will benchmark other utilities to identify other emerging technologies to enhance the inspection protocols.

4. ***Within the next 10 years:*** PG&E may develop asset or component-specific examination protocols that are proactively prescribed based upon predictive asset failure modelling.

### 5.3.4.11 Patrol Inspections of Distribution Electric Lines and Equipment

Patrol inspections of distribution electric lines and equipment are routinely undertaken for assets not scheduled for a detailed or climbing inspection within the calendar year. Patrol inspections are defined within the EDPM (TD-2301M) as maintenance activities that include a simple, visual examination of applicable overhead and underground facilities to identify obvious structural problems and hazards. Patrol inspections are visual reviews of the asset condition to proactively detect imminent or existing safety or reliability hazards in alignment with GO 165. Distribution overhead patrols may be executed on foot or by vehicle as appropriate to the terrain. See Section 5.3.4.1 for a description of PG&E's detailed inspection program for distribution lines and equipment.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue to implement the patrol inspection program. No enhancements are anticipated before the upcoming wildfire season.

2. ***Before the next annual update:*** PG&E intends to pilot paperless digital (mobile) patrol inspections protocols and records.

3. ***Within the next 3 years:*** PG&E intends to adopt paperless digital (mobile) patrol inspections technologies.

4. ***Within the next 10 years:*** PG&E will determine if adjusting asset patrol inspection cycles or modalities is likely to have adverse impacts on system safety or performance. PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors.

### 5.3.4.12 Patrol Inspections of Transmission Electric Lines and Equipment

Patrol inspections of transmission electric lines and equipment are performed in alignment with PG&E's approved CAISO Maintenance Plan. Patrol inspections of transmission electric lines and equipment are routinely undertaken for assets not scheduled for a detailed or climbing inspection within the same calendar year. Patrol inspections are defined within the ETPM (TD-1001M) as maintenance activities that include a simple, visual examination of applicable overhead and underground facilities to identify obvious structural problems and hazards. Patrol inspections may be undertaken by foot, vehicle, boat, or helicopter as appropriate to the terrain. See Section 5.3.4.2 for a description of PG&E's detailed inspection program for transmission lines and equipment.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue to implement the patrol and inspection program. No enhancements are anticipated before the upcoming wildfire season.

2. ***Before the next annual update:*** PG&E intends to pilot paperless digital (mobile) patrol inspections protocols and records.

3. ***Within the next 3 years:*** PG&E intends to adopt paperless digital (mobile) patrol inspections technologies.

4. ***Within the next 10 years:*** PG&E will determine if adjusting asset patrol inspection cycles or modalities is likely to have adverse impacts on system safety or performance. PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors.

### 5.3.4.13 Pole Loading Assessment Program to Determine Safety Factor

Pole loading assessment program to determine safety factor is applicable to distribution and transmission wood pole structures systemwide and has been in place for more than a decade. During a pole's service life, pole loading calculations are performed when load is added to a pole, or if a suspected overload condition is observed during inspection (GAC tags). Pole loading calculations are performed in O-Calc software during design phase to ensure poles are sized correctly to satisfy General Order 95 requirements. Following Commission Decision 09-08-029, pole loading calculations for poles in service are now retained. In 2016 PG&E began using O-Calc as its platform for completing pole loading calculations, and in 2017 a centralized database to retain Pole loading calculations record information was deployed.

In 2019, the Pole Loading Infrastructure Assessment program was initiated to increase the presence of pole loading calculations with "desktop verified" or better status in the Pole Loading Database (PLDB) by 10% annually, as desktop verifications are completed. The program is in development and is scheduled to be fully implemented in T2 / T3 HFTD areas in 2024. T1 deployment is planned to follow T2/T3 areas. Desktop validation of 100% of poles in T2 / T3 HFTD Areas is scheduled by 2024. Baseline pole loading calculations, Models & Pole Characteristics, performed using EDGIS information (small class, multiple circuits, treatment) help identify the priority assets for desktop verifications. Estimating resources provide quality assurance check on desktop reviews performed by contractors.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue conducting pole loading calculations with desktop verifications. No enhancements are anticipated before the upcoming wildfire season.

2. ***Before the next annual update:*** Continue conducting pole loading calculations and desktop verifications as described above.

3. ***Within the next 3 years:*** Continue conducting pole loading calculations and desktop verifications as described above. Desktop validation of 100 percent of the poles in Tier 2 and Tier 3 HFTD areas will be in process.

4. ***Within the next 10 years:*** Complete desktop validation of all poles in Tier 2 and Tier 3 HFTD areas in the system.

### 5.3.4.14 Quality Assurance / Quality Control of Inspections

Quality assurance/quality control of inspections utilizes a combination of program, process, tool, and other control points intended to rapidly identify anomalies in inspection and patrol results with the intention of addressing the gap, determining the root cause, and pursuing improvement opportunities. Among other things, quality assurance could mean establishing baseline metrics and measures of program performance to highlight outliers in any inspection process step. Quality controls can be established to identify inspection personnel who report abnormally high or low rates of corrective findings in the field. This could also mean identifying inspection personnel who experience abnormal rates of changes of their initial findings (increased or decreased priority of findings, rejection of findings).

PG&E's practice of a secondary review of all field inspection findings via a centralized gatekeeper prior to recording the finding in the system of record is one operational practice that works to drive consistency in inspection results. Work verification of inspector field inspection results by supervisory personnel, or through a representative re-inspection sampling scheme, is another means to assess the quality of inspection personnel. Work verification has been used for inspection quality management through 2019, yet PG&E will begin to leverage the data collected during digital paperless inspections and patrols to lessen the need for this type of after-the-fact sampling approach. In late 2019, PG&E issued guidance for self-assessment and enhancement of inspection program quality, which applies to electric asset inspection programs (GOV-1038S). In alignment with that guidance, PG&E will continue to self-assess process capabilities and improve maturity of inspection process quality management.

For inspections, quality assurance and quality control support are also provided after-the-fact by internal departments such as Internal Auditing (IA) and Electric Quality Management (EQM), who sample work to ensure it conforms to the governing process guidance. IA uses a risk-based approach in developing its annual Audit Plan. As part of this process, IA considers key and/or emerging risks that the Utility is facing, such as those related to the Utility's electric system that is exposed to wild fire hazards. IA includes audits covering these risks in its annual Plan; examples for 2020 include audits of inspection and maintenance processes for transmission and substation assets, and inspection and maintenance processes for distribution assets. In performing each individual audit, IA develops a risk and control matrix to document the relevant risks and controls and to help identify gaps and determine the scope of the audit. More specifically, in performing inspection and maintenance audits of electric assets, IA generally performs audit steps to assess the following:

- There is a complete population of electric assets for inspection,
- Utility and/or contract personnel performing the inspection and maintenance work are appropriately trained/qualified,
- Inspections and corrective work are completed within required timeframes,
- Work is performed to standard,
- Inspection and maintenance records are complete, accurate, and retrievable, and

- Inspection and maintenance guidance documents are current.

In performing this work, IA performs field visits (which may include consultation with Utility subject matter experts), interviews relevant Utility personnel, and reviews/tests applicable documentation. IA focuses on processes and controls. It does not have the technical expertise to evaluate the quality of corrective work; IA assesses the Utility's processes for ensuring that work is performed to quality, including evidence of review/approval by appropriate employees that the work adheres to Utility standards.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will consolidate its inspection gatekeeping function for transmission, distribution, and substation.

2. ***Before the next annual update:*** PG&E will establish initial process quality control metrics for field data collectors, inspectors, and gatekeepers (reviewers).

3. ***Within the next 3 years:*** PG&E plans to move all electric patrol and inspection activities to digital data collection platforms (e.g., mobile applications) and away from paper record keeping. Concurrently, PG&E will develop process control measures to more rapidly assess for abnormalities in patrol and inspection findings.

4. ***Within the next 10 years:*** PG&E will continue to evolve and improve its QA/QC programs.

### 5.3.4.15 Substation Inspections

Substation GO 174 baseline inspections in Tier 2 and Tier 3 HFTD areas were supplemented in 2019 as part of WSIP. PG&E baseline substation preventive maintenance practices ensure compliance with requirements of various regulatory agencies such as the CAISO, NERC, WECC, CPUC. The 2019 WSIP substation inspection program was designed to identify issues with substation equipment and components that could lead to a potential ignition source for a wildfire event.

Building on WSIP 2019, to further minimize the risk of a substation equipment failure causing a public or employee safety or system reliability concern (e.g., spreading a fire outside of the substation), PG&E has developed an ongoing program for performing supplemental inspections on selected facilities, based on risk assessment. These supplemental inspections are performed in addition to the routine inspections that are part of the maintenance practices described in utility standards TD-3322S and TD-3323S. To develop this supplemental inspection program, failure modes and effects analysis was performed on all substation equipment. As for the other WSIP 2019, substation supplemental (enhanced) inspections will utilize a mobile electronic checklist aligned to the FMEA to guide field assessments.

The WSIP program (and ongoing) supplemental inspections were carried out by teams of personnel, used visual and infrared inspection techniques to validate the condition of specific equipment and components. The supplemental inspection program includes three methods: Drone-based aerial inspection, Ground-based visual inspection, and Infrared inspection. Going forward, the supplemental inspections will be performed in PG&E-owned substations based on the following risk factors: High Fire Threat Districts (HFTD), Transmission Substation criticality, and Distribution Substation customer count. In 2020, supplemental inspections once annually for all HFTD Tier 3 stations, on a three-year cycle for stations in HFTD Tier 2. Additional non-HFTD sites may also be assessed using these supplemental inspection methods. For 2020-22, the baseline GO 174 monthly (or bi-monthly) station inspections are anticipated to proceed as per existing protocols. For 2019 WSIP, internal process quality checks were completed by the Electric Transmission Quality Verification team. In 2020, quality checks will utilize similar control measures as the transmission and distribution programs, including the centralized inspection review team.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** No changes to supplemental inspections are anticipated.

2. ***Before the next annual update:*** PG&E will continue to implement its substation inspection program as described above and expects to implement a new inspection field mobile application.

3. ***Within the next 3 years:*** PG&E intends to merge routine monthly and enhanced/supplemental detailed inspections using risk informed criteria to drive condition-based maintenance cycles.

4. ***Within the next 10 years:*** PG&E will also determine if adjusting asset patrol inspection cycles or modalities is likely to have adverse impacts on system safety or performance. PG&E anticipates moving to a risk-informed circuit-based inspection protocol that prescribes the timing for preventive maintenance activities aligned to multiple asset and environmental factors.

### 5.3.5 Vegetation Management and Inspections

*Explain the rationale for any utility ignition probability-specific inspections (e.g., "enhanced inspections") within the HFTD as deemed necessary over and above the standard inspections. This shall include information about how (i.e., criteria, protocols, etc.) the electrical corporation determines additional inspections are necessary.*

*Describe the utility's vegetation treatment protocols relating to treatment of any vegetation that could pose a grow-in or fall-in risk to utility equipment. Include in the description the threshold by which the utility makes decisions of whether to (1) treat, or (2) remove vegetation.*

*Discuss the overall objectives, strategies, and tactics of the electrical corporation for vegetation management. In the discussion,*

1. *Address how the electrical corporation has collaborated with local land managers to leverage opportunities for fuel treatment activities and fire break creation, and compliance with other local, state, and federal forestry and timber regulations.*
2. *Discuss how the electrical corporation identifies and determines which vegetation is at risk of ignition from utility electric lines and equipment.*
3. *Describe how (i.e., criteria, data, protocols, studies, etc.) the utility made the determination to trim any vegetation beyond required clearances in GO 95.*
4. *Describe utility plan to mitigate identified trees with strike potential, including information about how (i.e., criteria, protocols, data, statutes, etc.) the electrical corporation identifies and defines "hazard trees" and "trees with strike potential" based on height and feasible path to strike powerlines or equipment. Describe utility plan to identify reliability/at-risk tree species to trim or remove, where feasible, per location-specific criteria.*
5. *Include a discussion of how the utility's overall vegetation management initiatives address risks that may arise from trimming or removing trees, including but not limited to erosion, wind, flooding, etc.*

*Description of Programs to Reduce Ignition Probability and Wildfire Consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Additional efforts to manage community and environmental impacts*

2. *Detailed inspections of vegetation around distribution electric lines and equipment*
3. *Detailed inspections of vegetation around transmission electric lines and equipment*
4. *Emergency response vegetation management due to red flag warning or other urgent conditions*
5. *Fuel management and reduction of "slash" from vegetation management activities*
6. *Improvement of inspections*
7. *LiDAR inspections of vegetation around distribution electric lines and equipment*
8. *LiDAR inspections of vegetation around transmission electric lines and equipment*
9. *Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations*
10. *Other discretionary inspection of vegetation around transmission electric lines and equipment, beyond inspections mandated by rules and regulations*
11. *Patrol inspections of vegetation around distribution electric lines and equipment*
12. *Patrol inspections of vegetation around transmission electric lines and equipment*
13. *Quality assurance / quality control of inspections*
14. *Recruiting and training of vegetation management personnel*
15. *Remediation of at-risk species*
16. *Removal and remediation of trees with strike potential to electric lines and equipment*
17. *Substation inspections*
18. *Substation vegetation management*
19. *Vegetation inventory system*
20. *Vegetation management to achieve clearances around electric lines and equipment*
21. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

**Overview of PG&E's Vegetation Management Program**

Given the growing wildfire threat, PG&E has further expanded and enhanced its vegetation management around assets in HFTD areas. This includes addressing vegetation that poses a higher potential for wildfire risk in high fire-threat areas through PG&E's Enhanced Vegetation Management (EVM) program. The goal of this important wildfire safety effort is to reduce the risk of trees, limbs and branches contacting power lines and equipment to help keep our customers and communities safe.

This work is critical because PG&E operates in a heavily forested[17] and vegetated area, particularly compared to the other large California utilities. Additionally, PG&E's service area includes approximately:

- 81,000 circuit miles of overhead distribution power lines with approximately 25,200 circuit miles in HFTD areas
- 18,000 circuit miles of overhead transmission power lines with approximately 5,520 miles in HFTD areas
- An estimated 120 million or more trees with the potential to grow or fall into overhead power lines

The EVM program is being done in addition to other baseline and long-standing, multi-pronged PG&E vegetation management programs with various elements all designed to:

- Proactively conduct tree work that reduces the likelihood of tree failure that could impact electric facilities and pose a public safety risk;
- Comply with State and Federal regulations regarding minimum vegetation clearances for the Electric Transmission & Distribution overhead systems;
- Perform annual inspections so required vegetation clearances are maintained, remain compliant year-round and hazardous trees are abated;
- Maintain vegetation-to-line clearances, and radial clearances around poles, pursuant to PRC Sections 4292 and 4293, GO 95 Rule 35, and FAC-003-4 (Federal Electric Transmission standard), to ensure year-round compliance and risk reduction; and
- Validate that work was done as planned and intended through Quality Control (QC) and Quality Assurance (QA) reviews; including maintaining auditable records of all work done.

PG&E's EVM program encompasses all overhead distribution lines in Tier 2 and Tier 3 HFTD areas and is designed to exceed its annual Routine Vegetation Management work to comply with CPUC mandated clearances (GO 95, Rule 35). In HFTD areas, PG&E's Routine Vegetation Management meets regulations requiring 4 feet radial clearance around overhead distribution lines. The EVM program is much more expansive and aggressive and includes the following:

- Radial Clearances: Exceeding the 4-foot minimum clearance requirement by ensuring vegetation is trimmed to the CPUC recommended 12-foot clearance at time of trim to maintain compliance year-round, and in some cases, trimming beyond 12 feet depending on tree growth rates, among other factors. Trimming to the CPUC recommended 12-foot clearance ensures compliance with GO 95, Rule 35 year-round.
- Overhang Trimming: Removing overhanging branches and limbs four feet out from the lines and up to the sky for particular trees around electric power lines to further reduce the possibility of wildfire ignitions and/or downed wires and outages due to vegetation-conductor contact.

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17 For representations of the density of forests in PG&E's service territory within California. See pp. 3, 6, 7, 17 and more of https://www.fs.fed.us/pnw/pubs/pnw_gtr913.pdf.

- Assessing Trees with the Potential to Strike: Evaluating all trees tall enough to strike electrical lines or equipment and, based on that assessment, trimming or removing trees that pose a potential safety risk, including dead and dying trees.

**Objectives, Strategies, and Tactics for Vegetation Management**

1. Collaboration with Local Land Managers and Regulation Compliance

In order to facilitate timely completion of VM activities, PG&E is and will continue to collaborate with local landowners and communities, local governments, state agencies and federal agencies. This includes coordinating with cities, counties and other local authorities to obtain local encroachment permits or to manage other local requirements such as heritage tree requirements. PG&E's VM activities comply with endangered species and fish and game restrictions, CAL FIRE forest practices rules and state permitting requirements that could trigger review under the California Environmental Quality Act (CEQA). PG&E's VM Program is focused to a large degree on compliance with GO 95 Rules 35 and 37, PRC 4292, and PRC 4293.

While VM is focused on complying with regulatory requirements, PG&E's higher mission is to perform VM in ways that reduce wildfire threat as circumstances dictate. Because climate threat conditions today are more severe than those that existed when regulations were developed and adopted, PG&E's views VM requirements as the minimum standards for reducing risk. The program includes inspection identification, clearing and removal of potentially problematic vegetation, as well as Quality Assurance (QA) review of that work. PG&E's EVM Overhang Clearing will support compliance with GO 95 Rule 35 and PRC 4293 that require that no vegetation approach within four feet of electric distribution wires at any time.

2. Identify and Determination of Ignition Risk

PG&E complies with D.14-02-105 in which the CPUC adopted a Fire Incident Data Collection Plan that requires IOUs to collect and annually report certain information related to fire-related events. PG&E's annual report includes: the number of fire incidents; number of incidents by fire size; suspected ignition cause (e.g., third-party contact, equipment/ facility failure, wire/wire contact, objects); object type suspected of causing ignition; and, equipment failure type suspected of causing ignition. In addition, PG&E provides additional information about the tree species suspected of causing ignition. The data contained in these reports is analyzed to identify and determine the causes of ignition risk which ultimately drives the development of wildfire mitigation programs.

3. Determination to Trim Beyond GO 95 Requirements

PG&E determined that in certain circumstances it was prudent to exceed the GO 95 requirements for tree trimming. For example, instead of the required four feet radial clearance around conductors, PG&E is trimming trees from the conductor to sky for overhang clearing on particular trees. Additionally, through its EVM program, PG&E removes or trims trees outside of the GO 95 prescribed four-foot clearance where trees more than four feet away from a power line are determined to be hazard trees and have a clear path to strike.

4. Mitigation of Hazard Trees

PG&E initially identified 10 high risk tree species for removal where they are tall enough to strike a power line, have a clear path to strike, and exhibit other potential risk factors. However, PG&E continues to evolve the hazard tree mitigation program as it gains experience and receives input from the CPUC, industry and stakeholders about its tree assessment, program design, quality assessment and decision-making process. PG&E and the other California utilities will conduct a study to assess the need for and scope of the targeted tree species program. Depending on the circumstances, trees that have died or become unstable may be removed under either Enhanced VM or the Tree Mortality Program. When PG&E determines that overhang clearing work is so extensive that it will kill a tree, this tree is removed as part of the EVM Program. If overhang clearing work will only potentially cause a tree to die, the tree can generally be trimmed and left in place, subject to the property owner's agreement, to see if it recovers. In the latter case, if PG&E determines in a subsequent vegetation management inspection that a tree left in place ultimately died, that tree will be removed under the Tree Mortality Program.

5. Overall Vegetation Management Initiatives

PG&E's VM and EVM initiatives are designed to address the overall VM objectives including:

- Enhance community and public safety by further reducing the risk of power outages, wires down, and fires caused by trees growing or falling into high voltage distribution lines;
- Maintain the reliability of the electric distribution system and continue to comply with vegetation clearance regulations through the Routine Tree Work and Vegetation Control programs;
- Maintain program and work quality through a QA program;
- Continue to educate the public about the hazards posed by high voltage lines and vegetation through Public Education outreach efforts;
- Further improve field working conditions and safety practices for tree works through the Contractor Safety program; and
- Continue to comply with environmental regulations while performing VM work.

The EVM initiatives that PG&E introduced in 2018 included:

- Overhang Clearing: Removing branches overhanging electric power lines to further reduce the possibility of wildfire ignitions and/or downed wires due to vegetation-conductor contact;
- Targeted Tree Species Work: Identifying and pruning or removing specific tree species adjacent to power lines that may have a higher potential to fail during wildfire season;

- Fuel Reduction: Reducing vegetative fuels in the area under and adjacent to power lines with the intention of further reducing wildfire risk;

- Light Detection and Ranging (LiDAR) Using analytics from LiDAR and imagery (collectively referred to as remote sensing) data collection to augment the information gathered through manual patrols.

PG&E continues to refine its VM and EVM programs based on additional data and experience, feedback from stakeholders and the Commission, and developments within the vegetation management industry.

**Description of Programs**

The tables below outline various initiatives within PG&E's EVM program and broader vegetation management initiatives. While these initiatives are generally focused on supporting compliance with minimum clearance requirements, they are not static and continue to be informed by the evolving wildfire risk.

See Attachment 1, Table 24 for the details and data associated with the initiatives discussed in this section.

#### 5.3.5.1 Additional Efforts to Manage Community and Environmental Impacts

PG&E wants customers and communities to be completely informed about the EVM work taking place in their community. Vegetation management work in general**,** and the EVM work in particular, has an impact on the communities and properties where work is identified. PG&E proactively communicates to and partners with land owners, government agencies and community organizations on the work we are planning in and around their neighborhood. In some cases, through PG&E's outreach regarding this work, opportunities also arise for communities or agencies to leverage the work PG&E is doing to support or enhance community specific plans or efforts. In addition, for the past several years PG&E has provided grant funding to community organizations (generally Fire Safe Councils) to support them in performing community wildfire risk mitigation efforts, like fuel break creation or fuel cleanup efforts, that may not be adjacent to PG&E powerlines and therefore outside of the scope of PG&E's vegetation management programs.

The performance of vegetation management work could create environmental impacts as well, which PG&E is careful to mitigate, monitor, and manage. PG&E vegetation management contractors are trained on Best Management Practices and Avoidance and Minimization Measures to manage erosion, prevent impacts to sensitive environmental resources (e.g., bird nests, sensitive species and habitats) and protect waterways. For example, in some cases wood debris is re-distributed around the work area to create a mulch layer to cover the soil and prevent erosion. In addition, stumps and roots are left in place which can also help mitigate potential erosion issues.

Similarly, changing the ecosystem of a stand of trees can create new risks, like exposing a previously protected tree to increased sunlight or wind, that the utility arborists performing PG&E's vegetation management work are conscious of and on the lookout for. Trees that exhibit risk factors (like poor taper) and could be a risk after adjacent tree work is performed may be proactively identified for treatment (trimming or removal).

PG&E also coordinates with numerous cities, counties, and other local authorities to obtain local encroachment permits or to manage other local requirements, such as heritage tree ordinances. However, some state permitting requirements could cause delays by triggering review under the California Environmental Quality Act (CEQA). For example, PRC Section 30000 imposes requirements on tree removal in coastal zones. Not only is this requirement administered by many local governments through certified local coastal programs, requiring coordination for each area worked, if a permit is needed, but the level of CEQA review is determined separately by each permitting authority. Likewise, CAL FIRE forest practice rules also require approvals for the removal and disposal of trees. Vegetation management activities must also comply with endangered species and fish and game restrictions, which may trigger permitting requirements, as well as restrict when, where, or how the work may be performed (e.g., not during nesting season). Work on federal lands also require permits for tree removal, VM work, or land rights that predate federal ownership of the land.

PG&E's land and environmental management and customer care teams work closely with PG&E's vegetation management team to overcome challenges as described above and any other challenges that may come with this impactful work as quickly as possible. They coordinate and plan the work in order to reach out to landowners, communities, and local governments to address concerns in advance of the proposed vegetation management activities. PG&E tries to reach mutually agreeable results with concerned parties, but this regularly causes delays and sometimes PG&E must seek court orders. It could be helpful if the CPUC or state legislature addressed these constraints. For example, if the legislature extended PRC Section 4295.5 to also authorize utility tree workers to trim or remove trees or clarified the definition of a "conversion" in the forest practice rules to clearly exclude maintenance of a utility right of way, it could significantly improve the ability to execute vegetation management work. Likewise, legislative action could restrict the discretionary terms attached to encroachment permits.

In the coming years, PG&E will continue to communicate and partner with stakeholders regarding this important vegetation safety work. In addition, and where possible, PG&E will inform cities and counties of vegetation management work within their community and work with them to address any questions they may have.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to: inform customers and communities about the vegetation management work taking place or planned to take place in their community through customer outreach efforts; monitor and manage potential environmental impacts resulting from EVM activities; obtain the necessary permits and clearances before conducting work; and reach out to local landowners, communities and local governments to address potential concerns about planned and ongoing EVM work.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. Additionally, PG&E will incorporate lessons learned in 2020 in its efforts to manage community and environmental impacts going forward.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years. To the extent regulations, permitting requirements or legislative changes are implemented, PG&E will adjust its efforts to manage community and environmental impacts to address these changes.

4. ***Within the next 10 years:*** PG&E will continue to implement the activities described above within the next ten years. To the extent regulations, permitting requirements or legislative changes are implemented, PG&E will adjust its efforts to manage community and environmental impacts to address these changes.

### 5.3.5.2 Detailed Inspections of Vegetation Around Distribution Electric Lines and Equipment

PG&E conducts detailed inspections of vegetation around distribution electric lines and equipment on an annual cycle under its routine VM program.

Pre-inspection is the first step in the vegetation management process. After onboarding inspectors as described in Section 5.3.5.14 below, pre-inspectors are assigned circuits and deployed to work in various areas throughout PG&E's service territory. Correctly assessing tree characteristics such as species, health, growth rate, and likely failure patterns is critical to determining the type of tree work needed to reduce wildfire risk and to keep trees from coming into contact with power lines or electrical equipment. Importantly, all trees identified for work by pre-inspectors are evaluated for the urgency of the required tree work. If tree failure is judged to be possibly imminent, a crew will be dispatched the same day. Trees can also be flagged for immediate follow-up work, while trees that require work but show no near-term risk factors are scheduled following the standard process.

Trees identified for work by the pre-inspector are then assigned to a tree crew to be worked according to PG&E standards to create adequate tree-to-line clearances.

PG&E assesses routine vegetation management work performance using both Quality Control (QC) and Quality Assurance (QA) processes. Both QC and QA process select samples to assess. QC samples inspections or tree work recently completed to validate that all work was performed in accordance with PG&E standards. The QA effort is designed to validate that the entire process, starting with pre-inspectors, is creating the desired outcomes and identify areas where expectations are not being met, and if additional work is needed or other process modifications are required.

QA is accomplished through the physical inspection of a sample of the newly cleared PG&E system. The objective of the sampling exercise is to estimate the work quality rate for all trees in the geographic area covered by an audit. PG&E uses the results of the QA Program to improve future performance and to also help inform performance management activities such as re-training of pre-inspectors. PG&E has reviewed its QA Program and procedures with third-party experts who have validated that the sampling design in use is appropriate for PG&E's objectives, stating "[t]he use of a cluster sampling design is entirely appropriate for PG&E's objectives…."[18]

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**18** Dr. Karl Snow of Bates White Economic Consulting, PG&E's QA statistical sampling methodology.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to execute its detailed inspection program around distribution lines and equipment as described above: PG&E will conduct a pre-inspection to assess tree characteristics and determine the urgency of the required tree work; pre-inspectors will prescribe the appropriate work by circuit to maintain adequate vegetation-to-line clearances. PG&E's tree contractors will conduct the prescribed tree work. PG&E will implement its QA program to assess the quality of work performed in the field.

2. ***Before the next annual update:*** PG&E will continue to execute its detailed inspection program and associated tree work as described above.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years and will continue to incorporate lessons learned as the program evolves. To the extent that regulations change or new regulations or requirements are adopted, PG&E will adjust its program to comply with those changes.

4. ***Within the next 10 years:*** PG&E will continue to implement the activities described above and will continue to incorporate lessons learned as the program evolves. To the extent that regulations change or new regulations or requirements are adopted, PG&E will adjust its program to comply with those changes.

### 5.3.5.3 Detailed Inspections of Vegetation Around Transmission Electric Lines and Equipment

PG&E's transmission vegetation management work is regulated by the Federal Energy Regulatory Commission (FERC), the North American Electric Reliability Corporation (NERC) and the Western Electricity Coordinating Council (WECC). PG&E is required to comply with the NERC Standard – FAC-003-4, which is a FERC-approved standard implemented to eliminate transmission outages and resulting blackouts due to vegetation contact. This standard applies to transmission lines carrying 200,000 volts and higher and certain lower-voltage transmission lines identified as critical by the WECC. It requires that PG&E patrol and clear any vegetation that is incompatible with the clearances set forth in the FAC-003-4 standard.

In addition, we also comply with the American National Standards Institute's (ANSI) A300 – Part 7 Integrated Vegetation Management (IVM) Standard, followed by electric utilities nation-wide. IVM involves removing any vegetation that is incompatible with the safe and reliable operation and maintenance of high-voltage transmission lines. The standard also includes maintaining the Wire Zone and Border Zone surrounding the lines by establishing and maintaining a corridor that retains low fire risk, along with healthy and compatible vegetation, and removal of all incompatible vegetation.

The Wire Zone is the area under the transmission wires, plus 10 feet beyond the outside wires. The Border Zone extends from the Wire Zone out to the edge of the corridor, which may be up to 50 feet from the transmission centerline on 115 kV lines. Industry best practices dictate we remove incompatible vegetation up to and beyond the Border Zone due to various factors, including:

- Line sag and wind sway
- Vegetation treatment cycle length
- Tree movement and limbs blowing into the corridor in high-wind scenarios
- Line height above the ground and streams
- Sensitive species habitats

In addition, PG&E will remove or trim any hazard and/or danger trees beyond the Border Zone that could fail and strike the line. A danger tree is any tree located on or adjacent to a utility right-of-way or facility having characteristics with higher likelihood of failure that could damage utility facilities should it fall, as defined by Title 14 California Code of Regulations, Sec. 895.1. A hazard tree is a tree that poses an increased potential risk of falling into the lines due to, for example, poor health (all or a portion of the tree dying, diseased or decayed) or other defects.

In order to maintain these clearances, PG&E conducts annual inspections to remove any vegetation that is incompatible with the safety of high-voltage transmission lines and equipment.

In the coming years, PG&E will also be looking at the process and scope of work for overhang removals on all transmission circuits. Due to the historically broader

clearances maintained between transmission lines and vegetation and a practice of preventing direct overhangs of transmission lines, PG&E anticipates that the number of trees anticipated to require work to align the electric transmission system with this scope will be significantly less than for the distribution system.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to: conduct annual inspections to remove any vegetation that is incompatible with the safety of high-voltage transmission lines and equipment; maintain the Wire Zone and Border Zone surrounding transmission lines; and remove or trim any hazard and/or danger trees beyond the Border Zone that could fail and strike the line.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. Additionally, PG&E will incorporate lessons learned in 2020 as part of its detailed transmission line and equipment inspection program going forward.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years. PG&E will also be looking at the process and scope of work for overhang removals on all transmission circuits. To the extent regulations or requirements related to the transmission inspection program change, PG&E will adjust its program to address those changes.

4. ***Within the next 10 years:*** PG&E will continue to implement the activities described above within the next ten years with adjustments as we determine that modifications are needed to better achieve the goal of reducing vegetation-to-line contacts that cause ignitions and potential wildfires. To the extent regulations or requirements related to the transmission inspection program change, PG&E will adjust its program to address those changes.

#### 5.3.5.4 Emergency Response Vegetation Management Due to Red Flag Warning or Other Urgent Conditions

As described above in Section 5.3.5.2, all trees identified for work by pre-inspectors are evaluated for the urgency of the required tree work. If tree failure is judged to be possibly imminent, a crew will be dispatched the same day. Trees can also be flagged for immediate follow-up work, while trees that require work but show no near-term risk factors are scheduled following the standard process. The same process would be followed during any urgent conditions, as long as conditions are safe enough for the tree crews to work in.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to identify potentially imminent tree failure and flag trees for immediate follow-up work. PG&E will dispatch crews as soon as the same day an urgent condition is identified as long as crews can safety complete the work.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. Additionally, PG&E will incorporate lessons learned in 2020 as part of its emergency response vegetation management program.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years.

4. ***Within the next 10 years:*** PG&E will continue to implement the activities described above within the next ten years subject to adjustments and evolution appropriate to technology opportunities, regulations and determination about the most effective ways to meet the goal of reducing vegetation-to-line contacts, ignitions and catastrophic wildfires.

#### 5.3.5.5 Fuel Management and Reduction of "Slash" From Vegetation Management Activities

In 2018, PG&E began a fuel reduction program, performing ground-to-conductor vegetative fuel reduction work (i.e. under and adjacent to power lines) in select locations. The goal of the fuel reduction work is to create "fire defense zones" which enhance defensible space for communities, properties, and buildings. These "fire defense zones" can also mitigate the spread of an ignition if one were to occur under or adjacent to PG&E powerlines. As such PG&E will continue to conduct fuel reduction work when appropriate, in select locations.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to conduct ground-to-conductor fuel reduction work, when and where appropriate.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. Additionally, PG&E will incorporate lessons learned in 2020 as part of its fuel reduction program

3. ***Within the next 3 years:*** PG&E will continue to assess the effectiveness and risk reduction benefits of fuel reduction, and other vegetation management, activities to continue adjusting and refining vegetation management programs and the resource deployment across those programs.

4. ***Within the next 10 years:*** See above, PG&E will continue to assess the effectiveness and risk reduction benefits of fuel reduction activities to continue adjusting and refining the program.

### 5.3.5.6 Improvement of Inspections

See Section 5.3.5.2 (distribution inspections) and Section 5.3.5.3 (transmission inspections) above for a discussion of areas where PG&E's inspection programs are continuing to improve and mature.

### 5.3.5.7 LiDAR Inspections of Vegetation Around Distribution Electric Lines and Equipment

Physical, on the ground pre-inspections are being augmented by the capture of LiDAR and related, remote sensing, data that can be thoroughly and consistently analyzed to take measurements, reveal patterns and identify risks more precisely than the pre-inspector on the ground. In 2019, PG&E captured LiDAR for most Tier 2 and Tier 3 HFTD areas.[19] In addition to LiDAR, PG&E also gathered hyperspectral data in 2019 and plans to use both to inform the accuracy of electric distribution lines in the ArcGIS layers used to identify power lines and identify trees with the potential to strike electric lines. PG&E will also continue to explore additional ways to utilize LiDAR data in the coming years. See also Section 5.3.4.7, LiDAR Inspections of Distribution Electric Lines and Equipment.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to use LiDAR and related, remote sensing data to reveal patterns and identify risk. PG&E will continue to correct the accuracy of electric distribution lines in its GIS data to more accurately identify trees with strike potential.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. Additionally, PG&E will incorporate lessons learned in 2020 as part of its LiDAR program.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years. PG&E will continue to explore ways to use LiDAR data to reduce wildfire risk.

4. ***Within the next 10 years:*** PG&E will continue to implement the LiDAR program activities described above within the next ten years.

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**19** To underscore the unprecedented scope of this work, PG&E's 2019 data capture of approximately 25,200 distribution circuit miles is believed to be the world's largest ever hyperspectral data survey.

### 5.3.5.8 LiDAR Inspections of Vegetation Around Transmission Electric Lines and Equipment

Transmission LiDAR inspections are conducted every year as part of the transmission vegetation management program's annual inspections to identify necessary vegetation work. Any vegetation that requires work as identified by the LiDAR data analysis is then field verified by qualified pre-inspectors to prescribe the appropriate tree work. This also includes hazard trees that are encroaching into the right-of-way and trees that are tall enough to strike PG&E facilities, which are then further inspected on the ground.

Transmission LiDAR inspections are designed to identify work prior to any vegetation coming out of compliance and to align with PG&E's standards that exceed compliance clearances.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to use LiDAR to help identify vegetation management work along electric transmission lines. In addition, PG&E is developing a risk matrix using topographical and wind analysis to differentiate tree risk in HFTD areas from non-high fire-threat areas.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above as well as explore additional ways to reduce wildfire risk on transmission lines in the next three years. This may include developing applications in LiDAR and other remote sensing technologies to asses fuel loading in the right-of-way, among other potential initiatives.

4. ***Within the next 10 years:*** PG&E will continue to implement the LiDAR program activities described above within the next ten years.

#### 5.3.5.9 Other Discretionary Inspection of Vegetation Around Distribution Electric Lines and Equipment, Beyond Inspections Mandated by Rules and Regulations

Following the guidance of tree mortality proclamations from California government officials and the CPUC in, and subsequent to, 2014 PG&E has undertaken additional inspections around overhead electric distribution lines to inspect for and remove dead or dying trees that threaten powerlines. Primarily this effort, referred to as the CEMA[20] program or "dead and dying tree program", involves performing a second annual inspection in many parts of our service territory, namely HFTDs and State Responsibility Areas (SRA), that are at higher risk of tree mortality and/or wildfire risk.

As these CEMA / "dead and dying" inspections result in identification of trees that need to be addressed they are assigned to a tree crew and removed.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to execute additional annual inspections in HFTD and SRA areas and prioritize and work the trees identified for removal due to being dead or dying.

2. ***Before the next annual update:*** See above.

3. ***Within the next 3 years:*** PG&E anticipates continuing to execute the addition inspections of the CEMA program. Additionally, PG&E will incorporate lessons learned, further analysis and available data into optimizing the CEMA, and all other vegetation management, programs to reduce the likelihood of vegetation-to-line contacts and the associated wildfire risk.

4. ***Within the next 10 years:*** See above.

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**20** The CEMA name simply refers to the memorandum account that the costs of this effort are recorded to: the Catastrophic Emergency Memorandum Account.

### 5.3.5.10 Other Discretionary Inspection of Vegetation Around Transmission Electric Lines and Equipment, Beyond Inspections Mandated by Rules and Regulations

See Section 5.3.5.3 (transmission inspections) above for a discussion of PG&E's vegetation inspection programs for transmission facilities. There are limited "other discretionary inspections" performed on Transmission lines.

### 5.3.5.11 Patrol Inspections of Vegetation Around Distribution Electric Lines and Equipment

See Section 5.3.5.2 (distribution inspections) above for a discussion of PG&E's vegetation inspection programs for distribution facilities. There is no specific program to perform "patrols" around distribution lines unique from the inspections described in Section 5.3.5.2.

### 5.3.5.12 Patrol Inspections of Vegetation Around Transmission Electric Lines and Equipment

See Section 5.3.5.3 (transmission inspections) above for a discussion of PG&E's vegetation inspection programs for transmission facilities. There is no specific program to perform "patrols" around transmission lines unique from the inspections described in Section 5.3.5.3.

### 5.3.5.13 Quality Assurance / Quality Control of Inspections

PG&E assesses vegetation management work performance using both Quality Control (QC) and Quality Assurance (QA) processes. Both QC and QA process select samples to assess. QC samples inspections or tree work recently completed to validate that all work was performed in accordance with PG&E standards. The QA effort is designed to validate that the entire process, starting with pre inspectors, is creating the desired outcomes and identify areas where expectations are not being met, and if additional work is needed or other process modifications are required.

QA is accomplished through the physical inspection of a sample of the newly cleared PG&E system. The objective of the sampling exercise is to estimate the work quality rate for all trees in the geographic area covered by an audit. PG&E uses the results of the QA Program to improve future performance and to also help inform performance management activities such as re-training of pre-inspectors. PG&E has reviewed its QA Program and procedures with third-party experts who have validated that the sampling design in use is appropriate for PG&E's objectives, stating "[t]he use of a cluster sampling design is entirely appropriate for PG&E's objectives…."

The one exception to the sampling discussed above is the EVM program where 100% of work completed is thoroughly reviewed through a work verification effort wherein all miles reported as completed by the assigned tree crew are then re-inspected to be validated as properly completed to EVM standards. If any trees were not managed to program scope then rework is assigned for completion before work verification is completed. On top of that 100% work verification process the EVM program is then also assessed with a sample-based QA program (as described in Section 5.3.5.15 below).

Note that the costs and program details provided in Section 13 of Table 25 combine the QC & QA efforts of the multiple vegetation management programs.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to deploy QC and QA programs to assess the performance of vegetation management activities and identify improvements or lessons learned.

2. ***Before the next annual update:*** As described above, PG&E will continue to deploy QC and QA programs to assess the performance of vegetation management activities and identify improvements or lessons learned.

3. ***Within the next 3 years:*** As described above, PG&E will continue to deploy QC and QA programs to assess the performance of vegetation management activities and identify improvements or lessons learned.

4. ***Within the next 10 years:*** As described above, PG&E will continue to deploy QC and QA programs to assess the performance of vegetation management activities and identify improvements or lessons learned.

### 5.3.5.14 Recruiting and Training of Vegetation Management Personnel

In 2019 alone, PG&E was able to increase its total contract pre-inspector workforce from 580 to 1375 pre-inspectors to meet the demands of the expansive EVM program. The pre-inspectors performing EVM work receive training from PG&E to teach contractors program scope, tools and relevant procedures to ensure consistency in how the work should be performed and how findings/prescriptions should be recorded. This process includes training and skills assessment testing. All pre-inspectors are required to take a skills assessment to show their competency on the program requirements and appropriate processes to gain and maintain access to PG&E EVM tools. The test comprises multiple choice questions about EVM's scope (e.g., the overhang and radial clearance requirements), to assess pre-inspectors' preparedness to accurately identify the work that should be prescribed in the field.

PG&E's intensive EVM program creates substantial challenges in regard to the availability qualified tree crew contractors. Previously, the most significant challenge to the EVM program schedule has been the limited availability of qualified workers, putting a strain on the timing and pacing of work. However, in 2019, PG&E was able to expand its contracted tree trimmer workforce from 1400 to 5437 new experienced tree workers and continues to identify additional tree crew contractors to complete this important work. By the end of 2019, 774 pre-inspectors and 2,234 tree trimmers were performing EVM work for PG&E.

The limited pool of qualified personnel, whether through contract, company or mutual aid, is exacerbated by the particular challenges of performing vegetation management work in Northern California. Logging and tree felling are one of the most hazardous industries in the nation, and the Northern California forests pose a very different challenge than in most parts of the country. Safely removing a 200+ foot tall tree in proximity of a high voltage distribution line must be done by a qualified professional.

The pace and schedule of PG&E's multi-year EVM program is based on maintaining a resource complement of approximately 3,000 qualified tree workers to perform vegetation management activities. With that volume of workers split between PG&E's routine VM and EVM programs results in an approximately 10-year EVM program until approximately 2028. Any acceleration of that schedule would require a sustainable increase in the volume of trained, safe, qualified, line clearance certified tree workers.

To address this constraint in the coming years, PG&E is exploring approaches to increase the population of qualified tree workers that could perform this work. PG&E is exploring possible partnerships with community colleges to develop VM pre-inspector and utility-qualified tree trimmer certificate programs to increase the talent pipeline. PG&E also expects Senate Bill 247 to increase the number of qualified tree workers in California over time, although however it will increase program costs due to increased wage requirements as per the senate bill. In addition, PG&E has also developed a series of trainings for transitioning pre-inspectors to move them from routine VM to EVM, to expand the available pool of contractor resources which can perform EVM work.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to: on-board qualified pre-inspectors; identify and hire qualified tree workers; confirm that pre-inspectors and tree workers are properly trained and qualified.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. PG&E will continue to explore approaches to increase the population of qualified tree workers that can perform EVM work. Additionally, PG&E will incorporate lessons learned in 2020 into its approach for identifying, training and hiring qualified vegetation management personnel.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years. To the extent legislative changes occur that impact PG&E's approach for identifying, training and hiring vegetation management personnel, PG&E will adjust its program to address those changes.

4. ***Within the next 10 years:*** PG&E will continue to implement its vegetation management training and hiring program activities described above within the next ten years.

### 5.3.5.15 Remediation of At-Risk Species

PG&E's VM team conducts site visits to vegetation-caused outage events as part of its standard service interruption investigation process. The data collected from these investigations informs failure patterns by specific tree species associated with wire-down events. In 2018 PG&E used this data to target 10 species of trees that were responsible for nearly 75 percent of the investigated vegetation-caused outage events in HFTD. This data and list of "at-risk" tree species formed the basis of the EVM program.

The EVM program, further described in the introduction to this Section 5.3.5, also includes two additional aspects. However, the program is managed and executed in an integrated manner that prevents costs or activities from easily being separated into the components of the program. The two other aspects of the EVM program are (1) that all branches and limbs will be trimmed to the CPUC recommended 12-foot clearance at the time of trim (GO 95, Rule 35, Appendix E), and in some cases, trimming beyond the 12 feet depending on tree growth rates, among other factors, to remain compliant year-round; and (2) trimming and removal of overhanging vegetation from directly above and around distribution lines to supplement radial clearances. This work is focused on further limiting the possibility of wildfire ignitions and/or downed wires due to vegetation-conductor contact by removing branches and limbs that are overhanging within 4 feet of the conductors and up to the sky.

In response to the CPUC's direction in the 2019 WMP Decision, PG&E began evaluating all trees with the potential to strike or fall into power lines, above and beyond the original top 10 species of at-risk trees. With this enhanced effort to reduce wildfire risk, the total number of trees PG&E will evaluate as part of the EVM program has increased substantially to include the estimated 120 million or more trees in northern and central California that have the potential to grow or fall into overhead power lines. Pre-inspectors are identifying these trees using PG&E's tree assessment tool which is designed to evaluate a tree's risk of striking the electrical equipment. The tool was developed by a team of ISA Certified Utility Arborists and uses PG&E data regarding regional vegetation-caused outages and ignitions during fire season, tree species height and distance to the electrical equipment, lean, health, and the terrain, and among other factors. PG&E will continue assessing strike-potential trees in the coming years as part of the EVM program.

For EVM, pre-inspectors are responsible for walking the lines to look for radial clearances and overhanging branches and limbs, as described above. In addition, pre-inspectors are assessing trees around the power lines that are tall enough to strike the lines. Pre-inspectors will then prescribe the appropriate work to meet the EVM scope requirements. This prescribed tree work is then assigned to a Tree Crew to perform the work in a safe, compliant, efficient manner.

After all EVM-required tree work is completed by PG&E's contractors and passed 100% Work Verification (including the performance of an necessary rework before it is "passed" by the Work Verification assessor), the final step in the vegetation management process is the QA Program to assess the quality of work performed in the field. The QA effort is designed to validate that the entire process, starting with pre-inspectors, is creating the desired outcomes and identify areas where expectations

are not being met, and if additional work is needed or other process modifications are required.

The scale, scope and complexity of this work necessitates that, to address the more than 25,000 overhead distribution circuit miles in HFTD areas, this program is established as a multi-year effort. In 2019, the EVM program completed approximately 2,498 circuit miles which includes the vegetation clearances, overhang and hazard tree removals mentioned above. In 2020, PG&E plans to work approximately 1,800 additional circuit miles on both distribution lines in HFTDs, dependent on factors such as resource availability, vegetation density, topography, access and environmental considerations. As PG&E addresses the challenges that come with implementing an evolving and expansive program, the miles to be worked under the EVM program will continue to be re-assessed on a year-by-year basis. At this time, for 2021 and 2022, PG&E is forecasting to work on approximately 1,800 circuit miles each year.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to execute the EVM program and enhance its efforts to evaluate all trees with the potential to strike or fall onto power lines or electrical equipment.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. PG&E, along with the other California utilities, will begin the process to study and assess the need for and scope of the targeted tree species program. Additionally, PG&E will incorporate lessons learned in 2020 into its EVM program and approach to remediating at-risk species.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above; when the targeted tree species study is complete, PG&E will adjust its program to incorporate the findings from that study. PG&E will also continue to evaluate the interplay between EVM, PSPS and opportunities to perform additional wildfire risk mitigation work and will adjust the program, as appropriate, to maximize the benefits of PSPS, EVM and other mitigation programs.

4. ***Within the next 10 years:*** PG&E anticipates continuing to implement its EVM program with the focus on remediating at-risk tree species, incorporating the findings from the targeted tree species study and other lessons learned. PG&E will also continue to evaluate the interplay between EVM, PSPS and opportunities to perform additional wildfire risk mitigation work and will adjust the program, as appropriate, to maximize the benefits of PSPS, EVM and other mitigation programs.

### 5.3.5.16 Removal and Remediation of Trees with Strike Potential to Electric Lines and Equipment

Note that this broad initiative description overlaps with several of the previously discussed programs. Pursuant to PRC Section 4293 and GO 95, Rule 35, all PG&E vegetation management inspections assess for hazard trees. A hazard tree is defined as a tree that has been assessed from the ground to pose a potential danger to fall or fail into electrical facilities due to poor health (all or a portion of the tree dying, diseased or decayed) or other defects. See the previously outlined sections for more discussion of those routine activities to assess for hazard trees.

An additional program PG&E leverages to remove or remediate trees with strike potential is the Right of Way clearing program on the electric transmission system. This program seeks to create increased clearances, beyond compliance minimums, to further reduce wildfire risk and improve system reliability. This Right of Way expansion program seeks to create broader clearances on lower voltage transmission lines (60/70kV or 115kV) similar to the Wire Zone and Border Zone concepts applied to higher voltage lines (and discussed in Section 5.3.5.3). This work includes establishing and maintaining a corridor that retains low fire risk, along with healthy and compatible vegetation, and removal of all incompatible vegetation.

In addition to the wildfire risk reduction of establishing these cleared transmission rights of way PG&E is assessing how these activities can help reduce the scope and footprint of PSPS events. As discussed previously, having to shut off a transmission line during a PSPS event has major consequences for communities and customers. Service to all customers who are directly served by a single, long, radial transmission line will be shut off for the duration of the PSPS event, even though they may not be experiencing the same high-risk weather conditions.

By creating significantly increased clearances from vegetation to powerlines this transmission right of way clearing program is expected to raise the wind threshold for when a PSPS must be taken on lines where the cleared right of way has been established. To capture this double benefit of reduced wildfire risk and reduced PSPS footprint PG&E is increasing the focus on this work in 2020 by shifting some resources from EVM work on distribution lines to this right of way clearing work.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, continue executing transmission right of way clearing projects to reduce wildfire risk while completing analysis to determine the extent to which PSPS thresholds for treated transmission line segments can be modified to reduce the risk of PSPS outages for customers.

2. ***Before the next annual update:*** PG&E will continue to implement program activities and incorporate lessons learned in 2020.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above and further incorporate lessons learned, updated risk analysis, and other insights to optimize this, and other, vegetation management program.

4. ***Within the next 10 years:*** PG&E will continue to implement the activities described above and further incorporate lessons learned, updated risk analysis, and other insights to optimize this, and other, vegetation management program.

### 5.3.5.17 Substation Inspections

PG&E is assessing the area around the substations in HFTD areas to ensure there is a safe distance between trees and/or vegetation and critical infrastructure to create defensible space. PG&E is looking at the area within 100 feet of the substation and potentially removing or thinning out trees and brush, per CAL FIRE recommendations and state guidelines. In 2019, PG&E conducted inspections of vegetation surrounding 222 substations and 70 hydro facilities in and around HFTD areas. In 2020, PG&E will continue to conduct annual maintenance of the defensible space around these facilities.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to inspect the areas around substations and critical infrastructure in HFTD areas to create defensible space and will conduct annual maintenance of the defensible space around these facilities.

2. ***Before the next annual update:*** PG&E will continue to implement the activities described above before the next annual update. Additionally, PG&E will incorporate lessons learned in 2020 into its substation inspection program.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years. To the extent regulations, guidelines or recommendations related to substation inspections change, PG&E will adjust its program to address those changes.

4. ***Within the next 10 years:*** PG&E will continue to implement its substation inspection program with modifications and improvements as appropriate, within the next ten years.

### 5.3.5.18 Substation Vegetation Management

Substation vegetation management efforts are incorporated into and addressed by the substation inspection program described in Section 5.3.5.17.

### 5.3.5.19 Vegetation Inventory System

PG&E's vegetation management work is kept in a centralized system that includes the historical work prescribed and the timing of any tree work or inspections completed, among other things. PG&E's EVM program also utilizes an ArcGIS application to manage work flows. In the coming years, PG&E will continue to review its processes and procedures and look for opportunities to enhance and streamline our vegetation inventory systems. Within the next few years, PG&E will continue to improve our tools. [Note that the costs for maintaining these tools and databases are included in the overall programmatic costs of executing vegetation management activities, principally Section 5.3.5.2 for distribution and Section 5.3.5.3 for transmission.]

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** As described above, PG&E will continue to update and maintain its vegetation management inventory system.

2. ***Before the next annual update:*** PG&E will continue to update and maintain its vegetation management inventory system. Additionally, PG&E will incorporate lessons learned in 2020 into vegetation inventory program.

3. ***Within the next 3 years:*** PG&E will continue to implement the activities described above within the next three years. PG&E will identify opportunities to improve the systems and tools its uses to maintain its vegetation management records.

4. ***Within the next 10 years:*** PG&E will continue to implement its vegetation inventory program with modifications and improvements within the next ten years.

### 5.3.5.20 Vegetation Management to Achieve Clearances Around Electric Lines and Equipment

Vegetation management, i.e., tree trimming, to achieve clearances around electric lines and equipment is conducted as part of the routine and enhanced VM programs described in throughout the sections above. While possible in some instances PG&E generally does not separate the cost of inspections from the cost of the tree trimming or removal efforts. See Section 5.3.5.2 for the primary distribution efforts related to "achieving clearances" and Section 5.3.5.3 for transmission efforts on that front.

### 5.3.6 Grid Operations and Protocols

*Description of Programs to Reduce Ignition Probability and Wildfire Consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Automatic recloser operations*
2. *Crew-accompanying ignition prevention and suppression resources and services*
3. *Personnel work procedures and training in conditions of elevated fire risk*
4. *Protocols for PSPS re-energization*
5. *PSPS events and mitigation of PSPS impacts*
6. *Stationed and on-call ignition prevention and suppression resources and services*
7. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

*For each of the above initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season,*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

See Attachment 1, Table 26 for the details and data associated with the initiatives discussed in this section.

#### 5.3.6.1 Automatic Recloser Operations

PG&E utility Procedure TD-1464P-01 establishes precautions for wildfire risks associated with recloser protection functions. Reclosing devices such as circuit breakers and line reclosers are used to quickly and safely de-energize lines when a problem is detected and re-energize lines when the problem is cleared. Using analyses provided by fire officials and PG&E's Meteorology team regarding each year's fire season timeline and exposure, PG&E makes an informed decision on when to disable automatic reclosing/testing during elevated fire conditions in protection zones that intersect Tier 2 or Tier 3 HFTD zones. Timing for disabling/enabling is based on the condition of fuels and a recommendation made by the WSOC and Meteorology. Once the decision to disable has been approved by the Vice President of Asset Management, CWSP all reclosing devices for transmission 115kV and below and all distribution lines will be disabled during the determined utility fire risk season for protection zones that intersect Tier 2 or Tier 3 HFTD areas. In some instances, this practice may reduce potential ignitions from sustained faults.

There are approximately 2,800 distribution reclosing devices on PG&E lines serving Tier 2 and Tier 3 HFTD areas. The devices that have reclosing functionality include substation circuit breakers, line reclosers, FuseSavers, and TripSavers. By June of 2019, approximately 2,500 of the 2,800 reclosing devices serving Tier 2 and Tier 3 HFTD areas were SCADA-enabled. Most of the remaining non-SCADA devices are TripSavers which cannot be SCADA-enabled. By June 2020, PG&E will permanently remove the automatic reclosing functionality of the remaining TripSavers serving the Tier 2 and Tier 3 HFTD areas. This will result in less than 40 remaining non-SCADA distribution reclosing devices serving the Tier 2 and Tier 3 HFTD areas, and PG&E will manually disable automatic reclosing/testing during the determined utility fire risk season. In addition, reclosing devices located on nearly 400 transmission lines with voltages of 115 kV and below are included in the program. Over 95 percent of the transmission line devices are SCADA-enabled and can be disabled remotely, and like the distribution devices that are not SCADA-enabled, PG&E will manually disable the remaining devices during the determined utility fire risk season for protection zones that intersect Tier 2 or Tier 3 HFTD areas.

Existing distribution line reclosers that are operated for fire safety (e.g., as part of the PSPS or Recloser Disabling programs) were originally installed to optimize electric reliability and limit the number of customers exposed to outages, which can also present serious public safety concerns. These reclosers are often not optimally positioned to isolate the newly designated HFTD areas.

PG&E will continue upgrading devices with SCADA capability in targeted portions of the HFTD areas to help minimize the impact of PSPS events on customers in low-risk areas adjacent to the HFTD areas. These upgrades will include adding or replacing existing manually operated fuses and switches at strategic locations with new SCADA-enabled Fusesavers™, switches, or reclosers. By isolating the lines closer to the border of the HFTD, fewer customers will be impacted and fewer lines will be de-energized. These

improvements will also expedite restoration by reducing the amount of lines requiring a patrol.

PG&E discusses efforts to further sectionalize distribution circuits and limit the duration and number of customers impacted by PSPS events in Section 5.3.3.9, Installation of System Automation Equipment.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue automatic recloser operations as described above.

2. ***Before the next annual update:*** Incorporate new reclosing devices that will be installed for the PSPS program into the reclose disable program.

3. ***Within the next 3 years:*** Continue to implement the reclose disable program as described above. Additionally, PG&E will begin to develop tools and technology to implementing the program using its Advance Distribution Management System (ADMS) that which would allow PG&E to disable/enable on a daily basis using fully automated computer systems.

4. ***Within the next 10 years:*** Implement the reclose disable program using the ADMS protocol described above.

### 5.3.6.2 Crew-Accompanying Ignition Prevention and Suppression Resources and Services

#### Safety and Infrastructure Protection Team (SIPT)[21]

The in-house SIPT team consists of two-person crews composed of IBEW-represented employees who are trained and certified safety infrastructure protection personnel. SIPT crews perform fire mitigation functions and gather critical data to help PG&E prepare for and manage wildfire risk. During elevated fire risk conditions, SIPT crews accompany PG&E crews when performing high risk work activities. In addition, SIPT crews perform critical fuel reduction work around PG&E assets to prevent damage from wildfires.

SIPT crews are expected to be utilized for the highest priority fire mitigation work.

#### Risk Informed Deployment of SIPT Crews

Prior to the next annual update, the WSOC intends to utilize various data points to calculate risk to inform SIPT deployment purposes. The WSOC plans to leverage a fire spread modeling application to support prioritization decisions. Factors will include fuel data, ignition potential calculations, weather forecasts, geography (terrain, slope, aspect, vegetation, etc.), historical climatology, and PG&E asset information.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Update and stabilize the current technology solutions and processes and increase staffing levels to support fire prevention and mitigation activities. Targeted staffing levels and associated equipment needs: 98 SIPT Crew members and 40 Engineers.

2. ***Before the next annual update:*** Develop and implement risk informed prioritization model.

3. ***Within the next 3 years:*** Continue to assess effectiveness of program and develop risk informed business case to potentially increase staffing levels and equipment needs.

4. ***Within the next 10 years:*** Continue to evaluate the SIPT program and update and modify it as appropriate to address current wildfire mitigation efforts.

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**21** SIPT resources are also discussed in in Sections 5.3.2.5 and 5.3.6.6.

### 5.3.6.3 Personnel Work Procedures and Training in Conditions of Elevated Fire Risk

**Update to Utility Standard TD-1464S, Preventing and Mitigating Fires While Performing PG&E Work**

This standard establishes requirements for PG&E employees and contractors to follow when traveling over, performing work on, or operating on any forest, brush, or grass-covered lands. In 2019 the standard was updated to better reflect California Public Resource Code (PRC) Sections 4427, 4428, and 4430 and lay out specific mitigations and restrictions based on the work being performed and the daily fire danger. In addition to the standard, two attachments were also posted; a Wildfire Mitigation Matrix which reviews various types of daily work performed by PG&E employees and contractors along with required preventative measures that must be taken based on the daily fire danger and a Wildfire Mitigation Checklist which is a tool for crews to use prior to beginning work to ensure all the preventative measures within the matrix and standard are in place. A version of the TD-1464S Standard was also created and posted to the external website.

The revisions to the new standard were thoroughly reviewed within PG&E Over the course of 3 months there were many field meetings and virtual learning sessions with employee to communicate the PRC requirements and the standard updates. Meeting attendees also had opportunities to ask questions and provide input. In addition, a web-based, annual required training (SAFE-1503WBT) for PG&E employees was revised in 2019 to reflect the changes in the standard. The training objectives include: subscribing to and understanding PG&E's Utility Fire Potential Index, understanding TD-1464S and the aforementioned attachments and safe use of the required hand tools (i.e. Shovel, McLeod, Pulaski and a 5-gallon backpack pump). Required tools and equipment were also prescribed in the updated standard. A template was utilized by each impacted organization to identify and purchase the required tools and equipment for their respective organization.

In 2019 and 2020, the Wildfire Safety Operations Team plans to implement a safety observation card via SafetyNet (PG&E's Safety Observation Program) and Quality Control program to ensure that the updated fire prevention and mitigation measures have been adopted by personnel working and functioning on any forest, brush or grass-covered lands.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Incorporate the fire prevention and mitigation checklist into SafetyNet.

2. ***Before the next annual update:*** Develop a Quality Control program to assess PG&E employee and contractor fire prevention and mitigation readiness.

3. ***Within the next 3 years:*** Continue to evaluate tools, equipment and other fire prevention and mitigation techniques to ensure field employees have the necessary training and resources while performing work in elevated fire risk areas.

4. ***Within the next 10 years:*** Continue to evaluate work procedures and training programs and update and modify them as appropriate to address current wildfire mitigation efforts.

#### 5.3.6.4 Protocols for PSPS Re-Energization

The objective for PSPS re-energization is to provide for the safe, efficient restoration of PG&E electric facilities (Transmission Lines, Substations and Distribution Circuits), including prioritizing of critical infrastructure, after those facilities have been de-energized in the interest of public safety through a PSPS.

The PG&E EOC Officer in Charge triggers the PSPS patrols and re-energization by approving the re-energization of impacted assets within the event footprint. This approval is termed “Weather all Clear,” indicating that a return to weather conditions supporting the commencement of restoration (both the patrol and re-energizing activities) activities in given area(s). Re-energizing activities then commence in the event footprint including conducting patrols and removing and repairing hazards.

The protocol for re-energization when both transmission and distribution assets (including substations) are involved typically includes executing re-energizing of both transmission and distribution assets simultaneously. The transmission element is often prioritized to ensure system stability (including the system protection component) is accounted for and to provide a source for substations and their associated distribution circuits that could be impacted. The transmission line patrol prioritization strategy is driven by electrical system stability (i.e., ensuring adequate transmission facilities are in service to support the overall grid and accompanying local loads along with ensuring that the system protection component is addressed) followed by the customer impacts associated with each line impacted in the event.

Distribution circuit “segmenting” is also used to better align both field and control center personnel in supporting and performing an enhanced safe and efficient by providing for distribution circuit-based isolation (segmentation) and using a circuit-based patrol personnel hierarchy structure. The segmenting process can commence immediately following impacted distribution assets being de-energized as part of a PSPS event as it is done in a de-energized state (while the weather event is ongoing) and typically consists of using previously created distribution circuit segment guides on impacted circuits to open pre-identified distribution field devices downstream of the open source device (used to de-energize given portion(s) of a distribution circuit) to allow for setting up “step restoration” once the “All Clear” is received.

These segment guides use alphabetical identifiers for segments (i.e., Segment “A”, Segment “B”, etc.). Because the entire distribution circuit may not have been de-energized as part of the PSPS event, the segmenting commences at the next distribution field device.[22] Those distribution circuits with assets within HFTD areas will each have an individual segment guide including accompanying maps with the

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[22] Distribution segment guides are being converted from Fire Index Area (FIA) based to circuit based for 2020 based on lessons learned from the 2019 events. This is driven by the need to move from an “FIA” (Fire Index Area) boundary philosophy to an individual circuit approach which better supports a more targeted meteorological boundary and a more strategic use of PSPS.

pre-identified segments.[23] A given distribution circuit's segments are currently derived by identifying SCADA (remote controlled) field devices and using methodology such as prioritizing for critical customers where possible.

Following the "All Clear," a distribution circuit segment is patrolled (starting at the source side device opened for the event), if no trouble is found PG&E will re-energize that segment up to the next open device (segment boundary). This restoration sequencing is based on the "step restoration" methodology which allows for re-energizing customers in a safe, controlled and efficient manner (rather than waiting to patrol the entire circuit and then re-energizing). This process typically follows the pre-identified segmenting alphabetical sequence (i.e., A-B-C-D, etc.). If damage is found in an individual segment, PG&E may revise the restoration order. This restoration process also provides for a scalable field patrol hierarchy and custom maps detailing both the circuit's individual segment(s) and overall circuit connectivity.

Re-energization information is given to both the field and control center personnel prior to executing the PSPS restoration activities.

The field patrol hierarchy typically consists of the following for a given distribution circuit:

- Task Force Lead: A single point of contact for a given PSPS impacted distribution circuit(s) who is responsible for ensuring PSPS patrols are completed and who works with the Control Center to safely re-energize distribution circuit segment(s). A sing point of contact allows for significant reduction in communication to the Control Center(s) and promotes increased safety and efficiency due to more focused attention of patrol personnel (both air and ground) engaged in the overall PSPS restoration process.

- Segment Lead: Personnel responsible for oversight of assigned patrol personnel (both air and ground) on given segment(s) of a distribution circuit, reports to the Task Force Lead.

- Patroller: Individuals (internal, contract and mutual aid) responsible for patrolling assigned portions of a distribution circuit, reports to their assigned Segment Lead.

To support the re-energizing activities, resources needs are identified for the scale and scope of the event footprint during the event pre-planning. Resources typically include helicopters, company personnel, contractors and mutual aid. These resources are then provided to the impacted areas and staged to support the event. Re-energization protocol is largely guided by the following documents:

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[23] Given the use of more defined weather forecasting, a given distribution circuit may be de-energized at any point on that circuit so while the segment guide will commence with Segment "A" it may be de-energized at Segment "C" or within a given segment. This allows for more targeted use of PSPS which in turn minimizes customer impacts including those involving critical infrastructure (i.e., public safety, hospitals, communications, water, etc.).

- TD-1464S, “Preventing and Mitigating Fires While Performing PG&E Work” as described in Section 5.3.6.3, Personnel Work Procedures and Training Conditions in Elevated Fire Risk.

- TD-1464B-002, “Public Safety Power Shut-Off for Distribution and Transmission Electric Facilities.” This document includes the protocols used by transmission and distribution control center and field/support personnel supporting PSPS restoration (patrols and re-energization) efforts.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Update TD-1464B-002 to include lessons learned from 2019 PSPS events and latest meteorology inputs (i.e. revised definition of patrol boundary requirements). Begin updating the existing Fire Index Area based Distribution Circuit Segment Guides and maps to circuit based, supporting more detailed meteorology event boundaries. Update the existing Distribution Control Center Operator training materials to incorporate revisions to TD-1464B-002 along with any new materials identified (i.e., potential meteorological and PSPS boundaries including associated segment guide updates as noted above). Confirm that PG&E personnel to complete annual TD-1464S training (see Section 5.3.6.3, Personnel Work Procedures and Training in Conditions of Elevated Fire Risk).

2. ***Before the next annual update:*** Confirm TD-1464B-002 and the distribution circuit segmentation process are reviewed and updated as appropriate based on lessons learned during the 2020 wildfire season.

3. ***Within the next 3 years:*** Continue evaluating, updating and improving de-energization protocols and associated guidance documents, process and training activities based on current PSPS tactics and lessons learned.

4. ***Within the next 10 years:*** Continue evaluating, updating and improving de-energization protocols and associated guidance documents, process and training activities based on current PSPS tactics and lessons learned.

### 5.3.6.5 PSPS Events and Mitigation of PSPS Impacts

PG&E's PSPS program proactively de-energizes a portion of our electric system in the interest of public safety when forecasts predict extreme fire-threat conditions. PSPS is utilized by PG&E in accordance with Commission Resolution ESRB-8 "to protect the public safety", D.19-05-042, and other Commission directives.[24] The purpose of proactive de-energization is to promote public safety by decreasing the risk of utility-infrastructure as a source of wildfire ignitions. PG&E will only consider proactively turning off power when the benefits of de-energization outweigh potential public safety risks.

De-energization is determined necessary to protect public safety when PG&E reasonably believes there is an imminent and significant risk of strong winds impacting PG&E assets, and a significant risk of large, destructive wildfires should ignition occur. PSPS is used as a measure of last resort and is only deployed when other measures are not adequate alternatives. PSPS addresses a specific type of risk and, while other measures described in PG&E's Wildfire Mitigation Plan help reduce the need to de-energize, PSPS remains a unique tool at the utility's disposal to use in the interest of public safety if extreme conditions are forecasted. A key objective of the PSPS program is to implement measures to dramatically reduce customer impacts of PSPS events without compromising safety. PG&E has developed and is continuing to evaluate accelerated strategies for achieving this objective in 2020 and beyond.

PG&E implemented its PSPS Program in 2018 to proactively de-energize lines that traverse Tier 3 HFTD areas under extreme fire risk conditions. In 2019, PG&E expanded the PSPS program scope to include high voltage transmission lines and the highest fire risk areas (Tier 2 (elevated fire risk) and Tier 3 (extreme fire risk) as referenced in the HFTD Map adopted by the CPUC. PG&E continues to evaluate and mature its program to most effectively eliminate potential ignitions during extreme weather conditions including developing risk-based processes to assess wildfire risk of individual lines and structures.

To develop the PSPS Program, PG&E worked extensively with SDG&E to understand and implement best practices from SDG&E's de-energization program, while addressing unique issues presented by PG&E's service area (which differs in terrain, weather, and population). PG&E worked with SDG&E to address issues such as PSPS execution decision factors, stakeholder communication strategies, post-event patrols and inspections, re-energization processes and tools and technology used to promote situational awareness and fire spread modeling.

In 2018 and 2019 PG&E initiated PSPS events that followed the guidelines set forth in the PSPS guidance documents it developed. Since the 2019 WMP submission PG&E executed multiple PSPS events ranging from approximately 10,000 to 1 million customers.

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[24] See Resolution Extending De-Energization Reasonableness Notification, Mitigation and Reporting Requirements in D.12-04-024 to all Electric IOUs.

Strategies to both reduce scope, duration, and frequency as well as mitigate the impact on customers when they are de-energized are described in Section 5.6.2 Protocols on Public Safety Power Shutoff.

PG&E's 1-year, 3-year, and 10-year vision for the PSPS program are described in Section 4.4 Directional vision for necessity of PSPS.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue to implement PSPS according to the protocols and processes currently in place.

2. ***Before the next annual update:*** See Section 4.4, Directional Vision for Necessity of PSPS.

3. ***Within the next 3 years:*** See Section 4.4, Directional Vision for Necessity of PSPS.

4. ***Within the next 10 years:*** See Section 4.4, Directional Vision for Necessity of PSPS.

### 5.3.6.6 Stationed and On-Call Ignition Prevention and Suppression Resources and Services

**Safety and Infrastructure Protection Team (SIPT)[25]**

This in-house team consists of two-person crews composed of IBEW-represented employees who are trained and certified safety infrastructure protection personnel. SIPT crews are used to perform fire mitigation functions and gather critical data to help PG&E prepare for and manage wildfire risk. On a daily basis during normal work hours (e.g., Monday – Friday day shift), SIPT crews are available to respond to emergency situations such as active wildfire response. The SIPT crews will be redirected from their planned assignment to the emergency situation by the WSOC and the SIPT Duty Officer.

During off hours, an On-call system has been established where a specified number of SIPT crews are available across the service territory to respond to emergency call outs. These SIPT crews are compensated with standby pay to be on call. In addition to the on-call crews, other SIPT crews will also be called out to support response if necessary. Finally, if fire danger risk is elevated, the WSOC will identify additional standby personnel to support ready response.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Stabilize the current technology solutions and processes and increase staffing levels to support fire prevention and mitigation activities. Targeted staffing levels and associated equipment needs: 98 SIPT Crew members and 40 Engineers.

2. ***Before the next annual update:*** Continue to stabilize technology, processes and staffing needs.

3. ***Within the next 3 years:*** Continue to assess effectiveness of program and develop risk informed business case to potentially increase staffing levels and equipment needs.

4. ***Within the next 10 years:*** Continue to evaluate the SIPT program and update and modify it as appropriate to address current wildfire mitigation efforts

### 5.3.7 Data Governance

*Description of Programs to Reduce Ignition Probability and Wildfire Consequence*
*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each*

**25** SIPT resources are also described in Sections 5.3.2.5; 5.3.6.2.

*initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Centralized repository for data*
2. *Collaborative research on utility ignition and/or wildfire*
3. *Documentation and disclosure of wildfire-related data and algorithms*
4. *Tracking and analysis of near miss data*
5. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

*The list provided is non-exhaustive and utilities shall add additional initiatives to this table as their individual programs are designed and structured. Do not create a new initiative if the utility's initiatives can be classified under a provided initiative.*

*For each of the above initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season,*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

See Attachment 1, Table 27 for the details and data associated with the initiatives discussed in this section.

#### 5.3.7.1 Centralized Repository for Data

This section provides an overview of PG&E's efforts to integrate certain data from different data sources into a single environment, enabling data driven approaches to wildfire mitigation initiatives and efforts. PG&E's vision for data analytics is focused on a practical data integration approach (utilizing data pipelines from data sources/systems into an integrated data platform) as opposed to a data consolidation approach (eliminating existing data sources/systems and building a single data system for all PG&E data). This section details efforts to advance data integration, in particular two elements that contribute to this capability: (i) Asset Data Foundation, and (ii) data governance practices.

Effective data governance and the enhanced data access provides greater ability to leverage data for risk informed decision-making. Asset Data Foundation further contributes to this capability by bringing together various data critical data into a single environment to support operations and analysis. The long-term objective is to enable advanced data analytics that allow for predictive models to identify at risk assets to further enable proactive asset management practices to mitigate the risk of asset failure and enhance customer safety.

**Evolution of Data**

As Electric Operations systems and processes related to wildfire mitigation mature, the systems that generate and store data relevant to those mitigation activities continue to grow and evolve. The mitigation of risks associated with wildfire and other events require being able to access and leverage not only data within PG&E but also from external sources. In some instances, existing software systems were not designed to be easily accessed or integrated with other systems, but were purpose built to support specific capabilities. For example, customer data, asset data, work management data, GIS data, operations data and event data have traditionally been managed in separate systems, with independent data stores, without being integrated centrally. Data streams from new technologies, such as remote sensing and LiDAR, introduce emerging data needs for storage and processing, while advanced analytics (including Artificial Intelligence and Machine Learning) offer the potential to leverage data to better manage risk and predict events before they happen. PG&E has responded to these challenges by developing strategies for data governance, management, integration and access. Core to these strategies is an integrated platform for Electric Operations data – the Asset Data Foundation (ADF).

**Element Overview: Asset Data Foundation**

The Electric Operations ADF is the lead initiative of a broader Enterprise Data Foundation (EDF) strategy responsive to the following drivers: (i) increasing expectations for data availability, data quality and trusted analytics; (ii) increasing demand for advanced analytics, BI, visualizations, dashboards and data sharing; and (iii) increasing need for data security and privacy.

ADF is a governed assembly of data sets where attributes are defined, sources are known, data pipelines are governed, and key connections are established. ADF's data is a product for data users that have need to access multi-faceted data concerning EO assets. A key objective of ADF is to bring together critical physical, operational, lifecycle and environmental data elements into a single environment to better enable cross-functional access to data in support of operations and analysis, as well as providing a layer of data analytics available for self-service. This will be accomplished through the assembly of data from dozens of system sources, curation of this data, and publishing of data systematically with asset and management information. ADF will also establish a layer of governed analytics and data science models that can be accessed through self-service mechanisms.

ADF currently is connected to 20 source systems, which contain over 1.3 billion records relevant to asset health analytics. The number of connected systems, records, and enabled analytics models will continue to grow as WMP projects are added. ADF does not replace the underlying systems of record, but rather provides a central platform to enable data integration/virtualization and access, support for data governance and advanced analytics. There are also several programs to consolidate data of similar types that originate from different systems into a single repository that are underway or proposed. These efforts consolidate data into core systems which are available through ADF for asset and risk analytics functionalities. These programs include:

- GIS Data Mart: To provide a single access point into various GIS systems
- T-Line Outage Database: To develop a Transmission Outage Tool that will provide repository for all recorded outages in the transmission system
- Asset Failure Database: To develop an Asset Failure Database that will provide more insights on reasons for equipment failures
- SAP HANA: moving SAP BW (SAP Business Warehouse) from an on-premise server to cloud environment to streamline ease of integration with data platforms (repositories)

**Element Overview: Data Governance Practices**

Data governance creates the organization, policies, processes and procedures that can help facilitate the achievement of foundational data capabilities. Select categories of data governance that have the potential to influence the establishment integration of data include: Data Architecture (including data models and cataloging); Data Quality Assurance (including rules, measurements, and remediation); and Data Security (including classification, policies, and lifecycle). Data governance is supported through technology tools such as Collibra Governance, which manages information about data and enhances data accessibility by providing a meta data catalogue with process controls.

Electric Operations is in the process of exploring the development of an organization to help guide electric data governance. This organization would set the standards for data critical to wildfire mitigation and safe operations through the centralized development of data policies, standards, and data cataloging. Data stewards throughout the business

and IT would collaborate with this organization to address data needs and drive data governance outcomes. Having a centralized group to facilitate these functions can help ensure alignment of data strategies across Electric Operations and the enterprise.

**Prioritization and Rationalization**

The prioritization and rationalization of the elements contributing to the integration of data are summarized as follows:

- Asset Data Foundation: ADF projects have been prioritized and approved based on pilots and outcomes from 2019, including continued assembly of data pertaining to transmission and distribution assets lifecycles and operations, enabling self-service data access and analysis, and machine learning and predictive analytics data models to support prioritization of inspection and repair/replacement work.

- Data Governance: Projects will undergo an "Intake and Prioritization" process that supports identification and selection of different data projects. The development of data policies, standards, and business definitions established through data governance practices will inform the strategic selection of data projects and help drive the direction of data platform priorities.

**Audits / Measuring Effectiveness**

Wildfire mitigation programs and initiatives are bolstered through the accessibility and accuracy of electric data. The success of the asset data foundation and data governance elements is in part driven by the quality of this data, its timely availability, and the ability to combine data from disparate sources. If either element does not meet success targets, PG&E will conduct an analysis to identify the causes of inefficiency or ineffectiveness and implement efforts to improve the methodology.

Audits are planned for data program, project, or initiative phases to further ensure effectiveness. These audits will be based on qualitative and quantitative parameters such as the following:[26]

- Qualitative parameter: Measure adoption by tracking number of users logging in and track data sets requested and used as a measurement of usefulness of the data offered

- Quantitative parameter: Assess the strategic value associated with investments made in data platforms and governance functions, including use case enablements and foundational value to long term objectives

Longer term, PG&E may be able to directly measure outcomes of actual asset lifecycle statistics and compare with predictions in data science models to inform effectiveness reviews. If a program, project, investment, or strategy is found to be ineffective, PG&E will analyze and consider improvements to both the immediate underlying factors and

**26** Parameters for effectiveness review are subject to change.

future prioritization/selection methodology, helping to ensure efficient spend of ratepayer funds.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue development of integrated data platform(s) (repository) in support of single view of multiple sources systems containing relevant data. Continue efforts to correct known data issues that may have impacted PG&E's ability to execute PSPS notifications, including: (i) correcting electric connectivity data to ensure that the scope of PSPS events is as accurate as possible; (ii) ongoing evaluation of different methods for producing maps with higher levels of precision for the potential outage impacts; (iii) offering expanded support for counties affected by PSPS events and working on data sharing processes.[27]

2. ***Before the next annual update:*** Continue testing of integrated data platform(s) (repository), including initial data analytics capability. Increase data inputs and continuously update event data.

3. ***Within the next 3 years:*** Develop mature analytics tools serving integrated data platform(s) (repository).

4. ***Within the next 10 years:*** Continue to develop integrated data platform(s) (repository) with the objective of bringing together all relevant data into a single environment to better enable cross-functional access to data in support of operations and analysis, and in addition provide a layer of data analytics available for self-service.

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**27** Additional information about these PSPS issues can be obtained through CPUC Rulemaking 18-12-005 (Order Instituting Rulemaking to Examine Electric Utility De-energization of Power Lines in Dangerous Conditions).

### 5.3.7.2 Collaborative Research on Utility Ignition and/or Wildfire

PG&E is engaged in various collaborative research projects related to utility ignition and/or wildfire risk. PG&E regularly benchmarks wildfire risk issues with other California utilities, both informally and through the RAMP proceeding. PG&E also reviews information from and engages in benchmarking discussions with, other U.S and foreign (e.g., Australian) utilities that may face similar wildfire issues to PG&E. In addition, PG&E sometimes engages with other utilities and/or outside experts to perform research, including the following examples:

- Leveraging nuclear industry risk modelling to develop wildfire risk assessment: PG&E is partnering with the B. John Garrick Institute for the Risk Sciences, University of California Los Angeles (UCLA) to leverage the rigorous modeling used in the nuclear industry to perform thorough and complex wildfire risk assessments and management planning. PG&E has used a probabilistic risk assessment model for over 30 years at its Diablo Canyon Nuclear Power Plant. The model is constantly updated with current plant design and state of the art analysis methodologies. Data from 30 years of industry and plant specific experience is used to model component reliability and unavailability. The model can perform quantitative assessment of risks from a multitude of complex factors, including internal plant failures, seismic events, fire and flooding. Each model element has been independently reviewed by industry peer review teams and the results have been audited on numerous occasions by the Nuclear Regulatory Commission. The model is capable of quantitatively risk ranking over 3,000 individual system components including the transmission lines that supply Diablo Canyon with offsite power. PG&E is working with risk experts at UCLA to develop a similar model for wildfire risks for its electrical assets within HFTD areas.

- Wildfire Evacuation Study: PG&E partnered with several renowned traffic simulation and evacuation experts to collaborate with a high fire risk community to perform a detailed wildfire evacuation study to examine anticipated traffic conditions and evacuation times associated with various rates of evacuation responses and alternative management strategies that could be used in response to them. The intent of this work is to develop a procedure or methodology that can be applied to any community with a high fire risk to improve their wildfire emergency plans and to inform PG&E's egress risk methodology with additional granularity. The evacuation study report will document the demand estimation methodology (how many people and vehicles need to be evacuated), the highway capacity estimation, mobilization (trip generation) time distributions and the computed evacuation time estimates (ETE) in tabular and graphical format. The report will also contain a description of the traffic simulation and trip distribution and assignment algorithms utilized in the modeling system, the technical details of the study and the supporting data. In addition, the report will identify traffic bottlenecks during evacuation and include a detailed discussion of potential improvements to evacuation time.

- Distribution Arcing Fault Signature Library: As discussed in Section 5.3.2.2.8—PG&E is partnering with two National Laboratories to install a high-fidelity optical sensor technology on a distribution feeder for the completion of a Distribution Arcing Fault Signature Library. The Distribution Arcing Fault Signature Library will inform PG&E about the types and resolutions of sensors needed to detect incipient fault

conditions on the distribution system and intervene with proactive maintenance to reduce wildfire risks.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to pursue both formal and informal benchmarking and collaborative research efforts related to wildfire risk.
2. ***Before the next annual update:*** See above.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** See above.

### 5.3.7.3 Documentation and Disclosure of Wildfire-Related Data and Algorithms

PG&E collects voluminous data related to wildfire and wildfire risk management. At the most basic level, PG&E collects wildfire ignition data and reports it to the CPUC. PG&E also collects data on system operations, outages, asset condition and other factors that we are using to develop and prioritize wildfire mitigations. PG&E's process for developing and prioritizing mitigations has been documented and shared with the Commission and other interested parties both here and in various other proceedings, including the 2020 GRC and the 2019 RAMP.[28] PG&E is continuing to refine its data collection and evaluation methodologies, and will continue to report on them in upcoming proceedings.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to refine its data collection and evaluation methodologies and will continue to report on them in upcoming proceedings.
2. ***Before the next annual update:*** See above.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** See above.

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**28** For example, the types of data that PG&E uses as the basis for its circuit prioritization model for wildfire mitigations are described in Section 5.3.3.17. The model itself was shared with the Commission as part of the 2020 GRC.

#### 5.3.7.4 Tracking and Analysis of Near Miss Data

PG&E has not established a technical, operational definition of “ignition near miss” events and therefore does not track near miss data related to ignition probability and wildfire consequence. PG&E currently uses outage events as a proxy for near miss events as a larger population of system events to be analyzed in relation to assessing wildfire risk.[29] Moving forward through this WMP period PG&E will be working to establish a technical, operational definition of “ignition near miss” events and will establish processes and tools to capture, track and analyze such events.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** No immediate changes planned.
2. ***Before the next annual update:*** Through this WMP period PG&E will be working to establish a technical, operational definition of “ignition near miss” events and will establish processes and tools to capture, track and analyze such events.
3. ***Within the next 3 years:*** See above.
4. ***Within the next 10 years:*** Continued evolution in near miss tracking and analysis depending on learnings over the coming years.

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**29** Note that for the purposes of determining ignition probability drivers in Table 11 in Section 3.2, PG&E has taken the approach that an outage is a proxy for a near miss. Further, near misses in this context are only limited to outages.

### 5.3.8 Resource Allocation Methodology

*Description of Programs to Reduce Ignition Probability and Wildfire Consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following resource allocation methodology and sensitivities initiatives, including a description of the data flow into the calculations involved in each. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Allocation methodology development and application*
2. *Risk reduction scenario development and analysis*
3. *Risk spend efficiency analysis*
4. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

*For each of the below initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season*
2. *Before the next annual update*
3. *Within the next 3 years*
4. *Within the next 10 years*

*The list provided is non-exhaustive and utilities shall add additional initiatives to this table as their individual programs are designed and structured. Do not create a new initiative if the utility's initiatives can be classified under a provided initiative. Where the columns listed do not apply or cannot be meaningfully calculated for a given resource*

*allocation methodology and sensitivities initiative, "N/A" may be logged in the corresponding cell.*

*For each of the above initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season,*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

See Attachment 1, Table 28 for the details and data associated with the initiatives discussed in this section.

#### 5.3.8.1 Allocation Methodology Development and Application

Allocating resources to wildfire risk mitigation activities is one aspect of PG&E's overall resource allocation process. Resource allocation and balancing requires identifying resource supply (ability to perform work) and resource demand (how much work to complete).

Resource supply is identified for major working groups, particularly the construction and estimating resource groups within Electric Operations' Transmission Operations, Distribution Operations and Major Projects & Programs organizations. These are the main resources that perform work execution on electric assets.

Focusing on construction resource supply as a key example, we identify the maximum level of work that could be completed within a given timeframe (i.e., month or year) with current available or assumed resources (i.e. after planned hiring is completed). The 2020 plan used a combination of current headcount and crew availability and assumed incremental hiring of PG&E electric construction personnel. Construction resource supply is calculated for both internal (PG&E) and external/contract construction crews. Additionally, resource supply is calculated at the division level and can be summarized at the region or system level. Some factors incorporated into the construction resources supply model include: headcount, work / paid days, overtime, productive time, external resources, number of crews, external resources work schedule and external resources productivity level.

On the other hand, construction resource demand is developed from the full amount of work targeted to be worked in a given timeframe based on the planned and forecasted work volumes. In other words, resource demand is the amount of work PG&E expects to be worked in the unit of man hours.

Matching up resource supply and demand is performed by allocating resources to the highest priority work (including wildfire ignition prevention mitigations) until all resources have been accounted for. This prioritized volume of targeted work demand is compared against supply for every division. The prioritized target demand (of work) generally exceeds supply (of resources) which requires further prioritization of planned and forecasted work to support the development of an executable work plan. The initial prioritization of work from highest to lowest priority is then followed by optimization scenario analysis leveraging a value and risk modelling platform to understand investment and timing options. These options are reviewed with leadership to select the preferred scenario(s) for optimizing the workplan and balancing resources to create an executable workplan.

### 5.3.8.2 Risk Reduction Scenario Development and Analysis

In order to make risk informed decisions to minimize the risk of electrical equipment causing wildfires, PG&E is developing risk models that can produce scenarios for decision-making with the following characteristics:

1. Granularity: PG&E is developing models at the asset level, which will allow PG&E to view probabilities, consequences, and risk assessments across a range of levels from the asset up to the system level. Asset level assessments allow for increased capability to measure risk improvement from asset replacement or maintenance. While averaging risk across circuits can be effective, it requires estimating the risk reduction of a project or program of work. An asset level view of risk will give PG&E the opportunity to develop project scopes and programs that will efficiently reduce the risk of ignitions caused by equipment.

2. Time periods: PG&E is working to develop model scenarios across a range of time periods – planning, operational, and event.

    a. Planning scenarios: It is useful to assess worst case conditions, such as for fire season, in a planning view. The planning scenarios will provide the basis for work planning on an annual and multi-year schedule. Planning scenarios enable the optimization of multi-year work plans to reduce risk. PG&E envisions a mature set of tools to enable optimization of the multi-year workplan by evaluating alternative work plans to identify which combination of mitigation work will provide the most effective reduction of wildfire risk over time.

    b. Operational scenarios: PG&E needs to know the current risk levels for operational purposes. Operational scenarios will provide the basis for tracking wildfire risk and identifying areas for inspection tag prioritization and operational action such as switching if an area shows an elevated risk of wildfire.

    c. Event scenarios: Finally, PG&E needs to assess conditions during events such as PSPS activations. Event scenarios will provide the basis for PSPS activations, de-energization decisions and responding to ignitions.

Scenarios developed during these three time periods: planning, operational, and events will provide for risk informed decisions on an annual, daily and event basis to reduce the risk of equipment caused wildfires.

**Data Requirements**

Risk scenarios require data from the following sources: asset data, inspection results, vegetation data, and meteorology data. For the planning scenarios these data sets will represent future system conditions. These future data sets will be influenced by load forecasting, climate modeling, and meteorological modeling. For the operational scenarios the data sets will represent current system conditions including, daily and weekly load and generation forecasts, hourly, daily and weekly meteorology forecasts and current status on vegetation and electric system work. For example, this data would show the improvement in risk reduction as work is completed through the year. Operational scenarios will show risk reduction from completed work in the next month.

### How Used in Prioritization

With each of the time period models, alternative scenarios can be developed to assess relative risk and accompanying mitigation costs. Applying the risk spend efficiency process outlined in Section 5.3.8.3 the capabilities of each scenario can be viewed and a risk informed decision can be made. For the planning model it might involve multi-year work plans or mid-year plan adjustments to respond to system conditions or shifted work schedules. For the operational model scenarios will provide for risk informed decisions on outage planning for work or shifts in load or generation forecasts responding to meteorological conditions. Scenarios modelled during events could inform PSPS activation and de-energization decisions or decisions about how to prioritize safety observers from the WSOC.

### Verification and Precision

Another function of the operational level model is to serve as a tool to measure the precision of the risk models. Each day, operational models will represent the probability of equipment failure, vegetation events and ignitions on the transmission and distribution system. The actual equipment failures, vegetation events and ignitions provide for a feedback on model performance. Constructing an ongoing measure of model precision as part of the operational model will provide a measure of confidence as part of making informed decisions based on the risk scenarios, data driven feedback for model improvement, and eventually an environment for machine learning methods to be incorporated in to the models.

### *Progress Timeline*

1. ***Before the upcoming wildfire season:*** PG&E currently employs transmission and distribution risk models capable of producing operational scenarios at the circuit level. Before the next fire season, PG&E will attempt to produce planning, operational, and event models at the circuit level. Because this level of functionality is a key component of improvements to PSPS, most of PG&E's work in the near term will be focused on creating event scenarios to inform PSPS decisions.

2. ***Before the next annual update:*** In preparation for the 2021 workplan, PG&E plans to develop the planning scenarios to evaluate different workplan scenarios at the asset level.

3. ***Within the next 3 years:*** PG&E plans to develop asset based operational, planning and event scenarios to a decision level of precision and quality. The verification and precision functionalities of the operational model will also be refined in the next 3 years.

4. ***Within the next 10 years:*** PG&E will continue to employ advanced modeling and machine learning algorithms to refine data inputs, model accuracy and scenarios tools.

### 5.3.8.3 Risk Spend Efficiency Analysis

Risk Spend Efficiencies (RSEs) represent the calculated risk reduction per dollar spent on an initiative. RSEs are calculated by the S-MAP aligned risk model. RSEs represent the calculated risk reduction associated with the implementation of a mitigation per dollar spent on that mitigation and are determined for each Mitigation by dividing the Risk Reduction by the total cost of the Mitigation program.

Risk reduction for a mitigation is calculated based on the difference between the pre-Mitigation Risk Score and Post-Mitigation Risk Score, for each year. To calculate the post-Mitigation Risk score, PG&E estimated the effectiveness of the proposed mitigations for each ignition driver by assembling a cross-functional team of experienced professionals from across the Company and established risk assessment and management consulting service providers. The team reviewed each of the CPUC-reportable ignition events for PG&E from 2015 – 2018 and assessed whether the given mitigation program would have potentially prevented the ignition.

When a Mitigation includes multiple programs, Total Risk Reduction is allocated to each program based on its marginal contribution to the risk score. The Net Present Value (NPV) of the Risk Reductions are then used for calculating Risk Spend Efficiency (RSE) of each program per the formula below.

- Risk Reduction = Total Risk Reduction x Risk Reduction Allocation Factor
- Risk Spend Efficiency (RSE) = NPV of Risk Reduction / NPV of Program Costs

Risk Reduction is calculated for each calendar year and represented as a present value in current year using the utility discount rate of 7.1% for calculating RSE. The utility discount rate is PG&E's after-tax weighted cost of capital.

Currently, RSEs have been calculated for four mitigation programs related to wildfire risk:[30]

1. System Hardening in PG&E's distribution system in HFTD areas
2. Enhanced Vegetation Management (EVM) for PG&E's distribution system in HFTD areas
3. Non-Exempt Surge Arrestor Replacement in distribution system (in PG&E's entire service territory);
4. Public Safety Power Shut off (PSPS) in Distribution and Transmission systems (in HFTD areas).

More background on risk quantification, which is a pre-requisite to calculating RSE is provided in Section 5.3.

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**30** RSEs presented in this filing are projections based on the current model, which will continue to be enhanced and validated with actual data. The RSEs in this filing should be seen as indicative of trends, rather than as forecasts of ignition probability.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to refine its RSE calculations and analysis. Updated descriptions will be included in PG&E's upcoming 2020 RAMP filing.

2. ***Before the next annual update:*** PG&E expects to incorporate RSEs into its Risk Informed Budget Allocation (RIBA) process and implement IT systems to support Risk Spend Accountability Reporting (RSAR) per D.19-4-020 and future project portfolio optimization initiatives.

3. ***Within the next 3 years:*** As part of the next S-MAP proceeding, PG&E expects to implement Risk Mitigation Accountability Reporting (RMAR), portfolio optimization and risk tolerance policies.

4. ***Within the next 10 years:*** PG&E expects that RSEs will play an integral role in its decision making and resource planning process.

### 5.3.9 Emergency Planning and Preparedness

*Include a general description of the overall emergency preparedness and response plan, and detail:*

1. *A description of how plan is consistent with disaster and emergency preparedness plan prepared pursuant to Public Utilities Code Section 768.6, including:*
   a. *Plans to prepare for and restore service, including workforce mobilization (including mutual aid and contractors) and prepositioning equipment and employees*
   b. *Emergency communications, including community outreach, public awareness, and communications efforts before, during, and after a wildfire in English, Spanish, and the top three primary languages used in California other than English or Spanish, as determined by United States Census data*
   c. *Showing that the utility has an adequate and trained workforce to promptly restore service after a major event, taking into account mutual aid and contractors*
2. *Customer support in emergencies, including protocols for compliance with requirements adopted by the CPUC regarding activities to support customers during and after a wildfire, including:*
   a. *Outage reporting*
   b. *Support for low income customers*
   c. *Billing adjustments*
   d. *Deposit waivers*
   e. *Extended payment plans*
   f. *Suspension of disconnection and nonpayment fees*
   g. *Repair processing and timing*
   h. *Access to utility representatives*
3. *Coordination with Public Safety Partners, such as stationing utility personnel in county Emergency Operations Centers*

*Describe utility efforts to identify which additional languages are in use within the utility's service territory, including plan to identify and mitigate language access challenges.*

*Description of Programs to Reduce Ignition Probability and Wildfire Consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Adequate and trained workforce for service restoration*
2. *Community outreach, public awareness, and communications efforts*
3. *Customer support in emergencies*
4. *Disaster and emergency preparedness plan*
5. *Preparedness and planning for service restoration*
6. *Protocols in place to learn from wildfire events*
7. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

*The list provided is non-exhaustive and utilities shall add additional initiatives to this table as their individual programs are designed and structured. Do not create a new initiative if the utility's initiatives can be classified under a provided initiative.*

*For each of the above initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season*
2. *Before the next annual update*

3. *Within the next 3 years*

4. *Within the next 10 years.*

This section describes PG&E's overall emergency preparedness and response plan. Detail is provided below regarding how PG&E's emergency response plan aligns with PUC Section 768.6, the support provided to customers during emergencies, engagement applied with public safety partners, as well as the approaches PG&E takes to identify and mitigate language access challenges. PG&E further describes six initiatives as it related to emergency planning and preparedness, including their anticipated evolution over time: (1) adequate and trained workforce for service restoration; (2) community outreach, public awareness, and communications efforts; *(3)* customer support in emergencies; (4) disaster and emergency preparedness plan; (5) preparedness and planning for service restoration; and (6) protocols in place to learn from wildfire events.

See Attachment 1, Table 29 for the details and data associated with the initiatives discussed in this section.

**Emergency Plan Alignment with Public Utilities Code Section 768.6**

In alignment, with PUC Section 768.6, which are standards for disaster and emergency preparedness plans, PG&E prepares for, responds to, and restores service during emergencies as documented in its Company Emergency Response Plan (CERP). The CERP is inclusive of the Electric Annex, Disaster Rebuild Annex, Public Safety Power Shutoff (PSPS), and other annexes that support the CERP. PG&E manages its Mutual Assistance agreements with other utilities through the California Utility Emergency Association (CUEA), Western Regional Mutual Assistance Agreement (WRMAA) and the Edison Electric Institute (EEI). Combined, these agreements provide PG&E with access to over 80% of the public utility industry across the United States and Canada.

PG&E utilizes a contractor workforce through its Contract Management office, ensuring that sufficient personnel are available for contingency operations. Electric Operations and Supply Chain Logistics divisions are each responsible for the pre-positioning of crews and equipment and such decisions are made based on the scope and location of a given incident. PG&E maintains numerous Service Centers and equipment warehouses throughout its service territory for such contingencies. Additionally, PG&E activates Base Camps, micro-sites, and equipment laydown yards on an *ad hoc* basis as the needs of each situation may dictate.

When PG&E's EOC is activated, PG&E utilizes a mass notification system (Send Word Now) to inform employees and public safety partner agencies about incidents taking place. This platform uses voice, text and email messaging to notify recipients of major events affecting their area. During any emergency incident, PG&E notifies customers (where possible) to provide incident-related updates if long-duration outages are anticipated, which may include the cause of the outage, estimated times of restoration and notification once power is restored (where possible). If a customer has set their notification preferences to receive outage-related updates, a customer will receive automated notifications with status of the outage. During a PSPS event, however, all forms of contact information available for a customer are utilized for direct notifications to potentially impacted customers.

PG&E provides emergency communications and a variety of outreach tactics to customers before, during and after an emergency (including wildfires), such as: community outreach, website, letters, factsheets, handouts, proactive news stories, social media, and translated outreach in multiple languages. PG&E Advice Letter 4139-G/5630-E more fully describes the emergency-related outreach plan, including the translation support provided before, during and after a disaster, including wildfires.

PG&E ensures unity of command, continuity of operations and a common operating picture through use of the National Incident Management System (NIMS), Incident Command System (ICS) and Standardized Emergency Management System (SEMS); this includes mutual assistance and contractor crews. These incident command system principles are applied to all emergency operations, ranging from Base Camp EOCs, to Operational Emergency Centers, to the main PG&E EOC. All PG&E personnel engaging in EOC operations are trained in the basic concepts of ICS. Electrical service contractors are required to meet established qualification criteria for inclusion in PG&E's contractor program, of which approximately 270 are qualified to perform restoration work. PG&E's Electric Operations divisions (Transmission and Distribution) also employ crews to perform emergency restoration work as needed in the aftermath of incidents.

**Customer Support in Emergencies**

Support for customers impacted by an emergency, including wildfires, is an important element of PG&E's post-incident emergency response. Following the October 2017 Northern California wildfires, PG&E established a series of billing and service modifications and disaster relief to support impacted customers. These measures, included in PG&E's Emergency Consumer Protection Plans, were adopted with Advice 3914-G-A/5186-E-A, effective December 22, 2017, in compliance with Commission Resolution M-4833, Emergency Authorization and Order Directing Utilities to Implement Emergency Consumer Protections to Support Residential Customers of the October 2017 California Wildfires. On September 7, 2018, PG&E revised its Emergency Consumer Protection Plan, as approved by Advice 3914-G-A/5186-E-A, for residential and non-residential customers in areas covered by a state of emergency issued by the Governor[31] due to a disaster, such as a wildfire, that affects utility services.

Disaster-related emergency declarations are becoming more frequent in California. The protections adopted in the 2017 resolutions were limited narrowly to the specific incidents identified in the resolutions, the CPUC established interim measures in D.18-08-004, which affirmed the provisions of Resolutions M-4833 and M-4835 as temporary disaster relief protection measures for customers until the proceeding under R.18-03-011 developed a permanent emergency disaster relief program. On July 11, 2019, the Commission issued D.19-07-015, adopting a permanent emergency disaster

[31] D.19-07-015 revised the authorization of who declares the state of emergency to also include the President of the United States.

relief program for utility customers and included the adoption of PUC Section 8386(c)(18) as part of this program.[32]

The provisions under the permanently established Emergency Consumer Protections program "shall be implemented upon a Governor of California's state of emergency declaration or a Presidential State of Emergency declaration, when a disaster has either resulted in the loss or disruption of the delivery or receipt of utility service and/or resulted in the degradation of the quality of utility service."[33] Upon each declared disaster, such as a wildfire, utilities are required to file a Tier 1 Advice Letter within 15 days of the state of emergency proclamation and a secondary Tier 1 Advice Letter after the conclusion of the disaster or at the default, 12-month conclusion of the customer protection period to report compliance. PG&E will meet these requirements in the event of a wildfire or other emergency.

Most of the requirements identified in PUC Section 8386(c)(18), among others, are addressed in PG&E's Revised Emergency Consumer Protections Plan in alignment with Resolutions M-4833 and M-4835 and D.19-07-015. The associated Advice Letters and D.19-07-015[34] more fully describes the customer support services provided by PG&E to eligible customers upon the declaration of an emergency. Below, PG&E addresses each of the issues identified in the WMP Guidelines:

A. Outage Reporting: While PG&E's revised Emergency Consumer Protection Plan does not discuss outage reporting specifically, PG&E leverages its existing outage reporting systems to notify customers of an actual electric outage caused by a PSPS event, or other planned or unplanned outages. For PSPS events, PG&E implements the notification guidelines as described in the De-energization Phase 1 Guidelines (D.19-05-042). In addition to customer notifications, PG&E includes emergency alerts and outage information on its website. PG&E continues to leverage different indicators (colors) on the outage map to distinguish which type of outage may be occurring (e.g., PSPS planned outage or unplanned outages);

B. Support for Low-Income Customers: PG&E provides support for low-income customers, including freezing CARE eligibility standards and high-usage post enrollment verification (PEV) requests, increasing the assistance cap for emergency assistance program, and modifying qualification requirements for the ESA Program by allowing customers to self-certify they meet income qualifications;

C. Billing Adjustments: PG&E stops estimated energy usage for billing attributed to the time period when the home/unit was unoccupied as a result of the disaster;

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**32** PUC Section 8386(c)(18) requires IOUs to provide "activities to support customers during and after a wildfire, outage reporting, support for low-income customers, billing adjustments, deposit waivers, extended payment plans, suspension of disconnection and nonpayment fees, repair processing and timing, access to utility representatives, and emergency communications."

**33** p. 2.

**34** Resolution M-4833 (pp. 5-8); Resolution M-4835 (pp. 4-8).

D. Deposit Waivers: PG&E waives security deposit requirements to re-establish service for customers whose home(s) or small business(es) were destroyed by the disaster;

E. Payment Plans: PG&E provides favorable payment plan options to eligible customers, including customers whose employment was impacted by a disaster, for any outstanding balances on their accounts. As required by D.19-05-037 (OP 24), PG&E Advice Letter 4145-G/5643-E extends bill payment arrangements to customers' whose employment was impacted by a disaster, including wildfires;

F. Suspension of Disconnection and Nonpayment Fees: PG&E suspends disconnection for non-payment and associated fees, and providing waiver of returned check or late fee requirements for customers whose homes or small businesses were destroyed by the disaster;

G. Repair Processing and Timing: Although PG&E's revised Emergency Consumer Protection Plan does not specifically discuss repair processing and timing, it does include the customer protections to expedite move-in and move-out service requests for the next business day, or another date selected by the customer, as well as the offering to reestablish service under prior rate (if requested) and waive the cost for temporary power under Electric Rule 13. Additionally, during a PSPS event, PG&E currently uses its best efforts to communicate the Estimated Time of Restoration (ETOR) to customers. Restoration timing for the entire affected area is estimated by calculating the projected restoration work hours and dividing by the available restoration crews. Following a wildfire, PG&E utilizes their existing repair and rebuild process and works with the impacted community to communicate priorities and timelines for repairs and restoration, prioritizing repairs with those customers impacted by a disaster or wildfire.

   Repair timing is largely dictated by access to the fire area, total damage to PG&E assets, length of the affected lines, ability to secure materials and repair resources, and the priority of the customer. For example, hospitals, schools, water treatment plants, communication providers, jails and other facilities deemed critical by the CPUC and local community will receive a higher priority for restoration. D.19-05-042 defines critical facilities as "facilities that are essential to the public safety and that require additional assistance and advance planning to ensure resiliency during de-energization events" and adopts an interim list of critical facilities that meet this definition.[35] In the event the fire's damage exceeds the restoration capacity of the local division, a base camp may be established to support the restoration crews, equipment, materials, housing, and incident command staff.

H. Access to Utility Representatives: Although PG&E's revised Emergency Consumer Protection Plan does not discuss access to utility representatives specifically, multiple channels of communication are available to its customers and communities before, during and after a wildfire, and include, but are not limited, to: PG&E's call

[35] pp. A4-A6.

center and website, customer service offices, public affairs and customer account representatives, and field teams.

In D.18-08-004,[36] the CPUC encouraged utilities to consider additional ways to assist customers impacted by a disaster. In addition to the above noted consumer protections described in PG&E's revised Emergency Consumer Protections Plan, PG&E also offers consumer protections for solar customers in the event their premise is destroyed by a natural or man-made disaster. On April 25, 2019, the CPUC approved PG&E Advice 5404-E that, through revisions to its tariff provisions in the Net Energy Metering (NEM) Tariff and NEM Successor Tariff (NEM2), grants PG&E the opportunity to offer the following three additional protections to solar customers:

1. Allowing customers to size their replacement system to the annual load of their new premise and remain on NEM, without being required to move to the successor tariff (NEM2) if the newly-sized system exceeds the sizing upgrade threshold;

2. Removing the interconnection application fee when reapplying to resume service on NEM2 (with some restrictions); and

3. Updating the interconnection application forms to allow Disaster-impacted customers to identify themselves during the interconnection process and benefit from these provisions.

Coordination with Public Safety Partners

PG&E is committed to coordination and collaboration with public safety partners through both emergency preparedness outreach and PSPS event notification and coordination.

Emergency Preparedness Outreach

Public Safety Partners, as defined by the D.19-05-042, include "first/emergency responders[37] at the local, state and federal level, water, wastewater and communication service providers, affected community choice aggregators and publicly-owned utilities/electrical cooperatives, the Commission, the California Governor's Office of Emergency Services and the California Department of Forestry and Fire Protection." PG&E's emergency preparedness outreach, includes, but is not limited to:

- One-on-one meetings to have more localized discussions and listening sessions with jurisdictions and agencies impacted by previous PSPS events. PG&E will utilize these meetings to gather feedback and adjust the program, as appropriate;

- More robust PSPS scenario planning (tabletop) exercises with County Offices of Emergency Services (OESs), tribes and other public safety partners;

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**36** p. 4.

**37** "Emergency response providers" include federal, state, and local governmental and nongovernmental public safety, fire, law enforcement, emergency response, emergency medical services providers (including hospital emergency facilities), and related personnel, agencies, and authorities.

- Direct outreach to County OES agencies, tribal agencies, and public safety partner customers, such as telecommunications providers and water agencies, to confirm contact information, as needed;

- Presentations at public meetings (e.g., city council meetings, board of supervisor meetings);

- Working with counties and tribes to identify critical facilities to assist with prioritizing restoration (as feasible) during an event;

- Share progress of local field work (e.g., system hardening, enhanced vegetation management);

- Providing access to the secure data transfer portal (PSPS Portal) in order to share additional customer information quickly during an event;

- Providing sample notifications and planning maps;

- Seeking and incorporating feedback where feasible to ensure agencies have information and procedures to proactively plan for and respond to a PSPS event; and

- Coordinating with counties and tribal agencies to pre-identify more permanent Community Resource Center (CRC) locations to utilize during an event.

**PSPS Event Notification and Coordination Strategy**

PG&E is committed to providing notification to potentially impacted stakeholders in advance of, during and after a PSPS event, as weather permits. Advanced priority notification will be provided to public safety partners in alignment with CPUC guidelines, as time and weather permits. The PSPS notification strategy will comply with CPUC rulings, as weather permits.

PG&E expanded its notification strategies for 2019 and continues to adjust as the company received feedback from state and local agencies, as well as its customers. For 2020-2022, PG&E will utilize the strategies below and will modify as the company works towards shorter event durations and fewer customers impacted. PG&E will continue to use all communication channels available during an event: direct to customer notifications, media (multi-cultural news outlets, earned and paid media, social media), website, collaboration with Public Safety Partners and Community Based Organizations (CBOs).

State agencies, cities, counties and tribes will be notified in advance of residential customers regarding a potential PSPS event in order to aid in preparedness efforts. PSPS event notification and coordination may include but is not limited to:

- Providing

- Providing updates to the state via the Cal OES form throughout the event;

- Issuing automated notifications throughout the event via phone, text and email;

- Providing the content of customer alerts to share via the city, county or tribal website, Nixle, and Nextdoor;
- dedicated single points of contact for potentially impacted counties and tribes to provide event-specific and agency-specific information in real-time throughout the event;
- Hosting county and tribal representatives in PG&E's EOC, if requested;
- Offering PG&E representatives, such as Liaison and GIS experts, to be available to be embedded in local and tribal EOCs, as needed;
- Posting maps and event-specific information on the secure data transfer portal (PSPS Portal) and website, including potentially impacted critical facilities and Medical Baseline customer information will also be posted on the portal;
- Coordinating with agencies and tribes on Community Resource Center locations;
- Managing a dedicated 24-hour PG&E Liaison email address where partners can reach PG&E EOC staff with any questions or requests for information; and
- Hosting local agency and/or State Executive calls, as needed, to provide situational awareness for the event.

Additional public safety partners, such as water agencies, communication providers, CCAs, and Municipal Utilities will receive the following notifications and support by PG&E during a PSPS event:

- Notification in advance of residential customers for preparedness efforts;
- Maps of potentially impact areas in advance of customers; and
- Dedicated single points of contact to communicate frequently via live calls for situation awareness updates and operational support.

**Language Access and Translations Strategy**

PG&E recognizes the diverse nature of its service territory and is committed to keep pace with changing demographic trends. To determine if a language is prevalent[38] in its service territory, PG&E uses the Federal Voting Rights Act, Section 203 standards for Minority Languages as its guide, based on census data related to counties served by PG&E. In addition, PG&E uses language preference data associated with PG&E's customer accounts, and tracks customers' use of PG&E's existing translation services and translated materials provide in its customer call center and on its website. Currently, PG&E provides translated content in seven languages on the website and

[38] Language defined as "prevalent" is based on the following: (1) If the in-language population is more than 10,000 within a county, or (2) if the in-language population is more than five percent of the total county population, based on census data.

uses a top translation service provider in the industry, Language Line Services, to provide translation services in over 240 languages in the contact center.

In order to reach customers with limited English proficiency and mitigate for language access challenges, PG&E has translated key emergency preparedness and PSPS outreach and awareness materials in English, Spanish, Chinese, Tagalog, Vietnamese, Korean, and Russian and made them available on www.pge.com and at community events. During a PSPS event, PG&E will make translated notifications available to potentially impacted customers in the languages noted above. Data on the prevalent languages in affected areas will be used to determine the language used for outreach through social, broadcast, and print media. Any additional language needs can be met by calling PG&E's customer call center, which is equipped to translate messaging in over 240 languages.

In 2020, PG&E will enhance coordination with Community Based Organizations (CBOs) and multi-cultural media partners that have existing relationships and serve disadvantaged and/or hard to reach communities to provide in-language / translated education The CBOs have established relationships and will ensure customers have a trusted-channel to get the information that they need. PG&E will continue to provide translated notifications during PSPS events, as well as translated outreach materials and emergency preparedness and PSPS-related content on PG&E's website. The approach to reach Limited English Proficiency (LEP) communities, could include paid and earned media, event outreach, social media, or reaching out to owners/property managers of migrant worker housing to identify opportunities for additional outreach and engagement.

**Emergency Planning and Preparedness Initiatives**

Below, PG&E describes the following emergency planning and preparedness-related initiatives, including the existing program and its expected evolution over the next 10 years.

1. Adequate and trained workforce for service restoration
2. Community outreach, public awareness, and communications efforts
3. Customer support in emergencies
4. Disaster and emergency preparedness plan
5. Preparedness and planning for service restoration
6. Protocols in place to learn from wildfire events

#### 5.3.9.1 Adequate and Trained Workforce for Service Restoration

PG&E has a large workforce that is geographically distributed and can be moved across the territory as needed. PG&E has begun, and will continue to use, the relevant, rapid training approach to build an internal workforce that is in a steady state of readiness with the skills and abilities to react and respond to any incident within the service territory. As discussed in more detail above in Section 5.3.9, PG&E has Mutual Aid agreements that allow the flexibility to increase resources in response to events. Contractor and Mutual Aid support resources will be adequately trained in PSPS Restoration Overview prior to performing work in the field when utilized.

For the 2020 training plan, PG&E is updating the curriculum and exercises to reflect the lessons learned from actual 2019 events. Workforce skills/performance will be tracked and measured after each training course completion (including field exercises) via PG&E's internal Learning Management System to ensure continuous improvement in processes, skills and behaviors. Training curriculum is developed in alignment with SEMS, where appropriate. As new or emerging technologies are identified for use in the field, training will be developed to facilitate timely use in field operations. Restoration skills and abilities training will be delivered and measured in classroom, Web Based Training (WBT) and restoration field exercises throughout the service territory at a periodicity driven by performance and behavior. Training will be revised, updated and adjusted to reflect changes and updates in policy and/or processes as needed.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will develop the exercise strategy and timeline described above, as well as deliver the updated TD 1464B-002 Public Safety Power Shutoff for Distribution and Transmission Electric Facilities training.

2. ***Before the next annual update:*** Before the next annual update, PG&E will complete PSPS OEC emergency planning exercises as scheduled.

3. ***Within the next 3 years:*** Continue to evaluate and update training needs for the service restoration workforce.

4. ***Within the next 10 years:*** Update training to align with changes in requirements, regulations or other guidance.

### 5.3.9.2 Community Outreach, Public Awareness, and Communications Efforts

Starting in 2018, PG&E began reaching out to customers and communities about its CWSP. This includes:

- Face to Face Interactions:
  - Hosting community open house events so local residents can learn more about CWSP.
  - Participating in face to face meetings with customers.
- Digital Engagement:
  - Hosting informational webinars for customers and/or organizations who are unable to attend a community open house event in person.
  - Developing and delivering additional video resources, including explainer videos that have been translated to American Sign Language (ASL) and other languages, further increasing PG&E's ability to communicate to a larger group of customers.
  - Providing PSPS preparedness, safety resources and event-specific information on PG&E's website.
- Direct Mail/Print Media Engagement[1]:
  - Sending direct mail and emails to customers with information regarding PSPS preparedness resources and reminders to update contact information so PG&E can reach out to customers in advance of a public safety power outage.
  - Providing paid and unpaid advertising in print media.

In addition, PG&E has been meeting regularly with state agencies, counties, cities, tribes, first responders, other local emergency responders and community groups throughout its service area regarding CWSP to gather feedback and share system improvements made and planned to further reduce the risk of wildfire. In addition, PG&E conducts annual gas and electric safety training for first responders, including law enforcement, fire departments, and public works and transportation agencies. Moving forward, PG&E will continue to find new ways to engage state agencies, counties, cities, tribes, first responders, other local emergency responders and community groups. This outreach ensures that customers, communities and public safety agencies are aware of PG&E's wildfire safety actions, potential impacts on their communities and steps they can take to prepare.

[1] See Table 30 Section 5-1 for details regarding PSPS and emergency preparedness media education campaigns.

PG&E will conduct listening sessions to gather feedback, as well as monitor comments received through regulatory proceeding, such as responses to PG&E's De-energization Event Reports. To assess the effectiveness of the customer outreach conducted, as more fully described in *Section 5.6.2.4 Customer, Agency and External Communications,* throughout the year, PG&E gathers and assesses both qualitative and quantitative data to evaluate customers' awareness, feedback and recall of PG&E outreach, including wildfire safety and preparedness. This is done through statistically significant research studies, as well as surveys, customer feedback and input from CBOs, and by tracking customer engagement including web traffic, click-through-rates of advertisements and conversion rates / actions taken by customers as a result. PG&E will adjust as needed to ensure the effective use of available outreach channels.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will implement its community outreach efforts as described above. Additionally, PG&E will continue to enhance its communications and engagement efforts with a focus on wildfire safety and preparedness for PSPS events. This includes increasing the number of open houses (approximately double the volume completed in 2019) and webinars hosted by PG&E for customers, maintaining strengthened website capabilities to withstand heightened traffic during a PSPS event, developing and delivering additional video resources, including explainer videos that have been translated to American Sign Language (ASL) and other languages, further increasing PG&E's ability to communicate to a larger group of customers, and continuing to work closely with state, county, city and tribal agency partners to improve coordination and begin implementing feedback through the activities described above.

2. ***Before the next annual update:*** PG&E will continue the outreach described above and will adjust communications channels and outreach approach based on the customers' channels of choice and lessons learned.

3. ***Within the next 3 years:*** PG&E will continue to adjust outreach and education to better address customer needs.

4. ***Within the next 10 years:*** PG&E will continue to assess its communications methods and adjust its focus areas for engagement, as appropriate.

### 5.3.9.3 Customer Support in Emergencies

In an effort to reduce the consequence of wildfires through multiple financial programs, PG&E will provide customer protections to eligible customers that are impacted by a state of emergency. The details of this program are more fully described in the introduction to Section 5.3.9.

Twelve months after each declared state of emergency (or at a time reasonably determined by the Governor's Office of Emergency Services), as required by CPUC D.19-07-015 (OP 6), PG&E will submit a report to the CPUC that describes the consumer protections offered and outreach provided to customers, including relevant metrics. As a mechanism to assess program effectiveness, PG&E will leverage this report to identify customer adoption of the program's offerings and may make recommendations for adjustments to the program and/or outreach based on customer utilization of the program. PG&E will submit its first post-emergency report by October 25, 2020[39] in response to California Governor Newsom's declaration of a State of Emergency on October 25, 2019 for customers impacted by the Kincade Fire in Sonoma County.

If necessary, PG&E will re-prioritize spending and deployment of resources where there would be no negative impact on public or employee safety in order to conduct disaster recovery and extend consumer protections.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue to implement PG&E's Consumer Protections Program as described above.

2. ***Before the next annual update:*** Continue to offer the consumer protections described above. PG&E will file its first post-emergency report in October 2020.

3. ***Within the next 3 years:*** PG&E will make modifications to its consumer protection and customer support programs based on the outcomes from the post-emergency report(s) review, if new regulatory requirements are issued in alignment with the Consumer Protections Proceeding R. 18-03-011 or as otherwise needed.

4. ***Within the next 10 years:*** Continue to implement and update consumer protection programs to meet regulatory requirements and as needed to support PG&E's customers.

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**39** Or a date or as reasonably determined by the Governor's Office of Emergency Services.

### 5.3.9.4 Disaster and Emergency Preparedness Plan

PG&E complies with CPUC Code 768.6 by a variety of methods. The CERP is drafted in accordance with GO 166. The CERP is considered an “all-hazards” reference, which is supplemented by numerous “Annex” documents that cover specific contingencies ranging from Wildfire, to Cyber Incidents, to Earthquakes. Each of these documents is reviewed and updated annually in accordance with the General Order. PG&E documents such compliance through an annual filing, which is submitted directly to the CPUC and is based on the previous year’s performance as documented through an internal audit process.

Feedback from stakeholders has typically been obtained through Public Safety Specialist (PSS) teams from both the Gas and Electric divisions, who interact directly with partner agencies, particularly during emergencies. Direct feedback through visits by agency officials to PG&E’s headquarters, which is required by CPUC Code and embraced by PG&E, has only partly materialized; for 2020, EP&R (All-Hazards Planning and Response) plans to meet directly with State and County Emergency Management Officials to obtain feedback and input into programs and processes. In addition, PG&E will be activating a managed email box that will allow external stakeholders to submit their feedback directly, without having to channel the information through a liaison. PG&E will also be visiting a minimum of 2 Mutual Aid Regional Advisory Council (MARAC) meetings, as well as participating in at least 2 emergency management industry conferences or trade shows, one of which will be the State CESA conference.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to implement wildfire-centric planning and preparedness, as well as conduct employee and public safety agency outreach activities. EOC planning and internal training/exercise program will be developed to expand beyond current parameters. Existing employees will undergo additional focused training on PSPS, ICS, SEMS, and individual position-specific emergency roles prior to upcoming wildfire season. Enhanced awareness activities for all employees will be in progress and on-going. For PSPS responses, additional emergency roles will be added to the PG&E ICS organization.

2. ***Before the next annual update:*** All applicable deliverables will be updated/published within specified timelines, including the Company Emergency Response Plan and all annexes. These documents are currently required to be updated annually, not later than June 30 for the CERP and September 30 for each of the Annexes. Development of partnerships with wildfire-specific public safety partner agencies expected to begin greater evolution. Partnerships with Operational Areas and Counties will demonstrate collaborations in emergency planning. Additional benchmarking of other utility practices in in relative planning and preparedness activities will have been achieved.

3. ***Within the next 3 years:*** Long term development of plans and annexes, as well as partnerships with other utilities and government agencies, will have taken place. PG&E will collaborate in local Hazard Mitigation Planning with specific Operational Areas within the service territory. Expect development of cyclic large-scale inter-agency exercise program.

4. ***Within the next 10 years:*** The preceding priorities will have reached a state of maturity and routine cyclic maintenance of plans and strategies will be taking place. Robust emergency management plans and strategies are expected to be fully developed and ahead of established best practices in the industry. The PG&E Emergency Preparedness and Response Organization will be fully resourced.

### 5.3.9.5 Preparedness and Planning for Service Restoration

In preparation for the upcoming wildfire season, throughout the service territory, PG&E will conduct field exercises, classroom trainings and WBT to prepare utility personnel to restore services after emergencies. Utility Standard TD-1464B-002 Preventing and Mitigating Fires While Performing PG&E Work is incorporated into the training to ensure compliance. Beyond these approaches, PG&E will provide additional support such as personnel and other reasonable resources where needed based on the lessons learned from these exercises. During restoration exercises, areas will be utilizing the latest tools and resources available in order to prepare for the upcoming season.

Future exercises will increase in complexity and difficulty to strengthen PG&E's preparedness posture. Training curriculum is developed in alignment with the SEMS, where appropriate. Restoration skills and abilities training will be delivered and measured in classroom, WBT and restoration field exercises throughout the service territory at a periodicity driven by performance and behavior. Training will be revised, updated and adjusted to reflect changes in policy and/or processes as needed. See also Section 5.3.6.3, Personnel Work Procedures and Training in Conditions of Elevated Fire Risk and Section 5.3.6.4, Protocols for PSPS Re-Energization.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Before the upcoming wildfire season, PG&E will deliver TD 1464B-002 training.

2. ***Before the next annual update:*** Before the next annual update, PG&E will complete all hazards approach emergency planning exercises.

3. ***Within the next 3 years:*** Continue to evaluate and update field exercise and classroom trainings to incorporate lessons learned and to address changing requirements and regulations.

4. ***Within the next 10 years:*** Continue to evaluate and update field exercise and classroom trainings to incorporate lessons learned and to address changing requirements and regulations.

### 5.3.9.6 Protocols in Place to Learn from Wildfire Events

Following major incidents or events that lead to an activation of the Company EOC, including major wildfire incidents and PSPS events, PG&E's routinely conducts After Action Reviews (AARs) to identify, collect and address lessons learned from such incidents and events. This process is outlined in the CERP per CPUC GO 166, "Standards for Operation, Reliability and Safety During Emergencies and Disasters."

Following an activation of the EOC, PG&E prepares an AAR, which generally involves the following process:

- Feedback from EOC staff who supported the activation is solicited and analyzed;
- An Improvement Plan is developed and disseminated to the appropriate stakeholders within the affected lines of business;
- Appropriate corrective actions determined, including reviewing emergency operations plans to determine whether modifications need to be made;
- Individual action items tracked as appropriate; and,
- Action item status reported monthly to internal corporate leadership

As applicable, such as in the Post-Event De-Energization Reports, PG&E also identifies and reports key lessons learned from PSPS events, which is an outcome from the AAR process.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will implement the protocols described above as conditions warrant.
2. ***Before the next annual update:*** PG&E will implement the protocols described above as conditions warrant and incorporate lessons learned into the protocols.
3. ***Within the next 3 years:*** PG&E will evaluate and update protocols for learning from wildfire events.
4. ***Within the next 10 years:*** PG&E will continue to review and modify protocols for learning from wildfire events.

### 5.3.9.7 Other / Not Listed [Only if an Initiative Cannot Feasibly be Classified Within Those Listed Above]

#### 5.3.9.7.1 Resource Sharing to Support Inspection Work and Other Aspects of the Wildfire Management Plan

PG&E inspection protocols currently utilize journeymen craft personnel (linemen, electrician, towermen) as the primary assessor, appropriate to the types of facilities being inspected or patrolled PG&E maintains a contractor workforce through its Contract Management office, ensuring that sufficient personnel are available for contingency operations. Additionally, PG&E manages its Mutual Assistance agreements with other utilities through the CUEA, WRMAA and the EEI, giving PG&E access to over 80% of the public utility industry across the United States and Canada. *See also* Section 5.5, Planning for Workforce and Other Limited Resources.
In addition to contractor resources and Mutual Assistance agreements, PG&E owns and maintains aviation resources. The 2020 – 2022 aviation operations and maintenance expense forecast in Table 29, Section 7 was determined by forecasting total operation and maintenance expenses, less forecast chargebacks and forecast reimbursements from CAL FIRE for utilizing PG&E helicopters.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** If additional resources are needed to support inspection work or the WMP, reach out to resources via the Contract Management Office or Mutual Assistance agreements listed above.

2. ***Before the next annual update:*** As needed, identify additional resources as described above. Continue to identify additional sources of qualified resources.

3. ***Within the next 3 years:*** Continually maintain and update resource sharing agreements to increase the pool of available, qualified resources.

4. ***Within the next 10 years:*** Continually maintain and update resource sharing agreements to increase the pool of available, qualified resources.

### 5.3.10 Stakeholder Cooperation and Community Engagement

*Description of Programs to Reduce Ignition Probability and Wildfire Consequence*

*For each of the below initiatives, provide a detailed description and approximate timeline of each, whether already implemented or planned, to minimize the risk of its equipment or facilities causing wildfires. Include a description of the utility's initiatives, the utility's rationale behind each of the elements of the initiatives, the utility's prioritization approach/methodology to determine spending and deployment of human and other resources, how the utility will conduct audits or other quality checks on each initiative, how the utility plans to demonstrate over time whether each component of the initiatives is effective and, if not, how the utility plans to evolve each component to ensure effective spend of ratepayer funds.*

*Include descriptions across each of the following initiatives. Input the following initiative names into a spreadsheet formatted according to the template below and input information for each cell in the row.*

1. *Community engagement*
2. *Cooperation and best practice sharing with agencies outside CA*
3. *Cooperation with suppression agencies*
4. *Forest service and fuel reduction cooperation and joint roadmap*
5. *Other / not listed [only if an initiative cannot feasibly be classified within those listed above]*

*The list provided is non-exhaustive and utilities shall add additional initiatives to this table as their individual programs are designed and structured. Do not create a new initiative if the utility's initiatives can be classified under a provided initiative.*

*For each of the above initiatives, describe the utility's current program and provide an explanation of how the utility expects to evolve the utility's program over each of the following time periods:*

1. *Before the upcoming wildfire season,*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

See Attachment 1, Table 29 for the details and data associated with the initiatives discussed in this section.

### 5.3.10.1 Community Engagement

The following describes PG&E's community engagement related to PG&E's wildfire safety programs, including System Hardening, Enhanced Vegetation Management, and the system inspections, which support wildfire mitigation activities. Community outreach related to emergency preparedness and PSPS is more fully described in Sections 5.3.9.2 Community Outreach, Public Awareness, and Communications Efforts and 5.6.2.3 PSPS Customer, Agency and External Communications, respectively.

PG&E conducts community outreach to educate customers/property owners on the details of PG&E's wildfire safety programs and the potential need for their participation to reduce wildfire risks in their communities. PG&E also conducts outreach to cities, counties, tribes and other emergency response agencies to share information and work together on a plan for the wildfire safety work. PG&E also maintains an open channel of communication with customers and communities who proactively reach out to PG&E when identifying safety risks related to these programs.

To identify and implement efficient and appropriate customer and community communications, PG&E assesses the anticipated program impacts related to planned road closures, property access needs, tree removal, helicopter operations, among others. To set expectations with customers and with the goal of limiting work refusals or access issues, PG&E uses various communication methods, such as letters, postcards, text messages, emails, and automated calls through Interactive Voice Recordings (IVRs). PG&E will provide translated outreach in alignment with the language access and translations strategy described in Section 5.3.9.

Outreach includes broad communications about PG&E wildfire safety-related work scope in neighborhoods, cities, and counties, as well as direct communications to customers/property owners who may be impacted by PG&E employees and contractors requiring access to their sites to conduct the necessary safety-related wildfire prevention work.

PG&E also responds to issues raised by customers/property owners including general access issues (*e.g.,* locked gate), or sensitive access issues (*e.g*., upset individual). In some cases, properties requiring access/work may be occupied by a customer of record that differs from the property owner, in which case PG&E will engage with both. PG&E addresses these issues by contacting the customers/property owners directly to understand their concerns and to develop a mutual solution that allows access to complete the relevant wildfire safety work.

In certain instances, such as in the system inspections program, if PG&E is unable to coordinate access to its facilities with the customer/property owner, PG&E may leverage their authorization via Rule 11 to turn off customers' power to complete safety-related work to inspect or repair facilities. PG&E will only consider this avenue to ensure safety related work can be completed and will work to limit such instances. Customers will receive communication from PG&E if this action must be implemented.

PG&E works with customers to develop solutions to resolve property owner non-compliance issues (*e.g*., property access or work refusals) and escalated CPUC complaints by landowners that are impacted by PG&E's CWSP programs, including EVM, system hardening, and system inspections. PG&E will work to minimize complaints and non-compliance through the outreach described above.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E will continue to conduct customer outreach and will continue to respond to customer-related access issues as described above.

2. ***Before the next annual update:*** PG&E will evaluate proactive outreach and reactive communications to identify any necessary adjustments to the outreach based on lessons learned.

3. ***Within the next 3 years:*** PG&E will continue to evaluate and adjust its outreach programs, focusing on building relationships with property owners where PG&E assets are located.

4. ***Within the next 10 years:*** PG&E will modify the community outreach programs to keep pace with the evolving WMP.

### 5.3.10.2 Cooperation and Best Practice Sharing With Agencies Outside CA

PG&E engages with parties both inside and outside the state of California, as discussed in Section 5.3.7.2, to share practices, tools and approaches on numerous topics, including wildfire risk reduction. PG&E has benchmarked substantially with utilities in Australia who have had meaningful experiences and learnings from that country's wildfire / bushfire challenges. For example, the Rapid Earth Fault Current Limiter (REFCL) technology that PG&E is piloting (see Section 5.1.D.3.6) was developed in Australia.

PG&E shares best practices and benchmarks with other utilities throughout the United States as well, particularly through industry associations like the Edison Electric Institute (EEI) which, as an example, has been facilitating a series of engagements regarding "Wildfire Technology" exploration, sharing and discussion.

Beyond the utility industry PG&E engages with other entities to identify synergies and learnings for addressing wildfire risks. As noted in Section 5.3.10.4, PG&E has been deeply engaged with Federal Land Owners on how to partner on mitigating wildfire risks on those lands. PG&E is also partnering with educational institutions and firms from across the country to explore technologies or other tools (like egress analysis) that may contribute to reducing wildfire risk. Examples include the Distribution Fault Anticipation Technology (Section 5.3.2.2.4) and Fault Signature (Section 5.3.2.2.7) technology projects.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue to engage with partners from inside and outside California to share PG&E's experiences and identify tools, technologies or other best practices that can contribute to reducing wildfire risk.

2. ***Before the next annual update:*** Same as above.

3. ***Within the next 3 years:*** Same as above.

4. ***Within the next 10 years:*** Same as above.

### 5.3.10.3 Cooperation With Suppression Agencies

Public Safety Specialist (PSS)

The PSS team maintains established relationships with agency partners to support emergency planning activities and information sharing during emergencies. The PSS team serves as the PG&E Agency Representative to coordinate and integrate PG&E's response with the Agency Having Jurisdiction (AHJ) over an active incident. The real-time intelligence sharing informs PG&E's tactical plans and the deployment of additional resources to support fire mitigation and asset protection activities.

After the PSS integrates into the local incident command structure they facilitate communications between the community first responders, PG&E Emergency Operations Center (EOC) staff, WSOC personnel and PG&E first responders. In this respect, the PSS team serves as liaison officers (LNO) and PG&E Agency Representatives, as well as support for other lines of business.

Another key focus area for the PSS team is to act as a single point of contact during large events (e.g., PSPS event). During these events, the PSS will report into PG&E's EOC Liaison Organization. The PSS serves as the primary Point of Contact for informational inquiries to all local agency partners.

The PSS team plays a key role during emergency planning activities and public safety agency engagement as outlined in Section 5.3.9.4, Coordination with Public Safety Partners. The following activities demonstrate many of the PSS team's coordination efforts with PG&E's internal teams and agency partners.

**Key Projects**

- Coordinate vegetation management activities between CAL FIRE and PG&E where feasible
- TD 1464s, Fire Prevention and Mitigation for PG&E Work, Training
- Satellite information sharing
- Camera siting input
- Weather station siting input
- System Hardening and PSSP Mitigation Plans

**Public Partner Outreach**

- CWSP Open Houses
- PSPS Workshops
- Public Safety Liaison Meetings – 49 CFR
- First Responder Workshops – 49 CFR Gas and Electric Training

- Triennial Regulatory Workshops – CPUC - Training on gas system
- Annual Contingency Plan Meeting – CPUC - Gas line emergency contingency planning
- Live Fire and Gas Release Training

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** Continue cooperation and coordinate with suppression agencies as described above.
2. ***Before the next annual update:*** Continue cooperation with suppression agencies and identify and implement new projects or other efforts as needed to enhance coordination.
3. ***Within the next 3 years:*** Evaluate and modify initiatives to address current needs with agency partners.
4. ***Within the next 10 years:*** Evaluate and modify initiatives to address current needs with agency partners.

### 5.3.10.4 Forest Service and Fuel Reduction Cooperation and Joint Roadmap

PG&E has had long-running partnerships with the United States Forest Service (USFS) and other federal landowners upon whose land PG&E assets are located. In some cases, the PG&E assets on those lands actually pre-date the existence of the federal mandate establishing the forest, park or entity that now manages the land. Nonetheless, those relationships have evolved over the last decade, and more aggressively in recent years, due to a number of factors including the California Drought and Bark Beetle infestation and the rapidly evolving wildfire risk facing these lands. Both parties have recognized the need for faster action to support wildfire risk mitigation. Through this partnership, PG&E and Region 5 of the USFS were able to successfully complete the reissuance and consolidation of hundreds of historically individual and unique utility permits on National Forest System Lands. Now the forests are able to monitor and renew utility permits by providing one permit and one easement per forest.

These updated permits are accompanied by a Programmatic Operations and Maintenance Plan (O&M Plan), that describes the utility's facilities and activities on USFS land and establishes the activity review process, which defines the environmental review and protection process and establishes communication and monitoring protocols between PG&E and the Forest. The O&M Plan has successfully reduced the amount of time staff spends reviewing and processing approvals for routine operation and maintenance activities. Where before it could have taken 6-12 months to obtain approval to address a potential wildfire hazard, it now takes 5 to 15 days to obtain approval to move forward with the activity. Therefore, the O&M Plan aids with maintaining PG&E's facilities in a safe and reliable manner as it lays out the when, where, and how PG&E can conduct vital work, including vegetation management around utility rights-of-way. This streamlined process helps assure electric facilities and rights-of-way are regularly maintained, thereby reducing fire hazards.

Building off the O&M Plan, in 2019 PG&E implemented a cost recovery program with the USFS that provided funding to four forests to complete fuels reduction on 3,500 acres of USFS land outside of PG&E's right of ways. This allows the forests an avenue to complete additional fuels reduction work that could impact PG&E assets within areas that PG&E does not have land rights or authorization to complete key fuel reduction activities (but the forest does have such rights).

In 2020, PG&E plans to continue and refine the cost recovery program with USFS, with additional funding available for all 11 forests within PG&E's service territory. Given the successes from 2019 we expect that all 11 forest will provide proposals for 2020. PG&E anticipates facilitating a request for proposal process in the first quarter of 2020 and starting to award funds in the 2nd quarter. Depending on the 2020 experience and learnings from this process PG&E is also exploring expanding this program to other Federal (or even State) Agencies, which could, conceivably include the National Park Service, BLM, and/or State Parks.

While PG&E staff members are in near-daily, operational contact and communication with USFS staff, PG&E leadership also meets with USFS leadership on a bi-annual basis to explore opportunities where we can continue to collaborate to reduce wildfire risk within California. Topics that have been or will be explored through these meetings

are clarifying the process for the disposition of felled trees (e.g., timber sale, lop and scatter, chipping), funding Forest Service positions to assist with the review of PG&E work requests, and the Integrated Vegetation Management (IVM) approach that would allow the use of Forest-approved herbicides to control utility incompatible vegetation while seeking to encourage a low-growing stable plant community around powerlines.

PG&E also has activities underway with other Federal and State landowners besides the USFS. Some highlights include:

- California State Parks: PG&E is finalizing a process agreement that allows for streamlining utility work throughout California State Parks across the entire service territory. This agreement would allow for non-invasive and emergency work to proceed without delay and minor wildfire fuels reduction work to proceed after a two-week notification process. (Major wildfire work would follow the existing, permitting requirements and process flow.) This process agreement is expected to go to the California State Parks executive committee for approval in early 2020.

- Bureau of Land Management (BLM): Building on ongoing efforts to reduce the threat of wildfires through active management, the BLM California State Office worked with SCE and PG&E to issue a new policy to limit fire risk from power lines crossing BLM-managed public lands. The new policy was enacted May 20, 2019 and extended by one year, through 2020, allows PG&E to facilitate and expedite O&M activities necessary to reduce the risk of wildfire by conducting the activities without prior authorization. Additionally, PG&E continues to work with the BLM Bakersfield Field Office on a Programmatic Right of Way renewal process and O&M Plan which may be used as a template to streamline process with other field offices in the future.

- National Park Service (NPS): In 2019, PG&E worked with the NPS Pacific West Region to put establish eight park-specific 1-Year Special Use Permits for 2020 which will allow PG&E to expedite critical, routine O&M activity within NPS-managed land. The permits require park approval within 15 days for most routine utility O&M activity and will also authorize drone usage within parks for utility purposes like asset inspections.

***Progress Timeline***

1. ***Before the upcoming wildfire season:*** PG&E anticipates funding USFS forests for fuel reduction projects outside of PG&E rights-of-way through the fuel reduction cost recovery program.

2. ***Before the next annual update:*** PG&E will be working with USFS leadership to incorporate the lessons learned from 2019 and 2020 into continued efficient use of the O&M plan to enable critical utility wildfire risk reduction work and exploring continued partnership opportunities to reduce wildfire risk.

3. ***Within the next 3 years:*** PG&E will be leveraging the progress made with USFS to develop improved processes and partnership with other Federal and/or State land owners / managers to streamline work approval processes (similar to the USFS O&M Plan) and partner on wildfire risk reduction work.

4. ***Within the next 10 years:*** PG&E anticipates continuing to incorporate learnings and partnering with Federal and State land-owners/managers to further enhance the efficiency and effectiveness of wildfire risk reduction activities that can be taken by any party on these lands.

### 5.3.11 Definitions of Initiative Activities by Category

These definitions were provided by the CPUC WSD for the purposes of the utilities in categorizing wildfire mitigation activities into initiatives in Section 5.3. These initiative definitions have been reproduced here for ease of cross-referencing the CPUC WSD's organizational guidance for the preceding section of the WMP.

| Category | Initiative | Definitions |
|---|---|---|
| *A. Risk mapping and simulation* | *A summarized risk map that shows the overall ignition probability and estimated wildfire consequence along the electric lines and equipment* | *Development and use of tools and processes to develop and update risk map and simulations and to estimate risk reduction potential of initiatives for a given portion of the grid (or more granularly, e.g., circuit, span, or asset). May include verification efforts, independent assessment by experts, and updates.* |
| | *Climate-driven risk map and modelling based on various relevant weather scenarios* | *Development and use of tools and processes to estimate incremental risk of foreseeable climate scenarios, such as drought, across a given portion of the grid (or more granularly, e.g., circuit, span, or asset). May include verification efforts, independent assessment by experts, and updates.* |
| | *Ignition probability mapping showing the probability of ignition along the electric lines and equipment* | *Development and use of tools and processes to assess the risk of ignition across regions of the grid (or more granularly, e.g., circuits, spans, or assets).* |
| | *Initiative mapping and estimation of wildfire and PSPS risk-reduction impact* | *Development of a tool to estimate the risk reduction efficacy (for both wildfire and PSPS risk) and risk-spend efficiency of various initiatives.* |
| | *Match drop simulations showing the potential wildfire consequence of ignitions that occur along the electric lines and equipment* | *Development and use of tools and processes to assess the impact of potential ignition and risk to communities (e.g., in terms of potential fatalities, structures burned, monetary damages, area burned, impact on air quality and greenhouse gas, or GHG, reduction goals, etc.).* |
| *B. Situational awareness and forecasting* | *Advanced weather monitoring and weather stations* | *Purchase, installation, maintenance, and operation of weather stations. Collection, recording, and analysis of weather data from weather stations and from external sources.* |
| | *Continuous monitoring sensors* | *Installation, maintenance, and monitoring of sensors and sensorized equipment used to monitor the condition of electric lines and equipment.* |
| | *Fault indicators for detecting faults on electric lines and equipment* | *Installation and maintenance of fault indicators.* |
| | *Forecast of a fire risk index, fire potential index, or similar* | *Index that uses a combination of weather parameters (such as wind speed, humidity, and temperature), vegetation and/or fuel conditions, and other factors to judge current fire risk and to create a forecast indicative of fire risk. A sufficiently granular index shall inform operational decision-making.* |

| Category | Initiative | Definitions |
|---|---|---|
| | *Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions* | *Personnel position within utility service territory to monitor system conditions and weather on site. Field observations shall inform operational decisions.* |
| | *Weather forecasting and estimating impacts on electric lines and equipment* | *Development methodology for forecast of weather conditions relevant to utility operations, forecasting weather conditions and conducting analysis to incorporate into utility decision-making, learning and updates to reduce false positives and false negatives of forecast PSPS conditions.* |
| *C. Grid design and system hardening* | *Capacitor maintenance and replacement program* | *Remediation, adjustments, or installations of new equipment to improve or replace existing capacitor equipment.* |
| | *Circuit breaker maintenance and installation to de-energize lines upon detecting a fault* | *Remediation, adjustments, or installations of new equipment to improve or replace existing fast switching circuit breaker equipment to improve the ability to protect electrical circuits from damage caused by overload of electricity or short circuit.* |
| | *Covered conductor installation* | *Installation of covered or insulated conductors to replace standard bare or unprotected conductors (defined in accordance with GO 95 as supply conductors, including but not limited to lead wires, not enclosed in a grounded metal pole or not covered by: a "suitable protective covering" (in accordance with Rule 22.8 ), grounded metal conduit, or grounded metal sheath or shield). In accordance with GO 95, conductor is defined as a material suitable for: (1) carrying electric current, usually in the form of a wire, cable or bus bar, or (2) transmitting light in the case of fiber optics; insulated conductors as those which are surrounded by an insulating material (in accordance with Rule 21.6), the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture; and suitable protective covering as a covering of wood or other non-conductive material having the electrical insulating efficiency (12kV/in. dry) and impact strength (20ft.-lbs) of 1.5 inches of redwood or other material meeting the requirements of Rule 22.8-A, 22.8-B, 22.8-C or 22.8-D.* |

| Category | Initiative | Definitions |
|---|---|---|
| | *Covered conductor maintenance* | *Remediation and adjustments to installed covered or insulated conductors. In accordance with GO 95, conductor is defined as a material suitable for: (1) carrying electric current, usually in the form of a wire, cable or bus bar, or (2) transmitting light in the case of fiber optics; insulated conductors as those which are surrounded by an insulating material (in accordance with Rule 21.6), the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture; and suitable protective covering as a covering of wood or other non-conductive material having the electrical insulating efficiency (12kV/in. dry) and impact strength (20ft.-lbs) of 1.5 inches of redwood or other material meeting the requirements of Rule 22.8-A, 22.8-B, 22.8-C or 22.8-D.* |
| | *Crossarm maintenance, repair, and replacement* | *Remediation, adjustments, or installations of new equipment to improve or replace existing crossarms, defined as horizontal support attached to poles or structures generally at right angles to the conductor supported in accordance with GO 95.* |
| | *Distribution pole replacement and reinforcement, including with composite poles* | *Remediation, adjustments, or installations of new equipment to improve or replace existing distribution poles (i.e., those supporting lines under 65kV), including with equipment such as composite poles manufactured with materials reduce ignition probability by increasing pole lifespan and resilience against failure from object contact and other events.* |
| | *Expulsion fuse replacement* | *Installations of new and CAL FIRE-approved power fuses to replace existing expulsion fuse equipment.* |
| | *Grid topology improvements to mitigate or reduce PSPS events* | *Plan to support and actions taken to mitigate or reduce PSPS events in terms of geographic scope and number of customers affected, such as installation and operation of electrical equipment to sectionalize or island portions of the grid, microgrids, or local generation.* |
| | *Installation of system automation equipment* | *Installation of electric equipment that increases the ability of the utility to automate system operation and monitoring, including equipment that can be adjusted remotely such as automatic reclosers (switching devices designed to detect and interrupt momentary faults that can reclose automatically and detect if a fault remains, remaining open if so).* |
| | *Maintenance, repair, and replacement of connectors, including hotline clamps* | *Remediation, adjustments, or installations of new equipment to improve or replace* |

| Category | Initiative | Definitions |
|---|---|---|
| | | *existing connector equipment, such as hotline clamps.* |
| | *Mitigation of impact on customers and other residents affected during PSPS event* | *Actions taken to improve access to electricity for customers and other residents during PSPS events, such as installation and operation of local generation equipment (at the community, household, or other level).* |
| | *Other corrective action* | *Other maintenance, repair, or replacement of utility equipment and structures so that they function properly and safely, including remediation activities (such as insulator washing) of other electric equipment deficiencies that may increase ignition probability due to potential equipment failure or other drivers.* |
| | *Pole loading infrastructure hardening and replacement program based on pole loading assessment program* | *Actions taken to remediate, adjust, or install replacement equipment for poles that the utility has identified as failing to meet safety factor requirements in accordance with GO 95 or additional utility standards in the utility's pole loading assessment program.* |
| | *Transformers maintenance and replacement* | *Remediation, adjustments, or installations of new equipment to improve or replace existing transformer equipment.* |
| | *Transmission tower maintenance and replacement* | *Remediation, adjustments, or installations of new equipment to improve or replace existing transmission towers (e.g., structures such as lattice steel towers or tubular steel poles that support lines at or above 65kV).* |
| | *Undergrounding of electric lines and/or equipment* | *Actions taken to convert overhead electric lines and/or equipment to underground electric lines and/or equipment (i.e., located underground and in accordance with GO 128).* |
| | *Updates to grid topology to minimize risk of ignition in HFTDs* | *Changes in the plan, installation, construction, removal, and/or undergrounding to minimize the risk of ignition due to the design, location, or configuration of utility electric equipment in HFTDs.* |
| *D. Asset management and inspections* | *Detailed inspections of distribution electric lines and equipment* | *In accordance with GO 165, careful visual inspections of overhead electric distribution lines and equipment where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded.* |
| | *Detailed inspections of transmission electric lines and equipment* | *Careful visual inspections of overhead electric transmission lines and equipment where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and* |

| Category | Initiative | Definitions |
|---|---|---|
| | | *the condition of each rated and recorded.* |
| | *Improvement of inspections* | *Identifying and addressing deficiencies in inspections protocols and implementation by improving training and the evaluation of inspectors.* |
| | *Infrared inspections of distribution electric lines and equipment* | *Inspections of overhead electric distribution lines, equipment, and right-of-way using infrared (heat-sensing) technology and cameras that can identify "hot spots", or conditions that indicate deterioration or potential equipment failures, of electrical equipment.* |
| | *Infrared inspections of transmission electric lines and equipment* | *Inspections of overhead electric transmission lines, equipment, and right-of-way using infrared (heat-sensing) technology and cameras that can identify "hot spots", or conditions that indicate deterioration or potential equipment failures, of electrical equipment.* |
| | *Intrusive pole inspections* | *In accordance with GO 165, intrusive inspections involve movement of soil, taking samples for analysis, and/or using more sophisticated diagnostic tools beyond visual inspections or instrument reading.* |
| | *LiDAR inspections of distribution electric lines and equipment* | *Inspections of overhead electric transmission lines, equipment, and right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).* |
| | *LiDAR inspections of transmission electric lines and equipment* | *Inspections of overhead electric distribution lines, equipment, and right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).* |
| | *Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations* | *Inspections of overhead electric transmission lines, equipment, and right-of-way that exceed or otherwise go beyond those mandated by rules and regulations, including GO 165, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.* |
| | *Other discretionary inspection of transmission electric lines and* | *Inspections of overhead electric distribution lines, equipment, and right-of-way that exceed or otherwise go beyond those mandated by rules and regulations, including GO* |
| | *equipment, beyond inspections mandated by rules and regulations* | *165, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.* |

| Category | Initiative | Definitions |
|---|---|---|
| | *Patrol inspections of distribution electric lines and equipment* | *In accordance with GO 165, simple visual inspections of overhead electric distribution lines and equipment that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.* |
| | *Patrol inspections of transmission electric lines and equipment* | *Simple visual inspections of overhead electric transmission lines and equipment that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.* |
| | *Pole loading assessment program to determine safety factor* | *Calculations to determine whether a pole meets pole loading safety factor requirements of GO 95, including planning and information collection needed to support said calculations. Calculations shall consider many factors including the size, location, and type of pole; types of attachments; length of conductors attached; and number and design of supporting guys, per D.15-11-021.* |
| | *Quality assurance / quality control of inspections* | *Establishment and function of audit process to manage and confirm work completed by employees or subcontractors, including packaging QA/QC information for input to decision-making and related integrated workforce management processes.* |
| | *Substation inspections* | *In accordance with GO 175, inspection of substations performed by qualified persons and according to the frequency established by the utility, including record-keeping.* |
| *E. Vegetation management and inspection* | *Additional efforts to manage community and environmental impacts* | *Plan and execution of strategy to mitigate negative impacts from utility vegetation management to local communities and the environment, such as coordination with communities to plan and execute vegetation management work or promotion of fire-resistant planting practices* |
| | *Detailed inspections of vegetation around distribution electric lines and equipment* | *Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.* |
| | *Detailed inspections of vegetation around transmission electric lines and equipment* | *Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.* |
| | *Emergency response vegetation management due to red flag warning or other urgent conditions* | *Plan and execution of vegetation management activities, such as trimming or removal, executed based upon and in advance of forecast weather conditions that indicate high fire threat in terms of ignition probability and wildfire consequence.* |
| | *Fuel management and reduction of "slash" from vegetation management activities* | *Plan and execution of fuel management activities that reduce the availability of fuel in proximity to potential sources of ignition, including both reduction or adjustment of live fuel (in terms of species or otherwise) and of* |

| Category | Initiative | Definitions |
|---|---|---|
| | | *dead fuel, including "slash" from vegetation* |
| | | *management activities that produce vegetation material such as branch trimmings and felled trees.* |
| | *Improvement of inspections* | *Identifying and addressing deficiencies in inspections protocols and implementation by improving training and the evaluation of inspectors.* |
| | *LiDAR inspections of vegetation around distribution electric lines and equipment* | *Inspections of right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).* |
| | *LiDAR inspections of vegetation around transmission electric lines and equipment* | *Inspections of right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).* |
| | *Other discretionary inspections of vegetation around distribution electric lines and equipment* | *Inspections of rights-of-way and adjacent vegetation that may be hazardous, which exceeds or otherwise go beyond those mandated by rules and regulations, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.* |
| | *Other discretionary inspections of vegetation around transmission electric lines and equipment* | *Inspections of rights-of-way and adjacent vegetation that may be hazardous, which exceeds or otherwise go beyond those mandated by rules and regulations, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.* |
| | *Patrol inspections of vegetation around distribution electric lines and equipment* | *Visual inspections of vegetation along rights-of-way that is designed to identify obvious hazards. Patrol inspections may be carried out in the course of other company business.* |
| | *Patrol inspections of vegetation around transmission electric lines and equipment* | *Visual inspections of vegetation along rights-of-way that is designed to identify obvious hazards. Patrol inspections may be carried out in the course of other company business.* |
| | *Quality assurance / quality control of vegetation inspections* | *Establishment and function of audit process to manage and confirm work completed by employees or subcontractors, including packaging QA/QC information for input to decision-making and related integrated workforce management processes.* |
| | *Recruiting and training of vegetation management personnel* | *Programs to ensure that the utility is able to identify and hire qualified vegetation management personnel and to ensure that both full-time employees and contractors tasked with vegetation management responsibilities are adequately trained to* |

| Category | Initiative | Definitions |
|---|---|---|
| | | *perform vegetation management work, according to the utility's wildfire mitigation plan, in addition to rules and regulations for safety.* |
| | *Remediation of at-risk species* | *Actions taken to reduce the ignition probability and wildfire consequence attributable to at-risk vegetation species, such as trimming, removal, and replacement.* |
| | *Removal and remediation of trees with strike potential to electric lines and Equipment* | *Actions taken to remove or otherwise remediate trees that could potentially strike electrical equipment, if adverse events such as failure at the ground-level of the tree or branch breakout within the canopy of the tree, occur.* |
| | *Substation inspection* | *Inspection of vegetation surrounding substations, performed by qualified persons and according to the frequency established by the utility, including record-keeping.* |
| | *Substation vegetation management* | *Based on location and risk to substation equipment only, actions taken to reduce the ignition probability and wildfire consequence attributable to contact from vegetation to substation equipment.* |
| | *Vegetation inventory system* | *Inputs, operation, and support for centralized inventory of vegetation clearances updated based upon inspection results, including (1) inventory of species, (2) forecasting of growth, (3) forecasting of when growth threatens minimum right-of-way clearances ("grow-in" risk) or creates fall-in/fly-in risk.* |
| | *Vegetation management to achieve clearances around electric lines and equipment* | *Actions taken to ensure that vegetation does not encroach upon the minimum clearances set forth in Table 1 of GO 95, measured between line conductors and vegetation, such as trimming adjacent or overhanging tree limbs.* |
| *F. Grid operations and protocols* | *Automatic recloser operations* | *Designing and executing protocols to deactivate automatic reclosers based on local conditions for ignition probability and wildfire consequence.* |
| | *Crew-accompanying ignition prevention and suppression resources and services* | *Those firefighting staff and equipment (such as fire suppression engines and trailers, firefighting hose, valves, and water) that are deployed with construction crews and other electric workers to provide site-specific fire prevention and ignition mitigation during on-site work* |
| | *Personnel work procedures and training in conditions of elevated fire risk* | *Work activity guidelines that designate what type of work can be performed during operating conditions of different levels of wildfire risk. Training for personnel on these guidelines and the procedures they prescribe, from normal operating procedures* |

| Category | Initiative | Definitions |
|---|---|---|
| | | *to increased mitigation measures to constraints on work performed.* |
| | *Protocols for PSPS re-energization* | *Designing and executing procedures that accelerate the restoration of electric service in areas that were de-energized, while maintaining safety and reliability standards.* |
| | *PSPS events and mitigation of PSPS impacts* | *Designing, executing, and improving upon protocols to conduct PSPS events, including development of advanced methodologies to determine when to use PSPS, and to mitigate the impact of PSPS events on affected customers and local residents.* |
| | *Stationed and on-call ignition prevention and suppression resources and services* | *Firefighting staff and equipment (such as fire suppression engines and trailers, firefighting hose, valves, firefighting foam, chemical extinguishing agent, and water) stationed at utility facilities and/or standing by to respond to calls for fire suppression assistance.* |
| *G. Data governance* | *Centralized repository for data* | *Designing, maintaining, hosting, and upgrading a platform that supports storage, processing, and utilization of all utility proprietary data and data compiled by the utility from other sources.* |
| | *Collaborative research on utility ignition and/or wildfire* | *Developing and executing research work on utility ignition and/or wildfire topics in collaboration with other non-utility partners, such as academic institutions and research groups, to include data-sharing and funding as applicable.* |
| | *Documentation and disclosure of wildfire-related data and algorithms* | *Design and execution of processes to document and disclose wildfire-related data and algorithms to accord with rules and regulations, including use of scenarios for forecasting and stress testing.* |
| | *Tracking and analysis of near miss data* | *Tools and procedures to monitor, record, and conduct analysis of data on near miss events.* |
| *H. Resource allocation methodology* | *Allocation methodology development and application* | *Development of prioritization methodology for human and financial resources, including application of said methodology to utility decision-making.* |
| | *Risk reduction scenario development and analysis* | *Development of modelling capabilities for different risk reduction scenarios based on wildfire mitigation initiative implementation; analysis and application to utility decision-making.* |
| | *Risk spend efficiency analysis* | *Tools, procedures, and expertise to support analysis of wildfire mitigation initiative risk-spend efficiency, in terms of MAVF and/ or MARS methodologies.* |
| *I. Emergency planning and preparedness* | *Adequate and trained workforce for service restoration* | *Actions taken to identify, hire, retain, and train qualified workforce to conduct service restoration in response to* |

| Category | Initiative | Definitions |
|---|---|---|
| | | *emergencies, including short-term contracting strategy and implementation.* |
| | *Community outreach, public awareness, and communications efforts* | *Actions to identify and contact key community stakeholders; increase public awareness of emergency planning and preparedness information; and design, translate, distribute, and evaluate effectiveness of communications taken before, during, and after a wildfire, including Access and Functional Needs populations and Limited English Proficiency populations in particular.* |
| | *Customer support in emergencies* | *Resources dedicated to customer support during emergencies, such as website pages and other digital resources, dedicated phone lines, etc.* |
| | *Disaster and emergency preparedness plan* | *Development of plan to deploy resources according to prioritization methodology for disaster and emergency preparedness of utility and within utility service territory (such as considerations for critical facilities and infrastructure), including strategy for collaboration with Public Safety Partners and communities.* |
| | *Preparedness and planning for service restoration* | *Development of plans to prepare the utility to restore service after emergencies, such as developing employee and staff trainings, and to conduct inspections and remediation necessary to re-energize lines and restore service to customers.* |
| | *Protocols in place to learn from wildfire events* | *Tools and procedures to monitor effectiveness of strategy and actions taken to prepare for emergencies and of strategy and actions taken during and after emergencies, including based on an accounting of the outcomes of wildfire events.* |
| *J. Stakeholder cooperation and community engagement* | *Community engagement* | *Strategy and actions taken to identify and contact key community stakeholders; increase public awareness and support of utility wildfire mitigation activity; and design, translate, distribute, and evaluate effectiveness of related communications. Includes specific strategies and actions taken to address concerns and serve needs of Access and Functional Needs populations and Limited English Proficiency populations in particular.* |
| | *Cooperation and best practice sharing with agencies outside CA* | *Strategy and actions taken to engage with agencies outside of California to exchange best practices both for utility wildfire mitigation and for stakeholder cooperation to mitigate and respond to wildfires.* |

| Category | Initiative | Definitions |
|---|---|---|
| | *Cooperation with suppression agencies* | *Coordination with CAL FIRE, federal fire authorities, county fire authorities, and local fire authorities to support planning and operations, including support of aerial and ground firefighting in real-time, including information-sharing, dispatch of resources, and dedicated staff.* |
| | *Forest service and fuel reduction cooperation and joint roadmap* | *Strategy and actions taken to engage with local, state, and federal entities responsible for or participating in forest management and fuel reduction activities; and design utility cooperation strategy and joint stakeholder roadmap (plan for coordinating stakeholder efforts for forest management and fuel reduction activities).* |

## 5.4 Methodology for Enterprise-Wide Safety Risk and Wildfire-Related Risk Assessment

*Describe methodology for identifying and evaluating enterprise wide safety risk and wildfire related risk, and how that methodology is consistent with the methodology used by other electric utilities or electrical corporations. If the risk identification and evaluation methodology is different, the utility shall explain why in this section.*

In D.18-12-014, the CPUC approved a Settlement Agreement, to which PG&E and the other California utilities were Settling Parties. The settlement agreement established steps required for a quantitative risk-based decision-making framework. Appendix A to the S-MAP settlement agreement is a list of 3 steps – with 25 individual elements divided among the steps - related to identifying and calculating risk factors. The key steps for calculating risk are shown in Table PG&E 5-4 below. PG&E's method for evaluating safety risk and wildfire risk is consistent the requirements of the S-MAP settlement agreement and, therefore, consistent with the other electric utilities

**TABLE PG&E-5-4: PG&E'S METHOD FOR COMPLYING WITH THE S-MAP SETTLEMENT AGREEMENT[40]**

| S-MAP SA Step | Description | PG&E Implementation |
|---|---|---|
| 1A | Build a Multi-Attribute Value Function (MAVF) | PG&E developed a MAVF that adheres to the set of principles in this Step. The MAVF is described in Section 4.2. |
| 1B | Risk Identification and Definition | PG&E maintains an event-based enterprise risk register (ERR) and works with its lines of business on a regular basis to review existing risks and identify new ones. |
| 2A | Risk Assessment and Risk Ranking in Preparation for RAMP | PG&E identifies different consequence severity categories, called "outcomes" (e.g., Ignition resulting in a small fire during a fire weather warning occasion) based on available data. The consequence distribution for each outcome is determined using utility-specific and industry data, supplemented with subject matter expertise. PG&E estimates the frequency of risk events based on utility data where available and supplements it with industry data and subject matter expertise. |

40 Step 2B in the settlement agreement is applicable only to the Risk Assessment and Mitigation Phase (RAMP) and is therefore excluded from this table.

**TABLE PG&E-5-4: PG&E'S METHOD FOR COMPLYING WITH THE S-MAP SETTLEMENT AGREEMENT[37] (CONTINUED)**

| S-MAP SA Step | Description | PG&E Implementation |
|---|---|---|
| 3 | Mitigation Analysis for Risks in RAMP | The wildfire risk bow-tie for presenting risk is shown in Section 4.2. PG&E developed the tranches by analyzing available data and identifying different risk profiles (*e.g.*, Ignitions caused by transmission assets in HFTDs versus Ignitions caused by distribution assets in HFTDs). Each element of risk in the system (e.g., mile of distribution circuit in HFTDs) is classified into a tranche and shares a risk profile with other elements in the tranche. Calculations like risk scores and risk spend efficiency scores (RSEs) were also implemented consistent with this step. Assumptions and implementation details are described below |

## Calculating A Risk Score

Consistent with Step 3/Row 13 of the S-MAP SA,[41] PG&E calculates risk scores for risks on its Enterprise Risk Register (ERR) as the product of the Likelihood of a Risk Event (LoRE) and the Consequences of a Risk Event (CoRE): LoRE x CoRE

Following the requirements in the S-MAP PG&E calculates a risk score that represents the score *per unit of exposure in the tranche* (for example for wildfire, the unit of exposure is miles of circuit in a tranche).

The risk score is multiplied by the number of exposure units in the tranche to obtain the tranche risk score. The tranche risk score can also be calculated by multiplying the *frequency* of a risk event by CoRE, where frequency is the product of the number of exposure units in the tranche multiplied by LoRE.

PG&E calculates the expected value of the CoRE using Monte-Carlo methods. The attribute level distributions are specified, and parameters are determined from utility-specific data, supplemented by industry data or subject matter expertise. Using the distributions, each attribute (i.e., safety, electric reliability, gas reliability) is simulated over multiple trials, and the MAVF values are calculated by applying the MAVF to each trial. The CoRE is estimated by calculating the average MAVF value of all the trials.

To calculate post-mitigation risk scores and risk reduction, PG&E estimates how specific mitigations reduce event frequencies and/or attribute distribution parameters (*e.g.,* forecasted reductions in the distribution mean or standard deviation, etc.). The post-mitigation risk scores calculated in this manner are compared against pre-mitigation scores to determine risk reduction.

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41 Step number 13 in the S-MAP SA, Appendix A, is "Calculation of Risk" in the section, "Mitigation Analysis for Risks in RAMP."

Risk spend efficiencies (RSE) are determined for each mitigation by dividing the risk reduction by the total cost of the mitigation program. Step 3/Row 25 of the SA directs PG&E to consider the full set of benefits and use present values in RSEs. To do this, PG&E calculates pre- and post-mitigation risk scores annually over the full life of the mitigation program, and discounts both the risk reduction scores, and the program costs by the PG&E utility discount rate.

## 5.5 Planning for Workforce and Other Limited Resources

*Include a showing that the utility has an adequately sized and trained workforce to promptly restore service after a major event, taking into account employees of other utilities pursuant to mutual aid agreements and employees of entities that have entered into contracts with the utility.*

PG&E described its efforts for providing adequate resources to respond to major events in Section 5.3.9. However, there are considerable work execution risks beyond major events that must be considered and carefully managed. PG&E's 2020 WMP continues to outline an ambitious volume of work activities as part of our commitment to aggressively reducing the wildfire risk facing the communities we serve. While PG&E has developed robust work plans in support of the work volume targets outlined in this WMP there are consider execution risks associated with completing all work in the various wildfire programs. Primary areas of execution risk, several of which were experienced in 2019 include:

- Access issues including due to weather, snowfall or other physical access restrictions, environmental regulations or restrictions, property owner objections, or access rights;
- Limited volume of and access to trained, qualified and *safe* personnel to perform targeted work;
- Inability to secure material, particularly for programs that leverage specialized equipment including automated sectionalization, system hardening, weather station and camera installations;
- Electric system access restrictions, specifically the inability to schedule timely transmission system clearances to allow for work to be performed; and/or
- Natural disasters (e.g., earthquakes), pandemics, and other natural hazards that that could cause the company to be unable to perform as intended.

PG&E works continuously to monitor and manage execution risks and has plans in place to mitigate these risks should they arise through actions including, but not limited to:

- In work areas where resource constraints may exist, efforts have been made in the planning process to balance the work and resources to ensure an executable plan exists by reprioritizing work, accelerating hiring, identifying work efficiencies and bundling work where possible; contingency plans have also been identified to shift resources to the highest priority and most time-sensitive work as necessary;
- Historical weather patterns (i.e. snow levels, typical rain or snow timing) have been incorporated into work planning and geographic scheduling of work;
- Identifying available, alternate materials providers and assessing material quality for use in PG&E's system; and,

- Identifying sources of qualified personnel and assessing if the addition of such personnel maintains workforce and public safety, as well as work quality.

In connection with the last point, in 2019, PG&E investigated partnering with local departments of public works to assess if they had qualified personnel and resources that PG&E could leverage to support asset inspections or vegetation management work. After initial investigations, PG&E determined that leveraging municipal employees to perform asset inspections or repairs was not likely to be feasible due to utility labor agreements and required qualifications (i.e. IBEW journeyman status) which were identified to be uncommon amongst municipal employees.

PG&E's team identified 23 priority communities to engage with on a possible partnership. These communities were chosen due to their location within Tier 2 or Tier 3 HFTD areas and where local governments' human resources websites listed job descriptions that could potentially overlap with utility inspection and vegetation management positions, such as park maintenance supervisor, public works maintenance worker, vegetation & fire ecologist and tree trimmer, among others. Through preliminary discussions several communities expressed that such an arrangement would not be of mutual benefit to them at this time due to their own resource constraints. However, a few communities have at least expressed interest in continuing the conversation. As of January 2020, no resource sharing agreements appear likely but these discussions are on-going and contribute to PG&E's overall community engagement and partnership efforts.

In summary, PG&E's 2020 WMP work targets remain ambitious, in alignment with our aggressive focus on reducing wildfire risk. While a number of execution risks, some within the utility's control and many not (weather, environmental restrictions, etc.), could derail our plans, we have incorporated lessons learned from the 2019 WMP implementation and will continue to adjust and refine our schedules and approaches in making every effort to deliver on the wildfire risk reduction efforts outlined in this plan.

## 5.6 Expected Outcomes of 3-Year Plan

### 5.6.1 Planned Utility Infrastructure Construction and Upgrades

*Explain how the utility expects the geographic location of transmission and distribution lines to shift over the three-year plan period and discuss its impact on 1) the utility's risk exposure and 2) the utility's wildfire mitigation strategy. Outline portions of grid within HFTD that are highest cost to serve, by highlighting circuits or portions of circuits that exceed $0.5M per customer in capital cost required to harden. Provide justification for the level of hardening required and why the lowest cost path to harden this equipment exceeds $0.5M per customer, including by describing the various alternatives that were considered to reduce ignition probability and estimated wildfire consequence. For each of these sections of the grid, outline any analysis that was conducted around islanding, serving with microgrids, or providing backup generation, all to reduce the impact of PSPS events and reduce ignition probability and estimated wildfire consequence at the lowest possible cost.*

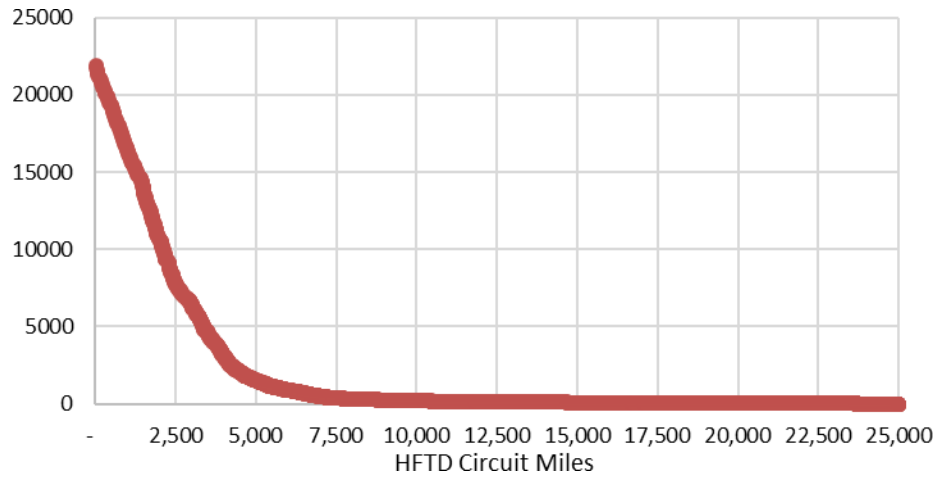
*Discuss how the utility wildfire mitigation strategy influenced its plan for infrastructure construction (in terms of additions or removal of overhead lines, including undergrounding of overhead lines) as detailed in Section 3.4.2. Discuss how the utility wildfire mitigation strategy influenced its plan for upgrades to overhead lines and substations as detailed in the Section 3.4.2.*

### 5.6.1.1 Changes in Geographic Location of Facilities

Over the next three years, PG&E expects that geographic location for distribution facilities will begin to shift due to targeted relocation of overhead to underground facilities in certain areas within the HFTDs. PG&E has planned to relocate approximately 150 miles of existing overhead distribution lines to underground distribution lines, although this is subject to change depending on estimating and engineering as PG&E described in more detail in the 2020 GRC proceeding. Also, in some cases, PG&E may also elect to remove distribution lines in lieu of a non-wires solution, such as a remote grid / microgrid solution to serve customers. Based on PG&E's relative mitigation effectiveness assessment, relocating overhead distribution facilities to be underground facilities will have a 100% effectiveness of reducing ignitions attributed to PG&E's electric assets.

Although overhead system hardening efforts (*e.g.*, covered conductor installation, pole replacement, exempt equipment replacement, etc.) typically will not change the geographic location of those facilities, it is projected to result in a relative risk mitigation effectiveness of 56% of reducing ignitions attributed to PG&E's electric assets. PG&E's approach to its wildfire mitigation strategy is to prioritize addressing its highest wildfire risk distribution lines via system hardening efforts. The following figure depicts relative wildfire risk score versus PG&E distribution feeder line mileage. As depicted in the chart below, approximately 95% of the wildfire risk is in 22% of the distribution line miles. Currently, there are approximately 25,200 circuit miles in HFTDs, so that 22% equates to approximately 5,500 circuit miles that has 95% of the wildfire risk.

**FIGURE PG&E 5-26: SYSTEM HARDENING REMAINING RELATIVE RISK SCORE**




As PG&E continues its system hardening efforts, the wildfire risk in PG&E's circuits should continue to decrease over time.

Within the next three years, the geographic location of PG&E's transmission lines are not projected to change significantly. However, furthered inspections, repairs, planned upgrades and replacements will reduce wildfire risk. Since the transmission system is mostly comprised of networked lines, a cost per customer is not routinely calculated for

repair, upgrade or replacement work. In addition to upgrades and replacements, other efforts to reduce wildfire risk and PSPS impact related to system hardening are discussed in Section 5.3.3.

#### 5.6.1.2 Costs of System Hardening Exceeding $0.5 Million Per Customer

PG&E does not currently have a cost analysis for all potential system hardening projects. As locations are recommended and reviewed in detail, alternatives for hardening are considered, including removal, relocation, non-wire alternatives like remote or microgrid, overhead and underground hardening. While it is appropriate to consider costs as one factor in the hardening strategy for each location, the customer count served by that line segment may not be the most appropriate normalizing factor. It is important to consider the overall potential impact to the wider community in the event of an ignition on such a line. A number of factors must be taken into account when evaluating hardening alternatives, which may result in a higher than expected cost per served customer for those line sections most at risk for high fire spread and consequence risk that happen to serve a lower volume of customers.

### 5.6.1.3 Wildfire Mitigation Strategy Impact on Construction and Upgrades

In order to build a more robust and hardened system, upgrades, as highlighted in PG&E's distribution System Hardening standard (TD-9001B-009, discussed in more detail in Section 5.3.3.17), will continue to place constraints on work execution efforts for all work planned in HFTDs. PG&E continues to work to mitigate risks related to material procurement and identification of construction resources required to inspect and re-construct infrastructure to the new standard. These new standards for deploying covered conductor and sizing of structures according to wind speeds will impact span lengths, possibly requiring more poles than historically deployed, and will require relocation of lines in some instances. This in turn may require additional rights-of-way for lines or poles or guy wires which places a burden on the timing of execution and costs required for negotiating new routes / land rights with property owners. These factors will continue to impact all construction planned in HFTD areas, not just hardening specific projects, as the new standard is applicable to all non-emergency and maintenance work.

*Instructions for Table 31*

*Assume weather patterns for each year are as consistent with the 5-year historical average and that wildfire mitigation initiatives are implemented according to plan. Report change in drivers of ignition probability based on WMP implementation according to whether or not near misses of that type are tracked, the number of incidents anticipated per year (e.g., all instances of animal contact regardless of whether they caused an outage, an ignition, or neither), the rate at which those incidents (e.g., object contact, equipment failure, etc.) are anticipated to cause an ignition in the column, and the number of ignitions that those incidents are anticipated to cause by category. List additional risk drivers tracked in the "other" row and additional rows as needed.*

Annual ignition frequency will vary significantly based on precipitation patterns and other climatological factors that influence vegetation and fuel moisture.

Table 31-1 (Distribution) and Table 31-2 (Transmission) below show the change in drivers of ignition probability taking into account planned initiatives, for each year of plan.

PG&E estimates a 10% reduction in vegetation-caused, equipment failure and animal-caused ignitions from the 2019 level due to planned System Hardening, Enhanced Vegetation Management and tag repair work that is planned for 2020 onwards. The 10% reduction is derived from the risk prioritization of work, estimation of combined CWSP mitigation effectiveness and associated ignition risk reductions. The same reduction trend of 10% is anticipated in 2021 and 2022.

PG&E utilizes 2019 (actual) incidents as a basis for estimation of 2020-2022 incidents.

PG&E utilizes 2019 (actual) ignitions as a baseline for estimation of 2020-2022 ignitions.

PG&E assumes that 2020- 2022 ignition to incident ratio remains as same as 2019 ignition to incident in Table 11. PG&E utilizes the 2019 ignition to incident ratio along

with the estimated mitigated ignitions in 2020-2022 in order to approximate incidents frequencies in 2020-2022.

With the above analysis, PG&E estimates an 8% reduction for HFTD ignitions in 2020, 2021 ad 2022, year over year.

Note that the validity of these assumption will need to be tested with time; annual ignition frequency will vary significantly based on precipitation patterns and other climatological factors that influence vegetation and fuel moisture.

## TABLE 31-1: CHANGE IN DRIVERS OF IGNITION PROBABILITY TAKING INTO ACCOUNT PLANNED INITIATIONS, FOR EACH YEAR OF PLAN – DISTRIBUTION

| Incident type by ignition probability driver | Detailed risk driver | Are near misses tracked ? | Number of incidents per year | | | | Average percentage likelihood of ignition per incident | | | Number of ignitions (mitigated) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2019 (Actual) | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2019 (Actual) | 2020 | 2021 | 2022 |
| Contact from object | All types of object contact | Y | 13,434.00 | 13,094.17 | 12,788.32 | 12,513.05 | 1.88% | 1.88% | 1.88% | 253.00 | 246.60 | 240.84 | 235.66 |
| | Animal contact | Y | 2,072.00 | 2,034.33 | 2,000.42 | 1,969.91 | 3.19% | 3.19% | 3.19% | 66.00 | 64.80 | 63.72 | 62.75 |
| | Balloon contact | Y | 464.00 | 464.00 | 464.00 | 464.00 | 3.02% | 3.02% | 3.02% | 14.00 | 14.00 | 14.00 | 14.00 |
| | Vegetation contact | Y | 8,167.00 | 7,807.10 | 7,483.19 | 7,191.67 | 1.44% | 1.44% | 1.44% | 118.00 | 112.80 | 108.12 | 103.91 |
| | Vehicle contact | Y | 1,835.00 | 1,835.00 | 1,835.00 | 1,835.00 | 2.02% | 2.02% | 2.02% | 37.00 | 37.00 | 37.00 | 37.00 |
| | Contact from Object - Other | Y | 896.00 | 896.00 | 896.00 | 896.00 | 2.01% | 2.01% | 2.01% | 18.00 | 18.00 | 18.00 | 18.00 |
| All types of equipment / facility failure | All types | Y | 13,031.00 | 12,835.54 | 12,659.62 | 12,501.29 | 1.07% | 1.07% | 1.07% | 140.00 | 137.90 | 136.01 | 134.31 |
| | Capacitor bank failure | Y | 70.00 | 70.00 | 70.00 | 70.00 | 10.00% | 10.00% | 10.00% | 7.00 | 7.00 | 7.00 | 7.00 |
| | Conductor failure—all | Y | 3,382.00 | 3,328.60 | 3,280.54 | 3,237.29 | 2.25% | 2.25% | 2.25% | 76.00 | 74.80 | 73.72 | 72.75 |
| | Conductor failure—wires down | Y | 1,593.00 | 1,593.00 | 1,593.00 | 1,593.00 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Fuse failure—all | Y | 345.00 | 345.00 | 345.00 | 345.00 | 0.58% | 0.58% | 0.58% | 2.00 | 2.00 | 2.00 | 2.00 |
| | Fuse failure—conventional blown fuse | Y | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Lightning arrestor failure | Y | 130.00 | 130.00 | 130.00 | 130.00 | 3.08% | 3.08% | 3.08% | 4.00 | 4.00 | 4.00 | 4.00 |
| | Switch failure | Y | 189.00 | 179.55 | 171.05 | 163.39 | 2.12% | 2.12% | 2.12% | 4.00 | 3.80 | 3.62 | 3.46 |
| | Transformer failure | Y | 3,962.00 | 3,905.40 | 3,854.46 | 3,808.61 | 0.53% | 0.53% | 0.53% | 21.00 | 20.70 | 20.43 | 20.19 |

**TABLE 31-1: CHANGE IN DRIVERS OF IGNITION PROBABILITY TAKING INTO ACCOUNT PLANNED INITIATIONS, FOR EACH YEAR OF PLAN – DISTRIBUTION (CONTINUED)**

| Incident type by ignition probability driver | Detailed risk driver | Are near misses tracked ? | Number of incidents per year | | | | Average percentage likelihood of ignition per incident | | | Number of ignitions (mitigated) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2019 (Actual) | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2019 (Actual) | 2020 | 2021 | 2022 |
| All types of equipment / facility failure | Pole failure | Y | 1,162.00 | 1,162.00 | 1,162.00 | 1,162.00 | 0.34% | 0.34% | 0.34% | 4.00 | 4.00 | 4.00 | 4.00 |
| | Insulator failure | Y | 374.00 | 355.30 | 338.47 | 323.32 | 1.07% | 1.07% | 1.07% | 4.00 | 3.80 | 3.62 | 3.46 |
| | Crossarm failure | Y | 1,001.00 | 1,001.00 | 1,001.00 | 1,001.00 | 0.20% | 0.20% | 0.20% | 2.00 | 2.00 | 2.00 | 2.00 |
| | Voltage Regulator failure | Y | 59.00 | 57.03 | 55.26 | 53.67 | 5.08% | 5.08% | 5.08% | 3.00 | 2.90 | 2.81 | 2.73 |
| | Recloser failure | Y | 106.00 | 106.00 | 106.00 | 106.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Guy/Span Wire failure | Y | 58.00 | 58.00 | 58.00 | 58.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Sectionalizer failure | Y | 3.00 | 3.00 | 3.00 | 3.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Equipment failure - Other | Y | 2,190.00 | 2,173.15 | 2,157.99 | 2,144.35 | 0.59% | 0.59% | 0.59% | 13.00 | 12.90 | 12.81 | 12.73 |
| Wire-to-wire contact / contamination | | Y | 16,357.00 | 16,357.00 | 16,357.00 | 16,357.00 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Other | Other | Y | 1,746.00 | 1,746.00 | 1,746.00 | 1,746.00 | 2.23% | 2.23% | 2.23% | 39.00 | 39.00 | 39.00 | 39.00 |

## TABLE 31-2: CHANGE IN DRIVERS OF IGNITION PROBABILITY TAKING INTO ACCOUNT PLANNED INITIATIONS, FOR EACH YEAR OF PLAN – TRANSMISSION

| Incident type by ignition probability driver | Detailed risk driver | Are near misses tracked ? | Number of incidents per year | | | | Average percentage likelihood of ignition per incident | | | Number of ignitions (mitigated) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2019 (Actual) | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2019 (Actual) | 2020 | 2021 | 2022 |
| Contact from object | All types of object contact | Y | 150.00 | 147.69 | 145.62 | 143.75 | 8.67% | 8.67% | 8.67% | 13.00 | 12.80 | 12.62 | 12.46 |
| | Animal | Y | 32.00 | 31.47 | 30.99 | 30.55 | 18.75% | 18.75% | 18.75% | 6.00 | 5.90 | 5.81 | 5.73 |
| | Vegetation | Y | 64.00 | 57.60 | 51.84 | 46.66 | 1.56% | 1.56% | 1.56% | 1.00 | 0.90 | 0.81 | 0.73 |
| | Mylar balloon | Y | 9.00 | 9.00 | 9.00 | 9.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Car pole | Y | 25.00 | 25.00 | 25.00 | 25.00 | 16.00% | 16.00% | 16.00% | 4.00 | 4.00 | 4.00 | 4.00 |
| | Third-Party (foreign object /aircraft/ vandalism) | Y | 20.00 | 20.00 | 20.00 | 20.00 | 10.00% | 10.00% | 10.00% | 2.00 | 2.00 | 2.00 | 2.00 |
| Equipment / Facility Failure | All types of Equipment Failure | Y | 132.00 | 125.40 | 119.46 | 114.11 | 6.06% | 6.06% | 6.06% | 8.00 | 7.60 | 7.24 | 6.92 |
| | Arrestor | Y | 0.00 | 0.00 | 0.00 | 0.00 | N/A | N/A | N/A | 0.00 | 0.00 | 0.00 | 0.00 |
| | Insulator or Bushing | Y | 33.00 | 30.80 | 28.82 | 27.04 | 9.09% | 9.09% | 9.09% | 3.00 | 2.80 | 2.62 | 2.46 |
| | Circuit breaker | Y | 8.00 | 8.00 | 8.00 | 8.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Conductor | Y | 35.00 | 35.00 | 35.00 | 35.00 | 2.86% | 2.86% | 2.86% | 1.00 | 1.00 | 1.00 | 1.00 |
| | Connector/ hardware | Y | 13.00 | 13.00 | 13.00 | 13.00 | 7.69% | 7.69% | 7.69% | 1.00 | 1.00 | 1.00 | 1.00 |
| | Other station | Y | 20.00 | 20.00 | 20.00 | 20.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Structure line | Y | 18.00 | 18.00 | 18.00 | 18.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Switch (line+station) | Y | 2.00 | 2.00 | 2.00 | 2.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Transformer | Y | 5.00 | 4.50 | 4.05 | 3.65 | 20.00% | 20.00% | 20.00% | 1.00 | 0.90 | 0.81 | 0.73 |
| | Other Equipment | N/A | 0.00 | 0.00 | 0.00 | 0.00 | N/A | N/A | N/A | 2.00 | 1.90 | 1.81 | 1.73 |

**TABLE 31-2: CHANGE IN DRIVERS OF IGNITION PROBABILITY TAKING INTO ACCOUNT PLANNED INITIATIONS, FOR EACH YEAR OF PLAN – TRANSMISSION (CONTINUED)**

| Incident type by ignition probability driver | Detailed risk driver | Are near misses tracked ? | Number of incidents per year | | | | Average percentage likelihood of ignition per incident | | | Number of ignitions (mitigated) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2019 (Actual) | 2020 | 2021 | 2022 | 2020 | 2021 | 2022 | 2019 (Actual) | 2020 | 2021 | 2022 |
| Contamination | All types of contamination | Y | 11.00 | 11.00 | 11.00 | 11.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| Disaster | All Types of Disaster (all but 2 Fire) | Y | 13.00 | 13.00 | 13.00 | 13.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| Other | All types of Other (e.g., customer or IPP caused) | Y | 24.00 | 24.00 | 24.00 | 24.00 | 25.00% | 25.00% | 25.00% | 6.00 | 6.00 | 6.00 | 6.00 |
| Unknown | Patrol Found No Cause, No Damage | Y | 138.00 | 138.00 | 138.00 | 138.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| Weather | All types of Weather | Y | 204.00 | 204.00 | 204.00 | 204.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Lightning | Y | 109.00 | 109.00 | 109.00 | 109.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Rain | Y | 23.00 | 23.00 | 23.00 | 23.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Snow/ Ice | Y | 61.00 | 61.00 | 61.00 | 61.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| | Wind | Y | 11.00 | 11.00 | 11.00 | 11.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |
| Work Procedure Error (WPE) | All types of WPE | Y | 21.00 | 21.00 | 21.00 | 21.00 | 0.00% | 0.00% | 0.00% | 0.00 | 0.00 | 0.00 | 0.00 |

### 5.6.2 Protocols on Public Safety Power Shutoff5.6.2 Protocols on Public Safety Power Shutoff

*Describe protocols on Public Safety Power Shut-off (PSPS or de-energization), to include:*

1. *Strategy to minimize public safety risk during high wildfire risk conditions and details of the considerations, including but not limited to list and description of community assistance locations and services provided during a de-energization event.*

2. *Outline of tactical and strategic decision-making protocol for initiating a PSPS/de-energization (e.g., decision tree).*

3. *Strategy to provide for safe and effective re-energization of any area that was de-energized due to PSPS protocol.*

4. *Company standards relative to customer communications, including consideration for the need to notify priority essential services – critical first responders, public safety partners, critical facilities and infrastructure, operators of telecommunications infrastructure, and water utilities/agencies. This section, or an appendix to this section, shall include a complete listing of which entities the electrical corporation considers to be priority essential services. This section shall also include description of strategy and protocols to ensure timely notifications to customers, including access and functional needs populations, in the languages prevalent within the utility's service territory.*

5. *Protocols for mitigating the public safety impacts of these protocols, including impacts on first responders, health care facilities, operators of telecommunications infrastructure, and water utilities/agencies.*

PG&E's most important responsibility is protecting health, welfare, and safety of its customers and the communities that it serves—including through the provision of safe, reliable electricity. When weather or other circumstances threaten the ability to provide electricity *safely*, PG&E must take the appropriate steps necessary to protect the public. PG&E's PSPS program proactively de-energizes a portion of the Company's electric system, in the interest of public safety, when there is a potential for a catastrophic wildfire should the lines be left energized. PG&E understands that de-energizing customers has real impacts and is actively working to reduce the impact on its customers.

In 2019, PG&E implemented multiple PSPS events, including some of the largest events in California history. While there were no fatalities in 2019 resulting from wildfires ignited by electrical equipment in PG&E's territory, PG&E acknowledges there is room for further improvement in its implementation of PSPS. PG&E is committed to learning from each incident and advancing practices for events in the future. PG&E is committed to executing its PSPS program in a manner that exceeds Resolution

ESRB-8, D.19-05-042, and other Commission directives[42] while also minimizing the corresponding risks and mitigating disruptions appropriately.

In this section, PG&E describes its: (1) strategy to minimize public safety risks during high wildfire risk conditions; (2) PSPS decision making protocols (3) re-energization strategy; (4) customer, agency, and external communications; and (5) protocols for mitigating the public safety impacts of these protocols.

[42] See Resolution Extending De-Energization Reasonableness Notification, Mitigation and Reporting Requirements in D.12-04-024 to all Electric IOUs.

#### 5.6.2.1 Strategy to Minimize Public Safety Risk During High Wildfire Risk Conditions

This section describes strategies to minimize public safety risk during high wildfire risk conditions and details of the considerations, including but not limited to list and description of community assistance locations and services provided during a de-energization event.

As outlined in *Section 4.4 Directional vision for necessity of PSPS,* the 2020-2022 PSPS program plans are targeted to achieve the objective of minimizing the customer impacts of PSPS *without* increasing catastrophic wildfire risk. Key initiatives focus on:

1. Reducing scope, duration, and frequency of PSPS events; and

2. Mitigating impacts on de-energized customers.

PG&E has developed and is continuing to evaluate accelerated strategies for achieving these objectives in 2020 and beyond. These strategies may be adjusted as PG&E continues to evaluate viable opportunities and there may be additional ways in which the PSPS program evolves, including stakeholder input and Commission direction through the open and ongoing Order Instituting Investigation (I.) 19-11-013 and Rulemaking (R.) 18-12-005.

#### 5.6.2.1.1 Reducing Scope, Duration, and Frequency of PSPS Events

PG&E is evaluating various mechanisms for impacting fewer customers and reducing PSPS outage duration. These efforts will only be considered if they *do not* create additional catastrophic wildfire risk. Below is a summary of currently planned initiatives, which is also included in *Section 4.4 Directional vision for necessity of PSPS.*

**Distribution Segmentation and System Hardening**

PG&E's plan is to enhance its distribution segmentation strategies including: (a) adding sectionalizing devices; (b) circuit reconfiguration / pre-PSPS event switching; and (c) additional system hardening to support PSPS switching. PG&E has identified various distribution lines where additional switching devices coupled with targeted system hardening can be utilized to further sectionalize distribution feeders to minimize the number of customers being impacted by PSPS outages. *See also* Section 5.3.3.8, Grid Topology Improvements to Mitigate or Reduce PSPS Events.

**Transmission Line Sectionalizing**

PG&E plans to enhance transmission segmentation strategies including installation of additional SCADA-controlled switches. PG&E has identified various transmission lines where additional switching devices will be utilized to further sectionalize transmission lines to be able to minimize the number of customers impacted by PSPS outages. Additional information found in Section 5.3.3.8 Grid Topology Improvements to Mitigate or Reduce PSPS Events.

**Transmission Line Exclusions**

Prior to next fire season, PG&E is evaluating all 552 transmission lines in the HFTDs to determine which lines can be removed from future PSPS event scope via: supplemental inspections (ultrasonic), below-grade inspections and repairs, increased VM (expand ROW), accelerated repairs or replacement of assets. Additional information found in Section 5.3.3.8 Grid Topology Improvements to Mitigate or Reduce PSPS Events.

**Establishing PSPS Criteria for Hardened Distribution Facilities**

PG&E plans to assess and develop decision making criteria for the potential exclusion of "safe-to-operate" hardened distribution facilities from PSPS de-energization during high fire threat weather conditions. Similar to PG&E's current risk-based transmission line assessment used during the event scoping process, distribution line criteria would be based on the wildfire risk reduction associated with the hardened assets. Additional information found in Section 5.3.3.8 Grid Topology Improvements to Mitigate or Reduce PSPS Events.

**Microgrids for PSPS Mitigation**

PG&E is proposing to pursue resiliency and reliability improvements to mitigate the customer impacts of PSPS through permanent and temporary front-of-the-meter

microgrid solutions.[43] Microgrids can reduce the number of customers de-energized during PSPS events, as well as provide additional impact mitigation by energizing shared community resources that support the surrounding population.

### Increased Model Granularity

PG&E weather modeling used for PSPS execution will increase weather and fuel model granularity from 3 km to 2 km. On-demand simulations will also be available at 0.67 km. Additional information found in Section 5.3.2 Situational Awareness and Forecasting.

### PSPS Guidance Review

PSPS decision making guidance will continue to be assessed, including the evaluation of systematic incorporation of outputs from fire spread and consequence modeling and calibrating outage and FPI models with new data as it becomes available. Additional information found in Section 5.3.2 Situational Awareness and Forecasting.

### Restoration Time

In 2019, PG&E's target was to restore service after a PSPS within 24 hours after the weather conditions clear. For 2020, PG&E is aiming for a 50% improvement in daylight restoration time, restoring power for 98% of customers within 12 daylight hours from the time the weather conditions clear. PG&E plans to increase aerial and ground resources and evaluate night patrol capabilities to reduce PSPS restoration time. Additional information found in Section 5.3.6 Grid Operations and Protocols and 5.3.9 Emergency Planning and Preparedness.

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[43] The targeted units and spend associated with Microgrids for PSPS mitigation in this 2020 WMP are provided for informational purposes only. Microgrids in this category may include temporary mid-feeder microgrids, temporary microgrids located at substations, temporary single-customer microgrids to power critical facilities needed to ensure societal continuity, and permanent distributed generation-enabled microgrid services (DGEMS) at substations. The actual units implemented and spend incurred may change.

#### 5.6.2.1.2 Mitigating Impacts on De-energized Customers

PG&E recognizes the community impacts that result from de-energization and intends to mitigate those impacts through providing backup power support, as well as a number of customer services and programs which is more fully described below. In addition, access to crucial planning and event information is critical to help customers and communities prepare. PG&E provides extensive proactive education and outreach, as well as customer and community notifications during a PSPS event. Additional information can be found in Section 5.6.2.4, Protocols for Mitigating Public Safety Impacts of PSPS.

**Backup Power Support for Societal Continuity**

PG&E encourages customers to have a plan, which may include backup power in the event their power is turned off due to a PSPS event. However, recognizing that unforeseen circumstances may arise, PG&E may deploy backup generation support in cases involving public health, safety, or environmental risks, or to enable emergency operations of first responders and other infrastructure critical to support societal continuity.

During the October and November 2019 PSPS events, PG&E deployed backup generation support to 41 different sites across 14 counties, with a peak deployment of approximately 41 megawatts (MW) concurrently supporting 26 sites at one time. This was an emergency response deployed by PG&E and its contractors during these PSPS events due to the imminent failure or lack of customer-operated backup generation systems. Customers supported by PG&E with temporary generation included transportation tunnels, water treatment and pumping facilities, medical centers, 911 dispatch centers, jails, and fire departments.

PG&E expects that during PSPS events in 2020 it will be necessary to deploy temporary backup power to facilities, which would be provided in alignment with PG&E's existing Portable Generator Use Standards. PG&E has included a proposal in the Microgrid OIR R.19-09-009 addressing the need to reserve temporary generation capacity for the year.

**PSPS Customer Services and Programs**

PG&E currently offers services and programs to customers that can assist in limiting the disruption of a PSPS-related outage before, during and after a PSPS event. The programs and services listed below were available in 2019 and will continue to be implemented, promoted and refined during the 2020-2022 program time period. These programs apply broadly to all types of customers and include providing the following: 24/7 information updates, experienced and knowledgeable business teams, continuous power programs, Community Resource Centers (CRCs), Third-Party Partnerships and Grant Programs, and coordination with Critical Facilities and Third-Party Commodity Suppliers.

### 24/7 Information Updates

PG&E's website and call center allow for customers to have access to 24/7 information before, during and after a PSPS event. PG&E's website provides customers with convenience and flexibility by allowing them access to a variety of topics associated with wildfire preparedness and, when a PSPS event is active, the website is updated with event-specific situational updates, including an address lookup tool to determine customer impacts, PSPS event maps and information, weather awareness updates, and more.

During an event, PG&E will also provide event updates on social media, and also work closely with external media outlets, including multicultural news outlets, to provide broader awareness, critical insight and capture crowdsourced feedback—all of which promotes more effective communication. These resources also serve as backup communications channels should cell service be unavailable for direct customer notifications.

PG&E operates four contact centers in the state of California and provides 24/7 emergency live-agent service for customers to report emergencies, or obtain PSPS-related updates, as needed. PG&E's Contact Center agents are trained in how to handle customers dealing with natural gas and electric emergencies with specific procedures to escalate life-threatening situations, which is available for translation services in 240 languages. PG&E's customer communications support is more fully described in Section 5.6.2.4.

### Experienced and Knowledgeable Business Teams

PG&E will provide support to all business customers to help them plan and prepare for a PSPS event. PG&E supports the unique and complex needs of its largest industrial, commercial and agricultural customers with a dedicated team of over 60 customer relationship managers supporting over 3,500 business customers. PG&E's dedicated account management team provides critical information and timely updates before, during and after a PSPS event to its large business customers.

PG&E will continue to engage with business and critical customer accounts to support PSPS and emergency preparedness planning, including topics such as business continuity, backup power options, safety, financing, and sourcing. Further, during EOC activation when a potential PSPS event is anticipated, PG&E will continue to have a dedicated point of contact that will be available 24/7 to conduct direct outreach, provide event updates and answer individualized questions to critical service providers (e.g., telecommunications providers, transmission-level customers and Water Agencies).

### Community Resource Centers

In an effort to minimize public safety impacts as a result of the loss of power upon implementing PSPS protocols, PG&E mobilizes (opens) Community Resource Centers (CRC) in potentially impacted counties and tribal communities to provide customers and

residents a space that is safe, energized and air-conditioned or heated (as applicable) primarily during daylight hours (typically from 0800 to 2000). CRCs will:

- Provide communities with PSPS event information, drinks such as bottled water/coffee/tea, non-perishable snacks, ice, blankets (upon request / as needed), and power strips to meet basic charging needs, including charging for cell phones and laptops, small medical devices, as well as Wi-Fi and cellular service access (where possible);

- Meet Americans with Disabilities Act (ADA) requirements and be environmentally compliant;

- Accommodate up to approximately 100 customers at a time;

- Have site owner approval and be located on 1-2 acres of flat and (preferably) paved areas for outdoor locations; and

- Provide transportation for AFN customers to and from center(s) by collaborating with CBOs, local stakeholders and first responders.

PG&E will adapt to the changing needs of CRCs for customers during an event, including varying the offerings available and number and type of CRCs mobilized based on the scale (number of customers impacted) and expected duration of the event based on weather forecasts. Different levels of CRC support include: (1) PG&E-operated mobile answer centers, (2) PG&E-operated outdoor, tented CRC locations, (3) PG&E operated indoor CRC locations (providing backup power where needed), (4) County or Tribal agency-operated support centers whereby PG&E provides temporary backup power and/or reimbursement for reasonable costs for the mobilization and demobilization of agency-operated public support centers.

The number of CRCs set up concurrently during an event will be determined at the time of the event in the EOC with real-time input and agreement on site location from local governments and tribes. Site location execution will depend on vendor availability and land usage agreement status.

PG&E will continue to work with counties, tribes and other agencies to develop a CRC playbook to understand and address their general needs, preferences, and priorities for CRC locations. To build out the playbook, PG&E will leverage previous input received from counties and tribes and will re-circulate the list of potential CRC sites to solicit more feedback. PG&E is currently exploring semi-permanent, indoor CRCs with on-site backup power, while working with property owners to secure agreements. For each potential CRC location, PG&E will conduct Americans with Disability Act (ADA) assessments and confirm readiness for backup power connectivity.

In 2019, during its largest impacting PSPS event (October 23-29, 2019), PG&E stood up 77 CRCs in 30 counties throughout the impacted areas in the territory. As of February 2020, PG&E has almost 100 CRC locations across over 30 counties with agreements executed with land owners  These sites are a mix of both indoor and outdoor locations that may be leveraged as a CRC location during a future PSPS event. Prior to the 2020 wildfire season, however, PG&E is targeting to have approximately 200 indoor CRC locations identified with input from local governments and agreements

executed that may be used during a PSPS event. PG&E will continue to account for feedback from customers and local agencies that may influence the support and resources provided by PG&E for CRCs.

Attachment 2 includes the CRC locations that are currently under agreement with PG&E.

### Third-Party Partnerships / Grant Programs

PG&E will continue to collaborate and partner with CBOs that best serve AFN and Medical Baseline customers (e.g., California Foundation for Independent Living Centers). More detail is provided in below in Section 5.6.2.3 related to "Access and Functional Needs (AFN) and Medical Baseline Customers." Based on feedback, lessons learned and research, PG&E is exploring the development of new AFN support and grant programs to assist AFN customers before, during and after a PSPS event related, but not limited to, medical, financial, transportation, and translation needs.

### Continuous Power Programs

To help customers prepare for PSPS-related planned outage events, PG&E will continue to spread awareness and educate residential and non-residential customers on the commercially available temporary backup power options by pointing customers to options for portable battery backup power. PG&E will directly engage with backup power vendors to provide insight into customer demand and encourage the development of affordable programs that meet the needs of potentially impacted customers, including financing options.

As of 2019, over 120 MW of battery capacity has been installed at ~8,000 customer sites across PG&E's service area. Beginning early 2020, PG&E will leverage and target the recently approved, updated SGIP to incentivize eligible customers[44] that meet the equity resiliency criteria located in Tier 2 and Tier 3 HFTD areas adopt battery storage. With a generous incentive that offsets almost 100% of battery and installation costs, targeting Critical Facilities and Critical Infrastructure, as well as Medical Baseline customers, in Tier 2 and Tier 3 HFTDs or who have experienced two or more discrete PSPS events can significantly reduce PSPS impact for the most vulnerable customers in the highest impacted areas.

PG&E will continue to explore additional continuous power-related program offerings, such as on-bill financing, to support backup power needs for potentially impacted customers.

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**44** Customer eligibility for the SGIP program equity resiliency budget is more fully described in D.19-09-027. Key eligibility is focused on either medical baseline customers, a more "narrower subset" of critical facilities in Tier 2 or Tier 3 HFTD areas, or customers that have experiences two or more discrete PSPS events that have the "least ability to fund a storage system."

## Coordination With Critical Facilities and Critical Infrastructure

PG&E will continue to maintain an annual process for updating critical facilities designations and contact information in partnership with cities and counties in alignment with the CPUC definition of “critical facilities and critical infrastructure” as described in D.19-05-042. In addition, PG&E’s personnel will continue to serve as dedicated point of contact for critical facilities before, during and after a PSPS event.

Through on-going engagement, PG&E plans to continue to coordinate with critical facilities, such as fuel suppliers and refineries, telecommunications providers, transportation, among others, to further understand and more effectively plan for the impacts of a PSPS event on the ability to safely operate these facilities.

When PG&E’s EOC is activated for a PSPS event, a single point of contact at PG&E will provide timely updates with event scope and status and answer individual questions for facilities that meet the requirements of being both a critical facility and public safety partner.

Looking forward, PG&E will work to better understand the impact of PSPS events on critical infrastructure, such as bridges, tunnels and mass-transit systems. Additionally, PG&E will develop a resiliency playbook to communicate consistent policy for providing temporary backup power to critical facilities during a PSPS event, as described above under Backup Power Support for Societal Continuity. Finally, PG&E will also explore options to create a working group and cooperative framework to enhance information sharing and preparedness before the next wildfire season, establish realistic service expectations and planning needs, better coordinate during emergency and disaster events, and promote overall resiliency with Telecommunication providers in support of our mutual communities served.

## Coordination With Third-Party Commodity Suppliers

Regular communication and education will continue with CCA and DA providers regarding PSPS events and wildfire relief efforts. When PG&E’s EOC is activated for a PSPS event, CCA Relationship Managers will provide daily updates on timing, customer and event status and answer individual questions. CCAs are also provided access to the PSPS portal, which includes PSPS event-specific information, including event maps, impacted customers lists, and other relevant event information.

#### 5.6.2.2 PSPS Decision-Making Protocols

This section describes PG&E's 2019 process for determining when to initiate a PSPS event. PG&E is continuing to evaluate decision-making criteria. There is no singular algorithm that yields an objective result at this time. This ongoing evaluation may result in changes to PG&E's PSPS criteria and decision-making process in 2020 and beyond.

PG&E carefully reviews a combination of several factors when determining if power must be turned off for safety, and no single factor ultimately determines a PSPS decision. The two key drivers of the decision to initiate a PSPS event are PG&E's OPW and FPI forecast models. When there is spatial and temporal concurrence of high FPI and OPW, which means a high potential for outage activity and an increased probability of a large fire, a PSPS event is considered. When these conditions align, the FPI is forecasted to reach a rating of "R5-Plus", which indicates high fire danger plus the potential for outage activity. When this level is reached, a combination of other criteria may inform the ultimate decision to shut off power. These include:

- A Red Flag Warning declared by the NWS;
- High Risk forecasts from the Northern and Southern Geographic Area Coordination Centers
- Low humidity levels, generally 20 percent and below;
- Forecasted sustained winds generally above 25 miles per hour (mph) and wind gusts in excess of approximately 45 mph, depending on location and site-specific conditions such as temperature, terrain and local climate;
- Computer simulated fire spread and consequence modeling based on current and forecast weather and fuel conditions;[45]
- Condition of dry fuel on the ground and live vegetation (moisture content); and
- On-the-ground, real-time wildfire related information from PG&E's WSOC and field observations from PG&E field crews.

The first trigger for a potential PSPS event is a forecast of fire danger and high wind conditions by PG&E's Fire Science and Meteorology team. PG&E's Meteorology team uses the latest global forecast models to determine potential high-risk conditions that may develop several days out. With the enhanced situational awareness from increased weather stations and advanced modelling, PG&E's Fire Science and Meteorology team predicts conditions specific to local geographic areas as high-risk events approach.

Modeled weather and fuel conditions are combined in a FPI to forecast daily fire danger ratings by FIA. The FPI is a forecast describing the potential for fires to ignite and

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[45] This decision factor was developed and is being tested. It will be further integrated into the fire danger modelling analysis tool for use in 2020. PG&E previously had only ignition spread modeling based on historic climatology.

spread on a scale from “R1” (lowest) to “R5” (highest) specific to each FPI Rating Area. “R5-Plus” indicates there is elevated fire potential plus potential for wind-related outage activity, which may warrant a PSPS event. The FPI model was calibrated using a high-resolution dataset of historical weather, fuel conditions, geographic-features and fires.

The occurrence of strong, outage producing winds separates “R5-Plus” fire danger from “R5” fire danger. PG&E utilizes an OPW forecast to highlight local areas with an escalated probability of outages driven by wind conditions. The OPW model was developed by PG&E’s Fire Science and Meteorology team and is a location-specific model developed based on the historic frequency of outages at forecasted wind speeds.

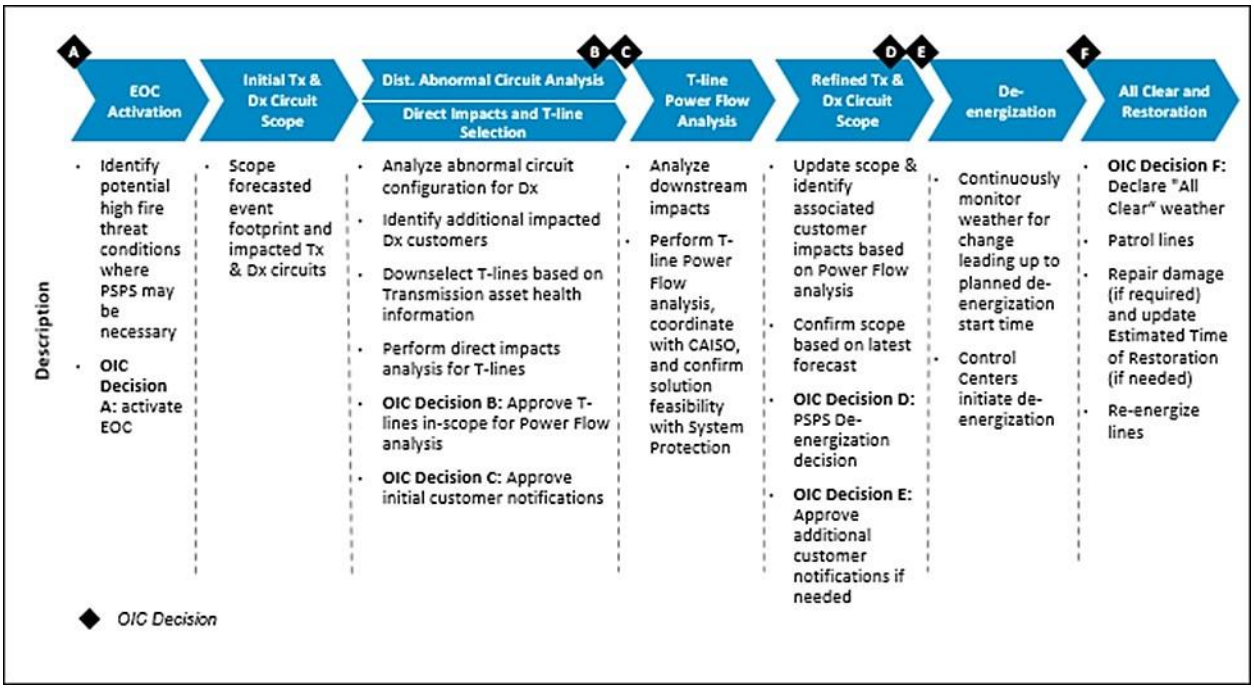
Once PG&E’s Fire Science and Meteorology team has identified an upcoming event (typically a period of adverse weather combined with dry fuels) that is being monitored for an increased potential of a PSPS event, they will issue an “Elevated” forecast in the PG&E 7-day PSPS Potential, which is available to the public at PGE.com. This also triggers a transition into a PSPS readiness posture, where PG&E leverages select teams and roles to better prepare and plan for potential PSPS events prior to EOC activation to enhance operational execution. Readiness posture activities are only intended to be completed on an as needed basis, driven by the forecasted PSPS potential and is dependent on the timing and amount of advanced warning for the event.

Once there is a reasonable chance of executing PSPS to reduce public safety risk due to a combination of adverse weather and an increased fire risk, PG&E activates its EOC, with a designated OIC, and PG&E’s Meteorology team issues a “PSPS Watch” on PG&E’s public facing weather website (pge.com/weather). Under the EOC structure, PG&E Planning and Intelligence, Operations, and other ICS teams continually monitor weather forecasts, as well as local conditions in areas forecasted for “R5-Plus” conditions and update the OIC of the real-time status of the factors listed above.

For a PSPS event, the OIC is responsible for making the following decisions also depicted in the figure below:

- Activating PG&E’s EOC for a forecasted PSPS event;
- Approving the transmission lines directly in-scope for the PSPS event;
- Approving initial customer notifications;
- Approving de-energization of distribution and transmission circuits within the final event scope (including indirectly affected transmission circuits outside the weather polygon); and
- Approving “All Clear” after weather conditions subside to begin the process of patrols and restoration.

**FIGURE PG&E 5-27: PSPS DECISION MAKING PROCESS WITH OIC DECISION POINTS (SUBJECT TO CHANGE AS REQUIRED BY PROGRAM EVOLUTION)**




The EOC commander for each event is charged with executing each OIC decision. Once the execution of PSPS is probable due to a combination of adverse weather conditions and an increased fire risk, PG&E's Fire Science and Meteorology team will issue a "PSPS Warning" on PG&E's public facing weather website (pge.com/weather). However, this level does not guarantee that de-energization will occur as conditions may change.

For distribution lines, PG&E's fire science and meteorology team will advise the OIC on the potential for a concurrence of heightened outage risk from wind, potential for large fires and the weather event's footprint based on their expertise and interpretation of PG&E's OPW and FPI model forecasts and external forecasts such as Fire Weather Watches issued by NOAA, and forecasts from Northern and Southern California Geographic Area Coordination Centers Predictive Services. PG&E evaluates which distribution lines (if any) pass through the forecasted weather event's footprint, and PG&E's EOC, distribution control center and transmission Grid Control Center will coordinate to ensure customers are identified and notified, and to prepare for possible de-energization.

As part of PG&E's wildfire risk monitoring, it will also review any transmission lines that pass through the meteorological event footprint determined by the meteorology team. The review is conducted in accordance with regulatory standards and in coordination with the CAISO. While no single factor drives a PSPS de-energization decision, some factors for a transmission-level impact include:

- Severity and duration of the weather
- Operability Assessment data

REAX computational wildfire spread and consequence modeling The Operability Assessment data is the product of an asset health model of PG&E's transmission system, which considers the likelihood of a specific transmission asset failure under certain wind loading conditions. To determine the likelihood of a transmission asset failure during wind loading conditions, this model factors the asset remaining strength from field inspections, and asset uncertainty from environmental threats, historical performance, and age. Design adjustments are made based on Subject Matter Expert input and computer aided analysis of structures, and historical outage producing winds through a Bayesian statistical analysis**.**

There is no single factor or threshold that will automatically trigger de-energization of any particular transmission line. Based on relative wildfire risk calculated for each transmission line in the footprint, PG&E will exercise expert judgment to identify which lines, if any, should be considered for de-energization. PG&E will then conduct fault-duty system protection studies and power flow assessments in coordination with the CAISO to ensure that de-energization of the transmission PSPS scope is feasible and will not compromise reliable bulk power system operations. This step is critical to support compliance with FERC and NERC reliability standards and to help identify the total count of customers who will be impacted. This step may result in a change in downstream PG&E distribution customers impacted by de-energization.

### 5.6.2.3 Re-Energization Strategy

PG&E will only restore power following a PSPS event after confirming that it is safe to do so. Crews will patrol all transmission, distribution, and secondary mainline facilities within Tier 2 or Tier 3 HFTD areas and within the de-energization scope to identify any damage that requires repair before re-energizing. To reduce the outage impact to customers, PG&E uses helicopter patrols in areas where visibility is not limited by vegetation. PG&E assigns a task force consisting of supervisors, crews, troublemen, and inspectors to each circuit or portions of a circuit. This structure enables PG&E to patrol and perform step restoration[46] in alignment with the impacted centralized control centers. Any necessary repairs are conducted while patrols continue to allow restoration to proceed as efficiently as possible. As needed and appropriate, PG&E will leverage mutual assistance agreements and contractors to support the patrol, repair, and restoration process.

In 2020, PG&E plans to continue building on the restoration process enhancements made in 2019 with a goal of reducing the length of customer outage after high-risk weather conditions have subsided. In 2019, PG&E's target was to restore service after a PSPS within 24 daylight hours after the weather conditions clear. For 2020, PG&E is aiming for a 50% improvement, restoring power for 98% of customers within 12 daylight hours from the time the weather conditions clear.

While strategies are still being evaluated, potential mechanisms for reducing restoration time include expanding exclusive use helicopter agreements and the commissioning of fixed wing aircraft with MX-15 cameras and infrared technology for night patrols of transmission lines. PG&E will continue to assess these approaches and weather additional enhancements to reduce restoration time are possible.

Additional information regarding PG&E's PSPS re-energization protocols are available in Section 5.3.6.4.

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46 Step restoration is when a substation is re-energized, and circuits are subsequently safely energized in segments as patrols continue to confirm areas are free of damage or hazards.

### 5.6.2.4 Customer, Agency, and External Communications

PG&E communicates with customers to prepare for PSPS prior to wildfire season to help customers prepare for a potential PSPS event, and when a PSPS protocol is initiated to notify potentially impacted customers and Public Safety Partners that a PSPS event is forecasted.

**Customer and Community Outreach**

For 2020-2022, PG&E will continue to implement and enhance the customer and community outreach support listed below and will adjust, as needed and based on feedback and lessons learned. Specifically, PG&E will account for input received from customers and communities gathered during the County and Customer Listening Tours held between December 2019 through February 2020.

Prior to the 2019 peak wildfire season, PG&E designed and executed a comprehensive PSPS community outreach strategy, serving to increase awareness of PSPS and readiness for extended power outages. PG&E also worked with first responders and local communities in advance to enhance customer notifications and ensure a coordinated response when PSPS events are forecasted and/or called. In 2019, PG&E:

- Participated in weekly meetings with the CPUC, Cal OES, CAL FIRE and the other California utilities to standardize the PSPS process and procedures;
- Conducted a statewide PSPS awareness and preparedness campaign in coordination with other California utilities;
- Conducted over 1,080 meetings with cities, counties, agencies, tribes, first responders, community groups, other stakeholders;
- Hosted 17 workshops with more than 930 local emergency services agencies;
- Hosted 23 community open houses and three customer-specific webinars with approximately 3,200 attendees;
- PG&E sent over 17.7 million PSPS related emails to customers and over 18.8 million pieces of PSPS related direct mail, letters and postcards to customers;
- Launched PSPS Weather Forecast and Safety Action Center websites to help customers better prepare;
- Established a secure data transfer portal to share planning information, including maps and customer counts, and event-specific data -- creating over 950 accounts for state and local agencies and tribes to access portal;
- Confirmed 24-hour primary and secondary points of contact for all jurisdictions located within the PG&E service territory to be used during PSPS events; and
- Continued to support local Fire Safe Councils through grant funding.

### State Agencies, Counties, Cities, Tribes and Other Local Emergency Responders

PG&E is committed to coordination and collaboration with local, state and federal agencies, as well as with tribes and other local emergency responders. PG&E will continue to conduct PSPS planning outreach, which includes, but is not limited to: one-on-one meetings to have more localized discussions and listening sessions with jurisdictions impacted by PSPS events. PG&E will utilize these meetings to gather feedback and adjust the program, as appropriate. In addition, PG&E will conduct more robust PSPS scenario planning exercises with County OESs, tribes and first responders, and will also continue the following PSPS preparedness activities:

- Gather updated contact information, as needed;
- Identify critical facilities to assist with prioritizing restoration (as feasible) during an event;[47]
- Provide access to the secure data transfer portal (PSPS Portal) in order to share additional customer information quickly during an event; and,
- Provide sample notifications and planning maps.

PG&E will continue to seek and incorporate feedback where feasible to ensure agencies have information and procedures to proactively plan for and respond to a PSPS event.

### Outreach to Customers and General Public

PG&E will continue to engage with its customers and the public who may be directly impacted by a PSPS event and will prioritize engagement with those most likely to be impacted by PSPS, which include those served by electric lines which traverse Tier 2 and Tier 3 HFTD areas. PG&E's messaging surrounding PSPS will transition from awareness to readiness, as awareness is now likely very high.[48] PG&E will continue direct-to-customer outreach campaigns that are focused on, but are not limited to, building PSPS readiness among customers, gathering updated contact information, sharing backup power safety tips, as well as support the Statewide Public Education and Outreach Campaign that was launched in 2019. PG&E will leverage multiple channels, such as email, letters, postcards, radio and TV broadcasting, print media,

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47 The list of critical facility entities identified by PG&E, and in coordination with local governments and tribes, is provided directly to the CPUC subject to applicable confidentiality rules. These facilities are identified in alignment with the CPUC definition of critical facilities and infrastructure described in D.19-05-042, and may change based on various factors, such as account status changes, or additional input from local government/tribe, customers or PG&E.

48 PG&E PSPS awareness increased from 46% in May 2019 to 62% in August 2019 and is expected to have increased significantly following the multiple and widespread PSPS events that occurred in October 2019.

social media, website, open houses and webinars, face-to-face meetings, and informational videos.

Additional touchpoints for medical baseline customers,[49] and the AFN community will be conducted, as described below. PG&E will also continue to translate key PSPS materials into multiple languages and also continue to provide live customer support, including translated support in 240 languages through PG&E's call center.

**Access and Functional Needs (AFN) and Medical Baseline Customers**

PG&E is committed to providing additional services to AFN and medically sensitive customers in advance of and during PSPS events by partnering with organizations whose business it is to assist and provide services to the AFN community. PG&E will continue to engage and collaborate with local governments and community-based organizations (CBOs) that serve AFN groups to encourage awareness and enrollment of the medical baseline program. By focusing additional efforts on understanding the needs of the AFN community, through customer research and surveys and coordinating with relevant regulatory proceedings, PG&E can more strategically act on the lessons learned through outreach, community partnerships and notifications, as applicable.

PG&E will also continue to conduct additional outreach to Medical Baseline-eligible customers to drive participation in the program, collect contact information in preparation for PSPS events, and share other relevant PG&E program and services information to streamline communications, as appropriate. In the outreach conducted, PG&E will also include customers that are tenants of master metered accounts who are not the customer of record with PG&E but can receive the same services as medical baseline customers that are PG&E's customer of record, including additional notifications during a PSPS event, as well as rate discounts.

PG&E will also partner with CBOs in targeted communities to increase their capacity to serve AFN communities, such as medically sensitive customers, low-income, limited-English speaking and tribal customers. Focus will be on emergency preparedness and response, disaster resiliency, expanded access to 211 referral services, and overall resiliency to climate-driven emergencies via the Better Together Resilient Communities program. PG&E will also engage with the CPUC's Disadvantaged Communities Advisory Group to provide relevant PSPS program updates and gain input from participants regarding approaches to support disadvantaged communities.

Through its CBO collaborations, PG&E also seeks to provide additional, customer-specific support to AFN community member customers during a PSPS event, such as medical device charging at local Independent Living Centers (ILCs), accessible transportation to PG&E CRCs, funds for hotel stays and short-term loans of a portable backup power batteries.

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**49** Medical Baseline customers are PG&E customers who are eligible for Medical Baseline tariffs and receive an additional allotment of electricity and/or gas per month. The tariffs are designed to assist residential customers who have special energy needs due to qualifying medical conditions.

Going forward, each year during fire season, between the months of May and November, PG&E will also suppress unenrollment of existing customers in the medical baseline program process to stop the automatic removal of customers that do not renew and/or recertify their eligibility in the Medical Baseline program. This process will operate normally between December and April each year; however, will provide added support for these customers that we know have recently met the medical baseline criteria and would still benefit from the support provided to medical baseline customers during wildfire seasons and during a PSPS event.

In 2020-2022, PG&E will continue to explore additional ways to support medical baseline and AFN customers before and during future PSPS events. New offerings that may be explored include but are not limited to:

- Standing up a PSPS AFN Advisory Committee to gain guidance and agreement on identifying executable offerings (focused on the HFTD areas) to support medically sensitive AFN population;
- Expanding the covered medical devices/conditions in the medical baseline program;
- Adjusting the medical baseline program enrollment process to grant immediate and temporary enrollment[50] in the program for customers to receive PSPS-related notifications / event support upon customers' request of an application, which helps PG&E be more reflective of the entirety of the AFN community;
- Leveraging the recently approved SGIP to incentivize medical baseline customers in Tier 2 and Tier 3 HFTD areas to adopt battery storage by paying up to 100% of the costs;[51] and
- Providing cold storage (e.g., coolers) to low income and medically sensitive or AFN customers in a high wildfire threat area who may benefit from a cold storage unit to help keep food items or medication from spoiling during a PSPS event.[52]

**Outreach Assessment**

PG&E qualitatively evaluates customers' awareness, feedback and recall of PG&E outreach, including wildfire safety and preparedness, through statistically significant research studies, as well as surveys, customer feedback and input from CBOs: measures noted below:

- Research Studies: Beginning in 2019, before and after the start of wildfire season, PG&E conducts semi-annual research studies with customers (in both English and Spanish) to capture distributed, diverse statistically significant awareness and recall

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**50** To be removed if certification not received after a certain to be determined time period.

**51** Authorized by D.19-09-027.

**52** Proposed offering described in prepared testimony in PG&E Application (A.) 19-11-003 for Energy Savings Assistance and California Alternate Rates for Energy Programs and Budget for the 2021-2026 Program Years.

of PG&E's customer communications, and measure statistically-significant changes over time.

- Surveys: PG&E hosts website surveys that allow customers to provide direct feedback on the site page and topic. PG&E's email newsletters also provide customers the option to score the value of the content and to provide direct comments.

- Customer Feedback: PG&E also regularly reviews customer sentiment received via the Contact Center, the website, and other social outlets during events.

- Input from local organizations: PG&E continues to work with community-based organizations (CBOs) that serve the AFN populations to both amplify messaging and solicit feedback before and after outreach.

PG&E also quantitatively tracks customer engagement at different periods of time throughout wildfire season to understand customer behavior, including:

- Web Traffic: Traffic to relevant pages on PG&E's website, such as wildfire alerts, updates to contact information, wildfire safety pages, safety action center, statewide PSPS program. Website traffic is currently measured by assessing number of unique visitors, visits, and page views.[53]

- Click-through-rates of advertisements: Click-through-rate of advertisements is an industry-accepted standard that measures the number of people visiting a webpage who access a hyperlink to an advertisement (e.g., wildfire safety). To note, advertisement click-through-rates measure the immediate response to an advertisement, but not necessarily the overall response. Customers may see the advertisement, absorb the messaging and choose to act later.

- Conversion rates / actions taken by customers as a result: Conversion rates of customers is the measurable actions taken by customers based on the outreach (e.g., updating contact information, attending an open house, enrolling in medical baseline program).

**Customer Notifications**

Recognizing that de-energization for public safety can burden communities with unintended risks and hardships, PG&E is committed to providing notification to potentially impacted stakeholders in advance of, during and after a PSPS event, as weather permits. Advanced notification will be provided to public safety partners. The PSPS notification strategy will comply with CPUC rulings, as weather permits.

PG&E expanded the notification strategies for 2019 and continued to adjust as the company received feedback from state and local agencies, as well as from customers.

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**53** Unique visitors are the number of individuals that visit the specific webpage. These unique visitors may make multiple visits to the webpage. Page views account for all webpages served by the website (pge.com) whereby a unique visitor goes to multiple pages on the website.

For 2020-2022, PG&E will utilize the strategies below and will adjust outreach plans. PG&E will continue to use all communication channels available during an event: direct to customer notifications, media (multi-cultural news outlets, earned and paid media, social media), website, collaboration with Public Safety Partners and CBOs.

**State Agencies, Counties, Cities, Tribes and Other Local Emergency Responders**

State agencies, cities, counties and tribes will be notified in advance of residential customers regarding a potential PSPS event in order to aid in preparedness efforts. PSPS event notification and coordination may include and is not limited to:

- Providing updates to the state via the Cal OES form throughout the event;
- Issuing automated notifications throughout the event via phone, text and email;
- Providing the content of customer alerts to share via the city or county website, Nixle, and Nextdoor;
- Providing dedicated single point of contacts for potentially impacted counties and tribes to provide event-specific information in real-time throughout the event;
- Offering PG&E representatives, such as Liaison and GIS experts, to be available to be embedded in local and tribal EOCs, as needed;
- Posting maps and event-specific information on the secure data transfer portal (PSPS Portal) and website, including potentially impacted critical facilities and Medical Baseline customer information will also be posted on the portal
- Coordinating with agencies on ideal CRC locations;
- Managing a dedicated 24-hour PG&E Liaison email address where partners can reach PG&E EOC staff with any questions or requests for information; and
- Hosting local agency and/or State Executive calls, as needed, to provide situational awareness for the event.

**Critical Facilities**

Critical facilities and critical infrastructure[54] are those that are essential to public safety and that require additional assistance and advance planning to ensure resiliency during de-energization events. Critical facilities will receive the following notifications and support by PG&E during a PSPS event:

- Notification in advance of customers for preparedness efforts;
- Maps of potentially impacted areas in advance of customer notifications; and

[54] The terms ‘critical facilities’ and ‘critical infrastructure’ can be used synonymously.

- A dedicated single point of contact to communicate frequently via live calls for situation awareness updates and operational support.

As directed in the guidelines for this section, in Attachment 3 to the 2020 WMP, PG&E is providing the CPUC with the confidential list of critical facility entities.[55]

**Potentially Impacted Customers**

Potentially impacted customers are those within the potential de-energization area of a PSPS event. These customers can continue to expect the following notifications during a PSPS event:

- Direct notifications throughout the event via multiple channels (e.g., phone, text and email), including in-language (translated) notifications and leveraging all available customer contact information; and

- Resources also provided to the general public (noted below).

PG&E will continue to look for opportunities to optimize the frequency and accuracy of notifications and will also explore new solutions and improved technologies to best communicate PSPS event updates and impacts with customers in the channel of their choice. Example approaches include but are not limited to considering new approaches for translated notifications or web technologies, and/or exploring options to provide a more personalized customer experience on the web, call center and/or direct notifications. PG&E will continue to consider feedback from customers, agencies, organizations, and other relevant stakeholders to continue to inform and adjust opportunities to improve the customer notification experience.

**Medical Baseline Customers**

PG&E customers who are eligible for Medical Baseline tariffs receive an additional allotment of electricity and/or gas per month. The tariffs are designed to assist residential customers who have special energy needs due to qualifying medical conditions. Medical Baseline customers can expect the following during a PSPS event:

- Notifications throughout the event via phone, text and email that request a confirmation of received notification; and

- Additional notifications in an attempt to verify receipt of notifications, such as hourly notification retry attempts for those customers that have not confirmed receipt of their notification and site visits (referred to as “door knocks”) if notifications were not previously confirmed by the customer as received.

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**55** The list of critical facility entities identified by PG&E, and with input from local governments and tribes, is provided directly to the CPUC subject to applicable confidentiality rules. These facilities are identified in alignment with the CPUC definition of critical facilities and infrastructure described in D.19-05-042, and may change based on various factors, such as account status changes, or additional input from local government/tribe, customers or PG&E.

Local governments, including cities, counties and tribes will be provided with Medical Baseline customer information through the secure data transfer portal to assist with notifications during an event.[56] PG&E will continue to explore new approaches for identifying and notifying medically sensitive customers for enhanced notifications, as appropriate.

**General Public**

In addition to the direct notifications sent to potentially impacted customers, PG&E also provides more channels of awareness to notify the public of a PSPS event including online, through the media and via live call support within PG&E's Call Center. The following methods will be leveraged to provide the general public with information in advance of and during a PSPS event.

- PSPS Zip Code Alerts: Opt-in alerts for non-PG&E account holders to sign up for pre-deenergization notifications based on zip codes;

- Website: On the PG&E website, tools and resources include, but is not limited to, customer impact address lookup tool, PSPS event maps and information, weather awareness updates, PSPS collateral (including translated materials), media engagement and links to social media, and short informational or event-specific videos (ex: process after a "Weather All Clear" is called, PSPS decision making process, American Sign Language (ASL) and translated videos). PG&E continues to ensure web stability and capacity, as well as enhance website functionality and user experience;

- Media: Continue issuing press releases, including to multi-cultural news outlets to ensure message is shared with non-English speaking communities, conducting and live streaming news conferences with ASL translators, participating in media interviews, providing real-time social media event updates (i.e. Twitter, Facebook, Next Door), providing preparedness / safety reminders, among others; and

- Live Agent Call Center Support: Continue to leverage PG&E's four Customer Support Contact Centers before, during and after a PSPS event, which offer support by trained agents that handle customer inquiries, including providing translation services available in 240 languages. PG&E may implement the PSPS call strategy,[57] as needed, to ensure elevated service with minimal wait times for PSPS customers during a PSPS event.

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**56** Authorized by CPUC Resolution No. L-598 issued on December 5, 2019.

**57** During an event, PG&E will consider implementing the PSPS call strategy, as needed, to ensure elevated service with minimal wait times for customers potentially affected by an active PSPS event customers. The PSPS Call strategy includes maintaining full staffing across Contact Center Operations and training Credit and Billing reps to be able to handle PSPS call types, and only accepting emergency-related calls (including calls related to downed wires, gas leaks, outages and PSPS) when notifications are sent to over 100,000 customers for an active PSPS event.

### 5.6.2.5 Protocols for Mitigating Public Safety Impacts of PSPS

In 2020-2022, activities to mitigate the public safety impacts of these protocols, including impacts on first responders, health care facilities, operators of telecommunications infrastructure, and water utilities/agencies are described the above in sections, as well as other sections of the WMP, including:

- PSPS impact mitigation efforts described in Section 5.6.2.1 Strategy to Minimize Public Safety Risk During High Wildfire Risk Conditions;
- Public Safety Partner coordination to collectively plan and prepare for emergencies described in Section 5.3.9, Coordination with Public Safety Partners; and
- Effective communication through providing advanced notifications of a potential PSPS event (weather permitting) to Public Safety Partners prior to customers, providing more granular planning maps and improving the impact map-sharing process, and providing effective situational awareness, including insight into impacted medical baseline customers as described in Section 5.6.2.4 Customer, Agency, and External Communications.

PG&E will continue to seek and adjust the protocols and offerings, as needed, based on feedback from relevant stakeholders and based on lessons learned after each event as described in each post-PSPS event report filed by PG&E.

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# SECTION 6

# UTILITY GIS ATTACHMENTS

# 6 Utility GIS Attachments

PG&E is attaching, as separate files, the GIS files outlined in section 2.7 of the WMP Guidelines. Notes associated with these GIS files are provided in section 2.7. These files are included in *Attachment 6: GIS Files.*

## 6.1 Recent Weather Patterns

## 6.2 Recent Drivers of Ignition Probability

## 6.3 Recent Use of PSPS

## 6.4 Current Baseline State of Service Territory and Utility Equipment

## 6.5 Location of Planned Utility Equipment Additions or Removal

## 6.6 Planned 2020 WMP Initiative Activity by End-2022

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# APPENDIX 1

# GLOSSARY OF DEFINED TERMS

## Glossary of Defined Terms

| Term | Definition |
|---|---|
| **10-hour dead fuel moisture content** | Moisture content of small dead vegetation (e.g. grass, leaves, which burn quickly but not intensely), which can respond to changes in atmospheric moisture content within 10 hours. |
| **Access and functional needs populations** | Per Government Code § 8593.3 and D.19-05-042, individuals who have developmental or intellectual disabilities, physical disabilities, chronic conditions, injuries, limited English proficiency or who are non-English speaking, older adults, children, people living in institutionalized settings, or those who are low income, homeless, or transportation disadvantaged, including, but not limited to, those who are dependent on public transit or those who are pregnant. |
| **Authority Having Jurisdiction** | AHJ, party with assigned responsibility, depending on location and circumstance. |
| **Asset (utility)** | Electric lines, equipment, or supporting hardware. |
| **At-risk species** | Species of vegetation that are particularly likely to contact power lines in the event of high winds and/or ignite if they catch a spark. |
| **Baseline (ignition probability, maturity)** | A measure, typically of the current state, to establish a starting point for comparison. |
| **Carbon dioxide equivalent** | Tons of greenhouse gases (GHG) emitted, multiplied by the global warming potential relative to carbon dioxide. |
| **Contractor** | Any individual in the temporary and/or indirect employ of the utility whose limited hours and/or time-bound term of employment are not considered as “full-time” for tax and/or any other purposes. |
| **Critical facilities and infrastructure** | In accordance with the interim definition adopted in D.19-05-042, those facilities and infrastructure that are essential to the public safety and that require additional assistance and advance planning to ensure resiliency during de energization events, namely: emergency services sector (police stations, fire stations, emergency operations centers), government facilities sector (schools, jails, prisons), healthcare and public health sector (public health departments, medical facilities, including hospitals, skilled nursing facilities, nursing homes, blood banks, health care facilities, dialysis centers and hospice facilities), energy sector (public and private utility facilities vital to maintaining or restoring normal service, including, but not limited to, interconnected publicly owned utilities and electric cooperatives), water and wastewater systems sector (facilities associated with the provision of drinking water or processing of wastewater including facilities used to pump, divert, transport, store, treat and deliver water or wastewater), communications sector (communication carrier infrastructure including selective routers, central offices, head ends, cellular switches, remote terminals and cellular sites), and chemical sector (facilities associated with the provision of manufacturing, maintaining, or distributing hazardous materials and chemicals). |
| **Customer hours** | Total number of customers, multiplied by the average number of hours (e.g. of power outage). |
| **Data cleaning** | Calibrating raw data to remove errors (including typographical and numerical mistakes). |
| **Dead fuel moisture content** | Moisture content of dead vegetation, which responds solely to current environmental conditions and is critical in determining fire potential. |
| **Detailed inspection** | In accordance with GO 165, an inspection where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded. |

| | |
|---|---|
| **Enhanced inspection** | Inspection whose frequency and thoroughness exceeds the requirements of the detailed inspection, particularly if driven by risk calculations. |
| **Evacuation impact** | Number of people evacuated, with the duration for which they are evacuated, from homes and businesses, due to wildfires. |
| **Evacuation zone** | Areas designated by CAL FIRE and local fire agency evacuation orders, to include both "voluntary" and "mandatory" in addition to other orders such as "precautionary" and "immediate threat". |
| **Fuel density** | Mass of fuel (vegetation) per area which could combust in a wildfire. |
| **Fuel management** | Removing or thinning vegetation to reduce the potential rate of propagation or intensity of wildfires. |
| **Fuel moisture content** | Amount of moisture in a given mass of fuel (vegetation), measured as a percentage of its dry weight. |
| **Full-time employee** | Any individual in the ongoing and/or direct employ of the utility whose hours and/or term of employment are considered as "full-time" for tax and/or any other purposes. |
| **GO 95 nonconformance** | Condition of a utility asset that does not meet standards established by General Order 95. |
| **Greenhouse gas (GHG) emissions** | Health and Safety Code 38505 identifies seven greenhouse gases that ARB is responsible to monitor and regulate in order to reduce emissions: carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), sulfur hexafluoride ($SF_6$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride ($NF_3$). |
| **Grid hardening** | Actions (such as equipment upgrades, maintenance, and planning for more resilient infrastructure) taken in response to the risk of undesirable events (such as outages) or undesirable conditions of the electrical system in order to reduce or mitigate those events and conditions, informed by an assessment of the relevant risk drivers or factors. |
| **Grid topology** | General design of an electric grid, whether looped or radial, with consequences for reliability and ability to support de-energization (e.g., being able to deliver electricity from an additional source). |
| **High Fire Threat District (HFTD)** | Per D.17-01-009, areas of the State designated by the CPUC and CAL FIRE to have elevated wildfire risk, indicating where utilities must take additional action (per GO 95, GO 165, and GO 166) to mitigate wildfire risk. |
| **Highly rural region** | In accordance with 38 CFR 17.701, "highly rural" shall be defined as those areas with a population of less than 7 persons per square mile. |
| **Ignition probability** | The relative possibility that an ignition will occur, probability is quantified as a number between 0% and 100% (where 0% indicates impossibility and 100% indicates certainty). The higher the probability of an event, the more certainty there is that the event will occur. (Often informally referred to as likelihood or chance). |
| **Ignition-related deficiency** | Any condition which may result in ignition or has previously resulted in ignition, even if not during the past five years. |
| **Impact/consequence of ignitions** | The effect or outcome of a wildfire ignition, affecting objectives, which may be expressed by terms including, although not limited to health, safety, reliability, economic and/or environmental damage. |
| **Initiative** | Measure or activity proposed or in process designed to reduce the consequences and/or probability of wildfire or PSPS. |
| **Inspection protocol** | Documented procedures to be followed in order to validate that a piece of equipment is in good condition and expected to operate safely and effectively. |
| **Invasive species** | Non-native species whose proliferation increases the risk of wildfires. |
| **Level 1 finding** | In accordance with GO 95, an immediate safety and/or reliability risk with high probability for significant impact. |

| | |
|---|---|
| **Level 2 finding** | In accordance with GO 95, a variable (non-immediate high to low) safety and/or reliability risk. |
| **Level 3 finding** | In accordance with GO 95, an acceptable safety and/or reliability risk. |
| **Life expectancy** | Anticipated years that a piece of equipment can be expected to meet safety and performance requirements. |
| **Limited English Proficiency (LEP)** | Populations with limited English working proficiency based on the International Language Roundtable scale. |
| **Live fuel moisture content** | Moisture content within living vegetation, which can retain water longer than dead fuel. |
| **Lost energy** | Energy that would have been delivered were it not for an outage. |
| **Major roads** | Interstate highways, U.S. highways, state and county routes. |
| **Match drop simulation** | Wildfire simulation method that takes an arbitrary ignition and forecasts propagation and consequence/impact. |
| **Member of the public** | Any individual not employed by the utility. |
| **Multi-attribute value function** | Risk calculation methodology introduced during CPUC's S-MAP and RAMP proceedings. |
| **Near miss** | An event with significant probability of ignition, including wires down, contacts with objects, line slap, events with evidence of significant heat generation, and other events that cause sparking or have the potential to cause ignition. |
| **Near-miss simulation** | Simulation of what the consequence would have been of an ignition had it occurred. |
| **Need for PSPS** | When utilities' criteria for utilizing PSPS are met. |
| **Noncompliant clearance** | Rights-of-way whose vegetation is not trimmed in accordance with the requirements of GO 95. |
| **Outages of the type that could ignite a wildfire** | Outages that, in the judgement of the utility, could have ignited a wildfire. |
| **Outcome metrics** | Measurements of the performance of the utility and its service territory in terms of both leading and lagging indicators of wildfire, PSPS, and other consequences of wildfire risk, including the potential unintended consequences of wildfire mitigation work, such as acreage burned by utility-ignited wildfire. |
| **Overcapacity** | When the energy transmitted by utility equipment exceeds that of its nameplate capacity. |
| **Patrol inspection** | In accordance with GO 165, a simple visual inspection of applicable utility equipment and structures that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business. |
| **Percentile conditions** | Top X% of a particular set (e.g. wind speed), based on a historical data set with sufficient detail. |
| **Planned outage** | Electric outage announced ahead of time by the utility. |
| **Preventive maintenance (PM)** | The practice of maintaining equipment on a regular schedule, based on risk, elapsed time, run-time meter readings, or number of operations. The intent of PM is to “prevent” maintenance problems or failures before they take place by following routine and comprehensive maintenance procedures. The goal is to achieve fewer, shorter, and more predictable outages. |
| **Priority essential services** | Critical first responders, public safety partners, critical facilities and infrastructure, operators of telecommunications infrastructure, and water utilities/agencies. |
| **Program targets** | Measurements of activity identified in WMPs and subsequent annual updates, in terms of volume or scope of work, such as number trees trimmed or miles of power lines hardened. |

| | |
|---|---|
| **Progress metrics** | Measurements that track how much utility wildfire mitigation activity has changed the conditions of utility wildfire risk exposure or utility ability to manage wildfire risk exposure, in terms of leading indicators of ignition probability and wildfire consequences. |
| **Property** | Private and public property, buildings and structures, infrastructure, and other items of value that were destroyed by wildfire, including both third-party property and utility assets. |
| **PSPS risk** | The potential for the occurrence of a PSPS event expressed in terms of a combination of various outcomes of the event and their associated probabilities. |
| **PSPS weather** | Weather that exceeds a utility's risk threshold for initiating a PSPS. |
| **Red Flag Warning** | RFW, level of wildfire risk from weather as declared by the National Weather Service. |
| **RFW Circuit Mile Day** | Sum of miles of utility grid subject to Red Flag Warning each day. For example, if 100 circuit miles were under a RFW for 1 day, and 10 of those miles were under RFW for an additional day, then the total RFW circuit mile days would be 110. |
| **Risk-spend efficiency** | An estimate of the cost-effectiveness of initiatives, calculated by dividing the mitigation risk reduction benefit by the mitigation cost estimate based on the full set of risk reduction benefits estimated from the incurred costs. |
| **Rule** | Section of public utility code requiring a particular activity or establishing a particular threshold. |
| **Run-to-failure** | A maintenance approach that replaces equipment only when it fails. |
| **Rural region** | In accordance with GO 165, "rural" shall be defined as those areas with a population of less than 1,000 persons per square mile as determined by the United States Bureau of the Census. |
| **Safety Hazard** | A condition that poses a significant threat to human life or property. |
| **Simulated wildfire** | Propagation and impact/consequence of a wildfire ignited at a particular point ('match drop'), as simulated by fire spread software. |
| **Span** | The space between adjacent supporting poles or structures on a circuit consisting of electric line and equipment. "Span level" refers to asset-scale granularity. |
| **System Average Interruption Duration Index (SAIDI)** | System-wide total number of minutes per year of sustained outage per customer served. |
| **Third-party contact** | Contact between a piece of electrical equipment and another object, whether natural (tree branch) or human (vehicle). |
| **Time to expected failure** | Time remaining on the life expectancy of a piece of equipment. |
| **Top 30% of proprietary fire potential index** | Top 30% of FPI or equivalent scale (e.g., “Extreme” on SCE’s FPI; “extreme”, 15 or greater, on SDG&E’s FPI; and 4 or above on PG&E’s FPI). |
| **Trees with strike potential / hazard trees** | Trees that could either 'fall in' to a power line, or have branches detach and 'fly in' to contact a power line in high-wind conditions. |
| **Unplanned outage** | Electric outage that occurs with no advance notice from the utility (e.g. blackout). |
| **Urban region** | In accordance with GO 165, "urban" shall be defined as those areas with a population of more than 1,000 persons per square mile as determined by the United States Bureau of the Census. |
| **Utility-ignited wildfire** | Wildfires ignited by utility infrastructure or employees, including all wildfires determined by AHJ investigation to originate from ignition caused by utility infrastructure. |
| **Vegetation management** | Trimming and clearance of trees, branches, and other vegetation that poses the risk of contact with electric equipment. |
| **Vegetation risk index** | Risk index indicating the probability of vegetation-related outages along a particular circuit, based on the vegetation species, density, height, and growth rate. |

| | |
|---|---|
| **Weather normalization** | Adjusting metrics based on relative weather risk, with RFW circuit mile days as the normalization factor. |
| **Wildfire impact/ consequence** | The effect or outcome of a wildfire affecting objectives, which may be expressed, by terms including, although not limited to health, safety, reliability, economic and/or environmental damage. |
| **Wildfire risk** | The potential for the occurrence of a wildfire event expressed in terms of a combination of various outcomes of the wildfire and their associated probabilities. |
| **Wildfire-only WMP programs** | Activities, practices, and strategies that are only necessitated by wildfire risk, unrelated to or beyond that required by minimum reliability and/or safety requirements. Such programs are not indicated or in common use in areas where wildfire risk is minimal (e.g., territory with no vegetation or fuel) or under conditions where wildfires are unlikely to ignite or spread (e.g., when rain is falling). |
| **Wildland urban interface (WUI)** | A geographical area identified by the state as a "Fire Hazard Severity Zone", or other areas designated by the enforcing agency to be a significant risk from wildfires, established pursuant to Title 24, Part 2, Chapter 7A. |
| **Wire down** | Instance where an electric transmission or distribution conductor is broken and falls from its intended position to rest on the ground or a foreign object. |

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# APPENDIX 2

# ACRONYM LIST

## Acronym List

| Acronym | Term/Definition |
|---|---|
| A. | Application |
| AAR | After Action Reviews |
| ADA | Americans with Disabilities Act |
| ADF | Asset Data Foundation |
| ADMS | Advanced Distribution Management System |
| AFN | Access and Functional Needs |
| AHJ | Agency Having Jurisdiction |
| AI | Artificial Intelligence |
| AMP | Asset Management Plans |
| ANSI | American National Standards Institute |
| API | Application Programming Interface |
| ASL | American Sign Language |
| BLM | Bureau of Land Management |
| CA | California |
| CAL FIRE | California Department of Forestry and Fire Protection |
| Cal OES | California Office of Emergency Services |
| CANSAC | California and Nevada Smoke and Air Committee |
| CARE | California Alternate Rate for Energy |
| CBM | Condition-Based Maintenance |
| CBO | Community Based Organizations |
| CEMA | Catastrophic Event Memorandum Account |
| CEQA | California Environmental Quality Act |
| CERP | Company Emergency Response Plan |

| Acronym | Term/Definition |
|---|---|
| CIRT | Centralized Inspection Review Team |
| CMC | Canadian Meteorologist Centre |
| CMI | Customer Minutes Interrupted |
| CoRE | Consequence of Risk Event |
| CPUC or Commission | California Public Utilities Commission |
| CRCs | Community Resource Centers |
| CUEA | California Utility Electric Institute |
| CWSP | Community Wildfire Safety Program |
| D. | Decision |
| DCD | Downed Conductor Detection |
| DER | Distribution Energy Resource |
| DFM | Dead Fuel Moisture |
| DG | Distributed Generation |
| DGA | Dissolved Gas Analysis |
| DGEM | Distribution Generation Enabled Microgrid Services |
| DMS | Demand Management System |
| D-OH | Distribution-Overhead |
| DPAM | Dynamic Pattern and Analog Matcher |
| DRI | Desert Research Institute |
| DRPP | Distribution Routine Patrol Procedure |
| DTS-FAST | Distribution, Transmission, and Substation: Fire Action Schemes and Technology |
| EC | Electric Corrective |
| ECMWF | European Centre for Medium-Range Weather Forecasts |
| EDF | Enterprise Data Foundation |
| EDGIS | Electric Distribution Geographic Information System |

| Acronym | Term/Definition |
|---|---|
| EEI | Edison Electric Institute |
| EF | Equivalent Fatalities |
| EFD | Early Fault Detection |
| EOC | Emergency Operations Center |
| EP&R | Emergency Preparedness and Response |
| EPIC | Electric Program Investment Charge |
| EPS | Ensemble Prediction System (from ECMWF) |
| ESA | Energy Savings Assistance |
| ETE | Evacuation Time Estimates |
| ETOR | Estimated Time of Restoration |
| ETPM | Electric Transmission Preventive Maintenance |
| EV | Expected Value |
| EVM | Enhanced Vegetation Management |
| EQM | Electric Quality Management |
| FAA | Federal Aviation Administration |
| FAN | Field Area Network |
| FAS | Field Automation System |
| FDAs | Fire Detection and Alert System |
| FEA | Finite Element Analysis |
| FERC | Federal Energy Regulatory Commission |
| FF+ | Fire Family Plus (aka Family Plus) |
| FFWI | Fosberg Fire Weather Index |
| FIA | Fire Index Area |
| FMEA | Failure Modes and Effects Analysis |
| FPI | Fire Potential Index |

| Acronym | Term/Definition |
|---|---|
| FRP | Fire Radiative Power |
| FWW | Fire Weather Warning |
| GACCs | Geographic Area Coordination Centers |
| GEFS | Global Ensemble Forecast System |
| GFS | Global Forecast System |
| GIS | Geographic Information System |
| GO | General Order |
| GRC | General Rate Case |
| HD | High Definition |
| HFTD | High Fire-Threat District |
| HREF | High Resolution Ensemble Forecast |
| HRRR | High Resolution Rapid Refresh |
| IA | Internal Audit |
| IBEW | International Brotherhood of Electrical Workers |
| ICS | Incident Command Structure |
| IEEE | Institute of Electrical and Electronic Engineers |
| IID | Imperial Irrigation District |
| ILCs | Independent Living Centers |
| ILIS-ODB | Integrated Logging Information System-Operations Data Base |
| IR | Infrared |
| IRWIN | Integrated Reporting of Wildland-Fire Information |
| IVM | Integrated Vegetation Management |
| IVR | Interactive Voice Recording |
| km | Kilometer |
| kV | Kilovolt |

| Acronym | Term/Definition |
|---|---|
| LADWP | Los Angeles Department of Water & Power |
| LEP | Limited English Proficiency |
| LF 2.0.0 | LANDFIRE Remap 2016 |
| LFM | Live Fuel Moisture |
| LiDAR | Light Detection and Ranging |
| LMS | Learning Management System |
| LNO | Liaison Officers |
| LoRE | Likelihood of a Risk Event |
| MAA | Mutual Assistance Agreements |
| MADIS | Meteorological Assimilation Data Ingest System |
| MARAC | Mutual Aid Regional Advisory Council |
| MARS | Multi-Attribute Risk Scores |
| MAVF | Multi Attribute Value Function |
| MEDs | Major Event Days |
| MET | Model Evaluation Tools |
| mph | miles per hour |
| NAM | North American Mesoscale Model |
| NARR | North American Regional Reanalysis |
| NCAR | National Center for Atmospheric Research |
| NCEP | National Center for Environmental Prediction |
| NEETRAC | National Electric Energy Testing Research and Applications Center |
| NEM | Net Energy Metering |
| NERC | North American Electric Reliability Corporation |
| NFDRS | National Fire Danger Rating System |
| NFMD | National Fuel Moisture Database |

| Acronym | Term/Definition |
|---|---|
| NIC | Network Interface Card |
| NIMS | National Incident Management Systems |
| NOAA | National Oceanic and Atmospheric Administration |
| NPS | National Park Service |
| NWA | Non-Wires Alternative |
| NWS | National Weather Service |
| O&M Plan | Operations and Maintenance Plan |
| OA | Operability Assessment |
| OES | Office of Emergency Services |
| OH | Overhead |
| OII | Order Instituting Investigation |
| OMS | Outage Management System |
| OP | Ordering Paragraph |
| OPW | Outage Producing Wind |
| OSA | Office of Safety Advocates |
| OSHA | Occupational Safety and Health Administration |
| PCORP | PacifiCorp |
| PD | Partial Discharge |
| PDAC | Primary Distribution Alarm and Control |
| PEV | Post Enrollment Verification |
| PG&E or the Company | Pacific Gas and Electric Company |
| PHMSA | Pipeline and Hazardous Materials Safety Administration |
| PIH | Pre-installed Interconnection Hubs |
| Plan | Wildfire Safety Plan |
| PLDB | Pole Landing Database |

| Acronym | Term/Definition |
|---|---|
| PLDN | PG&E Lighting Detection Network |
| PMD | Project Management Database |
| PMO | Project Management Office |
| POMMS | PG&E Operational Mesoscale Modeling System |
| PRC | Public Resources Code |
| PSPS | Public Safety Power Shutoff |
| PSS | Public Safety Specialists |
| PT&T | Pole Test & Treat |
| PWAS | PG&E Wind Alert System |
| QA | Quality Assurance |
| QC | Quality Control |
| R. | Rulemaking |
| RAMP | Risk Assessment and Mitigation Phase |
| REFCL | Rapid Earth Fault Current Limiter |
| RF | Radio Frequency |
| RFW | Red Flag Warning |
| RIBA | Risk Informed Budget Allocation |
| RMAR | Risk Mitigation Accountability Reporting |
| ROW | Right-of-Way |
| RSAR | Risk Spend Accountability Reporting |
| RSE | Risk Spend Efficiencies |
| SAIDI | System Average Interruption Duration Index |
| SB 209 | Senate Bill 209 |
| SB 247 | Senate Bill 247 |
| SCADA | Supervisory Control and Data Acquisition |

| Acronym | Term/Definition |
|---|---|
| SCE | Southern California Edison Company |
| SDG&E | San Diego Gas & Electric Company |
| SED | Safety Enforcement Division |
| SEMS | Standardized Emergency Management System |
| SF6 | Sulfur Hexafluoride |
| SI | Smart Inverter |
| SIPT | Safety and Infrastructure Protection Teams |
| SJSU | San Jose State University |
| S-MAP | Safety Model and Assessment Proceeding |
| SmartMeter™ | Brand Name for Automated Metering Initiative (AMI) |
| SMEs | Subject Matter Experts |
| SMUD | Sacramento Municipal Utility District |
| SOPP | Storm Outage Prediction Model |
| SSEC | Space Science and Engineering Center |
| STAR | System Tool for Asset Risk |
| TA | Tail Average |
| TD&D | Technology Demonstration and Deployment |
| T&D | Transmission and Distribution |
| T-OH | Transmission Overhead |
| UCLA | University of California Los Angeles |
| U.S. | United States |
| USFS | United States Forest Service |
| USL | Uncoupled Surface Layer |
| UT | Ultrasonic |
| VIIRS | Visible Infrared Imaging Radiometer Suite |

| Acronym | Term/Definition |
|---|---|
| WAPA | Western Area Power Administration |
| WBT | Web Based Training |
| WECC | Western Electricity Coordinating Council |
| WPE | Work Procedure Error |
| WRF | Weather Research and Forecast |
| WRMAA | Western Regional Mutual Assistance Agreement |
| WSOC | Wildfire Safety Operations Center |
| WUI | Wildland-Urban Interface |
| VM | Vegetation Management |
| VP | Vice President |
| WSIP | Wildfire Safety Inspection Program |
| WMP | Wildfire Mitigation Plan |
| XLPE | Crosslinked Polyethylene |

# PACIFIC GAS AND ELECTRIC COMPANY

# 2020 WILDFIRE MITIGATION PLAN

# APPENDIX 3

# CONFIDENTIALITY DECLARATION

**BEFORE THE PUBLIC UTILITIES COMMISSION**
**OF THE STATE OF CALIFORNIA**

**DECLARATION SUPPORTING CONFIDENTIAL DESIGNATION**
**ON BEHALF OF**
**PACIFIC GAS AND ELECTRIC COMPANY (U 39 E)**

1. I, Michael Lewis, am the Senior Vice President of Electric Operations of Pacific Gas and Electric Company ("PG&E"), a California corporation. My business office is located at:

   Pacific Gas and Electric Company
   77 Beale Street
   San Francisco, CA 94105

2. PG&E will produce the information identified in paragraph 3 of this Declaration to the California Public Utilities Commission ("CPUC") or departments within or contractors retained by the CPUC in response to a CPUC audit, data request, proceeding, or other CPUC request.

   Name or Docket No. of CPUC Proceeding (if applicable): R.18-10-007

3. Title and description of document(s):
   1. Attachment 3: List of Critical Facilities per Section 5.6.2.2
   2. Attachment 6: GIS Files per Section 6
      a. cpuc_Grid_MedicalCusts_CONF
      b. cpucGrid_AllCusts_CONF
      c. cpucGrid_CriticalCusts_CONF
      d. Transmission-GIS_CONF.zip
      e. Distribution-GIS_CONF.zip

4. These documents contain confidential information that, based on my information and belief, has not been publicly disclosed. These documents have been marked as confidential, and the basis for confidential treatment is identified in the below chart and further explained in Appendix A, below.:

| Check | Basis for Confidential Treatment | Where Confidential Information is located on the documents |
|---|---|---|
| ■ | Customer-specific data, which may include demand, loads, names, addresses, and billing data<br>(Protected under PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; Public Util. Code § 8380; Decisions (D.) 14-05-016, 04-08-055, 06-12-029) | Attachment 3: List of Critical Facilities per Section 5.6.2.2<br>Attachment 6 - GIS Files_CONF<br>a. cpuc_Grid_MedicalCusts_CONF<br>b. cpucGrid_AllCusts_CONF<br>c. cpucGrid_CriticalCusts_CONF |
| ☐ | Personal information that identifies or describes an individual (including employees), which may include home address or phone number; SSN, driver's license, or passport numbers; education; financial matters; medical or employment history (not including PG&E job titles); and statements attributed to the individual<br>(Protected under Civ. Code §§ 1798 *et seq.;* Govt. Code § 6254; 42 U.S.C. § 1320d-6; and General Order (G.O.) 77-M) | |
| ■ | Physical facility, cyber-security sensitive, or critical energy infrastructure data, including without limitation critical energy infrastructure information (CEII) as defined by the regulations of the Federal Energy Regulatory Commission at 18 C.F.R. § 388.113<br>(Protected under Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2) | Attachment 3: List of Critical Facilities per Section 5.6.2.2<br>Attachment 6 - GIS Files_CONF<br>a. cpucGrid_CriticalCusts_CONF<br>b. Transmission-GIS_CONF.zip<br>c. Distrbution-GIS_CONF.zip |
| ■ | Proprietary and trade secret information or other intellectual property and protected market sensitive/competitive data<br>(Protected under Civ. Code §§3426 *et seq.*; Govt. Code §§ 6254, *et seq*., e.g., 6254(e), 6254(k), 6254.15; Govt. Code § 6276.44; Evid. Code §1060; D.11-01-036) | Attachment 3: List of Critical Facilities per Section 5.6.2.2<br>Attachment 6 - GIS Files_CONF<br>a. cpucGrid_CriticalCusts_CONF<br>b. Transmission-GIS_CONF.zip |

| | | |
|---|---|---|
| | | c. Distribution-GIS_CONF.zip |
| ☐ | Corporate financial records<br>(Protected under Govt. Code §§ 6254(k), 6254.15) | |
| ☐ | Third-Party information subject to non-disclosure or confidentiality agreements or obligations<br>(Protected under Govt. Code § 6254(k); see, e.g., CPUC D.11-01-036) | |
| ■ | Other categories where disclosure would be against the public interest (Govt. Code § 6255(a)) | Attachment 3: List of Critical Facilities per Section 5.6.2.2<br>Attachment 6 - GIS Files_CONF<br>a. cpucGrid_CriticalCusts_CONF<br>b. Transmission-GIS_CONF.zip<br>c. Distribution-GIS_CONF.zip |

5. The importance of maintaining the confidentiality of this information outweighs any public interest in disclosure of this information. This information should be exempt from the public disclosure requirements under the Public Records Act and should be withheld from disclosure.
6. I declare under penalty of pe1jury that the foregoing is true, c01Tect, and complete to the best of my knowledge.
7. Executed on this 6th day of February, 2020 at San Francisco, California.

Michael Lewis
Senior Vice President, Electric Operations
Pacific Gas and Electric Company

**Appendix A to Confidentiality Declaration**

Table 9 of the WMP Guidelines requires the utility disclose to the public for its entire service territory a current baseline state of measurements and variables, one of which is "All utility assets by asset type, model, age, specifications, and condition" by "point, GPS coordinate" (Asset Disclosure). PG&E is greatly concerned about the security risks created by disclosing to the public all of these components on all assets in our entire system. This Asset Disclosure goes beyond disclosing the location of overhead transmission lines and distribution lines, most of which are visible to the public or otherwise accessible via internet maps such as Google Earth. Instead, this required Asset Disclosure includes all electric equipment including, specialized functional equipment (such as reclosers, switches, and interrupters), substation facilities and equipment which are remotely operable and perform sophisticated system reliability and protection functions. For each piece of equipment, PG&E has been asked to provide the specification, model, age, condition, and its location by GPS coordinate.

All utilities are responsible for safeguarding their electric facilities from sabotage and cyber security risks, and with that responsibility comes vigilance and the requirement to challenge or avoid any disclosure that has potential to put the reliability of the electric system and the safety of the public at risk. PG&E believes that broad public disclosure of certain information requested in this proceeding would provide marginal benefit to the general public relative to the significantly enhanced physical security risks. PG&E has repeatedly resisted requests from both private and public entities to publicly disclose sensitive and confidential information that would jeopardize the ongoing safety and operation of its generation facilities and its electric and gas transmission and distribution systems, which serve major metropolitan areas, military bases, major sea ports, airports and Silicon Valley. As a public safety matter and, in some cases, a national security matter, ongoing protection of this sensitive information from public disclosure far outweighs the public interest in its public disclosure. SB699 states: "Physical threats to the electrical distribution system present risks to public health and safety and could disrupt economic activity in California… Ensuring appropriate actions are taken to protect and secure vulnerable electrical distribution system assets from physical threats…are in the public interest." Broad public disclosure here undercuts PG&E efforts to secure its system assets from threats. For these reasons, PG&E will provide all of the requested information to the CPUC under this Declaration, but does not agree to disclose to the public, information responsive to the Asset Disclosure for 115 kV or above facilities or information that is contained within paragraphs 1 through 8 below at any voltage level, because the potential for public detriment outweighs the public interest in its disclosure:

1. Information and data associated with PG&E's operation and control of its critical bulk electric system (BES) facilities that are subject the North American Electric Reliability Corporation's Critical Infrastructure Protection ("NERC CIP") program and are confidential. These include, but are not limited to, information and data associated with PG&E's:
    a. BES cyber system facilities and assets,
    b. BES cyber assets;
    c. physical access control systems,
    d. electronic access control and monitoring systems,
    e. network topology diagrams, and

f. physical security perimeter diagrams.

2. SCADA enabled devices
3. Synchrophasor measurement units
4. Protection equipment:
    a. Reclosers,
    b. Interrupters,
    c. Sectionalizers, and
    d. Fuses.
5. Switches
6. Voltage Regulating Equipment:
    a. Regulators,
    b. Boosters, and
    c. Capacitors.
7. Disconnects
8. All substation equipment

The above equipment is either remotely operable, and/or responsible for real-time operation of the electric system and has not already been publicly disclosed. Therefore, providing specifications, GPS location, condition, model and age of such equipment provides essential information that a bad-actor would use to sabotage the electric grid. The aggregate of this information and some of the information singularly, will help identify potential weaknesses of specific facilities, the extent of capabilities and its security functions and potential vulnerabilities associated with PG&E's grid design or operation. The apparent risk of a bad actor using this information for sabotage of the electric system outweighs the benefit of the public in accessing such information. While PG&E understands the interest in permitting the public to access this information to review, analyze, and verify the components of the Wildfire Mitigation Plan and its effectiveness in reducing wildfire caused by utility facilities, such access must stop at the point of risking a compromise of the security and reliability of the electric system PG&E operates. Though it should be obvious, it is worth stating that any information that is disclosed publicly cannot be controlled or reigned in later. There is little to no benefit to making this information publicly available. Third parties do not need the asset characteristics of millions of PG&E's assets to evaluate the effectiveness of PG&E's 2020-2022 Wildfire Mitigation Plan. They do not need precise locations of system protection equipment, substations, and critical facilities. And they do not need it alongside other potentially sensitive information that could facilitate damaging attacks on PG&E's infrastructure. As such, the public interest in not disclosing this information far outweighs the public interest in disclosing it.

Malicious individuals and nation states already target PG&E, seeking bits and pieces of data to map its facilities and systems in order to identify possible and optimal attack vectors. The public disclosure of any single piece of information may not, on its own, provide everything needed to exploit a utility and attack the electric grid. But successive public disclosures of additional pieces of information (and particularly a bulk production of information) will increase the likelihood of a cyber or physical intrusion with a corresponding adverse effect on energy infrastructure. Each successive disclosure fills in some knowledge gaps of those planning to do harm, helping to complete the maps of entity systems. Therefore, it is important to examine,

evaluate and properly narrow the scope of the proposed disclosure to properly balance the public interest with the public risk.

Additionally, the proposed Asset Disclosure includes trade secret information or other intellectual property and protected market sensitive/competitive data, the disclosure of which would put PG&E at an unfair business disadvantage. Detailed public disclosure about each of the assets on the utility system would allow competitors, potential competitors or parties interested in acquiring PG&E facilities to evaluate and assess PG&E facilities for competitive or business purposes that go far beyond the purported and intended need for information to assess PG&E's WMP. PG&E is entitled to protection of its intellectual property, and PG&E does not believe the benefit to the public of receiving such information outweighs the risk of releasing such competitive data to the public and PG&E's competitors.

PG&E will provide to the CPUC GIS information responsive to the Asset Disclosure under this Declaration. However, for the above reasons, PG&E will not disclose to the public this information regarding 115 kV or above facilities or equipment of the types listed in 1-8 above. PG&E will require intervenors to execute a Nondisclosure Agreement and use a password to access remaining GIS information responsive to the Asset Disclosure.

In addition, PG&E will not provide to the public information responsive to the Table 9 request for "Number and location of critical facilities" as this constitutes customer confidential information. However, PG&E will provide this information to the CPUC under declaration. In addition, information responsive to Table 9 requests for "Number and location of customers," and "Number and location of customers belonging to access and functional needs populations" by "Point, GPS coordinate" or "Area, number of people, square mile resolution" are provided to the public so as to not disclose customer confidential information by redacting information showing customers of less than 150. PG&E will provide the unredacted information to the CPUC under this declaration.

# Attachment B

# PACIFIC GAS AND ELECTRIC COMPANY

# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT

# NO. 06-2020

# IN COMPLIANCE WITH CPUC DECISION 18-11-050

# SUBMITTED APRIL 30, 2020



PACIFIC GAS AND ELECTRIC COMPANY
SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
NO. 06-2020
IN COMPLIANCE WITH CPUC DECISION 18-11-050
SUBMITTED APRIL 30, 2020

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# PACIFIC GAS AND ELECTRIC COMPANY
# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
# NO. 06-2020
# IN COMPLIANCE WITH CPUC DECISION 18-11-050

## I. Introduction

Pacific Gas and Electric Company (PG&E or the Company) submits this sixth Safety Culture and Governance Quarterly Report (Report) in compliance with California Public Utilities Commission (CPUC or Commission) Decision (D.) 18-11-050.[1] In that decision, the Commission directed PG&E to implement the recommendations of the Commission's Safety and Enforcement Division (SED), as set forth in a report prepared by NorthStar Consulting Group (NorthStar), no later than July 1, 2019, and to serve quarterly reports on the status of its implementation and ongoing execution to the service list for this proceeding. In addition, in compliance with D. 19-06-008, adopted by the Commission on June 13, 2019, PG&E and PG&E Corporation also provide details of safety-specific training, education, and support given to the PG&E and PG&E Corporation Boards of Directors (BODs).

This Report provides an update on PG&E's ongoing execution and sustainability of NorthStar's recommendations between January 1, 2020 and March 31, 2020. Additionally, this Report discusses the BODs' safety training, education, and support for the same time period, and the One PG&E Occupational Health and Safety Plan[2] (One PG&E Plan) and associated safety performance metrics.

This Report is organized as follows:

- Executive Summary
- Sustainability Update
- Board of Directors' Reporting
- One PG&E Plan and Key Safety Metrics

## II. Executive Summary

In this sixth update to the Commission, PG&E certifies the ongoing execution of NorthStar's recommendations that are summarized in Section III of the Report.

As part of PG&E's commitment to strengthening public and workforce safety, Francisco Benavides was appointed as Vice President and Chief Safety Officer (CSO) by the BODs for both PG&E Corporation and the Utility effective March 9. Mr. Benavides brings over 30 years of experience to PG&E and has held senior

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1 See Order Instituting Investigation (OII) on the Commission's Own Motion to Determine Whether Pacific Gas and Electric Company and PG&E Corporation's Organizational Culture and Governance Prioritize Safety (I.15-08-019).

2 The One PG&E Occupational Health and Safety Plan is reviewed annually.

leadership positions over safety, health and environmental functions with global companies. Mr. Benavides reports directly to PG&E Corporation's Chief Executive Officer (CEO) and the BODs' Safety and Nuclear Oversight (SNO) Committees. Mr. Benavides is responsible for developing the company's workforce and public safety strategy.

During the first quarter of 2020, PG&E experienced three serious injuries or fatalities (SIF). One contract employee lost his life and two employees sustained serious injuries. This is unacceptable. No one should lose their life or sustain a life-threatening or life-altering injury while performing work for PG&E. PG&E is taking actions to bring a sense of urgency, improve the investigation process and increase the data collection on the cause of incidents. PG&E will implement strategies to reduce serious injuries and the rate of high-potential incidents as a part of a multi-year safety strategy being developed by the new CSO.

To improve workforce safety and learn from safety incidents as soon as they occur, PG&E has improved its communication process with a Safety Flash. The goal of the Safety Flash is to increase enterprise learning opportunities by rapidly sharing safety incidents and key takeaways with employees to prevent recurring safety incidents. The focus is on safety incidents arising from hazards that exist in more than one Line of Business (LOB).

A key part of PG&E's safety efforts involves the Leader in the Field (LIF) program, which has a goal of ensuring that field-facing supervisors make a time commitment of 50% of base hours to provide safety and quality at the source of the work we execute. Across all supervisors, year-to-date time in the field has increased from 27% to 33%. For managers, year-to-date performance similarly improved from 16% to 18%. Within the specific LOBs: Power Generation time in the field increased from 38% to 39%, Electric Operations increased from 28% to 35%, and Gas Operation increased from 24% to 30%. In light of the recent stay-at-home orders issued due to the COVID-19 pandemic, PG&E leaders with field personnel that provides essential services are utilizing virtual meetings when possible and following social distancing practices when in the field to protect the health and safety of PG&E employees and customers.

Another part of PG&E's overarching strategy for workforce safety is to improve access to health care for our employees at the time they need it. Getting quicker care has shown to reduce the severity of injuries. On January 21, 2020, we started deploying Mobile Medics in locations across our service area with the highest occupational injury risk. The Mobile Medics service dispatches an Emergency Medical Technician (EMT) to employees who report an injury where they are at the time of the injury, whether it be in the field at a job site or at a PG&E work facility. The EMT provides an evaluation, first aid care and telemedicine. If a higher level of care is necessary, the EMT will refer the employee to a health clinic. By the end of March, Mobile Medics services were available in Fresno and Sacramento; future locations include Auburn, Stockton, Paradise, San Jose, Bakersfield and Santa Rosa areas. PG&E will review implementation data on the roll-out and will provide an update in the next Report.

In 2019, PG&E formed the Independent Safety Oversight Committee (ISOC) to provide external oversight of our safe work practices. In the first quarter of 2020, PG&E responded to a report by the ISOC, described in the prior quarterly Report.[3] The first ISOC report focused on processes related to wildfire public safety risks in Electric Operations. The ISOC team evaluated five programs: Enhanced Vegetation Management; System Hardening; the Wildfire Safety Inspection program; the Public Safety Power Shutoff program; and real time monitoring and intelligence. The major areas for improvement identified by the ISOC were the lack of effective collaboration within PG&E and with external stakeholders on permitting practices, lack of effective work and resource planning, lack of accurate and trustworthy data, and lack of effective change management. PG&E appointed owners for each of these areas during the first quarter of 2020 in order to develop and execute a gap closure plan and liaised with the ISOC on the proposed plans. The action owners began reporting out progress on these plans to the Utility CEO and the CSO. The ISOC team will review progress against that gap closure plan in subsequent meetings with PG&E.

In D.19-06-008, the Commission directed PG&E to provide certain BOD-related information "in the quarterly reports submitted to SED pursuant to D.18-11-050." Information in compliance with this requirement is provided in Section IV of this Report.

Consistent with PG&E's previous quarterly Reports, Section V of this Report has a progress update on the One PG&E Plan, including first quarter safety performance.

Attachment 1 to this Report provides a Glossary of Safety Terms.

Attachment 2 to this Report includes approved BOD and SNO Committee meeting minutes.

## III. Sustainability Update

PG&E continues to execute on NorthStar's recommendations and has verified the sustainability of its Safety OII plans for the period of January 1, 2020, through March 31, 2020. Temporary gaps occurred in the execution of one PG&E Safety OII plan (F-5 _Best Practice Coordination, which includes IV-5_IV-6_IV-7_V-1_V-2_V-5), and PG&E has taken actions to address them as described in Section III (C).

All but two PG&E Safety OII plans are considered implemented and ongoing, and compliance with the NorthStar recommendations is certified by the Plan Owners and Sponsors quarterly. The two plans that do not require ongoing

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**3** See PG&E's "Safety Culture and Governance Quarterly Report No. 05-2019," submitted on January 31, 2020.

execution are IX-4 Speak-up Effectiveness[4] and VIII-8 OQ Feasibility Study,[5] with a one-time compliance certification in the fourth quarter of 2019.

Compliance certifications for the first quarter of 2020 are shown in Table 1 below, and the status of the additional NorthStar recommendations is provided in Table 2.

**A. Ongoing Execution and Sustainability**

**Table 1**

**Matrix of Sustainability Plans[6]**

| | PG&E Implementation Plan | Certification Due Date | Certification Status[7] | Approver | Initial Implementation |
|---|---|---|---|---|---|
| 1 | Safety Culture and Governance OII - F-2 _Supv in the Field_includes V-4 | 03/31/2020 | Certified | Jan Nimick | Report No. 04-2019 |
| 2 | Safety Culture and Governance OII - F-3 SLD includes VIII-1 | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019<br>Report No. 03-2019 |
| 3 | Safety Culture and Governance OII - F-4 _Comprehensive Safety Strategy_includes III-2_III-3_V-3 | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 4 | Safety Culture and Governance OII - F-5 _Best Practice Coordination_includes IV-5_IV-6_IV-7 V-1 V-2 V-5 | 03/31/2020 | Not Certified[8] | Roy Vlaovich | Report No. 01-2018 |
| 5 | Safety Culture and Governance OII - III-1 Board Qualifications | 03/31/2020 | Certified | Brian Wong | Report No. 01-2018 |
| 6 | Safety Culture and Governance OII - IV-2 CSO Org Position | 03/31/2020 | Certified | Brian Wong | Report No. 01-2018 |
| 7 | Safety Culture and Governance OII - F-1 OII Implementation Plan | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 8 | Safety Culture and Governance OII - IX-1 Safety Communication | 03/31/2020 | Certified | Keith Stephens | Report No. 01-2018 |
| 9 | Safety Culture and Governance OII - IX-2 Safety Culture Metrics | 03/31/2020 | Certified | David Hatton | Report No. 01-2018 |
| 10 | Safety Culture and Governance OII - IX-3 Reach Every Employee | 03/31/2020 | Certified | Julie Kane | Report No. 01-2018 |
| 11 | Safety Culture and Governance OII - III-5 IA Safety Role | 03/31/2020 | Certified | Stephen Cairns | Report No. 01-2018 |

4 See completion narrative in PG&E's "Safety Culture and Governance Quarterly Report No. 01-2018", submitted on December 30, 2018.

5 See completion narrative in PG&E's "Safety Culture and Governance Quarterly Report No. 03-2019", submitted on July 31, 2019.

6 Additional recommendations from NorthStar's Report – First Update (March 29, 2019) are certified in MetricStream under the plans in scope for the assessment (F-1, F-2, F-3, F-4, III-1, and IX-1). See implementation details in Table 2.

7 MetricStream compliance certification status.

8 See description of the identified gaps and remediation plan in Section III (C) below.

| | PG&E Implementation Plan | Certification Due Date | Certification Status[7] | Approver | Initial Implementation |
|---|---|---|---|---|---|
| 12 | Safety Culture and Governance OII - IV-3 _Safety Dept Roles and Responsibilities_includes IV-4 | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 13 | Safety Culture and Governance OII - IV-1 _CSO Experience | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 14 | Safety Culture and Governance OII - VI -1 _Separate Safety Expenditures-RAMP | 03/31/2020 | Certified | Stephanie Williams | Report No. 01-2018 |
| 15 | Safety Culture and Governance OII - VI – 2 _Safety IPP includes III-4 | 03/31/2020 | Certified | Jan Nimick | Report No. 02-2019 |
| 16 | Safety Culture and Governance OII - VI -3 _Risk and Bus Case Planning | 03/31/2020 | Certified | Jan Nimick | Report No. 02-2019 |
| 17 | Safety Culture and Governance OII - VI -4 _PPM for Power Gen | 03/31/2020 | Certified | Andrew Abranches | Report No. 03-2019 |
| 18 | Safety Culture and Governance OII - VI -5 _Session D Link to Sessions 1 and 2 | 03/31/2020 | Certified | Janaize Markland | Report No. 02-2019 |
| 19 | Safety Culture and Governance OII - VII-1 _STIP and LTIP Metrics includes VII-4 VII-5 | 03/31/2020 | Certified | John Lowe | Report No. 02-2019 |
| 20 | Safety Culture and Governance OII - VII-2 _Former STIP metric tracking | 03/31/2020 | Certified | Stephanie Williams | Report No. 01-2018 |
| 21 | Safety Culture and Governance OII - VII-3 _LTIP Safety Weight | 03/31/2020 | Certified | John Lowe | Report No. 02-2019 |
| 22 | Safety Culture and Governance OII - VII-6 _BPR Metrics | 03/31/2020 | Certified | Stephanie Williams | Report No. 01-2018 |
| 23 | Safety Culture and Governance OII - VII-7 _Expanded Best Practice Sharing | 03/31/2020 | Certified | Jan Nimick | Report No. 02-2019 |
| 24 | Safety Culture and Governance OII - VIII-10 _PwrGen Training Completion | 03/31/2020 | Certified | Chris Pickett | Report No. 01-2018 |
| 25 | Safety Culture and Governance OII - VIII-11 _PwrGen Refresher Training | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 26 | Safety Culture and Governance OII - VIII-2 _Field-first Training Profiles | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 27 | Safety Culture and Governance OII - VIII-3 _SLD 360 | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 28 | Safety Culture and Governance OII - VIII-4 _Mandatory Refresher Training | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 29 | Safety Culture and Governance OII - VIII-5 _Human Performance Training | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 30 | Safety Culture and Governance OII - VIII-6 _OQ Status Reporting | 03/31/2020 | Certified | Evelina Cowsert | Report No. 01-2018 |
| 31 | Safety Culture and Governance OII - VIII-7 _2014 OQ Review | 03/31/2020 | Certified | Evelina Cowsert | Report No. 03-2019 |
| 32 | Safety Culture and Governance OII - VIII-9 _PwrGen Apprentice Program | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 33 | Safety Culture and Governance OII - X-1 _SEMS-CAP Integration | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |

| | PG&E Implementation Plan | Certification Due Date | Certification Status[7] | Approver | Initial Implementation |
|---|---|---|---|---|---|
| 34 | Safety Culture and Governance OII - X-2 _CAP-NH Costs and Benefits | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 35 | Safety Culture and Governance OII - X-3 _CAP-NH Reporting Benefits | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 36 | Safety Culture and Governance OII - X-4 _IA Review of Serious Incident Investigations | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 37 | Safety Culture and Governance OII - X-5 _WGE Documentation Improvement | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 38 | Safety Culture and Governance OII - X-6 _Central Repository for Investigation info | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 39 | Safety Culture and Governance OII - X-7 _ Safety Communication Protocol | 03/31/2020 | Certified | Diane Thurman | Report No. 01-2018 |
| 40 | Safety Culture and Governance OII - X-8 _Cause Evaluation Process includes X-9 | 03/31/2020 | Certified | Wayne Edmiston | Report No. 02-2019 |
| 41 | Safety Culture and Governance OII - XI-1 _Surprise Inspections for Cont Safety | 03/31/2020 | Certified | Roy Vlaovich | Report No. 01-2018 |
| 42 | Safety Culture and Governance OII - XI-2 _Solely Responsible Cont Language | 03/31/2020 | Certified | Jamie Martin | Report No. 01-2018 |
| 43 | Safety Culture and Governance OII - XI-3 _Cont Incident Closure Criteria | 03/31/2020 | Certified | Roy Vlaovich | Report No. 01-2018 |
| 44 | Safety Culture and Governance OII - XI-4 _Cont Safety best Practice Sharing | 03/31/2020 | Certified | Roy Vlaovich | Report No. 02-2019 |
| 45 | Safety Culture and Governance OII - XI-5 _LOB Guidelines for Cont Safety | 03/31/2020 | Certified | Roy Vlaovich | Report No. 02-2019 |
| 46 | Safety Culture and Governance OII - XI-6 _PwrGen Contractor On-boarding | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 47 | Safety Culture and Governance OII - V-6 _Reduce Overall Mileage | 03/31/2020 | Certified | Paula Gerfen | Report No. 02-2019 |

### B. Additional NorthStar Recommendations

At the request of SED, NorthStar performed a secondary assessment of six PG&E Safety OII plans, established in response to recommendations from NorthStar's original report,[9] and included a set of additional recommendations in the NorthStar Report - First Update.[10] PG&E agreed with the additional recommendations and embraced the opportunity to further improve its safety culture and governance. Details and supporting documentation related to these additional recommendations were provided to NorthStar in response to data

[9] NorthStar Report, issued on May 8, 2017.

[10] NorthStar Report - First Update, issued on March 29, 2019.

request # 1087, submitted on December 17, 2019. The current status of PG&E's implementation of these additional recommendations is provided in Table 2 below.

Three additional recommendations under PG&E's Safety OII plan F-2 Supervisors in the Field, which includes V-4, are still being implemented.

- *Increase the number of Supervisors in Electric Operations, Gas Operations and Power Generation field operations to comply with Corporate Procedure HR-2010-P01 thereby limiting the span of direct reports to a maximum of 1:20.*

  PG&E continues to increase the number of leaders in Electric Operations, Gas Operations, and Power Generation, and to focus on increasing the understanding of the importance of leaders spending more time in the field. In the first quarter of 2020, the three organizations added a total of 48 leaders, thus decreasing the span of direct reports. Quarterly reports from Human Resources Data Analytics show that less than 10% of leaders are out of span as of this Report.

- *Move completed work review to the jobsite, allowing for immediate feedback before electronic records and paperwork are finalized.*

  As a standard practice, Gas Operations and Power Generation review work as it is being performed, allowing for supervisor jobsite work review and immediate feedback, therefore having a "completed work review."

  As NorthStar noted, Electric Operation's two-step practice to a completed work review, which includes a return to the work site to assess quality, may impact the supervisors' time in the field. To address the comment, the System Inspection group is actively piloting an approach to limit the need for supervisor "post work review" in the field. System Inspections is implementing mobile technology to enable work quality analysis and data trending, without "post work review" or field work verification. This shift will allow for the number of supervisor post-work field verification to be reduced, allowing supervisors to have more time with their crews.

- *Reduce travel requirements for field personnel and supervisors who are frequently assigned to work or attend meetings outside their normal work locations.*

  PG&E has reduced the frequency of travel and added remote attendance options for large business meetings, such as All Hands and All Employee Calls. PG&E has also worked to provide regionalized sessions for key in-person meetings such as Safety Summits, Grassroots Safety Meetings, Listening Sessions, and Workplan Overviews. These shifts in leadership practice help limit the travel demand on field leaders while still including them in core business discussions.

  Additionally, PG&E's Plan of Reorganization provides a vision of regionalized operating structures. This will help to reduce the demand for out-of-area travel to meetings.

## Table 2

## Matrix of Additional NorthStar Recommendations and PG&E's Implementation Status

| | PG&E Implementation Plan | NorthStar Recommendation | Status |
|---|---|---|---|
| 1 | **F-1_OII Implementation Plan** | Institute version control over, and include dates for the implementation plans, completion narratives, sustainability plans and for the IA sign-off process. | Implemented Under Existing Plan |
| 2 | **F-1_OII Implementation Plan** | Increase the rigor and formality over target completion date changes, status changes and scope changes associated with the implementation of NorthStar's recommendations. Review the implementation status of all recommendations to ensure all elements of the recommendations have been addressed or PG&E's modifications have been documented and justified. | Implemented Under Existing Plan |
| 3 | **F-1_OII Implementation Plan** | Develop processes to ensure the sustainability of the implementation of NorthStar's recommendations. | Implemented Under Existing Plan |
| 4 | **F-1_OII Implementation Plan** | In addition to the status of the implementation of NorthStar's recommendations, continue to report to the Commission on any significant changes that might affect the sustainability of the recommendations. | Implemented Under Existing Plan |
| 5 | **F-1_OII Implementation Plan** | Report to the Commission on a quarterly basis the status of the One PG&E Operational Health & Safety (OH&S) Plan and associated metrics (in process). | Implemented Under Existing Plan |
| 6 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Increase CSO oversight and governance over public and other aspects of safety to mitigate potential silos and ensure risks are adequately addressed. | Implemented Under Existing Plan |
| 7 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Communicate results of Internal Audit (IA) safety-related audits and LOB management response to Safety, Health and Enterprise CAP (reporting to the CSO). | Milestones Complete |
| 8 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Include the Generation Safety Lead in routine meetings between Electric Operations and Gas Operations and Safety & Health regarding the implementation of OH&S plan. | Implemented Under Existing Plan |
| 9 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Conduct an annual (or biennial) blue sky strategic safety planning exercise to concentrate on the changing environment, potential risks and threats. The exercise should force a comprehensive analysis of all safety-related opportunities and threats and a formal, proactive action plan. The planning exercise should:<br>• Consider the environmental, financial, political, technological, infrastructure, public, workforce and other risks and safety advancements.<br>• Include executives, management and potentially the BODs.<br>• Be facilitated by an outside expert.<br>• Cover ALL potential contributors to safety. | Implemented Under Existing Plan |
| 10 | **F-2_Supv in the Field_includes V-4** | Increase the number of Supervisors in Electric Operations, Gas Operations and Power Generation field operations to comply with Corporate Procedure HR-2010-P01 thereby limiting the span of direct reports to a maximum of 1:20. | Plan in Progress |

| | PG&E Implementation Plan | NorthStar Recommendation | Status |
|---|---|---|---|
| 11 | **F-2_Supv in the Field_includes V-4** | Commit to a target level of dedicated time in supervisors calendars each week for time in the field; guidance will remain flexible for each LOB to take into consideration the different job functions and geographic work considerations. | Implemented Under Existing Plan |
| 12 | **F-2_Supv in the Field_includes V-4** | Transfer administrative tasks such as scheduling of work, training and paperwork review, from the Supervisor to the office-based staff. | Implemented Under Existing Plan |
| 13 | **F-2_Supv in the Field_includes V-4** | Formalize Gas, Electric, and Power Generation management expectations for supervisors spending time in the field and communicate techniques for how to reduce impediments in each LOB thereby increasing time in the field. | Implemented Under Existing Plan |
| 14 | **F-2_Supv in the Field_includes V-4** | Move completed work review to the jobsite, allowing for immediate feedback before electronic records and paperwork are finalized. | Plan in Progress |
| 15 | **F-2_Supv in the Field_includes V-4** | Reduce travel requirements for field personnel and supervisors who are frequently assigned to work or attend meetings outside their normal work locations. | Plan in Progress |
| 16 | **F-3_SLD_includes VIII-1** | Continue to provide Crew Lead Safety Leadership training courses for employees that move into Crew Lead positions. Automatically include Crew Lead Safety Leadership training in the training profiles for new crew leads. | Implemented Under Existing Plan |
| 17 | **F-3_SLD_includes VIII-1** | On an annual basis, revise Safety Leadership Development (SLD) training to address any areas of concern identified in the review of SafetyNet observation data. | Milestones Complete |
| 18 | **III-1_Board Qualifications** | Report any changes in the Board of Director (BOD) skills matrix, and any changes to the composition of the BOD to the CPUC. | Implemented Under Existing Plan |
| 19 | **III-1_Board Qualifications** | Continue to update the BOD on safety and other significant industry issues. | Implemented Under Existing Plan |
| 20 | **III-1_Board Qualifications** | Encourage BOD members to inquire and challenge PG&E executives to ensure a robust governance process. Revise PG&E Corp.'s Governance Guidelines to include expectations for Directors. As an example, see the Sempra Energy Corporate Governance Guidelines. Among other items, the Sempra Energy Guidelines include the following:<br>• Maintain an attitude of constructive skepticism, ask relevant, incisive, probing questions and engage in direct and forthright discussions with the Board and management.<br>• Develop and maintain a broad understanding of the corporation's business and risk profile, its strategic, financial and operating opportunities and plans, and its internal control systems and disclosure controls and procedures, including environmental, and health and safety systems and procedures.…<br>• Balance prompt action with thorough deliberations, prioritize matter requiring attention, gather sufficient information, engage in open discussion, invite differing views, evaluate the benefits and risks of various courses of action and support the acceptance of prudent business risks to permit informed and timely decision making. | Milestones Complete |

| | PG&E Implementation Plan | NorthStar Recommendation | Status |
|---|---|---|---|
| 21 | **IX-1_Safety Communication** | Implement the recommendations identified in the outside vendor's communications audit. | Milestones Complete |
| 22 | **IX-1_Safety Communication** | Revise the communications plan as necessary to address any safety and health issues that are identified in recent and on-going Premier surveys and associated analyses | Implemented Under Existing Plan |

## C. Changes to PG&E Execution of Plans

As recommended by NorthStar, PG&E will continue to report to the Commission on any significant changes that might affect the sustainability of the recommendations.

- Under PG&E's Safety OII plan F-5_Best Practice Coordination, which includes IV-5_IV-6_IV-7_V-1_V-2_V-5 recommendations, Electric Operations hired approximately 50 Field Safety Specialist (FSS) at the end of 2019 to primarily perform contractor safety observations to replace contract FSS. During the first quarter of 2020, PG&E identified areas in which these recommendations were not being followed due to a lack of awareness of the requirements. To ensure that all LOBs are aware of the NorthStar recommendations, Safety, Health, ECAP and DOT (SHED) will reiterate these requirements by utilizing Daily Digest. Additionally, SHED is working with Electric Operations to resolve the areas of concern.
    - IV-6, Roles and Responsibilities - A highly detailed division of safety responsibilities was created and utilized, but with the establishment of the Electric Operations FSS team and the re-purposing of the SHED FSS team, it is no longer applicable. Discussions have begun and a refreshed, high-level division of responsibilities has been agreed to.
    - IV-7 and V-5, Training - SHED developed a five-year training plan consistent with the response to these Safety OII recommendations. Electric Operations will create a training plan to meet this requirement. SHED will develop a process to close the awareness gap.
    - IV-5, Safety Certifications - SHED committed to either hiring new FSS with safety certifications or requiring them to obtain such certifications within one year of hire. Electric Operations will have all FSS obtain a Certified Utility Safety Professional (CUSP) certification during 2020. A control in the hiring process is being implemented. The job profiles for the FSS job family have been updated with the certification requirements. These will be published in May 2020 and all other FSS job descriptions will be removed from the system.
    - F-5, Greater Coordination between Corporate Safety and LOBs - A regular weekly coordination meeting was established as part of the initial implementation of this recommendation. Due to personnel changes in late 2019, this meeting ceased but frequent ad-hoc communication continued. Beginning in May 2020, a similar meeting will be reinstated.

- V1, Best Practices and V-5 Safety Support at the Supervisor/Foreperson Level - Both recommendations were unaffected by the changes.

- PG&E anticipates changes to Safety OII plan VII-1 - STIP and LTIP Metrics, which includes VII-4 and VII-5. Currently, PG&E does not have 2020 Short Term Incentive Plan (STIP) that has received Bankruptcy Court approval. As required under the Chapter 11 reorganization filing, a proposed STIP plan for 2020 was submitted to the Bankruptcy court on January 31, 2020.

## IV. Board of Directors Reporting

In D.19-06-008, the Commission directed PG&E to provide the following information in the quarterly reports submitted to SED pursuant to D.18-11-050:

1) Non-confidential versions of the minutes of all BOD and safety committee meetings.
2) All training, education or other support on safety that PG&E and PG&E Corporation are providing to Board members so that they can adequately perform their duties on safety issues.[11]

### A. BOD and SNO Committee Meeting Minutes

Attachment 2 to this Report includes non-confidential versions of approved minutes for the following BOD or SNO Committee meetings that were held on or after June 13, 2019,[12] and for which approved minutes have not been provided in connection with a prior quarterly report.

- Meetings of the BODs of PG&E and PG&E Corporation were held concurrently on the following dates:

| |
|---|
| October 4, 2019 |
| October 11, 2019 |
| October 17, 2019 |
| October 24, 2019 |
| October 27, 2019 |
| November 1, 2019 |
| November 6, 2019 |
| November 12, 2019 |
| November 15, 2019 |
| November 16, 2019 |
| November 21, 2019 |
| December 2, 2019 |
| December 4, 2019 |
| December 5, 2019 |
| December 10-11, 2019 |
| December 12, 2019 |

[11] D.19-06-008, *mimeo*, p. 4

[12] Effective date of D.19-06-008.

| |
|---|
| December 13, 2019 |
| December 15, 2019 |
| December 19, 2019 |
| December 30, 2019 |

- Meetings of the SNO Committees of the BODs of PG&E and PG&E Corporation were held concurrently on the following dates:

| |
|---|
| November 19, 2019 (concurrent with Audit and CPP Committees) |
| December 10, 2019 |

Meeting minutes for the BODs and the SNO Committees must be formally reviewed and approved by the relevant governance body prior to finalization. The timing for this process varies, and in many cases the minutes will be finalized in a different quarter than the quarter in which the meeting was held.

## B. BOD Safety-Related Training

PG&E is submitting information regarding "all training, education or other support on safety that PG&E and PG&E Corp." provided "to board members to ensure that they can adequately perform their duties on safety issues."

- During the first quarter of 2020, consistent with the directors' commitment to each conduct at least three site visits per year, non-employee directors of PG&E and PG&E Corporation made various field visits and facility tours to meet with employees, observe employees and contractors performing work in the field, and tour safety training facilities and operating facilities. Activities during the first quarter of 2020 included individual directors (1) visiting various job sites to observe locate and mark work and other gas and electric work, and (2) visiting the Sacramento Customer Contact Center and meeting with customer service employees.
- In January 2020, the PG&E Corporation Compliance and Public Policy (CPP) Committee received a report on PG&E's fourth quarter 2019 Wildfire Safety Plan progress.
- In February 2020, the PG&E Corporation CPP Committee reviewed a draft of the Committee's fourth quarter 2019 oversight report to the BODs on PG&E's progress against its Wildfire Safety Plan.
- In January and February 2020, the PG&E Corporation CPP Committee received a report regarding the companies' Wildfire Mitigation Plan.
- In February 2020, the Audit Committees and the SNO Committees reviewed summaries of open high-risk audit issues with operational risks, including safety, and the status of action plans to address these issues: (1) the electric and hydro Supervisory Control and Data Acquisition systems, (2) the brake inspection program for regulated vehicles and equipment, (3) electric transmission and distribution asset management, inspection, and repairs, (4) contractor safety oversight in gas operations and power generation, (5) access for atmospheric corrosion inspections, and (6) distribution leak surveys.

- In February 2020, the PG&E Corporation CPP Committee received a report on the wildfire maturity model.
- In February 2020, the SNO Committees received a safety report, which included a review of the One PG&E Safety Plan and a serious injury and fatality update.
- In February 2020, the SNO Committees also received a report regarding public safety power shutoff mitigation efforts under the Wildfire Mitigation Plan.
- In February 2020, the SNO Committees also received reports on top enterprise risk topics and enterprise risks, including cybersecurity, cross-core loss of containment from gas distribution facilities, records and information management, and motor vehicle safety incidents.
- In February 2020, the BODs received the PG&E Corporation CPP Committee's fourth quarter 2019 oversight report on PG&E's progress against its Wildfire Safety Plan.
- In March 2020, the SNO Committees received reports on top enterprise risk topics and enterprise risks, including potential loss of containment at natural gas storage wells or reservoirs, employee workforce safety incidents, and contractor workforce safety incidents.
- During the first quarter of 2020, in-person regular meetings of the BODs and the SNO Committees included a safety tailboard similar to those presented to employees. Topics covered during the first quarter of 2020 included (1) rattlesnake awareness and (2) poison oak prevention and awareness.

## V. One PG&E Occupational Health and Safety Plan and Key Safety Metrics

### A. Introduction

The One PG&E Plan encompasses Employee Safety, Contractor Safety, Motor Vehicle Safety, and the Enterprise Safety Management System (ESMS), as well as eight focus areas to facilitate execution and reporting. The One PG&E Safety Plan was revised and reviewed on February 20, 2020. As the CSO sets the Company's workforce safety strategy going forward, this plan will continue to be factored in.

### B. Employee Safety

#### 1. Safety Management System

PG&E is committed to developing and adopting the ESMS to define how PG&E consistently manages all safety domains under a single, comprehensive governance framework. The ESMS will establish governance and oversight of public safety practices, which primarily includes asset management; occupational health and safety practices, which primarily affect workforce safety; environmental management practices; and safety-related business functions, which support the practices outlined above. See Table 3 for progress in the first quarter of 2020.

**Table 3**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Implement Enterprise Safety Management System | •Implement the ESMS by 2022.<br>•Including third party certification. | •Drafted key policies and standards to define the ESMS for the company. |
| Independent Safety Oversight Committee | •Implement an ISOC to provide safety assurance across PG&E by December 31, 2020. | •Received and responded to initial ISOC report covering Electric Operations.<br>•Published enterprise ISOC standard.<br>•Confirmed ISOC visit schedule and members for 2020 visits and implementation (impact of coronavirus TBD). |
| Management of Change | •Implement Management of Change (MOC) software within Gas Operations by December 31, 2020.<br>•Implement MOC software in its Electric Operations and Dam Operations by December 31, 2021.<br>•Provide an annual report on the procurement, development, and implementation of MOC software for PG&E's operations to the SED and the Office of the Safety Advocates (OSA) at the CPUC and/or OSA's successor.<br>•The first report will cover activities performed during 2020 and be presented to SED, OSA, and/or OSA's successor by July 1, 2021. | •Drafted a policy and standard for enterprise MOC that defines MOC requirements for implementation in a software system.<br>•Established an owner for enterprise MOC implementation. |
| Safety Culture | •Implement a safety culture consistent with safety leadership commitments. | •Drafted definition of safety culture around safety values and actions.<br>•Established an owner for enterprise safety values and actions implementation. |

## 2. Musculoskeletal Disorders (MSD), Sprains and Strains

PG&E's MSD program supports the prevention of injury though changes and re-design of key programs such as office, vehicle, industrial ergonomics, and the Industrial Athlete program. These programs are designed to take a systematic approach to identifying the ergonomic risk factors associated with performing physical work. See Table 4 for progress in the first quarter of 2020.

## Table 4

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Office Ergonomics | •Work with each LOB to proactively identify leading indicators that could result in injury.<br>•Reduce the number of evaluators and increase their hours to have a smaller more streamlined cohesive support staff.<br>•Establish weekly meetings with evaluators to understand and address situations and share best practices.<br>•Refine reporting in case management.<br>•Use data to conduct predictive analysis.<br>•Pilot centralized ordering for efficiencies. | •Analysis of current data shows that approximately 30% employees are not current on their annual training and 45% have identified issues that have not been resolved. The gap has been attributed to the training being housed in vendor software while acknowledgment of completion is in PG&E's system. To resolve the issue, PG&E is linking the 2 systems.<br>•Additional analysis of data revealed that 45% of employees have identified issues that have not been resolved. To assist employees, PG&E is taking a proactive approach of scheduling workstation evaluations, beginning with the highest risk, and those with most issues, employees.<br>•Evaluator team has been restructured to have 9 full-time evaluators allowing for better case management and quality assurance. This is a shift from fragmented model of 30 part-time evaluators, which caused delays in the past. |
| Industrial Athlete | •Train all industrial athlete specialist in industrial ergonomics software.<br>•Develop heat maps to overlay data to reflect impact of services.<br>•Focus on field workforce only. | •All industrial athletes began training in January 2020 on software and industrial ergonomic principles. The objective is to expand the number of evaluations occurring across the enterprise to create a robust data source with a hierarchical risk-rating system to address industrial ergonomics. |
| Industrial Ergonomics | •Perform assessments based on injury data.<br>•Partner with LOB on risk mitigations using electromyographical (EMG) data.<br>•Broaden program to risk-based approach addressing musculoskeletal health hazards. | •Industrial ergonomics - Communications and partnership across all LOBs to understand and incorporate industrial ergonomics into daily work practices continues to grow. Each year shows approximately a 20 percent increase in request for industrial ergonomic evaluations.<br>•12 specialists were trained on the industrial software and are using it to capture quantitative data on work task.<br>•Humantech industrial ergonomics software is in place with HR attribute build out. Systematically working with all LOBs and grassroot teams to capture data on work. |
| Vehicle Ergonomics | •Revise vehicle ergonomic evaluation process. Focus on objective, quantitative data.<br>•Develop form in software.<br>•Partner with Transportation Services on process, procedures and vehicle design. | •Trained new industrial athlete specialists on vehicle ergonomics.<br>•Continued partnership with fleet to ensure that vehicle ergonomics principles are discussed, and where feasible, incorporated up front versus a later retrofit. This has shown significant 70% reduction in reports of discomfort on new vehicle where ergonomics was incorporated on design process. |

### 3. Safety Leadership

All employees who are new to operational leadership positions are required to attend Safety Leadership Development (SLD) workshops within 90 days of being profiled for the training. The profiling occurs automatically when an employee assumes a new leadership role. PG&E is looking for ways to integrate the skills and language from the SLD Program into other safety programs, such as LIF, to build and reinforce PG&E's desired safety culture. See Table 5 for progress in the first quarter of 2020.

**Table 5**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Safety Leadership Development Workshops | •Ensure PG&E Academy curriculum is aligned with Operational Learning/SLD priorities. | •The SLD program is in a self-sustaining mode. Major themes from the analysis of SLD observations were incorporated during the annual update cycle and implemented in January of 2020. Thirty-two new leaders completed the training in the first quarter. |
| SLD Observations | •Promote the use of SLD observation checklist to guide and inform LIF engagements. | •Corporate Field Safety provided feedback to the LOBs and FSS on the SLD observation results to assist with continuous improvement. |
| Learning Teams | •Learning teams have now been turned over to LOBs to conduct as needed. | •The goal for Learning Teams is for LOBs to establish and maintain the capacity to conduct Learning Teams when appropriate. Diablo Canyon Power Plant and Supply Chain have embraced Learning Teams, and Gas Operations and Information Technology are piloting Learning Teams. |
| Operational Learning | •Refine Operational Learning tools and processes. | •Team formed in the first quarter to prioritize Operational Learning initiatives. |
| Strategy & Prevention Debriefs | •Collaborate with communications and LOB field-facing leaders to develop a method to consistently deliver critical information to the appropriate audience in a timely manner. | •To improve the effectiveness and speed of sharing incident learnings, a Safety Flash protocol and standard template were developed. |

### 4. Serious Injury and Fatality Prevention

PG&E investigates incidents that result in an actual employee SIF, meaning a fatality, a life-threatening or life-altering injury or illness. PG&E also identifies incidents with SIF potential to understand the conditions that led to the incident, learn from the investigation findings, and develop corrective actions. PG&E investigates SIF actual events for contractors, provided that they were conducting work under the supervision of PG&E, on PG&E property, or on PG&E assets. See Table 6 for progress in the first quarter of 2020.

**Table 6**

| Work stream | Objectives [13] | Q1 2020 Progress |
|---|---|---|
| SIF Investigations | •Improve SIF and Cause Evaluation (CE) processes and tools. | •Review of SIF investigation guidelines, policies, procedures, standards, and manuals in parallel with reviewing all CE guidelines, policies, procedures, standards and manuals to identify redundancies, inconsistencies, and gaps. |
| | •Improve timeliness and clarity of SIF-related communications to provide actionable intelligence to LOBs. | •New approval process has reduced several days of lag time in sharing information about SIF incidents when they first occur and once an investigation has been completed. |
| | •Analyze SIF investigations and share key learnings. | •Evaluated all SIF-Potential incidents to identify any safety successes to share with LOBs. |
| Safety Observations | •Expand user population in SafetyNet. | •Completed internal SafetyNet audit and identified issues causing less-than-optimal data. |
| | •Evaluation of SafetyNet tool and product enhancements. | •Created in-depth plan and initiated re-launch of the SafetyNet tool. |
| | •Increase ownership of SafetyNet within the LOBs. | •Engaged LOBs and gathered SafetyNet revision requirements from Shared Services, SHED, Materials, and Power Generation. |
| | •Identify additional training & support materials. | •Onboarded and trained four employees to support Safety Observations team activities. |
| Near Hit | •Identify and develop a strategy and plan for Near Hits for the enterprise. | •Onboarded new program lead to re-launch the Near Hits program.<br>•Implemented "Near Hits at Home" mechanism to collect and analyze near hits for remote workers during COVID-19 shelter-in-place directives. |

## 5. Injury Management

PG&E provides a number of Injury Management programs, such as timely injury reporting, a Return to Work (RTW) Task Program, on-site medical clinics, and Mobile Medics, to improve employees' overall well-being, and to promote early return to work. Early intervention and convenient access to care helps to reduce the severity of injuries and leads to better outcomes. In addition, PG&E's RTW Task Program allows employees to return to work with medical restrictions that might otherwise prevent them from working. See Table 7 for progress in the first quarter of 2020.

**13** The Essential Controls program was suspended in the fourth quarter of 2019 with resources focused on process improvements in other programs that provide greater impact on safety, such as SIF investigations and the SafetyNet observation tool.

**Table 7**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Timely Reporting | •Continue targeted leadership conversations.<br>•Improve employee experience. | •Nurse Care Line: 4% improvement year-to-date (YTD) in timely reporting, as compared to same time last year.<br>•YTD timely reporting: 77% |
| RTW Task Program | •Provide additional return to work opportunities.<br>•Reduce unavailable workforce and lost work days (LWD). | • Placed 33 employees into task assignments.<br>• Saved 748 LWD by returning employees to work who otherwise would have remained off work.<br>• Added 3 new assignments into Task Bank.<br>• Finalized Task Bank procedures. |
| On-site Clinics | •Provide convenient access to primary and urgent care and wellness services for both work-related and non-work-related injuries and conditions. | •Concord Gateway clinic opened in January of 2020.<br>•San Francisco General Office, Fresno, and San Carlos onsite clinics continue to provide health services. |
| Fit4U Pilot Program | •Prevent repeat injuries.<br>•Long Term Program Goals - Reduce Workers' Compensation claims (count, duration, cost).<br>•Improve long-term overall health and well-being through a lifestyle change | •Following the September 2019 conclusion of the Fit4U pilot, the data has been maturing which will allow for analysis and decision regarding the program effectiveness (expected in the second quarter). |
| Mobile Medics | •More immediate, convenient, on-location medical care for employees.<br>•Prevent work-related discomfort, pain or injuries from worsening. | •Mobile Medics in place in Fresno and Sacramento |

## 6. Health and Wellness

PG&E's Health and Wellness (H&W) programs use employee education and engagement to help employees take action to improve their overall well-being and to reduce risks of health conditions and injuries. PG&E promotes healthy lifestyles by improving access to and awareness of available H&W resources, which include mental health and Employee Assistance Program (EAP) services. See Table 8 for progress in the first quarter of 2020.

**Table 8**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Health Screenings | •Maintain >80% participation.<br>•Expand awareness of lab and physician screening options. | •As of the first quarter of 2020, 16,944 employees (77%) have completed their health screenings. |
| Health Coaching | •Reduce workforce health and safety risks by providing access to telephonic, onsite and digital health coaching support. | •Redesigned and simplified digital health coaching offering.<br>•Onsite health coaching - 120 employees completed onsite appointments.<br>•Transitioned onsite health coaching to telephonic due to workforce shelter-in-place/remote work order. |
| Health Promotion | •Provide total wellbeing solution for PG&E's workforce through H&W portal/application.<br>•Drive workforce awareness and engagement in wellness programs and benefits through Wellness Ambassador Network. | •H&W portal enrollment – 2,316 (10%) employees enrolled.<br>•Launched 4-week step-based Team Challenge to promote awareness.<br>•Monthly H&W Roundup newsletters to Wellness Ambassadors and Safety leads; COVID-19 resources highlighted.<br>• The program has 353 Wellness Ambassadors as of the first quarter of 2020. |
| Mental Health Support | •Increase awareness and enhance support for mental health conditions as a health and safety risk factor.<br>•Deploy new mindfulness resilience resources.<br>•Grow Peer Volunteer Program (PVP) to cover all LOBs and service territory. | • Department of Transportation (DOT) communication re: Kaiser substance use disorder treatment coverage.<br>• Support employees during shelter-in-place via telemedicine, communications, webinars, remote access to onsite EAPs.<br>• Virtual mindfulness sessions to support employees during shelter-in-place and "Mindfulness for Sleep" webinar.<br>• PVP Quarterly Meeting in February 2020. |
| Telemedicine | •Promote Anthem and Kaiser telemedicine programs. | •2020 YTD telemedicine visits - 367 total all modes, 328 registrations.<br>• Increased telemedicine communications due to COVID-19, shelter-in-place/remote work order. |
| Condition Management | •Expand Knova Solutions program for Human Capital Risk (HUI) risk scores from top 5% to top 20%, include dependents | •Utilization as of March 2020 - total enrollment 794; 560 employees and 234 dependents with high health risks. |

PG&E has identified key performance metrics tied to the Employee Safety focus areas above. In 2020, PG&E is focusing on a few key metrics that are meaningful indicators of safety performance. As a result, the following metrics have been removed from the quarterly reports:

- OSHA[14]
- LWD Case Count
- SIF Timeliness of Corrective Actions
- SIF Quality of Corrective Actions
- Workforce Unavailable due to Health
- Timely Reporting of Injuries

The metrics that were removed are still tracked and available for leadership reporting as needed.

PG&E established Days Away, Restricted or Transferred (DART) targets for 2020 to move the rate from 4th quartile to 3rd quartile. The company continues to see challenges with SIF events (actual and potential), repetitive motion injuries in the contact centers and strains from lifting, pulling and pushing in field workers. The company is reviewing the historical SIF data including investigations, incident history and Corrective Action Program (CAP) closure to inform a strategy for eliminating SIF and reducing the rate of high-risk incidents. Efforts are underway to reduce the non-serious and repetitive motion injuries including expanded clinics, mobile medics, on-site ergonomic specialists and expansion of the industrial athlete program.

Table 9 below summarizes key metrics performance and established targets for 2018 - 2020. Figure 1 below provides current performance with respect to employee safety metrics as of March 31, 2020.

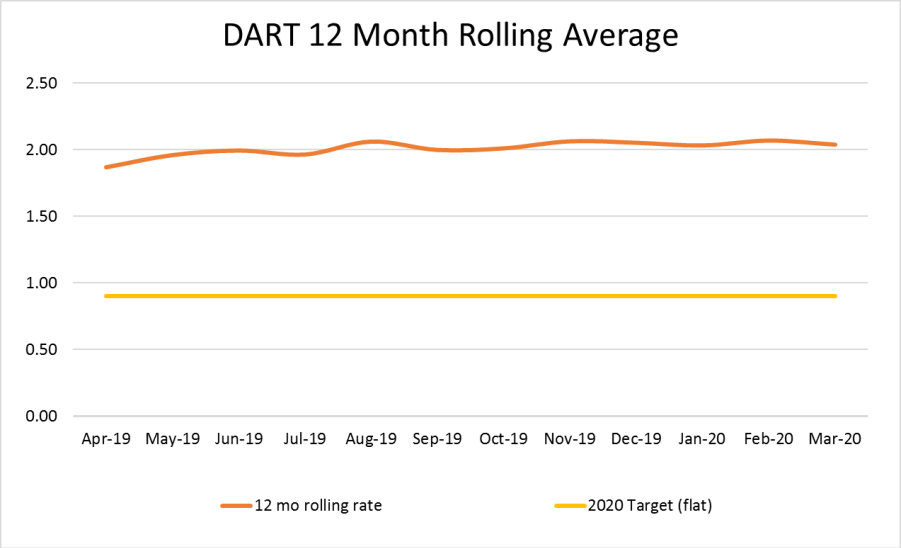
**TABLE 9**
**2018 - 2020 PERFORMANCE AND ESTABLISHED TARGETS**

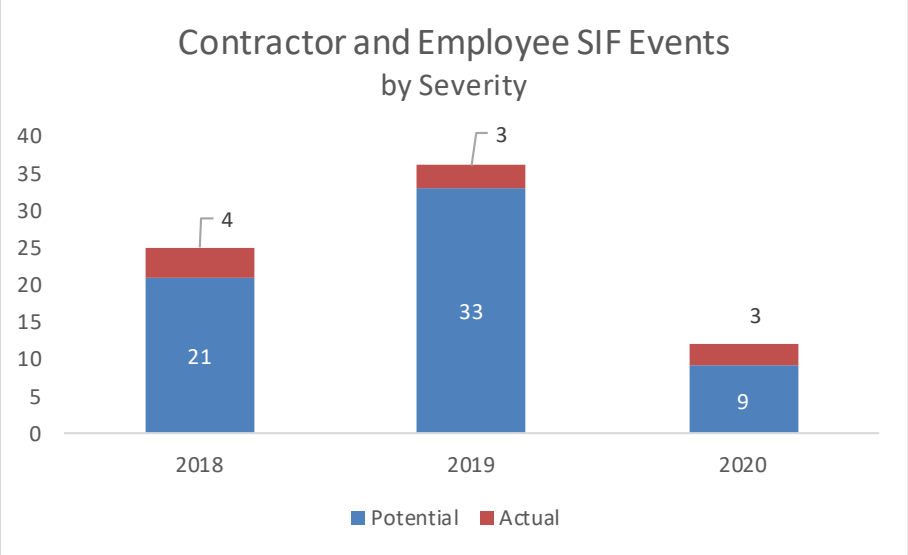
| Metric | 2018 | | 2019 | | 2020* | | |
|---|---|---|---|---|---|---|---|
| | Actual | Target | Actual | Target | YTD Actual | YTD Target | EOY Target |
| Employee SIF Count (Actual and Potential) | 22 | | 33 | | 11 | | |
| DART Case Count | 1.81 | 1.88 | 2.05 | 1.34 | 2.04 | 1.77 | 0.90 |

**2020 rates and targets are based on 12 month rolling rates*

**14** Occupational Safety and Health Administration

**FIGURE 1**
**CURRENT PERFORMANCE AS OF MARCH 31, 2020**




## C. Contractor Safety

PG&E's Contractor Safety Program requires primary contractors and subcontractors performing medium- and high-risk work to meet minimum pre-qualification requirements. PG&E monitors the implementation of the program requirements by conducting compliance assessments in the LOBs and performing Management and Organization Assessments (MOAs) on contractors who are new in business (less than three years) or have experienced rapid growth (significant increase in employees working for PG&E). See Table 10 for progress in the first quarter of 2020.

## Table 10

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Training & Qualifications | •Develop and implement new training requirements for PG&E employees and contractors. | • Tracking Contractor Safety Program training completions for contractors and PG&E employees.<br>•ISN Badging: Requiring contractors to track their worker's OSHA training (EOY 2020 completion date; ~ 20% of contractors have completed).<br>•Added three additional PG&E safety orientations in ISN for contractors. |
| Field Observations | •Utilize PG&E observation tool for capturing safety observations on contractors. | • 17,610 Field Observations were conducted and feedback provided. |
| Contractor Safety Forums | •Communicate and share PG&E's safety culture. | • 18 LOB workstreams began planning their 2020 Contractor Safety Forums, to be completed by year end. |
| Program Scope/Contractor Management | •Utilize ISN to track increase in contractor workers and contractors that are in business less than three years.<br>•Establish requirements for minimum Safety Officers on projects.<br>•Increase safety oversight in the field. | • 22 MOA assessments were conducted to evaluate the contract safety management structure.<br>• Implemented a new field safety inspection team to perform field audits on contractors. Eleven inspections completed with 6 non-compliance findings identified, with 4 of them high-risk. High-risk findings have been communicated to the contractors. Contractors are expected to complete a Corrective Action Plan identifying short- and long-term corrective actions to prevent recurrence. |

Table 11 below summarizes key metrics performance in 2018 - 2020. Figure 2 below provides current performance with respect to contractor safety metrics as of March 31, 2020.

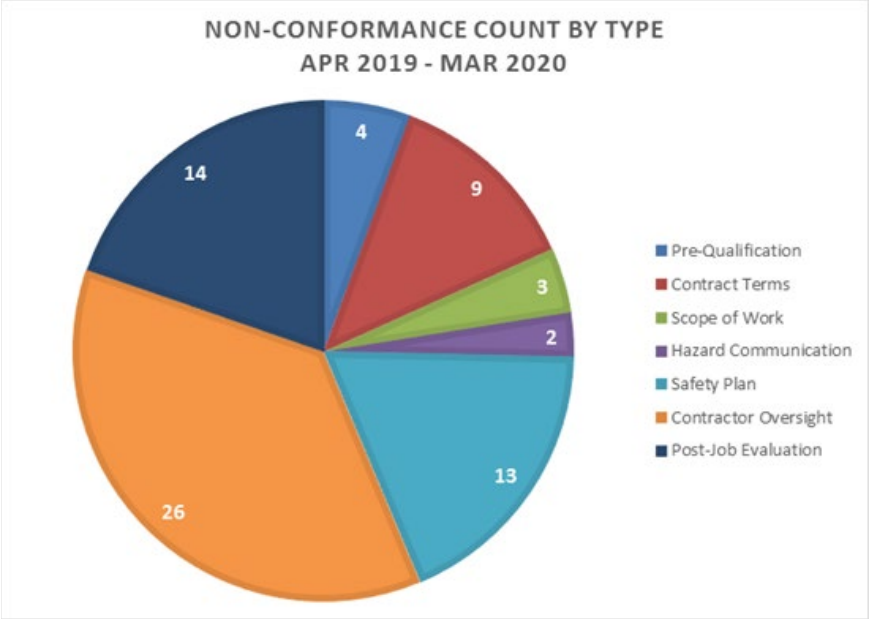
**TABLE 11**
**2018 - 2020 PERFORMANCE**

| Metric | 2018 | | 2019 | | 2020 | | |
|---|---|---|---|---|---|---|---|
| | Actual | Target | Actual | Target | YTD Actual | YTD Target | EOY Target |
| Contractor SIF Count (a) | 3 | | 3 | | 1 | | |
| % of Contractor Assessments with Non-Conformance Findings (b) | 10.3% | | 12.5% | | 11.1% | | |

(a) PG&E only tracks SIF Actual events for Contractors.

(b) An assessment is determined to be not met if one or more non-conformances are found.

**FIGURE 2**
**CURRENT PERFORMANCE AS OF MARCH 31, 2020 (a)**




(a) An assessment is determined to be not met if one or more non-conformances are found.

## D. Motor Vehicle Safety

PG&E's Motor Vehicle Safety program is focused on preventing and reducing the risk of motor vehicle incidents (MVI) to mitigate harm to employees and the public. PG&E is leveraging technology and data for driver feedback and interventions to reduce risks associated with driver's behavior and improving availability of data to field leaders to enable targeted risk assessments and coaching. See Table 12 for progress in the first quarter of 2020.

**Table 12**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| 360 App | •360 Walk Around App - Mobile application designed to require 360-degree walkaround prior to driving. Developed for non-regulated company drivers. | •Launched kickoff meetings and development sessions with IT to develop requirements, specifications, and initial design of the application. |
| UCLA Risk Assessment | •Partnering with UCLA to conduct risk assessment of the MVS Program. Desired outcomes will be to identify gaps, and to inform future mitigations, alternatives, and program recommendations. | •First draft reviewed with team and feedback provided to UCLA. UCLA is working on the updated analysis, recommendations, and final report. |
| Safe Backing Training | •Safe Backing Training (TECH-9161) - This course is for all company drivers and reviews safe backing principles, company policies, and proper use of spotter/backers. Available to all PG&E employees. | •Course was developed and is available to all employees in PG&E's My Learning portal. |
| Vehicle Safety | •Vehicle Safety Technology (VST) Installation and Activation: PG&E's Transportation Services will | •Pilot installations of 337 devices delayed due to the COVID-19 response. |

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Technology (VST) | install and activate VST in all on-road PG&E owned vehicles (approx. 10,000) by the end of 2022. The technology will provide better visibility into the risk assessment process. | |
| Post Incident Review | •Post Incident Review - Procedure outlines leadership requirements to perform a consistent review of available information and corrective actions of an employee following an MVI. This procedure is designed to provide employees with timely coaching and reduce overall risk. The procedure will be rolled out enterprise wide with a dashboard for leaders to have access to a single source containing multiple data points related to driver/vehicle risk. Estimated implementation by 2021. | •Partnered with various stakeholders to facilitate agreement and consensus on required actions and details involved in the procedure |

In 2020, PG&E is focusing on key metrics that are indicators of safety performance. As a result, the following metric has been removed from the quarterly reports:

- Serious Preventable Motor Vehicle Incident (SPMVI) Count

The SPMVI metric is still tracked and available for leadership reporting as needed.

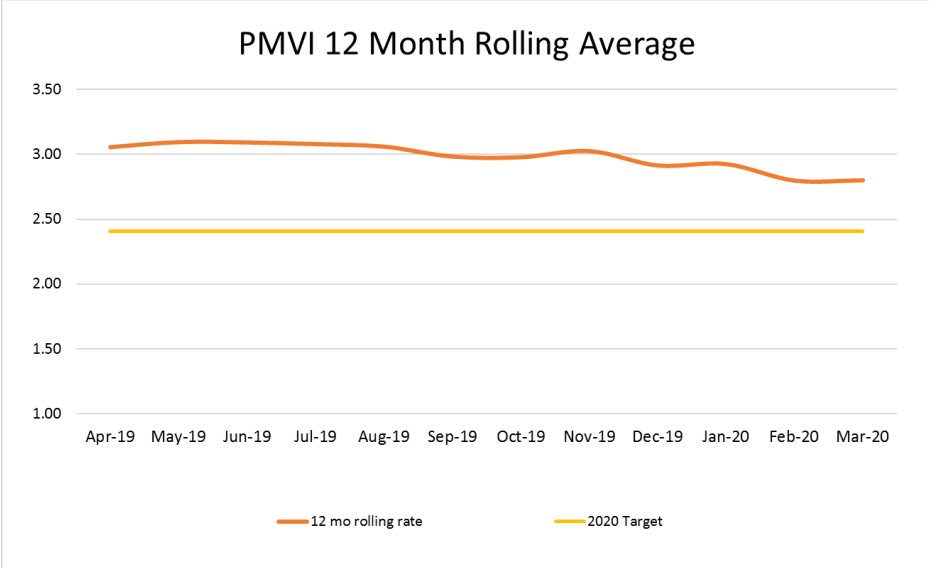
Table 13 below summarizes key metrics performance in 2018 - 2020. Figure 3 provides current performance with respect to motor vehicle safety metrics as of March 31, 2020. The preventable motor vehicle incidents (PMVI) rate is improving with first quarter results only slightly above target.

**TABLE 13**
**2018–2020 PERFORMANCE AND ESTABLISHED TARGETS**

| Metric | 2018 | | 2019 | | 2020* | | |
|---|---|---|---|---|---|---|---|
| | Actual | Target | Actual | Target | YTD Actual | YTD Target | EOY Target |
| PMVI Case Count | 2.79 | 2.34 | 2.91 | 2.45 | 2.80 | 2.79 | 2.41 |

**2020 rates and targets are based on 12 month rolling rates*

**FIGURE 3**
**CURRENT PERFORMANCE AS OF MARCH 31, 2020**




## E. Conclusion

PG&E is committed to improving its safety culture and performance and regaining the public's trust. The areas of opportunity identified by NorthStar in its Final Report and in its First Update are at the core of a strong and proactive safety culture. PG&E looks forward to continuing this important work and providing the Commission with quarterly updates on its progress.

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 1

# GLOSSARY OF SAFETY TERMS

# ATTACHMENT 1 - GLOSSARY

**SIF Timeliness of Corrective Actions:**

The total number of Serious Injuries or Fatalities (SIF) corrective actions completed on time (as measured by the due date accepted by Line of Business Corrective Action Review Boards (CARB)) divided by the total number of SIF corrective actions past due or completed. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. This metric includes Electric Operations, Gas Operations, Generation, Information Technology (IT), Supply Chain and Customer Care, as well as any SIF actual events from any line of business. Includes corrective actions with initial due date on or before month end reporting and corrective actions with initial due date after month end reporting but already completed.

**SIF Quality of Corrective Actions:**

The quality of SIF corrective actions as determined by the corrective action quality framework created by Dr. Mark Fleming. Quality is determined by assessing whether or not the corrective actions address all incident causes identified, extent of condition, hierarchy of controls, if the corrective action's effectiveness is measurable, and if the corrective actions have appropriate timelines for completion. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. The assessment is performed by an independent third party after acceptance by Line of Business CARBs.

**SIF Index: SIF Effectiveness of Action Completion**

The effectiveness of corrective actions as measured by the number of repeat SIF Exposure Factors over a 36-month period. Only SIF incidents in Electric Operations, Gas Operations or Generation are included in this metric. Only investigations that have been approved by the Line of Business-specific CARBs are included in Long-Term Incentive Plan reporting.

**SIF Exposure Factors List**

1. Animal Attack or Bite
2. Assault or Violent Attack
3. Confined Space
4. Heavy Equipment Operation or Traffic Hazards
5. Control of Hazardous Energy
6. Dropped Object of Sufficient Mass to Cause Injury
7. Excavation
8. Hazardous Chemicals/Material
9. Heat Exposures
10. Helicopter Use
11. Welding, Grinding, Cutting, Hot Work Permits
12. Live Electrical Work
13. Grounding (Live Electrical Work Supplement)
14. Mobile Equipment Use (i.e., Lifts, Cranes, Forklifts, etc.)
15. Off-road Vehicle Use
16. Powered Tool use
17. Public Safety
18. Work at Heights (4 ft. or Greater)

19. Suspended Loads and Rigging

**SIF Exposure Rate**: SIF Exposure rate is the number of actual or potential SIF per 200,000 hours worked. Includes Electric, Gas, Generation, IT, Supply Chain, Customer Care.

**Days Away, Restricted and Transfer (DART) Rate:** includes Occupational Safety and Health Administration (OSHA)-recordable injuries that result in lost time or restricted duty per 200,000 hours worked.

**Preventable Motor Vehicle (PMVI) Rate:** the total number of motor vehicle incidents for which the driver could have reasonably avoided, per 1 million miles driven.

**Lost Work Day Case Rate (LWD)**

This measures the number of Lost Workday (LWD) cases incurred for employees and staff augmentation per 200,000 hours worked, or for approximately every 100 employees. A LWD Case is a current year OSHA Recordable incident that has resulted in at least one LWD. An OSHA Recordable incident is an occupational (job related) injury or illness that requires medical treatment beyond first aid, or results in work restrictions, death or loss of consciousness.

**Workforce Unavailable Due to Health**

This is a percentage of PG&E's workforce that is out due to the following:

- Sick time
  - Family sick time excluded
- Short Term Disability (<1 year)
- Long Term Disability (> 1 year)
- Workers Compensation
- Family and Medical Leave Act
  - Due to one's own medical condition
- Company medical leave

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 2

# BOARDS OF DIRECTORS AND SAFETY AND NUCLEAR OVERSIGHT COMMITTEE MEETING MINUTES

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 4, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, October 4, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, and Linda Y.H. Cheng, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, and Mario A. Ponce of Simpson Thacher & Bartlett LLP, Richard Hall, Christopher J. Kelly, Kevin J. Orsini, and George E. Zobitz of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Buckman, Mr. Brian, and Mr. Orsini left the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Cheng, Mr. Hall, Mr. Hort, Mr. Kelly, Ms. Liou, Mr. Mesterharm, Mr. Ziman, and Mr. Zobitz were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Goldin, and Mr. Ponce present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Goldin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the

independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:15 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 4, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, October 4, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, and Linda Y.H. Cheng, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, and Mario A. Ponce of Simpson Thacher & Bartlett LLP, Richard Hall, Christopher J. Kelly, Kevin J. Orsini, and George E. Zobitz of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Buckman, Mr. Brian, and Mr. Orsini left the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Cheng, Mr. Hall, Mr. Hort, Mr. Kelly, Ms. Liou, Mr. Mesterharm, Mr. Ziman, and Mr. Zobitz were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Goldin, and Mr. Ponce present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Goldin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the

independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:15 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 11, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility] was held on Friday, October 11, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies] Board of Directors.

Directors Richard R. Barrera (who joined during the meeting as noted below), Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell (who joined during the meeting as noted below), Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Janet C. Loduca, and Linda Y.H. Cheng, along with Paul C. Curnin and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

The meeting was convened in executive session with Mr. Johnson, Mr. Vesey, Mr. Simon, Ms. Loduca, Ms. Cheng, Mr. Curnin, and Mr. Qusba present.

Ms. Schmidt, on behalf of Mr. Leffell, Chair of the PG&E Corporation Nominating and Governance Committee, discussed the Committee's recommendation relating to the size of the Companies' respective Boards of Directors, determinations by the Boards regarding the independence and qualifications of two candidates for the Boards, and the election of the two candidates to the Boards, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She and Mr. Leffell reviewed the background and reasons for the proposed actions, including the

[1] [redacted]

background and experience of each candidate. The directors asked questions and discussed the proposed actions.

Directors Richard R. Barrera and Michael J. Leffell joined the meeting during the foregoing discussion.

On motion made and seconded, the Board adopted a resolution (1) amending the Bylaws so that the exact number of directors is set by a Board resolution, (2) fixing the exact number of directors at 16 to accommodate the election of William L. Smith and John M. Woolard as directors, (3) affirming the Board's determinations regarding Mr. Smith's and Mr. Woolard's independence and qualifications, and (4) electing Mr. Smith and Mr. Woolard to the Board, effective upon the adjournment of this meeting (see Resolution 1 in Attachment A).

The Board concluded its executive session. The following individuals joined the meeting at this point: Julie M. Kane and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Timothy G. Cameron, C. Daniel Haaren, Richard Hall, Christopher J. Kelly, and George E. Zobitz of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin and Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 9, 2019 across portions of its service area, customer impacts, the status of the safety inspection and restoration process, the performance of the Utility's website during the PSPS event, and media coverage relating to the PSPS event. The directors asked questions and discussed, among other matters, customer sentiment regarding the PSPS event, the Companies' PSPS communications plan, and several directors' visits to the Utility's Emergency Operations Center during the PSPS event.

Jason P. Wells, along with Kevin J. Orsini of Cravath, joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Schmidt and Mr. Curnin left the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the terms of the debt commitment letters substantially on the terms discussed with the Board, and authorized and directed the officers of the Utility to negotiate, execute, and deliver debt commitment letters in substantially the form presented at this meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Ms. Campbell, Mr. Wells, and Mr. Orsini left the meeting, and Ms. Schmidt rejoined the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:00 a.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

Bylaw Amendment

BE IT RESOLVED that, effective immediately, Section 1 of Article II of the Bylaws of this company is hereby amended as follows:

1. **Number.** The Board of Directors of this Company shall consist of such number of directors, not less than nine (9) nor more than seventeen (17). The exact number of directors shall be ~~fifteen (15) until changed,~~ within the limits specified above, fixed from time to time by ~~an amendment to this Bylaw~~ a resolution duly adopted by the Board of Directors~~or the shareholders~~.

Size of Board of Directors

BE IT RESOLVED that the exact number of directors of this corporation shall be fixed at 16.

Director Candidate Independence and Qualifications

WHEREAS, following a candidate search process, this Board of Directors has identified two new director candidates to serve on the Board of this company: William L. Smith and John M. Woolard;

WHEREAS, each of the above-named candidates has submitted a completed 2019 Screening Questionnaire for Director Candidates and a completed 2019 Questionnaire for Director Candidates (together, the "D&O Questionnaires"); and

WHEREAS, the Board has considered the above-named candidates' responses to the D&O Questionnaires, in light of the various regulatory requirements relating to the independence and qualifications of Board members;

NOW, THEREFORE, BE IT RESOLVED that the Board hereby affirmatively determines that William L. Smith and John M. Woolard are each (1) independent, as independence is defined in this company's Corporate Governance Guidelines, including the categorical independence standards adopted by the Board, and including the requirement that an independent director not have material relationships with the company, and (2) independent for purposes of service on the Audit Committee, as "independence" is defined in Rule 10A-3(b)(1) under the Securities Exchange Act of 1934 and Sections 801(g) and 803(B)(2)(a)(i) of the NYSE American Company Guide; and

BE IT FURTHER RESOLVED that the Board affirms its belief that each of the above-named individuals is "financially literate;" and

BE IT FURTHER RESOLVED that the officers and counsel of this company are hereby jointly and severally authorized and directed to provide any required written affirmation or certification on behalf of the company to the NYSE American that the Board has made such determinations regarding the independence and required qualifications of each candidate, if elected, as described above.

Election of Directors

BE IT RESOLVED that William L. Smith and John M. Woolard are hereby each elected a director of Pacific Gas and Electric Company, effective upon adjournment of this meeting, to serve until the next annual meeting of shareholders of this company until his successor is elected and qualified, except in the case of his death, resignation, or removal.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 11, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, October 11, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera (who joined during the meeting as noted below), Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell (who joined during the meeting as noted below), Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Janet C. Loduca, and Linda Y.H. Cheng, along with Paul C. Curnin and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

The meeting was convened in executive session with Mr. Johnson, Mr. Vesey, Mr. Simon, Ms. Loduca, Ms. Cheng, Mr. Curnin, and Mr. Qusba present.

Ms. Schmidt, on behalf of Mr. Leffell, Chair of the Nominating and Governance Committee, discussed the Committee's recommendation relating to the size of the Companies' respective Boards of Directors, determinations by the Boards regarding the independence and qualifications of two candidates for the Boards, and the election of the two candidates to the Boards, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She and Mr. Leffell reviewed the background and reasons for the proposed actions, including the background and experience of each candidate. The directors asked questions and discussed the proposed actions.

[1] [redacted]

Directors Richard R. Barrera and Michael J. Leffell joined the meeting during the foregoing discussion.

On motion made and seconded, the Board adopted a resolution (1) fixing the exact number of directors at 15 to accommodate the election of William L. Smith and John M. Woolard as directors, (2) affirming the Board's determinations regarding Mr. Smith's and Mr. Woolard's independence and qualifications, and (3) electing Mr. Smith and Mr. Woolard to the Board, effective upon the adjournment of this meeting (see Resolution 1 in Attachment A).

The Board concluded its executive session. The following individuals joined the meeting at this point: Julie M. Kane and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Timothy G. Cameron, C. Daniel Haaren, Richard Hall, Christopher J. Kelly, and George E. Zobitz of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin and Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 9, 2019 across portions of its service area, customer impacts, the status of the safety inspection and restoration process, the performance of the Utility's website during the PSPS event, and media coverage relating to the PSPS event. The directors asked questions and discussed, among other matters, customer sentiment regarding the PSPS event, the Companies' PSPS communications plan, and several directors' visits to the Utility's Emergency Operations Center during the PSPS event.

Jason P. Wells, along with Kevin J. Orsini of Cravath, joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Schmidt and Mr. Curnin left the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the terms of the debt commitment letters substantially on the terms discussed with the Board, and authorized and directed the officers of the Corporation to negotiate, execute, and deliver debt commitment letters in substantially the form presented at this meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Ms. Campbell, Mr. Wells, and Mr. Orsini left the meeting, and Ms. Schmidt rejoined the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:00 a.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

Size of Board of Directors

BE IT RESOLVED that the exact number of directors of this corporation shall be fixed at 15.

Director Candidate Independence and Qualifications

WHEREAS, following a candidate search process, this Board of Directors has identified two new director candidates to serve on the Board of this corporation: William L. Smith and John M. Woolard;

WHEREAS, each of the above-named candidates has submitted a completed 2019 Screening Questionnaire for Director Candidates and a completed 2019 Questionnaire for Director Candidates (together, the "D&O Questionnaires"); and

WHEREAS, the Board has considered the above-named candidates' responses to the D&O Questionnaires, in light of the various regulatory requirements relating to the independence and qualifications of Board members;

NOW, THEREFORE, BE IT RESOLVED that the Board hereby affirmatively determines that William L. Smith and John M. Woolard are each (1) independent, as independence is defined in Section 303A.02 of the NYSE Listed Company Manual (taking into account the Compensation Committee factors set forth in Section 303A.02(a)(ii) of the NYSE Listed Company Manual) and as provided in the categorical independence standards adopted by the Board, including the requirement that an independent director not have material relationships with the corporation, and (2) independent for purposes of service on the Audit Committee, as "independence" is defined in Rule 10A-3(b)(1) under the Securities Exchange Act of 1934 and Section 303A.07 of the NYSE Listed Company Manual; and

BE IT FURTHER RESOLVED that the Board affirms its belief that each of the above-named individuals is "financially literate;" and

BE IT FURTHER RESOLVED that the officers and counsel of this corporation are hereby jointly and severally authorized and directed to provide any required written affirmation or certification on behalf of the corporation to the NYSE that the Board has made such determinations regarding the independence and required qualifications of each candidate, if elected, as described above.

Election of Directors

BE IT RESOLVED that William L. Smith and John M. Woolard are hereby each elected a director of PG&E Corporation, effective upon adjournment of this meeting, to serve until the next annual meeting of shareholders of this corporation or until his successor is elected and qualified, except in the case of his death, resignation, or removal.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 17, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, October 17, 2019, at 8:45 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Nora Mead Brownell and Frederick W. Buckman were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson referred to the letters that Governor Newsom and California Public Utilities Commission (CPUC) President Marybel Batjer sent him on October 14, 2019 regarding the October 9-12, 2019 Public Power Shutoff Program (PSPS) event, and discussed the responses that he would send later in the day to Governor Newsom and President Batjer, and the Companies' PSPS communications plan.

[1] [redacted]

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba

present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the independent directors met in executive session without any management present.

Director Eric D. Mullins joined the meeting by telephone during the foregoing executive session with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:15 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 17, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, October 17, 2019, at 8:45 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Nora Mead Brownell and Frederick W. Buckman were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson referred to the letters that Governor Newsom and California Public Utilities Commission (CPUC) President Marybel Batjer sent him on October 14, 2019 regarding the October 9-12, 2019 Public Power Shutoff Program (PSPS) event, and discussed the responses that he would send later in the day to Governor Newsom and President Batjer, and the Companies' PSPS communications plan.

[1] [redacted]

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba

present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the independent directors met in executive session without any management present.

Director Eric D. Mullins joined the meeting by telephone during the foregoing executive session with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:15 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 24, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, October 24, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Richard R. Barrera was absent.

Also participating by telephone at the beginning of the meeting were Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 23, 2019, customer impacts, the status of the safety inspection and restoration process, process improvements implemented after the PSPS event earlier in the month, the performance of the Utility's website and call center during the PSPS event, Community Resource Centers opened by the Utility in affected counties, the potential for another PSPS event during the coming weekend, and the Kincade fire that began in Sonoma County on October 23, 2019. The directors asked questions and discussed, among other matters, the

[1] [redacted]

Kincade fire, and the potential PSPS event that might be initiated during the coming weekend.

Jason P. Wells joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Bleich and Mr. Hort left the meeting during the foregoing discussion. Mr. Brian left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 24, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, October 24, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Richard R. Barrera was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 23, 2019, customer impacts, the status of the safety inspection and restoration process, process improvements implemented after the PSPS event earlier in the month, the performance of the Utility's website and call center during the PSPS event, Community Resource Centers opened by the Utility in affected counties, the potential for another PSPS event during the coming weekend, and the Kincade fire that began in Sonoma County on October 23, 2019. The directors asked questions and discussed, among other matters, the

[1] [redacted]

Kincade fire, and the potential PSPS event that might be initiated during the coming weekend.

Jason P. Wells joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Bleich and Mr. Hort left the meeting during the foregoing discussion. Mr. Brian left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 27, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Sunday, October 27, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Andrew M. Vesey was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Ziman left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 27, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Sunday, October 27, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Ziman left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 1, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, November 1, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Frederick W. Buckman was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson noted that the Governor's office announced a press conference later in the day to address the Governor's "call for fundamental change to PG&E" and to "lay out a path forward to ensure the overly broad application of Public Safety Power Shutoffs (PSPS) will never happen again." He commented on the Governor's request for a meeting with the Companies' management and advisors the following week.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the PSPS events that the Utility initiated on October 23, October 26, and

[1] [redacted]

October 29, 2019; customer impacts; the Utility's efforts to reduce PSPS impacts in the future; instances of weather-related equipment damage and hazards that have been identified in post-PSPS inspections; the post-PSPS inspection and restoration process; and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed, among other matters, customer impacts of the recent PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory and legislative matters. Among other things, he discussed the California Public Utilities Commission's (CPUC) expected issuance of an Order Instituting Investigation (OII) relating to the PSPS events initiated by the California investor-owned utilities (IOU) in September and October 2019; the possibility of state legislation authorizing the CPUC to temporarily appoint a Public Administrator to oversee the management of the Utility; the possibility of a special state legislative session to address wildfires, PSPS programs, and homeowners insurance cancellations; an upcoming State Senate Energy, Utilities, and Communications Committee oversight hearing on IOUs' PSPS programs; the CPUC's OII regarding the Companies' joint plan of reorganization; and discovery requests in the CPUC's OII regarding the Companies' safety culture and governance.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:45 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 1, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, November 1, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Frederick W. Buckman was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson noted that the Governor's office announced a press conference later in the day to address the Governor's "call for fundamental change to PG&E" and to "lay out a path forward to ensure the overly broad application of Public Safety Power Shutoffs (PSPS) will never happen again." He commented on the Governor's request for a meeting with the Companies' management and advisors the following week.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the PSPS events that the Utility initiated on October 23, October 26, and

[1] [redacted]

October 29, 2019; customer impacts; the Utility's efforts to reduce PSPS impacts in the future; instances of weather-related equipment damage and hazards that have been identified in post-PSPS inspections; the post-PSPS inspection and restoration process; and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed, among other matters, customer impacts of the recent PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory and legislative matters. Among other things, he discussed the California Public Utilities Commission's (CPUC) expected issuance of an Order Instituting Investigation (OII) relating to the PSPS events initiated by the California investor-owned utilities (IOU) in September and October 2019; the possibility of state legislation authorizing the CPUC to temporarily appoint a Public Administrator to oversee the management of the Utility; the possibility of a special state legislative session to address wildfires, PSPS programs, and homeowners insurance cancellations; an upcoming State Senate Energy, Utilities, and Communications Committee oversight hearing on IOUs' PSPS programs; the CPUC's OII regarding the Companies' joint plan of reorganization; and discovery requests in the CPUC's OII regarding the Companies' safety culture and governance.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:45 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 6, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Wednesday, November 6, 2019, at 5:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Michael J. Leffell and Eric D. Mullins were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, Robert S. Kenney, and David S. Thomason, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, Henry Weissmann of Munger, Tolles & Olson LLP, and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted] that [redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The directors discussed a recent employee safety incident involving two linemen who were injured as a result of an electrical arc flash that occurred when a crew was replacing insulators on an energized transmission line in Vacaville.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Thomason, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 6:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 6, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Wednesday, November 6, 2019, at 5:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Michael J. Leffell and Eric D. Mullins were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, Robert S. Kenney, and David S. Thomason, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, Henry Weissmann of Munger, Tolles & Olson LLP, and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



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[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The directors discussed a recent employee safety incident involving two linemen who were injured as a result of an electrical arc flash that occurred when a crew was replacing insulators on an energized transmission line in Vacaville.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Thomason, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 6:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 12, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Tuesday, November 12, 2019, at 1:35 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Director John M. Woolard was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Brownell noted Frederick W. Buckman's resignation from the Board effective November 12, 2019, and expressed the Board's appreciation for his service.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 12, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Tuesday, November 12, 2019, at 1:35 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Director John M. Woolard was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Brownell noted Frederick W. Buckman's resignation from the Board effective November 12, 2019, and expressed the Board's appreciation for his service.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 15, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, November 15, 2019, at 8:10 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Andrew M. Vesey was absent.

Also participating by telephone at the beginning of the meeting were Janet C. Loduca and Linda Y.H. Cheng, along with Timothy G. Cameron and Evan R. Chesler of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Ms. Loduca, Mr. Cameron, Mr. Chesler, Mr. Curnin, Mr. Goldin, Mr. Karotkin, Mr. Ponce, and Mr. Qusba present.

The Board concluded its executive session.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, and Julie M. Kane, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall of Cravath, Gregory Hort and Kenneth S. Ziman of Lazard, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the federal Monitor's recent activities and evaluation of the Utility's 2019 Wildfire Safety Plan, and the District Court's recent decision regarding the Utility's community service obligations under the terms of probation.

At this point, Mr. Johnson, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Cameron, Mr. Chesler, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the independent directors continued their discussion

regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 15, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, November 15, 2019, at 8:10 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Janet C. Loduca and Linda Y.H. Cheng, along with Timothy G. Cameron and Evan R. Chesler of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Ms. Loduca, Mr. Cameron, Mr. Chesler, Mr. Curnin, Mr. Goldin, Mr. Karotkin, Mr. Ponce, and Mr. Qusba present.

The Board concluded its executive session.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, and Julie M. Kane, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall of Cravath, Gregory Hort and Kenneth S. Ziman of Lazard, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the federal Monitor's recent activities and evaluation of the Utility's 2019 Wildfire Safety Plan, and the District Court's recent decision regarding the Utility's community service obligations under the terms of probation.

At this point, Mr. Johnson, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Cameron, Mr. Chesler, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the independent directors continued their discussion

regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 16, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Saturday, November 16, 2019, at 10:05 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey (who joined during the meeting as noted below), Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Eric D. Mullins was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca and Linda Y.H. Cheng, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[1] [redacted]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Andrew M. Vesey joined the meeting during the foregoing discussion.

On motion made and seconded, the Board authorized and directed the officers of the Corporation to negotiate revisions to the equity backstop commitment letters substantially on the terms discussed with the Board.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:05 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 16, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Saturday, November 16, 2019, at 10:05 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Eric D. Mullins was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca and Linda Y.H. Cheng, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Andrew M. Vesey joined the meeting during the foregoing discussion.

On motion made and seconded, the Board authorized and directed the officers of the Corporation to negotiate revisions to the equity backstop commitment letters substantially on the terms discussed with the Board.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:05 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 21, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, November 21, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Cheryl F. Campbell and Michael J. Leffell were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin and Mario A. Ponce of Simpson Thacher & Bartlett LLP, C. Daniel Haaren of Cravath, Swaine & Moore LLP, Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on November 20, 2019, customer impacts, the post-PSPS inspection and restoration process, incidents of weather-related equipment damage and hazards that have been identified in post-PSPS inspections, the Utility's communications and coordination with the California Department of Forestry and Fire Protection and the California Governor's Office of Emergency Services, and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed,

[1] [redacted]

among other matters, customer feedback regarding the October and November PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

Ms. Kane presented a report on the Utility's monitorship in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the Companies' invitation to the federal Monitor to attend the Board meeting and/or the PG&E Corporation Compliance and Public Policy Committee in December. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Kenney presented a report on regulatory matters. Among other things, he discussed the status of discussions with the California Public Utilities Commission (CPUC) and other parties regarding the potential settlement of the Utility's 2020 General Rate Case as well as the CPUC's investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Bleich left the meeting during the foregoing presentation.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, and Mr. Ponce present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:30 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 21, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, November 21, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Cheryl F. Campbell and Michael J. Leffell were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin and Mario A. Ponce of Simpson Thacher & Bartlett LLP, C. Daniel Haaren of Cravath, Swaine & Moore LLP, Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on November 20, 2019, customer impacts, the post-PSPS inspection and restoration process, incidents of weather-related equipment damage and hazards that have been identified in post-PSPS inspections, the Utility's communications and coordination with the California Department of Forestry and Fire Protection and the California Governor's Office of Emergency Services, and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed,

[1] [redacted]

among other matters, customer feedback regarding the October and November PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

Ms. Kane presented a report on the Utility's monitorship in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the Companies' invitation to the federal Monitor to attend the Board meeting and/or the Compliance and Public Policy Committee in December. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Kenney presented a report on regulatory matters. Among other things, he discussed the status of discussions with the California Public Utilities Commission (CPUC) and other parties regarding the potential settlement of the Utility's 2020 General Rate Case as well as the CPUC's investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Bleich left the meeting during the foregoing presentation.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, and Mr. Ponce present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:30 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 2, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Monday, December 2, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Fred J. Fowler, William L. Smith, and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken and David Hindman of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Itzhak Gartenberg, Andrew Shannahan, and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Matthew Goren and Stephen Karotkin of Weil, Gotshal & Manges LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Joshua M. Mester of Jones Day, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed recent discussions that the Companies and certain of the Corporation's shareholders have had with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire; and potential terms of such a

[1] [redacted]

settlement. The representatives of Knighthead, who had participated as representatives of the Corporation's shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, Mr. Shannahan, and Mr. Wagner left the meeting at this point.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 2, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Monday, December 2, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Fred J. Fowler, William L. Smith, and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken and David Hindman of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Itzhak Gartenberg, Andrew Shannahan, and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Matthew Goren and Stephen Karotkin of Weil, Gotshal & Manges LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Joshua M. Mester of Jones Day, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed recent discussions that the Companies and certain of the Corporation's shareholders have had with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire; and potential terms of such a

[1] [redacted]

settlement. The representatives of Knighthead, who had participated as representatives of the Corporation's shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, Mr. Shannahan, and Mr. Wagner left the meeting at this point.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 4, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Wednesday, December 4, 2019, at 3:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, and Andrew M. Vesey attended by telephone, as permitted by the Utility's Bylaws. Directors Alejandro D. Wolff and John M. Woolard were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Timothy G. Cameron, C. Daniel Haaren, and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Itzhak Gartenberg and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed the status of discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire. The representatives of Knighthead, who had participated as representatives of the Corporation's

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shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

At this point, Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting. Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kevin J. Orsini of Cravath and Eli Silverman of Lazard joined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:35 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 4, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Wednesday, December 4, 2019, at 3:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and William L. Smith attended by telephone, as permitted by the Corporation's Bylaws. Directors Alejandro D. Wolff and John M. Woolard were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Timothy G. Cameron, C. Daniel Haaren, and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Itzhak Gartenberg and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed the status of discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire. The representatives of Knighthead, who had participated as representatives of the Corporation's

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shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

At this point, Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting. Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kevin J. Orsini of Cravath and Eli Silverman of Lazard joined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:35 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 5, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, December 5, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors William L. Smith and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with John R. Boken of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Itzhak Gartenberg of Knighthead Capital Management LLC (Knighthead), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Simon, Mr. Hall, Mr. Karotkin, Thomas A. Wagner (who joined the meeting during the discussion), and Mr. Weissmann led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. This included a discussion of certain materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed key terms of a proposed settlement with the Tort Claimants Committee, certain attorneys representing individual wildfire claimants, and certain of the

[1] [redacted]

Corporation's shareholders to resolve prepetition non-subrogation claims related to the 2017 and 2018 wildfires, the 2015 Butte fire, and the 2016 Ghost Ship fire; the timeframe for entering into a Restructuring Support Agreement with the parties to the settlement; and next steps. The directors asked questions, and a discussion ensued.

Thomas A. Wagner of Knighthead joined the meeting during the foregoing discussion. In the foregoing discussion, Mr. Wagner, who had participated as a representative of the Corporation's shareholders in certain of the discussions with representatives of the Tort Claimants Committees and other parties regarding the proposed settlement, was invited to provide the Board with his perspective on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board adopted a resolution authorizing the execution of a Restructuring Support Agreement with the parties to the settlement (see Resolution 1 in Attachment A).

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

BE IT RESOLVED that that the officers of the Utility be, and each of them hereby is, authorized, empowered, and directed, by and on behalf of the Utility, (1) to execute and deliver the Restructuring Support Agreement by and among the Companies, the Tort Claimants Committee, certain attorneys for fire victims, and certain of the Corporation's shareholders, in substantially the form presented to the Board, and (2) to perform all such acts and things, to execute, file, deliver or record in the name and on behalf of the Utility, all such certificates, instruments, agreements, or other documents, and to make all such payments as they, in their judgment, or in the judgment of any one or more of them, may deem necessary, advisable, or appropriate in order to carry out the purpose and intent of this resolution and/or all of the transactions contemplated therein or thereby, the authorization therefor to be conclusively evidenced by the taking of such action or the execution and delivery of such certificates, instruments, agreements, or documents.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 5, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, December 5, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors William L. Smith and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with John R. Boken of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Itzhak Gartenberg of Knighthead Capital Management LLC (Knighthead), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Simon, Mr. Hall, Mr. Karotkin, Thomas A. Wagner (who joined the meeting during the discussion), and Mr. Weissmann led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. This included a discussion of certain materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed key terms of a proposed settlement with the Tort Claimants Committee, certain attorneys representing

[1] [redacted]

individual wildfire claimants, and certain of the Corporation's shareholders to resolve prepetition non-subrogation claims related to the 2017 and 2018 wildfires, the 2015 Butte fire, and the 2016 Ghost Ship fire; the timeframe for entering into a Restructuring Support Agreement with the parties to the settlement; and next steps. The directors asked questions, and a discussion ensued.

Thomas A. Wagner of Knighthead joined the meeting during the foregoing discussion. In the foregoing discussion, Mr. Wagner, who had participated as a representative of the Corporation's shareholders in certain of the discussions with representatives of the Tort Claimants Committees and other parties regarding the proposed settlement, was invited to provide the Board with his perspective on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board adopted a resolution authorizing the execution of a Restructuring Support Agreement with the parties to the settlement (see Resolution 1 in Attachment A).

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

BE IT RESOLVED that that the officers of the Corporation be, and each of them hereby is, authorized, empowered, and directed, by and on behalf of the Corporation, (1) to execute and deliver the Restructuring Support Agreement by and among the Companies, the Tort Claimants Committee, certain attorneys for fire victims, and certain of the Corporation's shareholders, in substantially the form presented to the Board, and (2) to perform all such acts and things, to execute, file, deliver or record in the name and on behalf of the Corporation, all such certificates, instruments, agreements, or other documents, and to make all such payments as they, in their judgment, or in the judgment of any one or more of them, may deem necessary, advisable, or appropriate in order to carry out the purpose and intent of this resolution and/or all of the transactions contemplated therein or thereby, the authorization therefor to be conclusively evidenced by the taking of such action or the execution and delivery of such certificates, instruments, agreements, or documents.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 10 and 11, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A regular meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held beginning at 4:50 p.m. on Tuesday, December 10, 2019, at the office of the Utility, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors. The first portion of the meeting was held concurrently with a meeting of the Compliance and Public Policy (CPP) Committee of the PG&E Corporation Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard. Directors Jeffrey L. Bleich, Fred J. Fowler, and Dominique Mielle attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also present at 77 Beale Street at the beginning of the meeting were John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, Linda Y.H. Cheng, Jane K. Yura, Eric Montizambert, and Alejandro Vallejo, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar Consulting Group (NorthStar), Paul C. Curnin, Mario A. Ponce, Sandeep Qusba, and Sara A. Ricciardi of Simpson, Thacher & Bartlett LLP, and Mark R. Filip and Charles J. Kalil II of Kirkland & Ellis LLP (Kirkland).

Quorum present, Ms. Schmidt, Chair of the PG&E Corporation CPP Committee meeting, presided as chair of the concurrent meeting with that committee. Ms. Cheng served as secretary of the meeting.

Mr. Filip and Mr. Kalil presented an update on the Utility's monitorship. They referred to the update that Mr. Filip presented to the Boards of Directors at their meeting on September 11, 2019, and discussed, among other things, the Monitor team's ongoing vegetation management

[1] [redacted]

field inspections; the expected timeframe for issuance of the Monitor's third report; the open dialogue and communications between the Monitor team and PG&E management and employees; the Monitor team's electric distribution infrastructure and asset inspections during 2019 and planned electric infrastructure and asset inspections in 2020; the Monitor team's observations regarding the Utility's recent Public Safety Power Shutoff events and emergency preparedness efforts; and the Monitor team's ongoing evaluation of the Utility's gas transmission integrity management work, data integrity, and compliance and ethics program. The directors asked questions and discussed various aspects of Mr. Filip's and Mr. Kalil's presentation.

Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Giammona, Ms. Kane, Ms. Kay, Mr. Lewis, Ms. Loduca, Mr. Mistry, Mr. Wan, Mr. Welsch, Ms. Cheng, Ms. Yura, Mr. Montizambert, Mr. Vallejo, Ms. Anderson, Mr. Bennett, and Mr. D. Smith were excused from the meeting, and the meeting continued in executive session, with Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present during portions of the executive session meeting.

After the executive session, Ms. Schmidt informed Ms. Cheng that the following discussions took place:

- With Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors discussed the Monitor's team's views and observations regarding various aspects of the Utility's operations and culture. Ms. Mielle, Mr. Filip, and Mr. Kalil then left the meeting.

- With Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

Mr. Mullins and Mr. Qusba left the meeting at this point.

The meeting recessed at 5:35 p.m. and reconvened at 8:45 a.m. on Wednesday, December 11, 2019.

At this point, Mr. Johnson re-entered the meeting, and Ms. Mielle and Mr. Mullins rejoined the meeting by telephone.

Ms. Brownell, Chair of the Board of the Corporation, presided over the remainder of the meeting.

The meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present, (1) Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed later in the meeting, and (2) the directors discussed various matters that would be covered later in the meeting.

The following individuals entered the meeting at this point: Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, and Walter R. Posey, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar, Charles J. Kalil II of Kirkland, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Mr. Posey presented a safety tailboard on working safely near trees. The directors asked questions and discussed various aspects of his presentation.

Mr. Posey left the meeting at this point.

The directors discussed various field visits and safety observations and facility tours that they had attended, as well as the tour of the Diablo Canyon Power Plant that several directors would be attending the following day.

Mr. Wells reviewed the Financial and Business Highlights report for November 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Utility's work to restore service in response to power outages caused by a recent winter storm.

At this point, (1) Ms. Kay, Mr. Mistry, and Mr. Welsch left the meeting, (2) the following individuals entered the meeting: Robert S. Kenney, Peter E. Kenny, and Sumeet Singh, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), and (3) Richard Hall of Cravath joined the meeting by telephone.

Mr. Lewis, Mr. Kenny, and Mr. Singh presented an update on the Utility's Community Wildlife Safety Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the Utility's continuing progress in enhancing its readiness and responsiveness to the threat of potential wildfires across its service territory; the Utility's wildfire risk reduction strategy; 2019 fire ignition trends; the Utility's progress in completing the commitments made in its 2019 Wildfire Safety Plan (WSP); enhanced risk analysis that is being incorporated into the development of the Utility's 2020 Wildfire Mitigation Plan (WMP); and the Utility's activities to minimize the scope, duration, and frequency of future PSPS events. The directors asked questions and discussed, among other matters, the Utility's enhanced vegetation management and system hardening work, the Utility's progress in completing its commitments under the 2019 WSP, and the Utility's 2020 WMP.

Mr. Bleich left the meeting during the foregoing presentation and discussion. Mr. Lewis, Mr. Wan, Mr. Welsch, Mr. Kenney, Mr. Kenny, Mr. Singh, Ms. Anderson, Mr. Bennett, Mr. Kalil, and Mr. D. Smith left the meeting after the presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Brian and Mr. Orsini left the meeting, and Fong Wan, Christopher A. Foster, and Katherine K. Davis entered the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]





[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Sandeep Qusba of Simpson entered the meeting, and Mr. Barrera left the meeting. Mr. Vesey, Mr. Wan, Mr. Foster, and Ms. Davis left the meeting after the discussion.

Ms. Cheng presented consent items relating to (1) the number of directors on the Board, (2) election of an Assistant Corporate Secretary, and (3) approval of minutes, all as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board adopted a resolution fixing the number of authorized directors at 15 (see Resolution 1 in Attachment A).

On motion made and seconded, the Board adopted a resolution electing an Assistant Corporate Secretary (see Resolution 2 in Attachment A).

On motion made and seconded, the Board approved the minutes of the Board meetings held on June 14, 2019, June 20 and 21, 2019, June 27, 2019, July 9, 2019, July 12, 2019, July 16, 2019, July 19, 2019, and July 25, 2019.

In the absence of Mr. Barrera, Chair of the PG&E Corporation Finance Committee, Mr. Wells presented a report on the actions taken and items discussed at the Committee’s meetings on November 15, 2019, November 25, 2019, and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee’s recommendation that the Board concur with the 2020 preliminary operating expense

and capital expenditure budgets contained in the preliminary 2020 Financial Performance Plan, as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board. He referred to materials that had been provided to the directors in advance of the meeting regarding the Butte County Rebuild Program (Program), and stated that management will return to the Finance Committee and the Boards in early 2020 with an updated Program cost estimate and an updated proposal for approval of Program expenditures.

On motion made and seconded, the Board concurred with the preliminary operating expense and capital expenditure budgets contained in the 2020 Financial Performance Plan, as presented.

Ms. Schmidt, Chair of the PG&E Corporation CPP Committee, presented a report on the items discussed at the Committee's meetings on November 25, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she presented the Committee's third quarter 2019 report to the Board on the Utility's progress against its Wildfire Safety Plan.

At this point, Mr. Brian, Mr. Karotkin, Mr. Orsini, and Mr. Weissmann left the meeting, and Mr. Kalil re-entered the meeting.

Mr. Leffell, Chair of the PG&E Corporation Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meeting held earlier in the day, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board (1) appoint (a) William L. Smith to the PG&E Corporation Compensation Committee, the PG&E Corporation Finance Committee, and the PG&E Corporation and Utility Safety and Nuclear Oversight (SNO) Committees, and (b) John M. Woolard to the PG&E Corporation CPP Committee and the PG&E Corporation Nominating and Governance Committee, and (2) amend the Corporate Governance Guidelines to (a) add a new "Expectations for Directors" section, and (b) revise the "Characteristics of Directors" section to add meeting attendance as a consideration for re-nominating

incumbent directors, all as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board appointed Mr. Smith to the SNO Committee, as presented.

On motion made and seconded, the Board approved amendments to the Corporate Governance Guidelines, as presented.

Ms. Moore, Chair of the PG&E Corporation Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 1, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she reported on the Committee's recommendation that the independent members of the Board (1) approve the treatment of 2019 Long-Term Incentive Plan (LTIP) awards for the Utility Chief Executive Officer (CEO) under various post-service and post-change in control scenarios, and (2) delegate authority to the Senior Vice President, Human Resources to implement awards reflecting these terms, as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the independent directors (1) approved the treatment of 2019 LTIP awards for the Utility CEO under various post-service and post-change in control scenarios, and (2) delegated authority to the Senior Vice President, Human Resources to implement awards reflecting these terms, as presented.

Ms. Mielle, Chair of the Audit Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 5, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Campbell, Chair of the SNO Committee, presented a report on the items discussed at the Committee's concurrent meeting with the Audit Committee and the PG&E Corporation Compliance and Public Policy Committee on November 19, 2019 and the SNO Committee's meeting on

December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Hall, Mr. Kalil, Mr. Mesterharm, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present for portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

WHEREAS, on November 12, 2019, Frederick W. Buckman informed this Board of Directors (the "Board") of his intent to resign from the Board and the Board of PG&E Corporation, effective immediately;

WHEREAS, in light of Mr. Buckman's resignation, the Board believes it is in the best interest of this company and its shareholders to fix a new number of directors constituting the Board;

WHEREAS, pursuant to Article II, Section 1 of this company's Bylaws, the number of directors constituting the Board shall be within the limits specified in the Bylaws, fixed from time to time by a resolution duly adopted by the Board; and

WHEREAS, pursuant to Article II, Section 1 of the Bylaws, the number of directors on the Board shall not be less than nine (9) nor more than seventeen (17);

NOW, THEREFORE, BE IT RESOLVED that the exact number of directors of this company shall be fixed at 15.

**Resolution 2**

BE IT RESOLVED that J. Ellen Conti is hereby elected Assistant Corporate Secretary, effective as of December 9, 2019.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 10 and 11, 2019
PG&E CORPORATION

A regular meeting of the Board of Directors of PG&E Corporation (Corporation) was held beginning at 4:50 p.m. on Tuesday, December 10, 2019, at the office of the Corporation, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors. The first portion of the meeting was held concurrently with a meeting of the Compliance and Public Policy (CPP) Committee of the PG&E Corporation Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard. Directors Jeffrey L. Bleich, Fred J. Fowler, and Dominique Mielle attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also present at 77 Beale Street at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, Linda Y.H. Cheng, Jane K. Yura, Eric Montizambert, and Alejandro Vallejo, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar Consulting Group (NorthStar), Paul C. Curnin, Mario A. Ponce, Sandeep Qusba, and Sara A. Ricciardi of Simpson, Thacher & Bartlett LLP, and Mark R. Filip and Charles J. Kalil II of Kirkland & Ellis LLP (Kirkland).

Quorum present, Ms. Schmidt, Chair of the CPP Committee meeting, presided as chair of the concurrent meeting with that committee. Ms. Cheng served as secretary of the meeting.

Mr. Filip and Mr. Kalil presented an update on the Utility's monitorship. They referred to the update that Mr. Filip presented to the Boards of Directors at their meeting on September 11, 2019, and discussed, among other things, the Monitor team's ongoing vegetation management

[1] [redacted]

field inspections; the expected timeframe for issuance of the Monitor's third report; the open dialogue and communications between the Monitor team and PG&E management and employees; the Monitor team's electric distribution infrastructure and asset inspections during 2019 and planned electric infrastructure and asset inspections in 2020; the Monitor team's observations regarding the Utility's recent Public Safety Power Shutoff events and emergency preparedness efforts; and the Monitor team's ongoing evaluation of the Utility's gas transmission integrity management work, data integrity, and compliance and ethics program. The directors asked questions and discussed various aspects of Mr. Filip's and Mr. Kalil's presentation.

Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Giammona, Ms. Kane, Ms. Kay, Mr. Lewis, Ms. Loduca, Mr. Mistry, Mr. Wan, Mr. Welsch, Ms. Cheng, Ms. Yura, Mr. Montizambert, Mr. Vallejo, Ms. Anderson, Mr. Bennett, and Mr. D. Smith were excused from the meeting, and the meeting continued in executive session, with Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present during portions of the executive session meeting.

After the executive session, Ms. Schmidt informed Ms. Cheng that the following discussions took place:

- With Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors discussed the Monitor's team's views and observations regarding various aspects of the Utility's operations and culture. Ms. Mielle, Mr. Filip, and Mr. Kalil then left the meeting.

- With Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

Mr. Mullins and Mr. Qusba left the meeting at this point.

The meeting recessed at 5:35 p.m. and reconvened at 8:45 a.m. on Wednesday, December 11, 2020.

At this point, Mr. Johnson re-entered the meeting, and Ms. Mielle and Mr. Mullins rejoined the meeting by telephone.

The meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present, (1) Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed later in the meeting, and (2) the directors discussed various matters that would be covered later in the meeting.

The following individuals entered the meeting at this point: Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, and Walter R. Posey, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar, Charles J. Kalil II of Kirkland, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Mr. Posey presented a safety tailboard on working safely near trees. The directors asked questions and discussed various aspects of his presentation.

Mr. Posey left the meeting at this point.

The directors discussed various field visits and safety observations and facility tours that they had attended, as well as the tour of the Diablo Canyon Power Plant that several directors would be attending the following day.

Mr. Wells reviewed the Financial and Business Highlights report for November 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Utility's

work to restore service in response to power outages caused by a recent winter storm.

At this point, (1) Ms. Kay, Mr. Mistry, and Mr. Welsch left the meeting, (2) the following individuals entered the meeting: Robert S. Kenney, Peter E. Kenny, and Sumeet Singh, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), and (3) Richard Hall of Cravath joined the meeting by telephone.

Mr. Lewis, Mr. Kenny, and Mr. Singh presented an update on the Utility's Community Wildlife Safety Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the Utility's continuing progress in enhancing its readiness and responsiveness to the threat of potential wildfires across its service territory; the Utility's wildfire risk reduction strategy; 2019 fire ignition trends; the Utility's progress in completing the commitments made in its 2019 Wildfire Safety Plan (WSP); enhanced risk analysis that is being incorporated into the development of the Utility's 2020 Wildfire Mitigation Plan (WMP); and the Utility's activities to minimize the scope, duration, and frequency of future PSPS events. The directors asked questions and discussed, among other matters, the Utility's enhanced vegetation management and system hardening work, the Utility's progress in completing its commitments under the 2019 WSP, and the Utility's 2020 WMP.

Mr. Bleich left the meeting during the foregoing presentation and discussion. Mr. Lewis, Mr. Wan, Mr. Welsch, Mr. Kenney, Mr. Kenny, Mr. Singh, Ms. Anderson, Mr. Bennett, Mr. Kalil, and Mr. D. Smith left the meeting after the presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Brian and Mr. Orsini left the meeting, and Fong Wan, Christopher A. Foster, and Katherine K. Davis entered the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Sandeep Qusba of Simpson entered the meeting, and Mr. Barrera left the meeting. Mr. Vesey, Mr. Wan, Mr. Foster, and Ms. Davis left the meeting after the discussion.

Ms. Cheng presented consent items relating to (1) the number of directors on the Board, (2) election of an Assistant Corporate Secretary, and (3) approval of minutes, all as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board adopted a resolution fixing the number of authorized directors at 14 (see Resolution 1 in Attachment A).

On motion made and seconded, the Board adopted a resolution electing an Assistant Corporate Secretary (see Resolution 2 in Attachment A).

On motion made and seconded, the Board approved the minutes of the Board meetings held on June 14, 2019, June 20 and 21, 2019, June 27, 2019, July 9, 2019, July 12, 2019, July 16, 2019, July 19, 2019, and July 25, 2019.

In the absence of Mr. Barrera, Chair of the Finance Committee, Mr. Wells presented a report on the actions taken and items discussed at the Committee's meetings on November 15, 2019, November 25, 2019, and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board concur with the 2020 preliminary operating expense and capital expenditure budgets contained in the preliminary 2020 Financial Performance Plan, as described in materials that had been provided to directors in advance of the

meeting and that are included in the records of this Board. He referred to materials that had been provided to the directors in advance of the meeting regarding the Butte County Rebuild Program (Program), and stated that management will return to the Finance Committee and the Boards in early 2020 with an updated Program cost estimate and an updated proposal for approval of Program expenditures.

On motion made and seconded, the Board concurred with the preliminary operating expense and capital expenditure budgets contained in the 2020 Financial Performance Plan, as presented.

Ms. Schmidt, Chair of the CPP Committee, presented a report on the items discussed at the Committee's meetings on November 25, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she presented the Committee's third quarter 2019 report to the Board on the Utility's progress against its Wildfire Safety Plan.

At this point, Mr. Brian, Mr. Karotkin, Mr. Orsini, and Mr. Weissmann left the meeting, and Mr. Kalil re-entered the meeting.

Mr. Leffell, Chair of the Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meeting held earlier in the day, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board (1) appoint (a) William L. Smith to the Compensation Committee, the Finance Committee, and the PG&E Corporation and Utility Safety and Nuclear Oversight (SNO) Committees, and (b) John M. Woolard to the CPP Committee and the Nominating and Governance Committee, and (2) amend the Corporate Governance Guidelines to (a) add a new "Expectations for Directors" section, and (b) revise the "Characteristics of Directors" section to add meeting attendance as a consideration for re-nominating incumbent directors, all as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board appointed Mr. Smith to the Compensation Committee, the Finance Committee, and the SNO Committee, and Mr. Woolard to the CPP Committee and the Nominating and Governance Committee, as presented.

On motion made and seconded, the Board approved amendments to the Corporate Governance Guidelines, as presented.

Ms. Moore, Chair of the Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 1, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Mielle, Chair of the Audit Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 5, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Campbell, Chair of the SNO Committee, presented a report on the items discussed at the Committee's concurrent meeting with the Audit Committee and the Compliance and Public Policy Committee on November 19, 2019 and the SNO Committee's meeting on December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Hall, Mr. Kalil, Mr. Mesterharm, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present for portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

WHEREAS, on November 12, 2019, Frederick W. Buckman informed this Board of Directors (the "Board") of his intent to resign from the Board and the Board of Pacific Gas and Electric Company, effective immediately;

WHEREAS, in light of Mr. Buckman's resignation, the Board believes that it is in the best interest of this corporation and its shareholders to fix a new number of directors constituting the Board;

WHEREAS, pursuant to Article II, Section 1 of this corporation's Bylaws, the number of directors constituting the Board shall be within the limits specified in the Corporation's Articles of Incorporation, fixed from time to time by a resolution duly adopted by the Board; and

WHEREAS, pursuant to Article Third, Section 1 of the Articles of Incorporation, the number of directors on the Board shall not be less than eight (8) nor more than fifteen (15);

NOW, THEREFORE, BE IT RESOLVED that the exact number of directors of this corporation shall be fixed at 14.

**Resolution 2**

BE IT RESOLVED that J. Ellen Conti is hereby elected Assistant Corporate Secretary, effective as of December 9, 2019.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 12, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, December 12, 2019, at 10:15 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Jeffrey L. Bleich, Fred J. Fowler, Michael J. Leffell, Eric D. Mullins, and Andrew M. Vesey were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Eileen O. Chan, along with C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP, James A. Mesterharm of AlixPartners, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Chan left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 12, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, December 12, 2019, at 10:15 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Jeffrey L. Bleich, Fred J. Fowler, Michael J. Leffell, and Eric D. Mullins were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Eileen O. Chan, along with C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP, James A. Mesterharm of AlixPartners, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Loduca, with the participation of Mr. Johnson, Mr. Simon, [redacted]

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[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Chan left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 13, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, December 13, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell (who joined during the meeting as noted below), Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, Andrew M. Vesey (who joined during the meeting as noted below), and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Alejandro D. Wolff was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken of AlixPartners, C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Stephen Karotkin of Weil, Gotshal & Manges LLP, Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson), and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Cheryl F. Campbell joined the meeting during the foregoing discussion.

Mr. Bleich, Mr. Leffell, and Ms. Schmidt left the meeting at this point.

The meeting recessed at 10:55 a.m. and reconvened at 3:30 p.m.

The following individuals joined the meeting at this point: directors Eric D. Mullins and Andrew M. Vesey, along with Brad D. Brian of Munger, Tolles & Olson LLP, Gregory Hort of Lazard, James A. Mesterharm of AlixPartners, Kevin J. Orsini of Cravath, and Mario A. Ponce of Simpson.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Jeffrey L. Bleich rejoined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 13, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, December 13, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell (who joined during the meeting as noted below), Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Alejandro D. Wolff was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken of AlixPartners, C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Stephen Karotkin of Weil, Gotshal & Manges LLP, Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson), and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Cheryl F. Campbell joined the meeting during the foregoing discussion.

On motion made and seconded, the Board authorized and directed the officers of the Corporation to negotiate revisions to the equity backstop commitment letters substantially on the terms discussed with the Board.

Mr. Bleich, Mr. Leffell, and Ms. Schmidt left the meeting at this point.

The meeting recessed at 10:55 a.m. and reconvened at 3:30 p.m.

The following individuals joined the meeting at this point: director Eric D. Mullins and Andrew M. Vesey, along with Brad D. Brian of Munger, Tolles & Olson LLP, Gregory Hort of Lazard, James A. Mesterharm of AlixPartners, Kevin J. Orsini of Cravath, and Mario A. Ponce of Simpson.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Jeffrey L. Bleich rejoined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 15, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Sunday, December 15, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle (who joined during the meeting as noted below), Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Dan Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Dominique Mielle joined the meeting during the foregoing discussion.

After the discussion, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Wong, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Ponce and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:50 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 15, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Sunday, December 15, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle (who joined during the meeting as noted below), Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Dan Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[1] 



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Dominique Mielle joined the meeting during the foregoing discussion.

After the discussion, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Wong, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Ponce and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:50 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 19, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, December 19, 2019, at 8:05 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich (who joined during the meeting as noted below), Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director William D. Johnson was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory matters, including the status of (1) the CPUC's cost of capital proceeding, and (2) the settlement agreements relating to the Utility's 2020 General Rate case and the CPUC's investigation relating to the 2017 Northern California wildfires and the 2018 Camp fire.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

David Hindman of AlixPartners joined the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the minutes of the Board meetings held on August 2, 2019, August 6, 2019, August 7, 2019, August 9, 2019, August 12, 2019, August 16, 2019, August 23, 2019, and August 30, 2019.

At this point, (1) Mr. Leffell left the meeting, (2) Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hindman, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Director Jeffrey L. Bleich joined the meeting during the foregoing executive session discussion.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

At this point, (1) the following individuals joined the meeting: Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Jamie L. Martin, and Brooke A. Reilly, along with Mr. Hindman, Mr. Mesterharm, and Patryk Szafranski of AlixPartners, and (2) Mr. Curnin left the meeting.

Mr. Hindman, Mr. Mesterharm, and Mr. Szafranski presented a report on cost savings opportunities, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed guideposts for costs savings opportunities and discussions, the Companies' ongoing spend reduction efforts, the Program Management Office (PMO) process for spend reductions, progress made toward the Companies' 2020 spend reduction target, and proposed spend reduction strategies. The directors asked questions and discussed, among other matters, the PMO process, various spend reduction categories and initiatives, and potential focus areas for future discussion with the Board.

Mr. Mullins and Mr. Woolard left the meeting during the foregoing presentation and discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:35 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 19, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, December 19, 2019, at 8:05 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich (who joined during the meeting as noted below), Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director William D. Johnson was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory matters, including the status of (1) the CPUC's cost of capital proceeding, and (2) the settlement agreements relating to the Utility's 2020 General Rate case and the CPUC's investigation relating to the 2017 Northern California wildfires and the 2018 Camp fire.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

David Hindman of AlixPartners joined the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the minutes of the Board meetings held on August 2, 2019, August 6, 2019, August 7, 2019, August 9, 2019, August 12, 2019, August 16, 2019, August 23, 2019, and August 30, 2019.

At this point, (1) Mr. Leffell left the meeting, (2) Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hindman, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Director Jeffrey L. Bleich joined the meeting during the foregoing executive session discussion.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

At this point, (1) the following individuals joined the meeting: Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Jamie L. Martin, and Brooke A. Reilly, along with Mr. Hindman, Mr. Mesterharm, and Patryk Szafranski of AlixPartners, and (2) Mr. Curnin left the meeting.

Mr. Hindman, Mr. Mesterharm, and Mr. Szafranski presented a report on cost savings opportunities, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed guideposts for costs savings opportunities and discussions, the Companies' ongoing spend reduction efforts, the Program Management Office (PMO) process for spend reductions, progress made toward the Companies' 2020 spend reduction target, and proposed spend reduction strategies. The directors asked questions and discussed, among other matters, the PMO process, various spend reduction categories and initiatives, and potential focus areas for future discussion with the Board.

Mr. Mullins and Mr. Woolard left the meeting during the foregoing presentation and discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:35 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 30, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Monday, December 30, 2019, at 3:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, William Smith, Andrew M. Vesey, Alejandro D. Wolff, and John Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Jeffrey L. Bleich, William D. Johnson, and Kristine M. Schmidt were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng and William V. Manheim, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) Ms. Brownell, Ms. Campbell, Mr. Vesey, Mr. Hort, and Mr. Mesterharm left the meeting, and (2) Richard Hall of Cravath joined the meeting and later left the meeting.

After the discussion, (1) Mr. Barrera left the meeting, and (2) Mr. Simon, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Manheim, Mr. Brian, Mr. Karotkin, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 30, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Monday, December 30, 2019, at 3:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, William Smith, Alejandro D. Wolff, and John Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Jeffrey L. Bleich, William D. Johnson, and Kristine M. Schmidt were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng and William V. Manheim, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[1] 



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) Ms. Brownell, Ms. Campbell, Mr. Vesey, Mr. Hort, and Mr. Mesterharm left the meeting, and (2) Richard Hall of Cravath joined the meeting and later left the meeting.

After the discussion, (1) Mr. Barrera left the meeting, and (2) Mr. Simon, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Manheim, Mr. Brian, Mr. Karotkin, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:55 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PACIFIC GAS AND ELECTRIC COMPANY

November 19, 2019

A telephonic meeting of the Safety and Nuclear Oversight (SNO) Committee of the Board of Directors of Pacific Gas and Electric Company (Utility) was held at 12:15 p.m. on Tuesday, November 19, 2019. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) SNO Committee, the PG&E Corporation Compliance and Public Policy (CPP) Committee, and the Companies' respective Audit Committees.

SNO Committee members Jeffrey L. Bleich (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, Eric D. Mullins, and Kristine M. Schmidt attended by telephone, as permitted by the Utility's Bylaws. Committee member Nora Mead Brownell was absent.

Also participating by telephone at the beginning of the meeting were directors Richard R. Barrera, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, and Alejandro D. Wolff, as well as Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Janet C. Loduca, Fong Wan, James M. Welsch, Stephen J. Cairns, Linda Y.H. Cheng, David S. Thomason, Wondy S. Lee, Eric Montizambert, James T. Murphy, and Jan A. Nimick, along with Timothy J. Gillam and Jean-Denis Ncho-Oguie of Deloitte & Touche LLP, Charles J. Kalil II of Kirkland & Ellis LLP, and Mario A. Ponce of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Campbell, Chair of the SNO Committees, presided over the concurrent meeting. Ms. Cheng served as secretary of the concurrent meeting.

Mr. Nimick presented a safety tailboard on managing customer satisfaction. The Audit, CPP, and SNO Committee members (Committee Members) asked questions and discussed various aspects of Mr. Nimick's presentation.

Ms. Giammona introduced Mr. Murphy, Senior Director, Corporate Security of the Utility. Mr. Murphy presented a report on corporate security, which included a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the evolving physical security landscape; the Corporate Security

organization’s focus on protecting the Companies’ employees, facilities, and customers; the Companies’ strategies for mitigating security risks, including continued capital investments in technology, automation, and artificial intelligence; the Companies’ physical security risk management program; various physical security metrics; and security engagement during Public Safety Power Shutoff (PSPS) events. The Committee Members asked questions and discussed, among other matters, employee safety during PSPS events, and security and safety protocols for employees working in the field.

Nicholas S. Goldin of Simpson joined the meeting during the foregoing presentation and discussion. After the presentation and discussion, Mr. Murphy left the meeting, and Christine Cowsert, Clifford J. Gleicher, and Lise H. Jordan joined the meeting.

Following an introduction by Ms. Kane, Mr. Gleicher presented a report regarding noncompliance (e.g., notices of violations), which included a discussion with Ms. Jordan and Ms. Cowsert of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. The Committee Members asked questions and discussed, among other matters, compliance programs in the Electric Operations and Gas Operations lines of business.

Mr. Vesey left the meeting during the foregoing presentation and discussion. Mr. Gleicher, Ms. Jordan, and Mr. Kalil left the meeting after the presentation and discussion.

Mr. Welsch presented a report on the results of the World Association of Nuclear Operators’ (WANO) evaluation of the Diablo Canyon Power Plant (Diablo Canyon). This included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the plant’s overall performance rating, areas for improvement identified by WANO, and strengths in practices and accomplishments noted by WANO. The Committee Members asked questions and discussed various aspects of Mr. Welsch’s presentation.

At this point, Christopher A. Pezzola joined the meeting, and Mr. Kalil rejoined the meeting.

Mr. Pezzola presented a report on results of audits performed by Internal Auditing (IA) during the third quarter of 2019, which included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the results of these audits, and the status of work completed with respect to the 2019 IA Work Plan. The Committee Members asked questions and discussed various aspects of Mr. Pezzola's presentation.

Mr. Pezzola left the meeting, and Jamie L. Martin entered the meeting at this point.

Mr. Cairns and Ms. Martin presented a report on contract management and third-party risk management, two of the enterprise risk topics in the Companies' Enterprise and Operational Risk Management (EORM) program. This presentation included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. They described the risk topics and discussed, among other things, risk controls and mitigations. The Committee Members asked questions and discussed, among other matters, the Companies' procurement and contracting processes, actions taken by the Companies to address contract management and third-party risk management issues, and next steps.

SNO Committee member Jeffrey L. Bleich joined the meeting during the foregoing presentation and discussion.

Ms. Martin left the meeting, and Kenneth J. Wells entered the meeting at this point.

Mr. Nimick presented a report on two recent safety incidents: (1) a contractor fatality involving a lineman contractor who drove off a public dirt road at a high elevation while working near Garberville, and (2) an employee significant injury incident resulting from an electrical arc flash. The Committee Members asked questions and discussed the incidents.

Mr. Nimick, Mr. Wells, Mr. Wan, Ms. Cowsert, and Mr. Welsch presented a report on employee safety, which included

a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, they discussed safety as the Companies' top priority, and strategies for improving employee safety. The Committee Members asked questions and discussed, among other matters, employee injury statistics and next steps.

During the foregoing presentation and discussion, Mr. Vesey rejoined the meeting, and Ms. Moore and Mr. Goldin left the meeting.

Mr. Vesey reported on a potential PSPS event that could be initiated during the next several days.

The secretary noted that, in advance of the meeting, the Committee Members had been provided a written report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety.

There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:30 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PG&E CORPORATION

November 19, 2019

A telephonic meeting of the Safety and Nuclear Oversight (SNO) Committee of the Board of Directors of PG&E Corporation (Corporation) was held at 12:15 p.m. on Tuesday, November 19, 2019. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) SNO Committee, the PG&E Corporation Compliance and Public Policy (CPP) Committee, and the Companies' respective Audit Committees.

SNO Committee members Jeffrey L. Bleich (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, Eric D. Mullins, and Kristine M. Schmidt attended by telephone, as permitted by the Corporation's Bylaws. Committee member Nora Mead Brownell was absent.

Also participating by telephone at the beginning of the meeting were directors Richard R. Barrera, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, and Alejandro D. Wolff, as well as Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Janet C. Loduca, Fong Wan, James M. Welsch, Stephen J. Cairns, Linda Y.H. Cheng, David S. Thomason, Wondy S. Lee, Eric Montizambert, James T. Murphy, and Jan A. Nimick, along with Timothy J. Gillam and Jean-Denis Ncho-Oguie of Deloitte & Touche LLP, Charles J. Kalil II of Kirkland & Ellis LLP, and Mario A. Ponce of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Campbell, Chair of the SNO Committees, presided over the concurrent meeting. Ms. Cheng served as secretary of the concurrent meeting.

Mr. Nimick presented a safety tailboard on managing customer satisfaction. The Audit, CPP, and SNO Committee members (Committee Members) asked questions and discussed various aspects of Mr. Nimick's presentation.

Ms. Giammona introduced Mr. Murphy, Senior Director, Corporate Security of the Utility. Mr. Murphy presented a report on corporate security, which included a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the evolving physical security landscape; the Corporate Security

organization’s focus on protecting the Companies’ employees, facilities, and customers; the Companies’ strategies for mitigating security risks, including continued capital investments in technology, automation, and artificial intelligence; the Companies’ physical security risk management program; various physical security metrics; and security engagement during Public Safety Power Shutoff (PSPS) events. The Committee Members asked questions and discussed, among other matters, employee safety during PSPS events, and security and safety protocols for employees working in the field.

Nicholas S. Goldin of Simpson joined the meeting during the foregoing presentation and discussion. After the presentation and discussion, Mr. Murphy left the meeting, and Christine Cowsert, Clifford J. Gleicher, and Lise H. Jordan joined the meeting.

Following an introduction by Ms. Kane, Mr. Gleicher presented a report regarding noncompliance (e.g., notices of violations), which included a discussion with Ms. Jordan and Ms. Cowsert of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. The Committee Members asked questions and discussed, among other matters, compliance programs in the Electric Operations and Gas Operations lines of business.

Mr. Vesey left the meeting during the foregoing presentation and discussion. Mr. Gleicher, Ms. Jordan, and Mr. Kalil left the meeting after the presentation and discussion.

Mr. Welsch presented a report on the results of the World Association of Nuclear Operators’ (WANO) evaluation of the Diablo Canyon Power Plant (Diablo Canyon). This included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the plant’s overall performance rating, areas for improvement identified by WANO, and strengths in practices and accomplishments noted by WANO. The Committee Members asked questions and discussed various aspects of Mr. Welsch’s presentation.

At this point, Christopher A. Pezzola joined the meeting, and Mr. Kalil rejoined the meeting.

Mr. Pezzola presented a report on results of audits performed by Internal Auditing (IA) during the third quarter of 2019, which included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the results of these audits, and the status of work completed with respect to the 2019 IA Work Plan. The Committee Members asked questions and discussed various aspects of Mr. Pezzola's presentation.

Mr. Pezzola left the meeting, and Jamie L. Martin entered the meeting at this point.

Mr. Cairns and Ms. Martin presented a report on contract management and third-party risk management, two of the enterprise risk topics in the Companies' Enterprise and Operational Risk Management (EORM) program. This presentation included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. They described the risk topics and discussed, among other things, risk controls and mitigations. The Committee Members asked questions and discussed, among other matters, the Companies' procurement and contracting processes, actions taken by the Companies to address contract management and third-party risk management issues, and next steps.

SNO Committee member Jeffrey L. Bleich joined the meeting during the foregoing presentation and discussion.

Ms. Martin left the meeting, and Kenneth J. Wells entered the meeting at this point.

Mr. Nimick presented a report on two recent safety incidents: (1) a contractor fatality involving a lineman contractor who drove off a public dirt road at a high elevation while working near Garberville, and (2) an employee significant injury incident resulting from an electrical arc flash. The Committee Members asked questions and discussed the incidents.

Mr. Nimick, Mr. Wells, Mr. Wan, Ms. Cowsert, and Mr. Welsch presented a report on employee safety, which included

a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, they discussed safety as the Companies' top priority, and strategies for improving employee safety. The Committee Members asked questions and discussed, among other matters, employee injury statistics and next steps.

During the foregoing presentation and discussion, Mr. Vesey rejoined the meeting, and Ms. Moore and Mr. Goldin left the meeting.

Mr. Vesey reported on a potential PSPS event that could be initiated during the next several days.

The secretary noted that, in advance of the meeting, the Committee Members had been provided a written report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety.

There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:30 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PACIFIC GAS AND ELECTRIC COMPANY

December 10, 2019

A regular meeting of the Safety and Nuclear Oversight (SNO) Committee of the Board of Directors of Pacific Gas and Electric Company (Utility) was held at 12:40 p.m. on Tuesday, December 10, 2019, at the office of the Utility, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the PG&E Corporation(Corporation and, together with the Utility, the Companies) SNO Committee.

Present at 77 Beale Street were Committee members Nora Mead Brownell, Cheryl F. Campbell, Eric D. Mullins, and Kristine M. Schmidt. Committee member Jeffrey L. Bleich attended by telephone, as permitted by the Utility's Bylaws. Committee member Fred J. Fowler was absent.

Also present at 77 Beale Street at the beginning of the meeting were directors Richard R. Barrera, Michael J. Leffell, Meridee A. Moore, Kristine M. Schmidt, Alejandro D. Wolff, and John M. Woolard, as well as William D. Johnson, Andrew M. Vesey, John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Fong Wan, James M. Welsch, Stephen J. Cairns, Linda Y.H. Cheng, Christine Cowsert, Jane K. Yura, and Jan A. Nimick, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar Consulting Group. Also participating by telephone at the beginning of the meeting was Sydney Schneider of Kirkland & Ellis LLP.

Quorum present, Ms. Campbell presided over the meeting. Ms. Cheng served as secretary of the meeting.

Mr. Nimick presented a safety tailboard on flooding and high water hazards. The Committee members asked questions and discussed various aspects of his presentation.

Mr. Nimick then presented a report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety. The presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of the Committee. The Committee members asked questions and discussed, among other

matters, the Companies' 2019 year-to-date performance on various safety metrics.

Mr. Barrera left the meeting during the foregoing presentation and discussion. Sumeet Singh and Mark Quinlan entered the meeting after the presentation and discussion.

Ms. Cowsert presented a report on wildfire considerations in the Utility's gas operations, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, she discussed the Gas Operations organization's risk management activities related to both the likelihood of gas assets starting a wildfire and the consequences of a wildfire impacting gas assets. The Committee members asked questions and discussed various aspects of Ms. Cowsert's presentation.

Ms. Cowsert left the meeting, and Martin Strasburger, along with Gary L. Parkey of the Diablo Canyon Power Plant's (Diablo Canyon) Nuclear Safety and Oversight Committee (NSOC), entered the meeting at this point.

Mr. Quinlan referred to the Public Safety Power Shutoff (PSPS) events executed by the Utility in October and November 2019, and presented a post-event review. This included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed how the Utility scopes PSPS events to minimize customer impact, instances of weather-related damage and hazards that were found in post-PSPS inspections, lessons learned and areas for improvement, and feedback received from external agencies. The Committee members asked questions and discussed, among other matters, weather-related damage and hazard findings, and positive feedback received from the California Department of Forestry and Fire Protection.

Mr. Quinlan left the meeting at this point.

Mr. Parkey, Chair of the NSOC, presented a briefing on the NSOC's activities, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed Diablo Canyon's

positive attributes, NSOC 2019 Executive Summary items, and 2020 NSOC focus areas. The Committee members asked questions and discussed various aspects of Mr. Parkey's presentation.

Mr. Welsch presented a report on nuclear generation and power generation operations, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed Diablo Canyon's and the Power Generation organization's respective year-to-date safety performance, and the Utility's actions to mitigate risks associated with dam safety. The Committee members asked questions and discussed various aspects of Mr. Welsch's presentation. Ms. Campbell noted that she and several other directors would be touring Diablo Canyon later in the week.

Mr. Parkey left the meeting, and Christopher P. Benjamin entered the meeting at this point.

Mr. Strasburger presented an update on the Companies' cybersecurity program, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Mr. Cairns noted that cyber attack is one of the enterprise risk topics in the Companies' Enterprise and Operational Risk Management (EORM) program. Among other things, Mr. Strasburger discussed actions taken by the Companies in response to the evolving cybersecurity risk landscape, the Companies' risk mitigation priorities, and the Companies' cybersecurity capabilities. The Committee members asked questions and discussed various aspects of Mr. Strasburger's presentation.

Mr. Strasburger left the meeting, and Jessica C. Hogle joined the meeting by telephone at this point.

Ms. Hogle and Mr. Benjamin presented a report on risk management activities associated with climate change/climate resilience, one of the key enterprise risk topics in the Companies' EORM program. This presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. They described the risk topic, and discussed, among other things, impacts on various enterprise

risks, and risk mitigations. The Committee members asked questions and discussed various aspects of Ms. Hogle's and Mr. Benjamin's presentation.

Ms. Hogle and Mr. Benjamin left the meeting at this point.

Mr. Singh presented a report on risk management activities associated with wildfire risk, one of the key enterprise risks addressed in the Companies' EORM program. This presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. He described the risk, and discussed, among other things, risk drivers and risk mitigations, including various programs and activities under the Utility's Community Wildfire Safety Program. The Committee members asked questions and discussed, among other matters, the Utility's wildfire mitigation activities, including the PSPS program and enhanced vegetation management work.

Mr. Singh left the meeting at this point.

Ms. Campbell referred to the materials provided to the Committee members prior to the meeting relating to risk management activities associated with motor vehicle safety incidents, and stated that the presentation on this topic would be deferred to a future meeting.

On motion made and seconded, the minutes of the meetings of the Committee held on June 20, 2019, July 16, 2019, August 20, 2019, and September 10, 2019 were approved.

The secretary noted that, in advance of the meeting, the Committee members had been provided the following written materials: (1) a summary of significant changes in laws and regulations affecting safety and operational performance, (2) Internal Auditing's proposed 2020 Audit Plan, and (3) the SNO Committees' 2020 work plan.

There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:55 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PG&E CORPORATION

December 10, 2019

A regular meeting of the Safety and Nuclear Oversight (SNO) Committee of the Board of Directors of PG&E Corporation (Corporation) was held at 12:40 p.m. on Tuesday, December 10, 2019, at the office of the Corporation, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) SNO Committee.

Present at 77 Beale Street were Committee members Nora Mead Brownell, Cheryl F. Campbell, Eric D. Mullins, and Kristine M. Schmidt. Committee member Jeffrey L. Bleich attended by telephone, as permitted by the Corporation's Bylaws. Committee member Fred J. Fowler was absent.

Also present at 77 Beale Street at the beginning of the meeting were directors Richard R. Barrera, Michael J. Leffell, Meridee A. Moore, Kristine M. Schmidt, Alejandro D. Wolff, and John M. Woolard, as well as William D. Johnson, Andrew M. Vesey, John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Fong Wan, James M. Welsch, Stephen J. Cairns, Linda Y.H. Cheng, Christine Cowsert, Jane K. Yura, and Jan A. Nimick, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar Consulting Group. Also participating by telephone at the beginning of the meeting was Sydney Schneider of Kirkland & Ellis LLP.

Quorum present, Ms. Campbell presided over the meeting. Ms. Cheng served as secretary of the meeting.

Mr. Nimick presented a safety tailboard on flooding and high water hazards. The Committee members asked questions and discussed various aspects of his presentation.

Mr. Nimick then presented a report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety. The presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of the Committee. The Committee members asked questions and discussed, among other

matters, the Companies' 2019 year-to-date performance on various safety metrics.

Mr. Barrera left the meeting during the foregoing presentation and discussion. Sumeet Singh and Mark Quinlan entered the meeting after the presentation and discussion.

Ms. Cowsert presented a report on wildfire considerations in the Utility's gas operations, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, she discussed the Gas Operations organization's risk management activities related to both the likelihood of gas assets starting a wildfire and the consequences of a wildfire impacting gas assets. The Committee members asked questions and discussed various aspects of Ms. Cowsert's presentation.

Ms. Cowsert left the meeting, and Martin Strasburger, along with Gary L. Parkey of the Diablo Canyon Power Plant's (Diablo Canyon) Nuclear Safety and Oversight Committee (NSOC), entered the meeting at this point.

Mr. Quinlan referred to the Public Safety Power Shutoff (PSPS) events executed by the Utility in October and November 2019, and presented a post-event review. This included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed how the Utility scopes PSPS events to minimize customer impact, instances of weather-related damage and hazards that were found in post-PSPS inspections, lessons learned and areas for improvement, and feedback received from external agencies. The Committee members asked questions and discussed, among other matters, weather-related damage and hazard findings, and positive feedback received from the California Department of Forestry and Fire Protection.

Mr. Quinlan left the meeting at this point.

Mr. Parkey, Chair of the NSOC, presented a briefing on the NSOC's activities, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed Diablo Canyon's

positive attributes, NSOC 2019 Executive Summary items, and 2020 NSOC focus areas. The Committee members asked questions and discussed various aspects of Mr. Parkey's presentation.

Mr. Welsch presented a report on nuclear generation and power generation operations, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed Diablo Canyon's and the Power Generation organization's respective year-to-date safety performance, and the Utility's actions to mitigate risks associated with dam safety. The Committee members asked questions and discussed various aspects of Mr. Welsch's presentation. Ms. Campbell noted that she and several other directors would be touring Diablo Canyon later in the week.

Mr. Parkey left the meeting, and Christopher P. Benjamin entered the meeting at this point.

Mr. Strasburger presented an update on the Companies' cybersecurity program, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Mr. Cairns noted that cyber attack is one of the enterprise risk topics in the Companies' Enterprise and Operational Risk Management (EORM) program. Among other things, Mr. Strasburger discussed actions taken by the Companies in response to the evolving cybersecurity risk landscape, the Companies' risk mitigation priorities, and the Companies' cybersecurity capabilities. The Committee members asked questions and discussed various aspects of Mr. Strasburger's presentation.

Mr. Strasburger left the meeting, and Jessica C. Hogle joined the meeting by telephone at this point.

Ms. Hogle and Mr. Benjamin presented a report on risk management activities associated with climate change/climate resilience, one of the key enterprise risk topics in the Companies' EORM program. This presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. They described the risk topic, and discussed, among other things, impacts on various enterprise

risks, and risk mitigations. The Committee members asked questions and discussed various aspects of Ms. Hogle's and Mr. Benjamin's presentation.

Ms. Hogle and Mr. Benjamin left the meeting at this point.

Mr. Singh presented a report on risk management activities associated with wildfire risk, one of the key enterprise risks addressed in the Companies' EORM program. This presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. He described the risk, and discussed, among other things, risk drivers and risk mitigations, including various programs and activities under the Utility's Community Wildfire Safety Program. The Committee members asked questions and discussed, among other matters, the Utility's wildfire mitigation activities, including the PSPS program and enhanced vegetation management work.

Mr. Singh left the meeting at this point.

Ms. Campbell referred to the materials provided to the Committee members prior to the meeting relating to risk management activities associated with motor vehicle safety incidents, and stated that the presentation on this topic would be deferred to a future meeting.

On motion made and seconded, the minutes of the meetings of the Committee held on June 20, 2019, July 16, 2019, August 20, 2019, and September 10, 2019 were approved.

The secretary noted that, in advance of the meeting, the Committee members had been provided the following written materials: (1) a summary of significant changes in laws and regulations affecting safety and operational performance, (2) Internal Auditing's proposed 2020 Audit Plan, and (3) the SNO Committees' 2020 work plan.

There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:55 p.m.

LINDA Y.H. CHENG
Secretary

# Attachment C

# Safety and Nuclear Oversight Committee

## RESOLUTION OF THE BOARD OF DIRECTORS OF PACIFIC GAS AND ELECTRIC COMPANY
## July 1, 2020

WHEREAS, in connection with the settlement resolving the consolidated shareholder derivative litigation seeking recovery on behalf of PG&E Corporation (the "Corporation") and Pacific Gas and Electric Company (the "Utility") (together, the "Companies" or "PG&E") for alleged breaches of fiduciary duty by certain current and former officers and directors, the Companies agreed to implement certain corporate governance therapeutics, including therapeutics relating to establishment of safety oversight committees of the Companies' respective Boards of Directors; and

WHEREAS, in testimony and briefing submitted in connection with the California Public Utilities Commission's ("CPUC") Order Instituting Investigation regarding the Utility's proposed Plan of Reorganization ("POR") filed pursuant to Chapter 11 of title 11 of the United States Code ("Chapter 11"), the Corporation stated its intent to implement certain governance matters, including certain matters relating to this Committee; and

WHEREAS, in Decision 20-05-053, the CPUC required, as a condition of its approval of the POR, that PG&E implement its proposal to create the positions of Chief Risk Officer and Chief Safety Officer reporting to the Safety and Nuclear Oversight Committee

NOW, THEREFORE, BE IT RESOLVED that, the Board reaffirms the establishment of the Safety and Nuclear Oversight Committee, to consist of at least three directors, one of whom shall be appointed as the Committee's chair; and

BE IT FURTHER RESOLVED that all members of the Safety and Nuclear Oversight Committee shall satisfy independence and qualification criteria established by this Board of Directors (as set forth in this corporation's Corporate Governance Guidelines), shall be "independent" as defined by standards established by any stock exchange on which securities of this corporation or the Utility are traded, and shall satisfy one or more of the following safety expertise criteria:

1. Specific substantial expertise related to wildfire safety, wildfire prevention, and/or wildfire mitigation;

2. Specific substantial expertise related to the safe operation of a natural gas distribution company;

3. Specific substantial expertise related to enterprise risk management, including cyber security, and/or experience with nuclear safety; and

BE IT FURTHER RESOLVED that the basic responsibility of the Safety and Nuclear Oversight Committee shall be to advise and assist this Board of Directors with respect to the oversight and review of (i) policies, practices, goals, issues, risks, and compliance relating to safety (including public and employee safety), and compliance issues related to PG&E's nuclear, generation, gas and electric transmission, and gas and electric distribution operations and facilities ("Operations and Facilities"), (ii) significant operational performance and other compliance issues related to such Operations and Facilities, and (iii) risk management policies and practices related to such Operations and Facilities. This role is one of oversight and in no way alters management's authority, responsibility, or accountability. More specifically, with respect to such Operations and Facilities, the Committee shall, among other things:

1. Review significant policies and issues related to safety, operational performance, and compliance.

2. Review and provide oversight of the Utility's wildfire mitigation plan, other natural disaster mitigation activities, and related investments

3. Review and provide oversight of the Utility's Public Safety Power Shutoff ("PSPS") program and related investments, including:

(a) the Utility's commitment to narrow the scope of PSPS events, including through the deployment and utilization of sectionalizing devices, weather stations, and microgrids; and

(b) the Utility's commitment to improve its execution of any necessary PSPS events, including by reinforcing the Utility's website and call centers, improving the quality and accessibility of outage maps, strengthening coordination with government agencies, promoting customer options, improving outreach to vulnerable customers, and improving the effectiveness of the Utility's Emergency Operations Center.

4. Review with management, including the Chief Risk Officer, the principal risks related to or arising out of PG&E's Operations and Facilities (including risks that are identified through PG&E's enterprise risk management program and that are selected in consultation with this Board of Directors and its committees, as applicable), and assess the effectiveness of PG&E's programs to manage or mitigate such risks, including with respect to:

(a) the safe and reliable operation of any nuclear facilities owned by PG&E;

(b) integrity management programs for PG&E's gas operations and facilities; and

(c) asset management programs for PG&E's electric operations and facilities.

5. Review and discuss how PG&E can continue to improve its safety practices and operational performance.

6. Review and discuss the results of PG&E's goals, programs, policies, and practices with respect to promoting a strong safety culture.

7. Review the impact of significant changes in law and regulations affecting safety and operational performance.

8. Advise this corporation's Compensation Committee on appropriate safety and operational goals to be included in PG&E's executive compensation programs and plans.

9. Oversee PG&E compliance with any safety and operational metrics developed and approved by the CPUC (the "Safety and Operational Metrics").

10. Meet at least six times per year. Such meetings shall include at least semiannual joint meetings with the Utility's Safety and Nuclear Oversight Committee, this corporation's Audit Committee, the Utility's Audit Committee, and the corporation's Compliance and Public Policy Committee to discuss PG&E's compliance program and any other topics agreed upon by those committees.

11. (a) Review the adequacy and direction of PG&E's corporate safety functions, including the appointment and replacement of any chief safety officer of this corporation (or any officer who is similarly given direct responsibility for overseeing enterprise-wide safety matters at the corporation) (the "Chief Safety Officer"), (b) review with the Chief Safety Officer the responsibilities, budget, and staffing of the corporation's safety function, (c) periodically review PG&E's corporate safety and health functions, goals, and objectives represented in PG&E's five-year planning process, and (d) periodically review

reports provided to management by the Chief Safety Officer and any chief safety officer of the Utility (or any officer who has direct responsibility for overseeing safety matters at the Utility).

12. Serve as a channel of communication between the Chief Safety Officer and the Chief Risk Officer, on the one hand, and this Board of Directors, on the other hand.

13. Meet separately with the Chief Safety Officer, and also with the Chief Risk Officer, from time to time, at the discretion of the Chair of the Committee.

14. Report regularly (and at least semiannually) to this Board of Directors on deliberations and actions taken by the Committee, and issues considered and addressed as part of the Committee's oversight responsibilities, including, when appropriate, detailed recommendations based on the Committee's review of the Utility's expenditures, protocols, and procedures with respect to the Committee's oversight of the Utility's wildfire mitigation plan, PSPS program, and related investments, and the Utility's compliance with the Safety and Operational Metrics.

15. Track progress against the Utility's Wildfire Safety Improvement Plan, as approved by the CPUC, and reflecting the new terms of the Utility's probation imposed on April 3, 2019 (the "April 2019 Probation") regarding wildfire safety. The Committee is to report in writing to the Board of Directors of the Utility at least quarterly, and also present orally to the Board of Directors of the Utility at least quarterly, that company's progress in meeting the terms of the approved Wildfire Safety Improvement Plan and the terms of the April 2019 Probation and, to the extent there are shortfalls, how the Utility will address the shortfalls.

16. Report periodically to the CPUC staff on the Committee's oversight responsibilities, including, when appropriate, detailed recommendations based on the Committee's review of the Utility's protocols, and procedures with respect to the Committee's oversight of the Utility's wildfire mitigation plan, PSPS program, and related investments, and the Utility's compliance with the Safety and Operational Metrics.

17. Review the Utility's responses to recommendations of the current Independent Safety Oversight Committee, and any additional or future Independent Safety Advisor or Independent Safety Monitor following termination of the current federal probation/monitorship.

BE IT FURTHER RESOLVED that the Committee shall approve the hiring of all executive officers of the Corporation prior to executive officer candidates being presented to the full Board of Directors for approval; and

BE IT FURTHER RESOLVED that the members of the Safety and Nuclear Oversight Committee shall periodically visit PG&E's nuclear and other operating facilities; and

BE IT FURTHER RESOLVED that the Chief Safety Officer shall provide reports to the Safety and Nuclear Oversight Committee, including (1) regular reports regarding the status of PG&E's policies, practices, standards, goals, issues, risks, and compliance relating to safety,

(2) regular reports regarding activities relating to creation and instillation of safety culture at PG&E, (3) regular reports relating to establishment of and performance on safety metrics, including monthly reports regarding key performance metrics relating to workforce safety,

(4) annual reports regarding the overall workforce safety plan; the processes, procedures, and budgets for achieving desired workforce safety metrics; and a plan for monitoring performance and enabling interim actions to modify the plan to improve safety performance as appropriate, and (5) reports on such other topics as may be requested by the Committee; and

BE IT FURTHER RESOLVED that the Chief Risk Officer shall provide reports to the Safety and Nuclear Oversight Committee, including (1) regular reports regarding the status of PG&E's policies, practices, standards, goals, issues, and compliance relating to risks associated with operations and the environment related to public safety, (2) regular reports regarding activities relating to integration of risk management into business strategy, quantification of risk limits, and the development of plans to mitigate risks, (3) annual reports regarding the processes, procedures, and budgets for achieving desired risk mitigation, and (4) reports on such other topics as may be requested by the Committee; and

BE IT FURTHER RESOLVED that the Chief Risk Officer shall provide reports directly to the Committee regarding risk assessment and mitigation activities relating to Operations and Facilities; and

BE IT FURTHER RESOLVED that this corporation's Chief Ethics and Compliance Officer shall regularly provide reports to the Safety and Nuclear Oversight Committee regarding activities relating to establishment of and performance on compliance and ethics metrics related to PG&E's Operations and Facilities; and

BE IT FURTHER RESOLVED that the Safety and Nuclear Oversight Committee also may request reports from any member of senior management of PG&E, that such reports shall be provided within a reasonable time of the request, and that any dispute or unreasonable delay with respect to such a request shall be documented in the Committee's minutes; and

BE IT FURTHER RESOLVED that the Safety and Nuclear Oversight Committee shall be empowered to act independently of other committees of this Board of Directors and shall not be subject to direction or limitation by any other committee of this Board, subject to applicable legal restrictions and stock exchange standards; and

BE IT FURTHER RESOLVED that the Safety and Nuclear Oversight Committee shall fix its own time and place of meetings and shall, by a majority vote of its members, and subject to the California Corporations Code and this corporation's Articles of Incorporation and Bylaws, prescribe its own rules of procedure; and

BE IT FURTHER RESOLVED that the Safety and Nuclear Oversight Committee shall have the right to retain or utilize, at this corporation's expense, the services of such firms or persons, including independent counsel, third-party safety and utility operations experts, or other advisors, as the Committee deems necessary or desirable to assist it in exercising its duties and responsibilities and to provide analysis and assist the Committee with its oversight obligations; and

BE IT FURTHER RESOLVED that the Committee shall have the right to request and receive from this Board of Directors reasonable resources to assist it in exercising its duties and responsibilities, and that such requests, and any failure to provide such requested resources, shall be documented and explained in the minutes of the Committee and this Board; and

BE IT FURTHER RESOLVED that, unless otherwise designated by the Committee, the Corporate Secretary of this corporation, or an Assistant Corporate Secretary, shall serve as secretary to the Safety and Nuclear Oversight Committee; and

BE IT FURTHER RESOLVED that the resolution on this subject adopted by the Board of Directors on April 29, 2020 is hereby superseded.

**Cheryl F. Campbell**

## A. Safety-Specific Education and Training

- Xcel Energy (Denver, CO), 2004 – 2018
  Senior Vice President (2011 – 2018); Vice President—Colorado Operations (2009 – 2011); Director, Asset Strategy (2004 – 2009)
  Participated in a number of safety programs and trainings, including several focused on developing safe workplace practices and behaviors, safety leadership, safety culture, identifying hazards, and behavioral safety in general. Participated in a number of safety meetings annually—including monthly work group safety meetings, quarterly regional safety meetings (with line workers), and annual working foreperson conferences for linepersons and fitters (which discussed safety issues at the line level, understanding risk, and communicating safety concerns with co-workers who are not following safety procedures). Also interacted regularly with safety speakers at these annual conferences, including individuals who had suffered serious injuries from safety incidents in the utility industry. Routinely interacted with and spoke about safety at annual safety kick-off meetings, mid-year safety campaigns, and on regular crew visits in the field.

- Pacific Gas and Electric Company and PG&E Corporation (San Francisco, CA), 2019
  Board Member
  As a member on the Boards of PG&E Corporation and Pacific Gas and Electric Company (together, PG&E), including during the on-boarding process, received general information regarding safety programs and culture at the companies, and received more targeted safety training regarding, among other things, hazards and associated mitigations for field work in connection with PG&E's gas and electric operations and power generation.

- As part of the ongoing training and education provided by PG&E, conducted 7 field visits and facility tours to meet with employees, observe employees and contractors performing work in the field, and tour safety training facilities and operating facilities.

## B. Direct, Supervisorial or Management Level Safety-Specific Work Experience

- Xcel Energy (Denver, CO), 2004 – 2018
  Senior Vice President (2011 – 2018); Vice President—Colorado Operations (2009 – 2011); Director, Asset Strategy (2004 – 2009)
  As Senior Vice President, led the gas business unit across eight states with 2 million customers. Responsible for both employee and public safety. Member of the Executive Safety Team, which met quarterly with the Corporate Safety VP to review and discuss successes as well as continuous improvement for safety overall. Performance metrics in both areas improved significantly during tenure in both the gas unit and enterprise wide.

  Also served as Chair, President and CEO of WestGas InterState, Inc., a FERC-regulated interstate gas pipeline subsidiary of Xcel Energy.

  As VP of Colorado Operations, responsible for gas operations within the state of

Colorado. Began the first in-line inspection (pigging) program at Xcel Energy in Colorado in 2008. Successfully led efforts to develop a distribution asset renewal program, focused on leak prone pipe (cast iron, bare steel, and early polymers)—obtaining support from both senior executives and the Colorado PUC. This program was later rolled into Xcel Energy's Distribution Integrity Management Program (DIMP). Met regularly with field employees—at job sites and service centers—discussing safety and challenges.

As Director of Asset Strategy, led the development of integrity management programs, which are developed to reduce the risk of and improve the safety of key infrastructure. Included developing programs for performing maintenance, hydrostatic pressure testing, well testing, and processes for testing and replacing assets. Also improved record keeping and data processes across a number of areas, including asset data, maintenance records, and inspection information. Developed a data-driven risk management system in partnership with various state public utility commissions to assess risk, and set acceptable risk levels. Was a member of the Executive Safety Team from 2011 to retirement in 2018. Met quarterly to discuss safety progress, culture change, and safety culture issues. Provided direction to the Corporate Safety department on the effectiveness or specific safety programs. Regularly met with line-level employees and the technical staff, along with the safety leadership team, to discuss current safety issues and potential safety issues. Attended quarterly employee driven safety meetings, where employees would raise safety issues or concerns. Workshopped solutions to quickly implement responses to those concerns together with employees and the safety leadership team.

Worked with the Corporate Vice President for Safety to set annual safety performance targets, review program effectiveness, discuss enterprise-wide as well as gas-specific safety concerns, and identify best practices at peer firms. Also worked closely with the Xcel Energy Board of Directors, particularly the Safety and Operational Committee, to discuss gas asset risks and safety culture, safety management systems, and related topics.

In addition to the regular quarterly meetings on the Safety Executive Team, and quarterly employee-led safety meetings, met monthly with gas leaders across the enterprise from 2012 to 2018 to discuss employee and public safety issues. Focus was on close calls/near misses, incidents where employees had failed to follow safety procedures, safety management systems, and effectively implementing "change management." Began implementation of American Petroleum Institute Recommend Practice 1173, concerning the development of an Enterprise Safety Management System. Completed the initial analysis and stages or implementation during tenure.

- Colorado Interstate Gas Company (Colorado Springs, CO), 1984-2003
  Variety of positions, including Engineer to Director.
  Experience includes design, operations, strategic planning, mid-stream operations, supply management and regulatory (FERC). All leadership positions included responsibility for safety of the employees and public around system infrastructure.

Member of the leadership team during the implementation of one of the first comprehensive In-line Inspection (ILI) programs in the country—now an industry standard.

- Gold Shovel Association (Tempe, AZ), January 2019 to
  February 2020 - Executive Director
  February 2020 to present – Vice Chair of Board of Directors
  for Gold Shovel Association Executive Director
  Lead non-profit organization aimed at reducing damage to underground infrastructure, including, gas, electric, water, and telecommunications infrastructure, during excavations. Companies that participate have seen significant reductions in the damage caused during excavations. Pacific Gas and Electric Company and the City of Sacramento are members of the Association.

**C. <u>Safety-Specific Board of Directors Experience</u>**

- PG&E Corporation and Pacific Gas and Electric Company, 2019 – present.
  Chair of each company's Safety, Nuclear and Operations committee.
  Regularly interface with PG&E's Chief Safety Officer, setting expectations, discussing programs, reviewing metrics.

- American Gas Association Operations Management Committee (Washington, D.C.), 2009 – 2018
  Executive Committee Member, Operations Management Committee Chair (2017)
  Group meets regularly to discuss overall gas operations and safety-specific issues, including public safety, worker safety, and cyber-security. Group consists of senior industry leaders representing about 45 companies across the nation, representing the majority of customers and assets in the gas industry. Participated in meetings in the aftermath of the San Bruno tragedy and other incidents to develop proactive industry positions on improving safety and operations. Also regularly attended annual Executive Safety Summits, focusing on industry hazards, safety management systems, safety culture, interacting with local emergency responders, worker safety, and damage prevention. Participated in the AGA Peer Review program—with Xcel Energy being reviewed in 2015. As part of that commitment/participation, acted as the Executive peer reviewer for ConEd. The program is a one-week intense review of a company's programs around safety and operations, including employee interviews and site visits. At the end of the week, the Executive peer reviewer provides the company with feedback on leading practices as well as opportunities for improvement.

- Department of Transportation Gas Pipeline Advisory Committee (GPAC) (Washington, D.C.), 2014 – 2018
  Member
  The GPAC is an integral part of the process for making changes to the federal safety regulations for gas pipelines. It includes representatives from industry, government and the public. During tenure on the GPAC, the group discussed regulatory updates/changes to a wide variety of safety regulations including pipeline integrity management (transmission and distribution), plastic piping, construction inspection, damage prevention, management of change Operator Qualification, and record keeping. Also discussed and provided guidance on the implementation of congressional mandates passed in the wake of the San Bruno

tragedy. Participated in a task force aimed at reducing barriers to implement pipeline safety management systems (SMS). Worked with industry groups and individual companies to assess SMS adoption and implementation status, and assess impediments to rapid implementation.

- Dynamic Risk (Calgary, Canada), December 2018 – present
  Consultant and Independent Panel Member
  The Massachusetts Department of Utilities retained Dynamic Risk to perform an assessment of the safety and integrity of gas infrastructure within the state of Massachusetts after the Merrimack Valley event in September 2018. As an Independent Review Panel member, reviewed 11 companies—including investor-owned utilities, privately-owned providers, and municipal utilities—including plans and programs, Operations & Maintenance manuals, work procedures, and overall operations. Performed field site visits, discussing processes & procedures, employee safety and public safety with various field crews. Final report complete and available online.
  The Massachusetts Department of Utilities hired Dynamic Risk in fall 2019 to perform a safety assessment of the newly installed facilities due to several identified shortfalls in abandonment and leaks on newly installed assets. Participated and directed work on assessment – final report will be available late June/early July 2020.

## D. Other Previous and Current Board Positions

- Hoffman Southwest (Orange County, CA), 2018 – Present
  Independent Director, Audit Committee Member

- JANA Technology (Toronto, Canada), January 2020 – present. Advisory Board member for privately held company focused on asset risk assessment/prediction and data management. Privately held.

- Colorado Oil & Gas Association (Denver, CO), 2010 – 2018
  Director

- Engineering Advisory Council—College of Engineering, Colorado University, Boulder (Boulder, CO), 2016 – 2018
  Member

- Building Opportunity Through Leadership & Diversity (BOLD) —College of Engineering, Colorado University, Boulder (Boulder, CO), 2012 – 2015
  Advisory Council Member

- Public Education and Business Coalition (PEBC) (Denver, CO), 2010 – 2014
  Member of the Finance Committee

- Junior Achievement of Southern Colorado (Colorado Springs, CO), 1990 – 2002
  Board Member, Member of Strategic Planning Committee

## E. Other Current Professional Commitments

- N/A

**Admiral Mark Ferguson**

## A. Safety-Specific Education and Training

- Qualified as damage control assistant and gas fee engineer, US Navy Firefighting School, Philadelphia, PA (1992).

- Qualified as Landing Signal Officer to oversee shipboard aviation safety for operation of helicopters from vessels at sea (1992).

- Qualified as a nuclear propulsion engineer by US Navy/Department of Energy (1992). Trained in radiological controls, electrical safety and shipboard safety programs incident to the operation and maintenance of naval nuclear power plants. Qualified as engineering officer of the watch for naval nuclear power plants.

## B. Direct, Supervisorial or Management Level Safety-Specific Work Experience

- Damage Control Assistant, USS South Carolina (CGN 37) (1989-1992). Responsible for management of all shipboard firefighting, flooding control, damage control, and fire safety programs for a vessel with crew of over 400 personnel. Certified as the ships' gas free engineer.

- Nuclear Propulsion Engineer, USS South Carolina (CGN-37) (1979-1983). Engineering officer of the watch, supervised the operation of shipboard nuclear power plants.

- Reactor Officer, USS Dwight D. Eisenhower (CVN-69) (1989-1992). Responsible for the safe operation, maintenance, and training and certification of 400 assigned personnel for two nuclear reactors onboard an aircraft carrier.

- Commanding Officer, USS Benfold (DDG 65) (1995-1997). Responsible for operations and the management of all safety programs for a vessel with crew of 300 personnel.

- Commander, Destroyer Squadron 18 (2000-2001). Responsible to certify safe operation and provide oversight of safety programs for six ships and 1500 personnel.

- Co-Chair, US Navy Safety Council (2011-2014). Responsible for safety policy, funding, and management of accident reporting and lost work statistics for the Navy Department and a 320,000 workforce.

- Chair, Nuclear Weapons Council (2011-2014). Responsible for management of physical security and security personnel certification for the Navy's nuclear weapons stockpile.

- Commander, US Naval Forces Europe and Africa (2014-2016). Responsible for physical security of five installations and management of personnel security, operational safety programs and vehicle safety programs for over 10,000 personnel stationed in Europe and Africa.

## C. Safety-Specific Board of Directors Experience

- VSE Corporation, Alexandria VA (2017- Present). As member of audit and governance committees, oversees the VSE industrial safety programs in the refurbishment and repair of military and commercial vehicles, ships and aircraft.

## D. Other Previous and Current Board Positions

- Navy Federal Credit Union, Merrifield, VA (2007-2008). Volunteer official and board member for world's largest credit union, serving members of the armed forces.

- Navy Marine Corps Relief Society, Arlington, VA (2008-2011). Society provides financial assistance, counseling, and in-home nurse care to Navy and Marine Corps service members and their families.

- Center for Naval Analyses, Arlington, VA (2017-Present). Chairman of the audit committee and member of ethics and governance committee for a not-for-profit federally-funded research and development center.

- VSE Corporation, Alexandria, VA (2017-Present). Member of the audit committee, compensation and human resources committee, and governance committee.

## E. Other Current Professional Commitments

- Institute for Defense Analysis: Senior Advisor to the Defense Science Study Group (DSSG). This is a program of education and study that introduces science and engineering professors to the security challenges of the United States. The program is directed by the nonprofit Institute for Defense Analyses (IDA) and is sponsored by the Defense Advanced Research Projects Agency (DARPA).

- MK3 Global LLC: Defense consulting firm that advises on leadership, digital transformation, operational design, and planning of military operations. Evaluates the NATO exercise program with a focus on leader performance. MK3 Global LLC is a service-disabled, veteran-owned small business.

**Craig Fugate**

**A. Safety-Specific Education and Training**

- State of Florida: Certified Paramedic/Firefighter.

**B. Direct, Supervisorial or Management Level Safety-Specific Work Experience**

- Emergency Manager, Alachua County, Fl (1987-1997). Disaster Planning and Response Coordination, included hazardous materials, and the Crystal River Nuclear Power Plant (50 miles Emergency Planning Zone).

- Director, Florida Division of Emergency Management (2001-2017). Oversaw the State's Nuclear Power Plant Exercise Program, Hazardous Material Program, and response to all Governor Declared Disasters as the Governor's Authorized Representative and State Coordinating Officer.

- Administrator, FEMA (2009-2017). Coordinated on behalf of the President response and recovery to all Federally declared disasters.

**C. Safety-Specific Board of Directors Experience**

- N/A.

**D. Other Previous and Current Board Positions**

- America's Public Television Stations.

- At-Large Trustee (2017 – Present).

**E. Other Current Professional Commitments**

- Craig Fugate Consulting LLC.

- One Concern, Chief Emergency Management Office.

- North Florida Amateur Radio Club (Amateur Radio Emergency Services).

**Michael Niggli**[1]

## A. Safety-Specific Education and Training

- As an executive officer and director of several companies, participated in safety education and training for electric, natural gas, water and nuclear facilities. Involved in setting corporate safety metrics, establishing safety reporting procedures, directing the installation of substantial safety related equipment, and implementing new safety protocols designed to improve the level of safe operations for our employees, customers and the general public.

- Safety education and training includes body mechanics, safe work processes, hazardous chemical awareness and handling, the use of radiation measuring devices, cardio-pulmonary resuscitation, electrocution, fire response, hypothermia responses, ignition prevention and emergency communications.

- Merchant Mariners certification (Captain's License) which indicates proficiency in safe operation of small vessels.

## B. Direct, Supervisorial or Management Level Safety-Specific Work Experience

- President & COO, San Diego Gas & Electric Co (2006-2013). Served in various roles including President & COO wherein had responsibility for all electric and gas operations for the Company. This included the safe operation of the electric and gas facilities, safety of employees, contractors, customers and the general public.

- President of Sempra Generation (2001-2006). President of Sempra Energy's international power generation company. This included the development, construction, operation and maintenance of power plants in California, Arizona, Nevada, Texas and the Republic of Mexico. Responsible for safe operation and compliance with all State and National standards for power plant operation.

- Chairman of the Board, CEO, & President of Sierra Pacific Resources & Nevada Power Company (1998-2001). Served in various roles with overall responsibility for operation of these two companies which were independent entities and later merged operations. The companies provided regulated utility service for electric, natural gas and water operations. Safe operation of these facilities and the production of safe drinking water for customers were top priorities.

- San Onofre Nuclear Power Plant; Administrative Committee Representative for SDG&E (approx. 1984-86). Served as the Owner's Representative for administration and operation of the SONGS facility, including reviews of safety protocols, safety protocols and operating performance.

- Following the devastating wildfires in San Diego County in 2007, had the lead responsibility for the company's efforts to enhance the safety and effectiveness of electric facilities, the safety practices of employees, and communication with customers and the general public. Instituted many new programs, processes, safety protocols and innovations over the next half dozen years. These included the first

[1] Appointed to PG&E Corporation but not Pacific Gas and Electric Company SNO Committee, pending receipt from the Federal Energy Regulatory Commission to serve on the Pacific Gas and Electric Company Board.

"Power Safety Power Shutoff" (PSPS) program in the State of California, installation of weather monitoring stations, employment of professional meteorologists, extensive collaboration with state and local firefighting agencies, development of new communications tools and websites for informing the public of the status of service in fire prone areas and the potential for PSPS events, purchase of the world's largest water carrying helicopter for dual use with firefighting and construction activities, the use of "pan, tilt and zoom" cameras mounted on our electric transmission towers and equipped with infrared detection capabilities, advanced vegetation management practices, the prohibition of cell phone use in company vehicles, the "electronic tagging" of our impacted field employees to ensure that we knew of their field location during fire season, the establishment of an "aircraft operations center" to coordinate with local authorities as we constructed major electric facility additions, the mounting of high capacity fiber optic lines on our electric transmission towers for joint use of agencies and universities in our fire prevention efforts, among other initiatives.

**C. <u>Safety-Specific Board of Directors Experience</u>**

- Board of Directors, ESS, Inc. (2015-present).
- Board of Directors, American Transmission Co. (2016-present).
- Board of Directors, ESVAL Water Company (2015-present).
- Board of Directors, ESSBIO Water Company (2015-present).
- While serving on these Boards of Directors, acted as a primary advocate for safe operations, establishment of appropriate safety metrics, contractor safety improvement programs and employee safety improvement.

**D. <u>Other Previous and Current Board Positions</u>**

- ESS Inc. (2018 – Present).
- American Transmission Company (2017 – Present).
- ESVAL (2015 – Present).
- ESSBIO (2015 – Present).
- Sierra Pacific Resources, Chairman of the Board, CEO, President (2000-2001).
- Nevada Power Co., Chairman of the Board, CEO, President (1998-2000).

**E. <u>Other Current Professional Commitments</u>**

- Beyond the current Board assignments, also serves on the Board of Directors of the Great Basin National Park Foundation, a non-profit organization which supports the mission of environmental stewardship, public outreach and interpretation of the resources of the Great Basin National Park.

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## A. Safety-Specific Education and Training

- National Grid (2018) — sponsored Safety Culture workshop on Generative Safety Culture.
- National Grid (2015) — Smith's Driver Training.
- National Grid (2015) — Safety Culture workshop focusing on storm response.
- ADT (2001) — Driver Safety, Safety in the workplace, and ladder safety.

## B. Direct, Supervisorial or Management Level Safety-Specific Work Experience

- National Grid (2015 to 2020) — President of the U.S. business responsible for improving the Safety Culture and for the Safety and Safety Performance for 17,000 employees. Delivered improved safety performance year/year for 5 years.
- SimplexGrinnell (2003 to 2007) — President of the largest Fire Integration business in North America responsible for the safety and safety performance for 12,000 employees.

## C. Safety-Specific Board of Directors Experience

- National Grid — standing member of the global safety committee responsible for the safety and well-being and safety performance for 24,000 employees
- National Grid — Chair of the U.S. safety committee responsible for the safety and wellbeing and safety performance for 17,000 employees
- Albemarle — Non-Executive Director and Chair of the Construction/Capital Committee, a global committee

## D. Other Previous and Current Board Positions

- National Grid U.S. — Chairman of the Board (U.S. business)
- Albemarle, Member of the Audit & Finance Committee (2018 - 2019)
- Albemarle, Member of the Construction/Capital Committee (2018 - 2020)
- Albemarle, Member of the Compensation Committee (2020)

## E. Other Current Professional Commitments

- N/A

# Attachment D

# PACIFIC GAS AND ELECTRIC COMPANY

# CHAPTER 7

# EXECUTIVE COMPENSATION (SCOPING MEMO SECTION 3.1)

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 7
EXECUTIVE COMPENSATION (SCOPING MEMO SECTION 3.1)

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# PACIFIC GAS AND ELECTRIC COMPANY
# CHAPTER 7
# EXECUTIVE COMPENSATION (SCOPING MEMO SECTION 3.1)

## A. Executive Summary

- Consistent with best practices and Assembly Bill (AB) 1054, a majority of the compensation for senior executives of Pacific Gas and Electric Company (the Utility, and together with PG&E Corporation, PG&E) will, upon emergence from Chapter 11, be at risk.
- PG&E's Short-Term Incentive Plan (STIP) will use objective, verifiable, and auditable performance metrics weighted predominantly to customer and workforce welfare, and within that category, primarily to wildfire safety and other public and employee safety metrics. This executive compensation design will lead the industry in its focus on safety.
- PG&E's Long-Term Incentive Plan (LTIP) upon emergence also will use objective, verifiable, and auditable performance metrics tied to customer welfare, and within that category, primarily wildfire safety and Public Safety Power Shutoff (PSPS) related safety. LTIP awards will consist of equity-based long-term compensation, which will meet the three-year holding requirement of AB 1054.
- For both the STIP and the LTIP, risk-related performance metrics will be informed by PG&E's Enterprise and Operational Risk Management (EORM) program, which in turn is informed by the California Public Utilities Commission's (Commission) Safety Model Assessment Proceeding (SMAP) and Risk Assessment Mitigation Phase proceeding (RAMP).
- The LTIP's PSPS-related metrics will be informed by the Utility Wildfire Mitigation Maturity Model the Commission is developing in Rulemaking (R.) 18-10-007.
- PG&E's executive compensation structure applicable upon emergence from Chapter 11 will comply with AB 1054, including by:
  - Promoting safety as a priority;
  - Promoting financial stability;
  - Using objective, measurable, and enforceable performance metrics;

- Preserving the discretion of the Utility's Board of Directors and the Compensation Committee of PG&E Corporation's Board of Directors to reduce or eliminate incentive compensation awards;
- Basing the majority of executive compensation on objective performance metrics via the STIP and LTIP, at target levels; and
- Requiring that a significant portion of compensation be equity-based and held for at least three years.

## B. Introduction

My name is John Lowe. I am Senior Director, Total Rewards for PG&E. I lead the Compensation and Benefits functions, which are responsible for design and implementation of PG&E's compensation and benefits programs and practices, including PG&E's executive compensation programs. I joined PG&E in 2012 as Director of Executive Compensation before accepting my current position in June 2016. I have worked in the field of Human Resources for more than 35 years, 25 of which have been specifically focused in the area of compensation. Prior to joining PG&E, I was the Manager of Compensation for Michigan-based energy provider DTE Energy Company, Director of Compensation and Benefits at Holly Automotive Division, Coltec Industries, and spent years consulting on compensation and benefits strategies with The UL Group, Ltd. consulting firm. I hold a Bachelor of Science in Human Resources Management from Oakland University and a Master of Arts in Industrial Relations from Wayne State University.

I understand that AB 1054, as codified in Public Utilities Code § 3292(b)(1)(C), requires the Commission to consider "the reorganization plan and other documents resolving [the Utility's] insolvency proceeding, including [whether the Utility's] resulting governance structure [is] acceptable in light of the [Utility's] safety history, criminal probation, recent financial condition, and other factors deemed relevant by the commission."[1] I further understand that AB 1054, as codified in § 8389(e)(6)(C), provides that "any approved bankruptcy reorganization plan of an electrical corporation should, in regards to compensation for executive officers of the electrical corporation, comply with the requirements of [§ 8389(e)(4) and (e)(6)]." I believe, and I understand that the

[1] All further statutory references are to the Public Utilities Code.

PG&E Corporation Compensation Committee believes, that the executive compensation structure described below, which the Utility intends to have in place upon emergence from Chapter 11, not only meets but exceeds AB 1054's requirements. The Utility hereby formally requests that the Commission approve this executive compensation structure pursuant to §§ 3292(b)(1)(C) and 8389(e).

My testimony below has three parts. First, I provide an overview of key executive compensation principles, including how a well-designed compensation program can align with achievement of a company's goals and objectives (which in PG&E's case include, as the top priority, promoting customer welfare, especially in the area of safety). Second, I describe the background and parameters of the executive compensation structure that the Utility plans to have in place upon its emergence from Chapter 11, focusing in particular on performance-based compensation awardable under PG&E's STIP and LTIP. As I discuss below, these programs will heavily incentivize customer welfare and safety—far more than the compensation programs of utilities historically have—consistent with PG&E's safety priorities. Third and finally, I discuss the ways in which the Utility's overall executive compensation structure that will apply upon emergence will address the requirements of § 8389(e)(4) and (e)(6).

## C. Overview of Executive Compensation Principles

Executive compensation is an important element of attracting and retaining talented leaders, and aligning their compensation with achievement of an organization's objectives. In PG&E's case, this includes safeguarding and improving customer welfare by compensating outcomes that are specifically related to safety culture and performance.

Executive compensation divides into two broad categories: (i) foundational compensation; and (ii) performance-based or incentive compensation (sometimes called "at risk" compensation). The two together are necessary to provide a market-competitive level of compensation.

Foundational compensation provides an executive with a stable foundation of income and other benefits. It includes base salary and certain other items such as health and pension benefits. Performance-based compensation, by contrast, is not guaranteed and serves different purposes. As its name implies, it is designed primarily to align compensation with various kinds of performance or conduct, and thus is contingent on such performance or conduct.

Performance-based compensation can be contingent in one or more of several ways. First, it may be paid only if specified criteria are met. An example would be cash that is paid only if the executive satisfies certain individual performance goals, if the business unit the executive leads achieves stated objectives, or if the company as a whole meets certain milestones. Second, performance-based compensation might be paid without meeting certain performance metrics, but nevertheless remain contingent on performance because its value depends on the performance of the company as a whole. An example would be restricted stock units that vest based on length of service; although such units vest based solely on the passage of time (and thus serve a retention purpose), their value depends on the company's stock price, which in turn depends on the company's performance across a variety of areas (e.g., avoiding catastrophic public safety incidents, operating efficiently, or earning the company's allowed rate of return). Third, performance-based compensation can be contingent for both reasons, i.e., it might be paid only if performance metrics are met, and its value further may depend on performance. An example would be performance shares that are settled/paid only upon achievement of performance metrics, with their value dependent on the stock price and thus dependent on overall company performance.

In April 2017, Willis Towers Watson, an international advisory firm that PG&E uses as a consultant, published a study entitled *Principles and Elements of Effective Executive Compensation Design*.[2] It took into account, among other things, "the views of hundreds of board members across various organizations and industries" and the views expressed during "a series of in-depth workshops to distill the insights and experience of more than 100 … senior EC [executive compensation] consultants."[3] Willis Towers Watson reported that "[w]hile there is little consensus on the specific principles that should guide EC decisions, …

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**2** According to Willis Towers Watson: "[It] is a leading global advisory, broking and solutions company that helps clients around the world turn risk into a path for growth. With roots dating to 1828, Willis Towers Watson has 40,000 employees serving more than 140 countries. [It] design[s] and deliver[s] solutions that manage risk, optimize benefits, cultivate talent, and expand the power of capital to protect and strengthen institutions and individuals." Willis Towers Watson, *Principles and Elements of Effective Executive Compensation Design*, at 51 (Apr. 2017).

**3** *Id.* at 1.

the views of diverse stakeholders have coalesced around a loosely shared point of view on what's right and wrong with pay at the top of the house in major organizations today."[4] Willis Towers Watson's report contains some guideposts for best practices in designing executive compensation programs, including the following:[5]

First, "EC programs should incent and reward the behaviors and processes that reinforce the activities organizations undertake to create sustainable long-term value for multiple stakeholders" (in PG&E's case, customer welfare and safety as the highest priorities).[6] Executive compensation should incentivize management to achieve positive outcomes for shareholders *and other* stakeholders (e.g., in the context of a regulated utility, customers and the public). As Willis Towers Watson explains, "While the creation of value for an organization's shareholders is the overriding imperative for public companies, the creation of value for other stakeholders is an important means to this end."[7]

Second, "[f]or senior executives, a majority of [overall compensation] should be in the form of incentive compensation; [and] a majority of incentive compensation should be in the form of LTIs [long-term incentives]."[8] A well-designed executive compensation structure nevertheless should recognize that "the creation of value needs to be viewed … over multiple time frames in light of short- and long-term outcomes."[9]

Third, "[o]rganizations should carefully evaluate and define the objectives associated with their incentive plans and should align plan features (e.g., vehicle and performance measures) with these objectives."[10] In other words, a

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**4** *Id.* at 2.

**5** I do not discuss all the principles articulated in the Willis Towers Watson report, but only certain principles that the Commission may find most relevant to whether the Utility's executive compensation structure fulfills the criteria of AB 1054.

**6** *Id.* at 8.

**7** *Id.* at 9.

**8** *Id.* at 15.

**9** *Id.* at 8.

**10** *Id.* at 16; see *also id.* ("[O]rganizations should put great[] emphasis on establishing well-conceived objectives and considering their short-term and LTI plans in totality as part of an overall portfolio."); *id.* at 17 ("Performance measures … should be selected in light of the organization's long-term strategy.").

company should have a clear idea of what it wants to incentivize, and should design its compensation vehicles and performance metrics accordingly (while guarding against and mitigating any unintended adverse incentives).

Fourth, a performance-based compensation "strategy should address … the desired targeted reward positioning at varying levels of performance."[11] In other words, a performance-based compensation program should clearly define applicable performance metrics and achievement of those metrics, and specify the financial benefits of achieving them to varying degrees. Implicit in this is the principle that targets must be realistically achievable; if they are perceived as out of reach, they will not have their desired incentive effect. To illustrate, a well-designed incentive program might include: (i) minimum or "threshold" metrics that must be met before any incentive payment is made;[12] (ii) "target" metrics that are more challenging but still reasonably achievable, and that result in higher payouts necessary to provide a market-competitive level of compensation; and (iii) "maximum" metrics that are even more ambitious but still within the realm of possibility, and that result in even higher payouts to provide even greater incentives to achieve desired outcomes.

Fifth, "[d]iscretion is a critical tool," whether used positively or negatively.[13] For example, situations can arise in which performance metrics are met and incentive payments are payable, but the compensation committee or board of directors determines that such payments nevertheless are inappropriate for some reason (e.g., because of a catastrophic public safety incident). Empowering the board or its compensation committee to reduce, eliminate, suspend, or defer incentive programs or payments thereunder (subject to legal restrictions) can be important for ensuring that incentive payments are not made inappropriately under the totality of the circumstances. After the devastating wildfires in 2018, the prior Compensation Committee of the PG&E Corporation

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**11** *Id.* at 10; see *also id.* at 20 ("The thoughtful determination of the incentive plan's targets as well as its performance and payout ranges are critical for the plan's effectiveness."); *id.* at 17 ("The[] measures should be transparent, and plan participants should understand how they can directly influence the outcomes with regard to the measures.").

**12** See *id.* at 20 ("[O]rganizations should establish a reasonable floor or minimum standard below which incentives will not be paid to senior executives … .").

**13** *Id.* at 21.

Board eliminated all 2018 STIP payments that otherwise would have been earned by senior executives.

### D. The Utility's Executive Compensation Structure

PG&E uses the same compensation structure for the executives of both PG&E Corporation and the Utility. PG&E's executive compensation structure that will apply upon emergence from Chapter 11 will differ substantially from the structure PG&E has used in the past. PG&E's revised structure will strongly align compensation with safety *outcomes*—much more than PG&E and other utilities historically have. This is consistent with customer and workforce welfare and safety being PG&E's highest priorities and the foundations of its future success.

PG&E has developed its new executive compensation design through a robust process. Briefly, its executive compensation professionals, including myself and others, developed recommended program features, such as the overall mix of compensation (including foundational versus performance-based compensation, and within performance-based, different types of awards such as cash incentive payments and performance shares). We worked with senior leaders and the operating units to identify the applicable categories of performance metrics, relative weightings of the metrics in calculating awards, how achievement of the metrics will be evaluated and measured, and so forth. We also worked with Willis Towers Watson, which as noted above is a recognized leader in executive compensation design.

The PG&E Corporation Compensation Committee played an integral role in the process. The Committee currently is comprised of independent directors Meridee A. Moore (the Chair), William L. Smith, and Alejandro D. Wolff, all of whom joined the PG&E Boards in 2019 with significant operating, compensation, and board experience. The Committee worked closely with PG&E's senior management, internal executive compensation professionals, and independent consultants through an iterative process to formulate the executive compensation structure that PG&E proposes to apply upon Chapter 11 emergence. This process required the Utility's Chief Executive Officer (CEO) and other senior operating leaders to develop metrics that would push PGE toward its most important safety, reliability, and affordability goals. The Compensation Committee also worked with Pay Governance, the independent

compensation consultant to the Board. Pay Governance is a recognized leader in executive compensation design and governance, utilizing nearly 60 professionals across the United States to work with nearly 400 companies annually. Pay Governance provided overall advice, market data, market insights, and other guidance.

As a result of the foregoing process, PG&E has revamped its short-term and long-term executive compensation incentive programs (the STIP and the LTIP). The process has produced an executive compensation design that PG&E believes will incentivize behaviors that will produce outcomes that will not only meet AB 1054's requirements, but chart a new compensation design path for the industry. PG&E's revised STIP and LTIP largely consist of outcome-based, objectively measurable, risk reduction measures that promote customer and workforce welfare (especially public and employee safety) and financial stability. PG&E's revised STIP and LTIP use metrics that are informed by the risk drivers associated with PG&E's top risks as identified through its EORM program—a quantitative-based risk-reduction program that incorporates learning from the Commission's SMAP and RAMP. To PG&E's knowledge, this approach to executive compensation is unique in the industry.

The following describes the overall executive compensation structure (including foundational compensation, the STIP, and the LTIP) that will apply upon Chapter 11 emergence, as approved by the Compensation Committee and subject to the direction the Commission may provide in its decision in this matter.

**1. Foundational Compensation**

Foundational compensation for executives will consist of base salaries plus a handful of standard items such as health insurance benefits. Certain limited corporate perquisites such as parking and health club memberships, as described in PG&E's 2019 joint proxy statement, also will be provided. Such perquisites are typical in the industry, and align with shareholder and other stakeholder interests by serving a recruiting and retention purpose.

Foundational compensation is expected to comprise only about 36 percent of overall executive compensation at target incentive compensation levels (ranging from 24 percent to 44 percent depending on the individual). Thus, a significant majority of overall compensation will be performance-

based compensation awarded through the STIP and the LTIP. This is consistent with best practices as described above.

### 2. The Short-Term Incentive Plan

The STIP will further the Utility's business objectives—especially customer and workforce welfare and safety—by promoting positive outcomes in line with those objectives, and making corresponding cash payments, on an annual basis (in contrast to the LTIP's longer-term focus). The STIP and the LTIP together are consistent with the best practice described above of using multiple timeframes for payment of incentive compensation. The STIP is expected to comprise about 21 percent of overall executive compensation at target levels (ranging from 18 percent to 21 percent depending on the individual).

The STIP's performance metrics will be weighted 75 percent to customer and workforce welfare, and within that category, predominantly public and employee safety. The STIP's remaining metric will be weighted to financial stability (which depends in significant part on strong safety performance). The STIP's metrics will be almost entirely outcome-based as opposed to activity- or effort-based. The STIP's emphasis on customer and workforce welfare (especially public safety) tied to outcome-based metrics represents industry leadership: Based on our analysis of 19 other utilities, only 20 percent use customer/public safety metrics, and only one uses such a metric that is outcome-based.

PG&E firmly believes that safety is the most important element of its mission of delivering safe, reliable, affordable, and clean electricity and gas services to its customers. PG&E also believes that a focus on customer welfare across all aspects of its business complements its safety culture. For example, with an overly narrow or exclusive focus on safety, PSPS could be routinely implemented—and although that might ensure wildfire safety, it could cause hardships to PG&E's customers, especially its most vulnerable customers. PG&E's mission is and must be to provide service both reliably and safely. As such, PG&E's performance-based compensation structure aligns with customer welfare overall—including safety as its most critical element—but the structure does so without sacrificing reliability and affordability. PG&E's compensation structure, for

example, promotes reducing the incidence and impacts of PSPS, and increasing operational efficiency.[14]

The chart below sets forth the specific metrics applicable under the STIP, their respective weightings, and the extent to which the metrics are outcome-based as opposed to activity- or effort-based. Exhibit 1 hereto sets forth the "threshold," "target," and "maximum" metric achievement milestones for each of these metrics.

| Category | Metric | Outcome-Based |
|---|---|---|
| **Customer Welfare (prioritizing public and employee safety)** **75%** | Electric Operations (25%) | |
| | • Reportable Fire Ignitions (10%) | Y |
| | • Electric Asset Failure (10%) | Y |
| | • Distribution Circuit Sectionalization (5%) | |
| | Gas Operations (15%) | |
| | • Large Overpressure Events (7.5%) | Y |
| | • Gas Dig-In Reduction (7.5%) | Y |
| | Generation (10%) | |
| | • Safe Dam Operating Capacity (5%) | Y |
| | • DCPP Reliability and Safety Indicator (5%) | Y |
| | Workforce Safety (15%) | |
| | • Days Away, Restricted and Transferred Rate | Y |
| | Additional Public Safety and Reliability (10%) | |
| | • Gas Operations Customer Response (3.33%) | |
| | • 911 Emergency Response (3.33%) | |
| | • Customers Experiencing Multiple Interruptions (3.33%) | Y |
| **Financial Stability** **25%** | Core Earnings Per Share (25%) | Y |

The following provides further information about these metrics:

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**14** On January 24, 2020, the federal court in the criminal case arising from the San Bruno pipeline explosion issued an order directing the Utility to "show cause at a hearing on February 19 at 8 a.m. why it should not, going forward, restrict all bonuses and other incentives for supervisors and above *exclusively* to achieving the PG&E Wildfire Mitigation Plan and other safety goals." (Further Order to Show Cause (re Bonuses) in *United States v. Pac. Gas. & Elec. Co.*, No. CR-14-00175-WHA, at 2 (N.D. Cal. Jan. 24, 2020) (emphasis added).) The foregoing portion of my testimony summarizes some of the reasons the Utility does not believe this would be appropriate.

Reportable Fire Ignitions: This public safety-related metric is designed to measure the results of PG&E's mitigation of wildfire risk, one of PG&E's key enterprise risks as identified through its EORM program (discussed above). The metric measures powerline-involved incidents that are annually reportable to the Commission pursuant to Decision 14-02-015 and that are within the Utility's High Fire Threat Districts. Specifically, the metric measures reportable fire incidents where: (i) ignition is associated with the Utility's transmission and/or distribution powerlines; (ii) something other than PG&E facilities burned; and (iii) the fire traveled more than one meter from the ignition point. The metric measures outcomes, not efforts. The metric's achievement milestones can be reviewed against data from several prior years and benchmarked against data reported to the Commission by the other California utilities.

Electric Asset Failure: This public safety- and reliability-related metric is designed to measure the results of PG&E's mitigation of the risks of wildfires and system failures. It measures the number of failure incidents (regardless of cause) of electric distribution, transmission, and substation underground and overhead assets. Specifically, the metric measures distribution asset or distribution substation asset failures in High Fire Threat Districts, and transmission asset or transmission substation asset failures system-wide, that result in sustained unplanned outages. The metric measures outcomes, not efforts. The metric's achievement milestones can be reviewed against historical company performance and benchmarked against external industry data.

Distribution Circuit Sectionalization: This public safety- and reliability-related metric will measure PG&E's mitigation of the scope and impacts of, and risks associated with, PSPS events. The metric pertains to the time it will take to complete planned installation/automation and operationalization of sectionalization devices, which reduce the scope and impacts of PSPS events by allowing power to remain on in areas where weather conditions do not warrant a PSPS but that nevertheless could experience an outage on account of system configurations. The metric's milestones for completing the planned work will be time-based, with a "target" completion date of

September 1, 2020—before the traditional height of the California wildfire season.

Large Overpressure Events: This public safety-related metric is designed to measure the results of PG&E's mitigation of the risk of a loss of gas containment, various types of which are among PG&E's key enterprise risks as identified through its EORM program. The metric tracks the number of large overpressure events (which occur when gas pressure exceeds the maximum allowable operating pressure) leading to loss of containment, damages to facilities, and/or reduced pipeline capacity or availability. The metric measures outcomes, not efforts. The metric's achievement milestones can be reviewed against PG&E's historical operating data.

Gas Dig-In Reduction: This public safety-related metric is designed to measure the results of PG&E's mitigation of the risk of a loss of containment from the Utility's underground gas transmission and distribution facilities. The Utility participates in a one-call "811" public service program administered by Underground Service Alert (USA). The Utility receives "tickets" from USA notifying the Utility of activities that could damage the Utility's underground pipelines. The metric tracks the number of gas dig-ins per 1000 USA tickets received for gas operations (subject to certain exclusions). The metric measures outcomes, not efforts. The metric's achievement milestones can be reviewed against PG&E's historical data and benchmarked against American Gas Association data.

Safe Dam Operating Capacity: This public safety-related metric is designed to measure the results of PG&E's mitigation of the risk of a large uncontrolled water release, which is one of PG&E's key enterprise risks as identified through its EORM program. The metric measures the operating capacity of the mechanical equipment that is used as the main control to reduce the risk of such a release. The metric measures outcomes, not efforts. The metric is, to PG&E's knowledge, a first-of-its-kind metric for the hydro industry. The metric's achievement milestones can be reviewed against historical operating data.

DCPP Reliability and Safety Indicator: This public safety-related metric is designed to measure the results of PG&E's reduction of the risk of a nuclear core damaging event with the potential for a radiological release at

the Diablo Canyon Power Plant, which is one of PG&E's key enterprise risks as identified through its EORM program. The metric represents a composite of 11 performance indicators for nuclear power generation developed by the nuclear industry and applied to all U.S. nuclear power plants. The metric measures outcomes, not efforts. Its achievement milestones can be benchmarked against others in the industry.

Days Away, Restricted, and Transferred Rate: This employee safety-related metric is designed to measure the results of PG&E's reduction of the risk of workforce injuries, and to promote improved performance in this key area. It measures the number of Occupational Safety and Health Administration (OSHA) recordable cases in the current year for employees that meet OSHA's recordkeeping requirements (excluding fatalities) and that have resulted in at least one lost workday or one day of job restriction or transfer. The metric measures outcomes, not efforts. Its achievement milestones can be benchmarked against data from other utilities.

Gas Operations Customer Response: This metric is designed to measure the results of PG&E's mitigation of public safety risks and its efforts to increase reliability of service, by promoting prompt responses to customer calls or notifications reporting a gas odor or gas emergency. It measures the number of minutes from the time the Utility is notified to the time Utility personnel or another qualified first responder arrives onsite to the location (subject to certain exclusions, such as multiple calls for the same event, or calls relating to a planned gas release). The metric is an industry standard, and achievement milestones can be benchmarked against other utilities.

911 Emergency Response: This public safety-related metric measures the percentage of time that PG&E personnel arrive onsite within 60 minutes after receiving a 911 call (with onsite defined as arriving at the premises where the 911 agency personnel are waiting). The metric is designed to promote prompt response times so as to accomplish two things: reducing public safety risks associated with a confirmed hazard, and freeing public agency resources to respond to other emergency situations. The metric is an industry standard, and achievement milestones can be benchmarked against other utilities.

Customers Experiencing Multiple Interruptions: This reliability-related metric is designed to measure the results of PG&E's efforts to promote system reliability. It measures the number of customers who experience five or more sustained service interruptions, whether planned or unplanned. The metric measures outcomes, not activities. The metric is an industry standard, and external benchmarks are available in connection with setting its achievement milestones.

Core Earnings Per Share: This metric promotes financial stability, consistent with AB 1054's imperative that executive compensation be structured not only "to promote safety as a priority and to ensure public safety," but also to "promote … utility financial stability."[15] This metric also promotes safety, moreover, in that strong public safety performance is essential to financial stability (as evidenced by the current Chapter 11 proceedings and the substantial decline in the price of PG&E Corporation common stock since the 2017 and 2018 wildfires). The metric also promotes customer affordability, in that it aligns with cost efficiency. A metric tied to financial performance and stability is customary in the industry, and in my experience, expected by institutional shareholders.[16] The metric's milestones will be set after equity issuances in connection with Chapter 11 emergence are determined.

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Two qualifying principles will overlay payment of STIP awards as calculated based on achievement of "threshold," "target," or "maximum"

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**15** Pub. Util. Code § 8389(e)(4).

**16** See, e.g., California Public Employees' Retirement System, *Governance and Sustainability Principles*, at 23 (Sept. 2019) ("Compensation programs should symmetrically align the interests of the companies' executives and employees with the providers of capital, that is, both sides should participate in good and bad times. Incentive pay should be tied to shareowner experience."); California State Teachers' Retirement System, *Corporate Governance Principles*, at 9-10 (Nov. 2018) ("The [compensation] philosophy should promote an alignment of interests between management and shareholders. The company's compensation philosophy should intend to create long-term value … .").

milestones on the foregoing metrics.[17] First, there will be an individual modifier for each executive that can result in adjustment of the executive's payout depending on how the executive performs relative to individually conveyed annual performance goals. The individual modifier could result in an executive's award being reduced to as low as 75 percent or increased to as high as 125 percent of the amount otherwise payable.

Second, the PG&E Corporation Compensation Committee and the Utility's Board of Directors at all times will retain complete discretion to reduce or eliminate STIP awards for any particular executive or more broadly if, in the totality of the circumstances, the Committee or the Board sees fit to do so. Such circumstances could include, for example, a catastrophic wildfire, loss of gas containment, or generating or nuclear event, or a failure of the Utility to maintain its safety certification pursuant to § 8389(e). The Committee and the Board exercised their discretion to reduce 2018 STIP payouts to zero in light of the devastating 2018 Camp Fire, the hardships incurred by communities, and the Utility's financial circumstances including the need to seek relief under Chapter 11.

### 3. The Long-Term Incentive Plan

The LTIP is designed to further PG&E's long-term objectives—especially customer welfare and safety—by aligning compensation with those objectives and making corresponding payouts over the longer term. LTIP awards are all equity-based, and therefore inherently align compensation with strong company performance. LTIP awards for 2020 post-emergence will consist entirely of performance shares that will be awarded only upon achievement of the objective performance metrics described below, with a proviso that such awards must be held for at least three years from the grant date.[18] Thus, LTIP performance share awards will be paid based on performance, and in addition, their value over time will depend on PG&E's stock performance at least three years into the future.

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**17** PG&E ensures and will continue to ensure that the underlying data used to evaluate achievement of incentive compensation milestones is reliable. PG&E historically has used its internal audit unit to confirm such reliability. PG&E is reviewing external verification solutions to buttress the internal audit verification process.

**18** The CEO's compensation structure currently also includes stock options.

LTIP awards will not include restricted stock units that vest based on length of service, notwithstanding the retention purpose such awards can serve; PG&E has elected to focus all of its long term compensation on achievement of safety and other important objectives. LTIP awards are expected to constitute about 44 percent of overall executive compensation at target levels (ranging from 36 percent to 55 percent depending on the individual).

The chart below sets forth the specific metrics that will apply upon Chapter 11 emergence, their respective weightings, and the extent to which the metrics are outcome-based as opposed to activity- or effort-based. Exhibit 2 hereto sets forth the "threshold," "target," and "maximum" metric achievement milestones for each of these metrics.

| Category | Metric | Outcome-Based |
|---|---|---|
| **Public Safety and Reliability 50%** | **System Hardening (25%)** | |
| | **Substation Enablement (25%)** | |
| **Customer Experience 50%** | **Customer Experience Index**<br>• Customer Satisfaction Score (25%)<br>• PSPS Notification Accuracy (25%) | <br>Y<br>Y |

To take into account the long term financial health and stability of PG&E, the LTIP score determined by the metrics above will be multiplied by a Total Shareholder Return (TSR) modifier, which will increase or reduce the total payout to LTIP participants based on the relative performance of PG&E Corporation stock over time (described in more detail below).

The following provides further information about the metrics:

System Hardening: This public safety- and reliability-related metric aligns with mitigation of the risk of catastrophic wildfires. The metric measures rebuilding of overhead circuitry to current hardening design standards, targeted undergrounding, or elimination of overhead circuitry, in High Fire Threat Districts. The metric's achievement milestones, which will

be measured in completed circuit miles, can be benchmarked against data from other California utilities.[19]

PG&E's risk analysis indicates that, while the risk of wildfires is inherent in delivery of electricity in California and can never be entirely eliminated, completing just 20 percent of PG&E's planned system hardening can reduce the risk of a catastrophic wildfire by up to 90 percent. PG&E therefore believes it is important to align compensation with progress toward completion of this critical work.

Substation Enablement: This public safety- and reliability-related metric promotes efforts to reduce the scope and customer impacts of PSPS. It relates to a list of 64 substations that were identified following the October 2019 PSPS events as able to reduce the number of customers impacted by a transmission-level PSPS event. The metric measures the number of such substations that are successfully rendered energizable during such events, whether through microgrid temporary or permanent solutions, or other to-be-identified solutions.

Customer Experience Index: This customer satisfaction-related metric aligns with strong customer service, especially in connection with PSPS events. Its two equally weighted components will measure progress toward two objectives. First, the "customer satisfaction score" will measure improvement in customer satisfaction in 2022 over current satisfaction levels based on a quarterly survey conducted by a third party that asks customers a single overall question: "How would you rate the products and/or services offered by PG&E?" Second, the "PSPS notification accuracy" component will measure the percentage of PSPS-affected customers who receive notifications at least 12 hours prior to a PSPS outage. The "PSPS notification accuracy" component derives from the Commission's proposed Utility Wildfire Mitigation Maturity Model in R.18-10-007, and at "threshold," "target," and "maximum" metric achievement milestones will correspond to

[19] Certain ongoing system hardening work in Butte County will not count toward achievement of the metrics.

Maturity Levels 1, 2, and 3, respectively, in such model.[20] Both components of the "customer experience" metric measure outcomes, not efforts. Both components can be compared against historical data.

* * *

Two principles will overlay payment of LTIP awards as calculated based on achievement of "threshold," "target," or "maximum" milestones on the foregoing metrics.

First, the TSR modifier will result in an adjustment of LTIP payments by multiplying the LTIP score by a low of 75 percent to a high of 125 percent depending on PG&E's relative TSR. Relative TSR is a measure of total share performance (price appreciation or depreciation, plus dividends received, if any), relative to the same measure for a comparator group of peer companies (a comparator group that the Compensation Committee reviews annually to ensure its appropriateness). TSR is commonly used as a metric in long-term compensation plans—including at peer utilities in California and elsewhere—and is typically heavily weighted in such plans. Also, TSR or a comparable financial performance metric is, in my experience, expected by institutional shareholders in order to help align executive incentives with long-term shareholder welfare.

Because the LTIP will use TSR only as a *modifier* after LTIP awards are initially calculated, TSR will receive less emphasis in the calculation of final awards than it would if, as is common at other companies, it were a metric in its own right with a significant weighting. For example, under the LTIP, if "threshold" milestones for the Public Safety and Reliability metrics and the Customer Experience metric are not met, executives will not be entitled to an LTIP payout even if PG&E Corporation's stock performs well compared to the stock of peer companies. If, however, the LTIP used TSR as an independent metric, then executives could be entitled to an LTIP payout notwithstanding that the Utility failed to meet public safety, reliability, and customer welfare goals. Because the LTIP uses TSR only as a modifier, the sole effect of TSR will be to increase or decrease the LTIP score that is

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**20** See Attachment 2 (Utility Wildfire Mitigation Maturity Model) to ALJ's Ruling on Wildfire Mitigation Plan Templates and Related Material and Allowing Comment, at 38, R.18-10-007 (Dec. 16, 2019).

otherwise calculated, thereby keeping the executive's compensation primarily tied to public safety, reliability, and customer welfare.

Second, the Board of Directors or the Compensation Committee may at any time suspend, terminate, modify, or amend the LTIP in any respect, and may cancel or annul any grant of an award provided that such cancellation or annulment does not, without the employee's consent, adversely affect the employee's rights under incentive awards previously granted. The Board and the Compensation Committee thus retain considerable discretion to reduce or eliminate LTIP awards if doing so is warranted in the totality of the circumstances.

### E. The Ways in Which the Utility's Executive Compensation Structure Addresses AB 1054's Requirements

AB 1054, as codified in § 8389(e), contains two pertinent subsections containing two sets of requirements. First, subsection (e)(4) requires a utility to show that it has "established an executive compensation structure" meeting various criteria. Specifically:

> The electrical corporation [must show that it] has established an executive incentive compensation structure approved by the division and structured to promote safety as a priority and to ensure public safety and utility financial stability with performance metrics, including incentive compensation based on meeting performance metrics that are measurable and enforceable, for all executive officers, as defined in Section 451.5. This may include tying 100 percent of incentive compensation to safety performance and denying all incentive compensation in the event the electrical corporation causes a catastrophic wildfire that results in one or more fatalities.

Second, subsection (e)(6) requires the utility to show that it has "established a compensation structure for any new or amended contracts for executive officers" that is based on certain principles. Specifically:

> The electrical corporation [must show that it] has established a compensation structure for any new or amended contracts for executive officers, as defined in Section 451.5, that is based on the following principles:
>
> (i) (I) Strict limits on guaranteed cash compensation, with the primary portion of the executive officers' compensation based on achievement of objective performance metrics[; and] (II) [n]o guaranteed monetary incentives in the compensation structure.
>
> (ii) It satisfies the compensation principles identified in paragraph (4).

(iii) A long-term structure that provides a significant portion of compensation, which may take the form of grants of the electrical corporation's stock, based on the electrical corporation's long-term performance and value. This compensation shall be held or deferred for a period of at least three years.

(iv) Minimization or elimination of indirect or ancillary compensation that is not aligned with shareholder and taxpayer interest in the electrical corporation.

I discuss below how these statutory requirements are addressed by the Utility's post-emergence executive compensation structure.

**1. The Criteria of § 8389(e)(4)**

Covered Officers: Section 8389(e)(4) requires the requisite compensation structure to apply to "all executive officers, as defined in Section 451.5." The definition of "officers" applied by PG&E is based in part on a functional analysis of individual duties, which may change over time. As of the time of this testimony, the structure described above will apply to all of the Utility's officers who qualify as "executive officers" under 17 C.F.R. 240.3b-7 (plus two officers listed in § 451.5 who are not listed in § 240.3b-7, namely, the Secretary and Treasurer).[21]

Safety Incentives: Section 8389(e)(4) requires the compensation to be "structured to promote safety as a priority and to ensure public safety." Both the STIP and the LTIP will do this. The STIP's metrics will be heavily weighted toward customer and workforce welfare, placing a priority on public safety. The LTIP's metrics similarly will be weighted primarily to promote wildfire- and PSPS-related safety.

Additionally, *all* LTIP awards incentivize customer and workforce welfare over the long term because their value will depend over time on how PG&E Corporation common stock performs. The stock's relative performance depends primarily on PG&E's performance, and PG&E's performance depends heavily on public safety performance. If safety performance is poor—for example, if there is a catastrophic public safety incident—the effect on the stock can be devastating, as evidenced by the stock losing

[21] I understand that the Commission has construed the term "officer" as used in Pub. Util. Code § 706 to mean the officers encompassed by 17 C.F.R. 240.3b-7. See Resolution E-4963 at 8 (Dec. 13, 2018).

significant value since the 2017 northern California wildfires. Inasmuch as performance-based LTIP awards must be held for at least three years after grant, all such awards necessarily promote safety over the long term.

Financial Stability Incentives: Section 8389(e)(4) also requires the compensation to be "structured to promote … utility financial stability." The STIP and the LTIP will do this. As noted, the STIP and the LTIP collectively will promote customer, public, and workforce safety, and thus contribute to financial stability. In addition, the STIP will promote financial stability directly via the core earnings per share metric, and the LTIP's TSR modifier likewise will promote financial stability.

Objective Performance Metrics: Section 8389(e)(4) requires the compensation structure to use "performance metrics[] [and to] includ[e] incentive compensation based on meeting performance metrics that are measurable and enforceable." As described above and in the exhibits hereto, both the STIP and the LTIP will use performance metrics that are objectively defined, measurable, enforceable, and auditable. The metrics will be almost entirely outcome-based.

Tying 100 percent of Incentive Compensation to Safety Performance: Section 8389(e)(4) provides in permissive, not mandatory, language that the compensation structure "may include tying 100 percent of incentive compensation to safety performance and denying all incentive compensation in the event the electrical corporation causes a catastrophic wildfire that results in one or more fatalities." As discussed above, PG&E believes that tying 100 percent of incentive compensation to safety metrics would not adequately align with PG&E's *overall* mission of providing safe, reliable, affordable, and clean energy to its customers. Though PG&E unequivocally views safety as the most important aspect of its mission, the other aspects also are important and should be promoted.

That said, as noted, the Board of Directors and the Compensation Committee have discretion to reduce or eliminate STIP awards for any reason (e.g., in the event of a catastrophic public safety event), and they did so for 2018. Similarly, the Board and the Compensation Committee may at any time suspend, terminate, modify, or amend the LTIP in any respect, and may cancel or annul any grant of LTIP awards provided that

such cancellation or annulment does not, without the employee's consent, adversely affect the employee's rights under incentive awards previously granted.

**2. The Criteria of § 8389(e)(6)**

Section 8389(e)(6) requires the "compensation structure [applicable to] any new or amended contracts for executive officers" to meet certain criteria. I understand that there is a legal question over whether this applies to general compensation programs such as the Utility's programs described above, or instead only applies to written employment contracts that set out all the material terms and conditions of employment—which the Utility generally does not have with its executives.[22] Assuming for present purposes only that subsection (e)(6) applies to the Utility's compensation structure described above, I make the following points.

Cash/Incentive Compensation Mix: Section 8389(e)(6)(i)(I) provides that the compensation structure must place "[s]trict limits on guaranteed cash compensation, with the primary portion of the executive officers' compensation based on achievement of objective performance metrics." The compensation structure applicable upon Chapter 11 emergence will do this. The only guaranteed cash compensation will be base salary (plus a modest cash stipend in lieu of broader perquisites), which is and will remain a minority of total compensation. Also, STIP and LTIP incentive compensation that is based on objective performance metrics will comprise greater than 50 percent of total executive compensation at target levels.

No Guaranteed Monetary Incentives: Section 8389(e)(6)(i)(I) provides that there must be "[n]o guaranteed monetary incentives in the compensation structure." STIP and LTIP awards are entirely "at risk," and thus, executives' only guaranteed monetary payments will be their foundational compensation. Further, PG&E generally does not have formal employment contracts with its executives, and thus, for example, there is no contractual entitlement to continued employment, to a salary for a particular

[22] LTIP awards are made through written award contracts, but such contracts do not set out all material terms and conditions of employment.

term following termination of employment, or to a pay raise from one year to the next.

Compliance With § 8389(e): Section 8389(e)(6)(ii) provides that the compensation structure should "satisf[y] the compensation principles identified in paragraph (4)." The compensation structure applicable upon Chapter 11 emergence will do this, as outlined above.

Equity Awards: Section 8389(e)(6)(iii) provides that the compensation structure should include "[a] long-term structure that provides a significant portion of compensation, which may take the form of grants of the electrical corporation's stock, based on the electrical corporation's long-term performance and value," with such "compensation … held or deferred for a period of at least three years." The LTIP will accomplish this because: (i) all of its awards will consist of equity awards; (ii) the Utility intends to ensure that these equity awards comprise about 44 percent of total executive compensation at target levels (ranging from 36 percent to 55 percent depending on the individual); and (iii) the Utility will require that performance-based equity awards be held for at least three years from grant.

Minimization of Ancillary Compensation: Section 8389(e)(6)(iv) requires "[m]inimization or elimination of indirect or ancillary compensation that is not aligned with shareholder and taxpayer interest in the electrical corporation." As noted, although executives receive corporate perquisites such as parking and health club memberships, these are de minimis, are typical in the industry, and are aligned with shareholder and other stakeholder interests by serving a recruiting and retention purpose.

In sum, I believe, and I understand that the Compensation Committee believes, that the Utility's post-emergence executive compensation structure meets the requirements of AB 1054.

# EXHIBIT 1

# STIP METRICS

# REPORTABLE FIRE IGNITIONS

| | |
|---|---|
| **Definition:** | Powerline-involved fire incidents annually reportable to the CPUC per Decision 14-02-015 and within the Utility's High Fire Threat District.<br><br>A reportable fire incident includes all of the following: (i) ignition is associated with Utility powerlines (both transmission and distribution); (ii) something other than PG&E facilities burned; and (iii) the resulting fire traveled more than one meter from the ignition point. |
| **Units and Calculation:** | Simple count of fire ignition incidents. |
| **Milestone Type:** | Lower is better. |
| **Milestones:** | Threshold: 105<br><br>Target: 101<br><br>Maximum: 96 |
| **Exclusions/Exceptions:** | None. |

## ELECTRIC ASSET FAILURE

| | |
|---|---|
| **Definition:** | The number of failure incidents of electric distribution, transmission, and substation underground and overhead assets resulting in sustained outages. The metric includes the following asset failures:<br>• Distribution and distribution substation asset failures limited to High Fire Threat District areas.<br>• Transmission and transmission substation asset failures system-wide. |
| **Units and Calculation:** | Simple count of outages caused by asset failure. |
| **Milestone Type:** | Lower is better. |
| **Milestones:** | Threshold: 2328<br>Target: 2166<br>Maximum: 2058 |
| **Exclusions/Exceptions:** | • Equipment failures resulting in only momentary outages.<br>• 2.5 Beta major event days based on Institute of Electrical and Electronics Engineers Standard 1366, generation/ISO (rotating outages), and momentary outages at the transmission and distribution system level. |

## DISTRIBUTION CIRCUIT SECTIONALIZATION

| | |
|---|---|
| **Definition:** | Work completion timeliness for a target population of 592 distribution circuit sectionalization Supervisory Control and Data Acquisition (SCADA) enabled PSPS devices.<br><br>The SCADA-enabled PSPS devices are a combination of Line Reclosers, FuseSavers, and SCADA Switches. The metric includes only devices that are installed, SCADA-automated, and operationalized during 2020. |
| **Units and Calculation:** | Date of work completion (with metric score interpolated on a linear basis if the date falls between threshold and target, or between target and maximum). |
| **Milestone Type:** | Sooner is better. |
| **Milestones:** | Threshold: October 1, 2020<br><br>Target: September 1, 2020<br><br>Maximum: June 1, 2020 |
| **Exclusions/Exceptions:** | None. |

## LARGE OVERPRESSURE EVENTS

| | |
|---|---|
| **Definition:** | Number of large overpressure (OP) events. An OP event occurs when the gas pressure exceeds the maximum allowable operating pressure (MAOP) of the pipeline. The established pressure limits for large OP events are:<br>• High pressure gas distribution (MAOP 1 pounds per square inch gauge (psig) to 12 psig) greater than 50% above MAOP.<br>• High pressure gas distribution (MAOP 12 psig to 60 psig) greater than 6 psig.<br>• Low pressure gas distribution by 16 inches water-column.<br>• Transmission pipelines by 10% (or >25 psig on pipelines operating over 250 psig). |
| **Units and Calculation:** | Simple count of total number of OP events. |
| **Milestone Type:** | Lower is better. |
| **Milestones:** | Threshold: 8<br>Target: 6<br>Maximum: 4 |
| **Exclusions/Exceptions:** | OP events identified by a Mini-AT Abnormal Pressure Report, because use of this report is in a pilot phase. |

## GAS DIG-IN REDUCTIONS

| | |
|---|---|
| **Definition:** | Number of third-party Gas dig-ins per 1000 gas-specific Underground Service Alert (USA) tickets received. This metric tracks all third-party dig-ins to Utility gas subsurface installations. A dig-in refers to damage that occurs during excavation activities (impact or exposure) and that results in repair or replacement of an underground gas facility.<br><br>The following definitions adopted by the Utility are in compliance with the Common Ground Alliance:<br><br>• Damage**:** Any impact or exposure that results in the need to repair an underground facility due to a weakening or the partial or complete destruction of the facility, including but not limited to the protective coating, lateral support, cathodic protection, or the housing for the line device or facility.<br><br>• Excavate or Excavation**:** Any operation using non-mechanized or mechanized equipment, demolition, or explosives in the movement of earth, rock, or other material below existing grade. |
| **Units and Calculation:** | Ratio of dig-ins to 1000 tickets received. |
| **Milestone Type:** | Lower is better. |
| **Milestones:** | Threshold: 1.53<br><br>Target: 1.44<br><br>Maximum: 1.28 |
| **Exclusions/Exceptions:** | Per American Gas Association benchmarking definition:<br><br>• Pre-existing damages (e.g., due to corrosion).<br><br>• Any intentional damage to a pipeline (e.g., drilling or cutting).<br><br>• Damage caused by driving over a covered facility (e.g., heavy vehicles damage gas pipe).<br><br>• Damage to abandoned facilities.<br><br>• Damage due to materials failure.<br><br>• Damage caused to gas lines by trench collapse or soldering work.<br><br>• Damage occurring during the STIP reporting year that is reported to PG&E after the close of STIP reporting for that year. |

## SAFE DAM OPERATING CAPACITY (SDOC)

| | |
|---|---|
| **Definition:** | Operating capability of mechanical equipment used as main control to reduce enterprise risk of large uncontrolled water release. |
| **Units and Calculation:** | The metric will be calculated as one minus the ratio of controlled outlet days forced out (CODFO) to controlled outlet days available (CODA) for the metric dam population:<br>*SDOC = 1 – (CODFO ÷ CODA)*.<br>The following guidance will be used to calculate SDOC performance:<br><u>Spillways</u>:<br>• Gates will be considered inoperable when the primary source of energy and all backup sources are unavailable and the gate cannot be opened manually; or when a mechanical failure, physical damage, debris or other condition renders the gate unable to be opened.<br>• If a gate is found inoperable, the metric count will be half the number of days since the gate was last operated.<br>• Each gate will be counted separately and considered equal to all other gates (i.e., each gate counts as one gate-day).<br>• Inoperable means the gate is in the closed position and unable to be opened. Inoperable gates dogged in the open position are considered mitigated and do not count against the metric.<br>• If a gate can be partially opened, the metric considers the gate to be derated based on the gate travel compared to the full design travel of the gate. (For example, if a gate travels five of ten feet, it is derated by 50%. If it is derated 50% for 30 days, the resulting CODFO is 15 days.)<br>• Uncontrolled overflow spillways, siphons, and flashboards are not counted.<br><u>Low Level Outlets (LLOs)</u><br>• Inoperable means that the LLO cannot be physically operated through its design range. If the LLO can be partially operated, the forced outage days will be calculated using a derate factor calculated by dividing the amount traveled by the design range. (For example, if the valve travels three of six feet, the valve will be considered derated by 50%. If it is derated 50% for 30 days, the resulting CODFO is 15 days.)<br>• If a LLO is found inoperable, the metric count will be half the number of days since the gate was last operated.<br>• Inoperable does not include when the LLO cannot be opened due to potential environmental concerns with turbidity or |

| | |
|---|---|
| | sediment loading in the stream below the dam, or when opening the gate might cause debris to make it difficult to close the LLO gate or valve.<br><br><u>Power Tunnels</u><br>• The number of power tunnel entries for a dam is modeled based on the number of powerhouse units.<br>• Power tunnels will be considered forced out when units are out of service and there is no alternate means of discharge.<br>• Power tunnels that are taken out of service for safety reasons during high flows (normal operating practice) are not counted.<br>• Power tunnel outages will be per the North American Electric Reliability Corporation's Generating Availability Data System outage definitions. Outages that are not included in the Power Generation Equivalate Forced Outage Factor calculation will not be included in the SDOC. |
| **Milestone Type:** | Higher is better. |
| **Milestones:** | Threshold: 96.92%<br><br>Target: 97.70%<br><br>Maximum: 98.92% |
| **Exclusions/Exceptions:** | • Planned and maintenance outages for gates, LLOs, and power tunnels.<br>• Known inoperable gates and LLOs as of December 31, 2019, for which the known risks are mitigated, are built into the metric targets and calculations.<br>• Passive equipment and features, such as passive spillways, flashboards, and siphons. |

## DCPP RELIABILITY AND SAFETY INDICATOR

| | |
|---|---|
| **Definition:** | The year-end combined (average) score for Unit 1 and Unit 2 at the Diablo Canyon Power Plant, representing a composite of 11 performance indicators for nuclear power generation developed by the nuclear industry and applied to all U.S. nuclear power plants. Indicator performance periods range from 18 months (rolling) to 36 months. The 11 performance indicators are:<br>• Unit Capability Factor %.<br>• Online Reliability Loss Factor %.<br>• Loss Events (excluding scrams).<br>• Unplanned Weighted Manual and Automatic Scrams.<br>• High-Pressure Safety Injection System Performance.<br>• Auxiliary Feedwater System Performance.<br>• Emergency AC Power System Performance.<br>• Sustained Fuel Reliability.<br>• Chemistry Effectiveness Indicator Revised.<br>• Collective Radiation Exposure.<br>• Total Industrial Safety Accident Index. |
| **Units and Calculation:** | The composite score for each Unit is the weighted average of the 11 performance indicator scores. The metric result is the average of the two composite Unit scores. |
| **Milestone Type:** | Higher is better. |
| **Milestones:** | Threshold: 92.50<br>Target: 95.00<br>Maximum: 97.50 |
| **Exclusions/Exceptions:** | None. |

## DAYS AWAY, RESTRICTED, AND TRANSFERRED (DART) RATE

| | |
|---|---|
| **Definition:** | OSHA-recordable incidents that result in lost time or restricted duty per 200,000 hours worked, or for approximately every 100 employees. An OSHA-recordable incident is an occupational (job related) injury or illness that requires medical treatment beyond first aid, or results in work restrictions, lost time, death, or loss of consciousness. |
| **Units and Calculation:** | DART rate is calculated as DART case count divided by 200,000 hours worked. |
| **Milestone Type:** | Lower is better. |
| **Milestones:** | Threshold: 1.19<br>Target: 0.90<br>Maximum: 0.81 |
| **Exclusions/Exceptions:** | Contractor incidents and fatality incidents are not included in the DART calculation. |

## GAS CUSTOMER EMERGENCY RESPONSE

| | |
|---|---|
| **Definition:** | The Utility's mean response time from when it receives a customer call or notification reporting a gas odor or gas emergency, to when Utility personnel arrive onsite to the emergency location. |
| **Units and Calculation:** | Total response minutes divided by the total number of gas emergency orders. |
| **Milestone Type:** | Lower is better. |
| **Milestones:** | Threshold: 22.0<br>Target: 20.8<br>Maximum: 20.0 |
| **Exclusions/Exceptions:** | The following immediate response gas emergency jobs are excluded from the total gas emergency orders volume count:<br>• Level 2 and above emergencies, defined in the Gas Emergency Response Plan.<br>• If the source is a non-planned release of PG&E gas, the original call is included but all subsequent related orders are excluded.<br>• For multiple leak calls from the same Multi-Meter Manifold, the first order is included and all subsequent orders are excluded.<br>• If the source is either a planned release of PG&E gas or another non-leak-related event (e.g., skunk, chemical spill, no discernible cause, etc.), all related orders, including the original call, are excluded from the metric.<br>• Duplicate orders for assistance.<br>• Cancelled orders.<br>• Unknown premise tag with no nearby gas facility.<br>If a technician finds a leak that was not previously identified as non-hazardous by company personnel, the individual order at which the leak was found will be included in the metric, even if the leak was clearly not the source of the odor complaint. |

## 911 EMERGENCY RESPONSE

| | |
|---|---|
| **Definition:** | The percentage of time that Utility personnel arrive onsite within 60 minutes after receiving a 911 call. |
| **Units and Calculation:** | Number of 911 calls where Utility personnel arrive onsite within 60 minutes, divided by the total number of 911 calls received where agency personnel are standing by. Call start time is defined as when the call is received by Utility personnel and entered into the Utility's Outage Information System (OIS). Onsite time is defined as when Utility personnel are recorded as at the site in the OIS database. |
| **Milestone Type:** | Higher is better. |
| **Milestones:** | Threshold: 95.5%<br>Target: 96.5%<br>Maximum: 97.5% |
| **Exclusions/Exceptions:** | • Any day that qualifies as a CPUC defined Measured Event – per General Order 166, a Measured Event is a Major Outage resulting from non-earthquake, weather-related causes, affecting between 10% (simultaneous) and 40% (cumulative) of a utility's electric customer base.<br>• Canceled 911 calls – any call where the 911 agency cancels the call even if Utility personnel already have responded or are on their way. |

## CUSTOMERS EXPERIENCING MULTIPLE INTERRUPTIONS

| | |
|---|---|
| **Definition:** | The percentage of customers experiencing five or more service interruptions lasting six minutes or longer. |
| **Units and Calculation:** | Percentage of total customers. |
| **Milestone Type:** | Lower is better. |
| **Milestones:** | Threshold: 3.28%<br>Target: 3.12%<br>Maximum: 3.05% |
| **Exclusions/Exceptions:** | • 2.5 Beta major event days based on Institute of Electrical and Electronics Engineers Standard 1366, generation/ISO (rotating outages), and momentary outages at the transmission and distribution system level.<br>• Secondary outages are excluded from the count of customer outage minutes. |

## CORE EARNINGS PER SHARE

| | |
|---|---|
| **Definition:** | A non-GAAP measure of financial performance from ongoing core operations, in dollars per share. |
| **Units and Calculation:** | GAAP earnings less non-core charges in dollars, divided by shares. |
| **Milestone Type:** | Higher is better. |
| **Milestones:** | To be set after equity issuances in connection with Chapter 11 emergence are determined. |
| **Exclusions/Exceptions:** | • Non-core charges such as bankruptcy-related costs, holding company debt, interest from net operating loss monetization or rate-neutral securitization, state wildfire fund contributions, and future recovery of wildfire claims.<br>• Non-core categories will be determined consistently with prior years' IICs. Examples from Q3 2019 IICs include 2017 Northern California Wildfire-related costs, 2018 Camp Fire-related costs, electric asset inspection costs, and PSPS customer bill credit. |

# EXHIBIT 2

# LTIP METRICS

## SYSTEM HARDENING

| | |
|---|---|
| **Definition:** | Completion of either (i) rebuild of overhead circuitry to current hardening design standards; (ii) targeted undergrounding; or (iii) elimination of overhead circuitry.<br>Circuit miles are recorded as complete when individual spans/sections for each project are constructed and inspected for quality control and quality assurance against the hardening design standard and are passed as "fire safe." |
| **Units and Calculation:** | Number of circuit miles completed, rounded to whole miles. |
| **Milestone Type:** | Higher is better. |
| **Milestones:** | Threshold: 919<br>Target: 1021<br>Maximum: 1225 |
| **Exclusions/Exceptions:** | Butte County rebuild miles are excluded. |

## SUBSTATION ENABLEMENT

| | |
|---|---|
| **Definition:** | The number of substations out of a possible 64 substations that are “energizable” during a Transmission-Level PSPS event.<br><br>“Energizable” includes microgrid temporary or permanent generation solutions or other yet-to-be-identified solutions that allow a substation to be energized during a Transmission-Level PSPS event.<br><br>The possible 64 substations list is based on analysis from the October 9, 2019 and October 26, 2019 PSPS events which were identified as able to reduce the number of customers impacted by a Transmission-Level PSPS event. |
| **Units and Calculation:** | Simple count of substations energizable. |
| **Milestone Type:** | Higher is better. |
| **Milestones:** | Threshold: 30<br><br>Target: 40<br><br>Maximum: 50 |
| **Exclusions/Exceptions:** | Wind events >Hurricane 2 force are excluded for purposes of defining a Transmission-Level PSPS event. |

## CUSTOMER EXPERIENCE INDEX

| | |
|---|---|
| **Definition:** | An index consisting of two equally weighted components:<br>• Customer Satisfaction Score: Customer satisfaction as measured by a quarterly survey conducted by a third party retained by PG&E. The score is based on customer responses to a single overall question: "How would you rate the products and/or services offered by PG&E?"<br>• PSPS Notification Accuracy: The percentage of PSPS-affected customers who receive notifications at least 12 hours in advance of a PSPS outage. |
| **Units and Calculation:** | • Customer Satisfaction Score: Customers rate PG&E, on a quarterly basis, on a scale of 1 to 10, with 1 meaning "extremely dissatisfied" and 10 meaning "extremely satisfied." Responses are weighted, at the case level, 60% for residential customers and 40% for small business customers. The quarterly score is calculated as the mean of the customer responses during the quarter, multiplied by 10 and rounded to one decimal. (*E.g.*, a mean score of 7.561 would be multiplied by 10 and then rounded to one decimal to become 75.6.) The final metric score is the average of the quarterly scores in 2022.<br>• PSPS Notification Accuracy: The number of PSPS-affected customers who receive notifications at least 12 hours in advance of PSPS outages, divided by the total number of PSPS-affected customers. The final metric score is the average of the percentages during all events across the performance period.<br>If there are no PSPS events during the performance period, the Customer Satisfaction Score component will be the final metric score. |
| **Milestone Type:** | Higher is better. |
| **Milestones:** | Customer Satisfaction Score<br>Threshold: 71.7<br>Target: 72.3<br>Maximum: 74.4<br><br>PSPS Notification Accuracy<br>Threshold: 98%<br>Target: 99%<br>Maximum: 99.9% |

| | |
|---|---|
| **Exclusions/Exceptions:** | • Customer Satisfaction Score: PG&E employees and customers on the "do not contact" list will be excluded. In the event of tragedies such as the Camp Fire, the San Bruno explosion, or a city evacuation, the research vendor may suppress surveys to the impacted customers until normal PG&E services are resumed or a reasonable recovery period is observed.<br>• PSPS Notification Accuracy: Customers for whom PG&E has no contact information will be excluded. |

# Attachment E

Pacific Gas and Electric Company

**Erik Jacobson**
Director
Regulatory Relations

Pacific Gas and Electric Company
77 Beale St., Mail Code B13U
P.O. Box 770000
San Francisco, CA 94177

Fax: 415-973-3582

November 27, 2019

**Advice 5700-E**
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

**Subject:** **Pacific Gas and Electric Company's Quarterly Advice Letter Pursuant to Assembly Bill 1054 Regarding the Implementation of Its Approved Wildfire Mitigation Plan and Its Safety Recommendations**

Per Public Utilities Code Section 8389(e)(7), Pacific Gas and Electric Company (PG&E) hereby submits this Tier 1 Advice Letter (AL) detailing the status of its approved wildfire mitigation plan (2019 WMP)[1], recommendations of the most recent safety culture assessment[2], and recommendations of the board of directors' safety committee meetings that occurred during the quarter.[3]

## Purpose

The purpose of this AL is to comply with Public Utilities Code (PUC) Section 8389(e)(7), established by California Assembly Bill (AB) 1054, for the 3rd Quarter of 2019—the first quarter following PG&E's receipt of its Initial Safety Certification on August 23, 2019.

## Background

On July 12, 2019, Governor Newsom signed AB 1054 into law adding Section 8389(e)(7) to the Public Utilities Code which requires, as one of the conditions to the executive director of the Commission issuing a safety certification, documentation of the following:

> The electrical corporation is implementing its approved wildfire mitigation plan. The electric corporation shall file a tier 1 advice letter on a quarterly basis that details the implementation of both its approved wildfire mitigation plan and recommendations of the most recent safety culture assessment,

[1] *See* Decisions (D.) 19-05-036 and (D.) 19-05-37.
[2] Pacific Gas and Electric Company's Safety Culture and Governance Quarterly Report No. 04-2019 In Compliance with CPUC Decision 18-11-050 Submitted October 31, 2019.
[3] Public Utilities Code Section 8389(e)(7) also requests the quarterly advice letter contain a summary of the implementation of the safety committee recommendations from the previous Advice Letter filing. Because this is the first submittal of the quarterly advice letter, it does not contain implementation of such recommendations.

> and a statement of the recommendations of the board of directors safety committee meetings that occurred during the quarter. The advice letter shall also summarize the implementation of the safety committee recommendations from the electrical corporation's previous advice letter filing. If the division has reason to doubt the veracity of the statements contained in the advice letter filing, it shall perform an audit of the issue of concern.

**Q3 2019 Update**

Implementation of Approved Wildfire Mitigation Plan

Based on the requirements of PG&E's 2019 WMP, PG&E is tracking 53 different initiatives to mitigate catastrophic wildfire risk associated with utility facilities. Attachment A, 2019 WMP Status, contains a snapshot of the progress of such initiatives as of September 30, 2019. Attachment B, Community Wildfire Safety Program Overview, contains additional details on implementation of the 2019 WMP through Q3 2019.

Implementation of the Recommendations of Most Recent Safety Culture Assessment. On October 31, 2019, PG&E submitted its Safety Culture and Governance quarterly report number 04-2019 in compliance with CPUC Decision 18-11-050, for the third quarter of 2019 ("Safety Culture Assessment"). Attachment C, Safety Culture and Governance Quarterly Report, reflects the implementation of the recommendations of such Safety Culture Assessment.

Recommendations of Board of Directors Safety Committee Meetings During Q3 2019

The PG&E Board of Directors' Safety and Nuclear Oversight (SNO) Committee, along with its indirect predecessor, the PG&E Corporation Nuclear, Operations, and Safety Committee (which was established in 2011), is an important part of PG&E's Board-level oversight of safety and other matters. A parallel SNO Committee also concurrently exists at the PG&E Corporation Board. The PG&E SNO Committee oversees matters relating to safety, operational performance, and compliance related to PG&E's nuclear, generation, gas and electric transmission, and gas and electric distribution operations and facilities. The PG&E SNO Committee also oversees certain enterprise risks related to, among other things, potential wildfires, workforce safety, and motor vehicle safety.

The PG&E SNO Committee is comprised entirely of independent directors. Committee members also have significant experience in relevant areas, as reflected on the attached copy of PG&E's August 2, 2019 Request for Initial Safety Certification Pursuant to P.U.C. § 8389 (*see* page 2-3, and Attachment C thereto).[4]

[4] The SNO Committee members are Cheryl Campbell (the Chair), Jeffrey Bleich, Nora Mead Brownell, Fred Fowler, Eric Mullins, and Kristine Schmidt.

Consistent with tenets of corporate law and the role of directors at large public companies, the PG&E Board and its committees – including the PG&E SNO Committee – provide general oversight of PG&E's operations and general direction for management.[5] In turn, management exercises responsibility for day-to-day operations.[6] Boards of directors at large public companies typically exercise this oversight responsibility by setting overall direction in substantive areas; adopting general policies and procedures; approving long-term plans and budgets, material business decisions, and other decisions as required by law or regulation; reviewing and requesting reports and information from management; selecting members of management to implement board direction and policies; and, as appropriate, removing members of management. Consistent with the oversight nature of a board's duties, California law permits a board of directors to rely in good faith on the expertise of, and information provided by, company officers, employees, and other advisors that the board believes are reliable.[7]

With respect to safety specifically, the PG&E SNO Committee exercises this oversight role through, among other things: (a) reviewing and overseeing the corporate safety function, including reviewing the appointment and replacement of PG&E's Chief Safety Officer, (b) overseeing PG&E's goals, programs, policies, and practices with respect to promoting a strong safety culture, (c) reviewing, discussing, and giving guidance on how PG&E can continue to improve its safety practices, (d) reviewing the impact of changes in law and regulations affecting safety performance, (e) advising the PG&E Corporation Board of Directors' Compensation Committee on appropriate safety and operational goals to be included in PG&E's executive compensation programs and plans, (f) meeting with the Chief Safety Officer, and advising the PG&E Board of Directors on those meetings, and (g) reviewing regular safety-related reports from the Chief Safety Officer and the Chief Ethics and Compliance Officer. As noted above, the PG&E SNO Committee also has been assigned oversight responsibility for numerous enterprise risks that have a potential safety impact.

The PG&E SNO Committee, together with the PG&E Board of Directors, regularly reviews and evaluates management's comprehensive safety plans. The Committee members have committed to making numerous visits to the field every year (over and above the three site visits per year to which all PG&E directors have committed).

The PG&E SNO Committee charter requires that the Committee meet at least six times per year. During the third quarter of 2019, the SNO Committee met three times (on July 16, 2019, August 20, 2019, and September 10, 2019) and discussed among the members and with management the following topics (among other things): (1) various "training, education or other support on safety" as reported in PG&E's Safety Culture and

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[5] California Corporations Code § 300(a).
[6] *Id*.
[7] Cal. Corp. Code § 309(b).

Governance Quarterly Report No. 04-2019, and (2) oversight of company processes for identifying and managing risks.

The following occurred during the July 16, 2019 meeting:

- Ms. Cheryl Campbell, Chair of the PG&E SNO Committee, noted that PG&E's and PG&E Corporation's (the Companies') SNO Committees are coordinating the review of operationally focused internal audits with the Companies' Audit Committees.

- Mr. Melvin Christopher (as PG&E's Vice President (VP), Gas Operations), Ms. Laurie Giammona (as PG&Es Senior Vice President (SVP) and Chief Customer Officer, Ms. Kathy Kay (as PG&E's SVP and Chief Information Officer), Mr. Michael Lewis (as PG&E's SVP, Electric Operations), and Mr. Jim Welsch (as PG&E's SVP and Chief Nuclear Officer) presented a report on the results of operationally focused internal audits.

- Mr. Lewis, Mr. Welsch, Mr. Christopher, and Mr. Jan Nimick (as PG&E's Senior Director, Interim Lead, Safety and Health, ECAP, DOT) presented a report on safety culture. Among other matters, the Committee members discussed the Companies' safety performance, the Companies' strategy for further improving safety culture, and senior management's commitment to safety.

The following occurred during the August 20, 2019 meeting:

- Mr. Stephen Cairns (as PG&E's VP, Internal Audit and Chief Risk Officer) and Mr. Christopher Pezzola (as PG&E's Director, Internal Auditing) presented a report on results of operational audits performed by Internal Auditing during the second quarter of 2019.

The following occurred during the September 10, 2019 meeting:

- Mr. Nimick (as PG&E's Senior Director, Interim Lead, Safety and Health ECAP, DOT) presented safety tailboards on (1) electrical backfeed, (2) gas pipeline solids, and (3) dog bite prevention.

- Mr. Stephen Cairns (as PG&E's VP, Internal Audit and Chief Risk Officer) and Ms. Janaize Markland (as PG&E's Senior Director, Enterprise and Operational Risk Management and Insurance) presented a report on the Companies' Enterprise and Operational Risk Management (EORM) risk management oversight process. Among other matters, the Committee members discussed the Companies' internal governance process for reviewing enterprise risks and associated mitigations, and 2019 enterprise risks that have been assigned to the PG&E SNO Committee for oversight.

- Mr. Michael Lewis (as PG&E's SVP, Electric Operations) presented a report on a recent contractor fatality incident involving a lineman who fell from an insulated

temporary pole-mounted platform while replacing an electric transmission pole in Plumas County, and immediate actions taken by PG&E and the contractor in response to the incident. Among other matters, the Committee members discussed PG&E's Contractor Safety program, and PG&E's oversight of work performed by contractors.

- Mr. Nimick, Mr. Lewis, Mr. Melvin Christopher (as PG&E's VP, Gas Operations), and Mr. Jim Welsch (as PG&E's SVP, Generation and Chief Nuclear Officer) presented a report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety. Among other matters, the Committee members discussed the Companies' 2019 year-to-date performance on various safety metrics.

- Mr. Sumeet Singh (as PG&E's VP, Asset, Risk Management, and Community Wildfire Safety Program) presented a report on distribution subsurface equipment failure risk and associated risk management activities.

- Mr. Welsch presented a report on nuclear generation operations and power generation operations. Among other things, he discussed the Diablo Canyon Power Plant's and the Power Generation organization's respective year-to-date safety performance, and PG&E's Dam Safety Program.

- Ms. Maureen Zawalick (as PG&E's Senior Director, Regulatory, Risk, and Decommissioning) presented a report on risk management activities associated with a potential large uncontrolled water release from a high or significant hazard dam, one of the key enterprise risks in the Companies' EORM program. She described the risk, and discussed, among other things, risk controls and mitigations.

- Ms. Zawalick then presented a report on risk management activities associated with a potential nuclear core-damaging event, a key enterprise risk addressed in the Companies' EORM program. She described the risk, and discussed, among other things, risk controls and mitigations, and independent oversight and monitoring of risk controls. Among other matters, the Committee members discussed risk drivers, and risk controls and mitigations.

- Mr. Christopher presented a report on the July 2019 earthquakes in Ridgecrest and their impact on PG&E's gas transmission and distribution systems. Among other things, he discussed PG&E's safety performance in connection with its response to the earthquakes, and proactive mitigations in place to prevent gas system failure or prevent additional consequences in the event of future earthquakes.

- Mr. Christopher then presented a report on risk management activities associated with loss of containment that would result from a hypothetical gas transmission pipeline rupture, one of the key enterprise risks in the Companies' EORM program. He described the risk, and discussed, among other things, risk controls and mitigations.

Among other matters, the Committee members discussed PG&E's Transmission Integrity Management Program.

- Ms. Campbell and the other SNO Committee members discussed various field visits and safety observations and facility tours that they had attended.

Although no formal SNO Committee recommendations were made during the third quarter of 2019, the following general guidance and direction were provided:

- The Committee emphasized that management should work to continue to strengthen accountability and transparency in how risks inherent in the business are being managed.

- The Committee reiterated the Board's expectations for creating visibility into the status of high-risk audits, endorsed use of standard methods for evaluating risks and communicating key drivers and controls, and requested that management continue to make improvements in the quality of data used for making risk mitigation decisions.

- The Committee emphasized its expectation that both strong safety culture and strong risk management program require going beyond minimum compliance obligations, and that compliance, itself, may not be a sufficient goal.

- The Committee emphasized its expectation that safety culture must address multiple elements of safety, including employee safety, public safety, and asset management.

- The Committee emphasized that PG&E leaders are responsible for creating behavioral and culture changes that lead to meaningful improvement in behavior and positive expectations regarding the safety of the work environment.

## Protests

Anyone wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than December 17, 2019, which is 20 days after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

## Effective Date

PG&E requests that this Tier 1 advice submittal become effective upon date of submittal, which is November 27, 2019.

## Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.18-10-007, R.18-12-005, and I.15-08-019. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Erik Jacobson
Director, Regulatory Relations

**Attachments:**
Attachment A – 2019 WMP Status
Attachment B – Community Wildfire Safety Program Overview
Attachment C – Safety Culture and Governance Quarterly Report

cc: Service Lists R.18-10-007, R.18-12-005, and I.15-08-019



California Public Utilities Commission

# ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39E)

Utility type:
☑ ELC ☐ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Kimberly Loo
Phone #: (415)973-4587
E-mail: PGETariffs@pge.com
E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 5700-E

Tier Designation: 1

Subject of AL: Pacific Gas and Electric Company's Quarterly Advice Letter Pursuant to Assembly Bill 1054 Regarding the Implementation of Its Approved Wildfire Mitigation Plan and Its Safety Recommendations

Keywords (choose from CPUC listing): Compliance

AL Type: ☐ Monthly ☑ Quarterly ☐ Annual ☐ One-Time ☐ Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #:
N/A

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information:
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? ☐ Yes ☑ No

Requested effective date: 11/27/19

No. of tariff sheets: 0

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

**Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:**

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

Name: Erik Jacobson, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility Name: Pacific Gas and Electric Company
Address: 77 Beale Street, Mail Code B13U
City: San Francisco, CA 94177
State: California Zip: 94177
Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

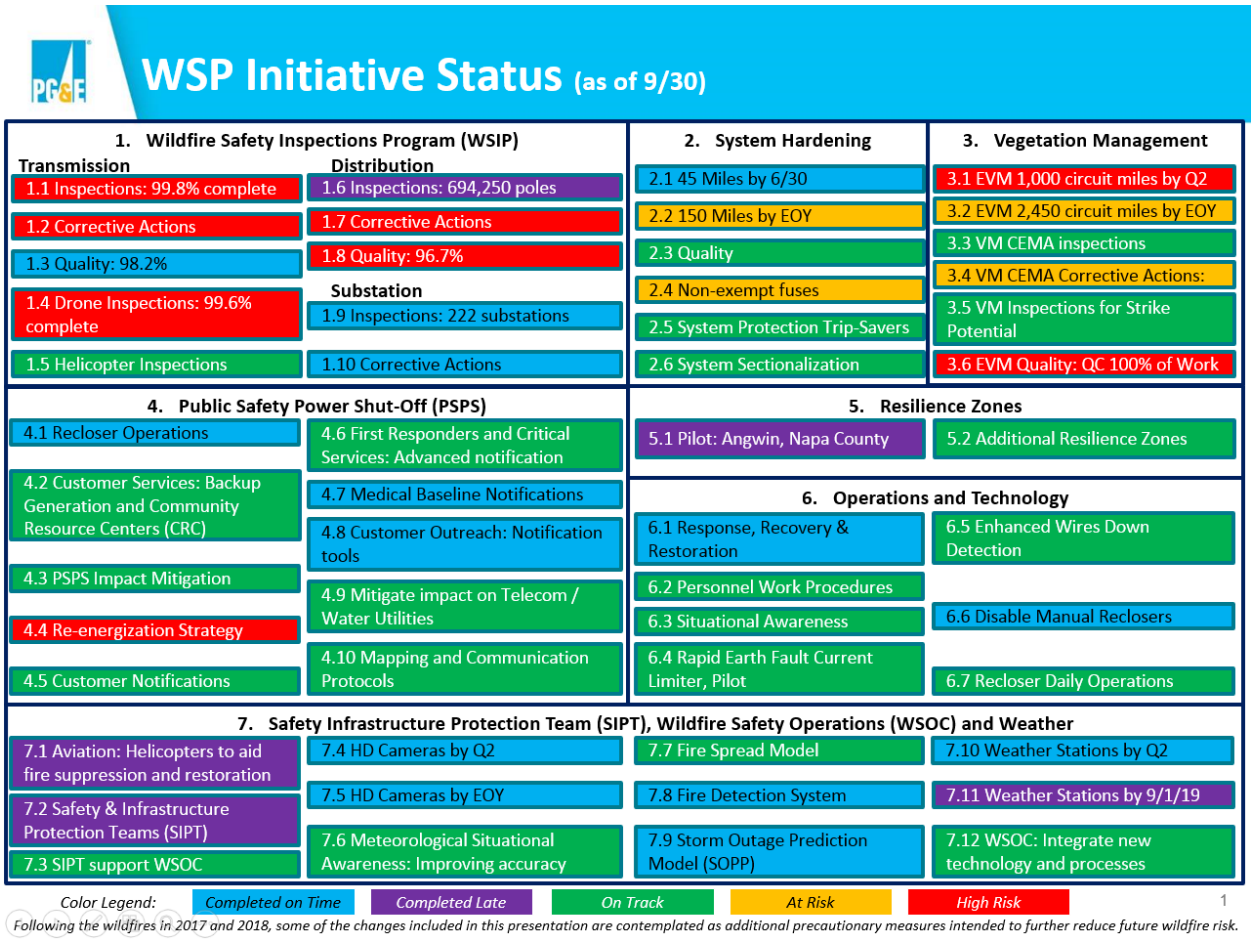
Clear Form

Advice 5700-E
November 27, 2019

# Attachment A

## 2019 WMP Status

# 2019 WMP Status



Advice 5700-E
November 27, 2019

# Attachment B

## Community Wildfire Safety Program Overview

# Community Wildfire Safety Program Overview

| Wildfire Reduction Measure | 2018 (Approx.) | 2019 (Approx.) | Percentage/ Capacity Increase (Approx.) | 2019 Planned Work Completion thru Sept 30[1] |
|---|---|---|---|---|
| **Vegetation Management** | 160,000 trees worked | 375,000 trees worked | 235% | ~39% [2] |
| | 760 circuit miles of fuel reduction, overhang clearing, or Enhanced Vegetation Management (EVM) | 2,450 circuit miles of EVM | 320% | 37% |
| **Inspections - Distribution** | 517,500 distribution poles for routine inspections | 685,000 distribution poles in High Fire Threat District (HFTD) areas with enhanced inspections in five months in addition to routine inspections | 130% -400% (excluding substations) | 100% |
| **Inspections - Transmission** | 9,400 transmission structures with enhanced inspections; 76,000 routine inspections of transmission structures | 40,600 transmission structures in HFTD areas with enhanced inspections in four months in addition to routine inspections | | 99.8% |
| **Inspections - Substations** | 960 monthly routine inspections | 200 enhanced risk-based inspections in HFTD areas in four months in addition to routine, monthly inspections | | 100% |

Notes:

[1] Percentage of 2019 Planned Work Completion as of end of September per 2019 Target

[2] Reflects weighted average of EVM program tree work being 37% complete through end of September and CEMA program being 47%; actual number of trees to be removed in 2019 may not end up being 375,000 based on actual trees identified for work in the field by pre-inspectors.

# Community Wildfire Safety Program Overview

| Wildfire Reduction Measure | 2018 (Approx.) | 2019 (Approx.) | Percentage/ Capacity Increase (Approx.) | 2019 Planned Work Completion thru Sept 30 |
|---|---|---|---|---|
| System Hardening | 17 circuit miles-tree wire projects | 150 circuit miles | 880% | 65%[3] |
| Situational Awareness | 200 weather stations | 400 additional weather stations | 200% | 100% |
| | 9 cameras | 70 additional cameras | 780% | 134%[4] |
| | N/A | Developing fire spread model capabilities – Phase 1 | N/A | N/A |
| Resilience Zones | N/A | At least 1 resilience zone operationalized | N/A | 100% |
| PSPS | 7,100 distribution circuit miles in Program (Tier 3 HFTD area) | 25,200 distribution circuit miles in Program (Tier 2 and Tier 3 HFTD areas) | 355% | 100% |
| | 370 circuit miles of transmission lines at 70kV and below | 5,500 circuit miles of transmission lines at 500kV and below | 1,485% | 100% |
| | 570,000 electric customer premises potentially impacted by PSPS events | 5.4 million electric customer premises potentially impacted by PSPS events | 950% | 100% |

Notes:

[3] As of 9/30, 98 miles had full QC completed

[4] As of 9/30, 94 Cameras had been installed in 2019, exceeding 2019 target

Advice 5700-E
November 27, 2019

# Attachment C

## Safety Culture and Governance Quarterly Report

# PACIFIC GAS AND ELECTRIC COMPANY

# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT

# NO. 04-2019

# IN COMPLIANCE WITH CPUC DECISION 18-11-050

# SUBMITTED OCTOBER 31, 2019



PACIFIC GAS AND ELECTRIC COMPANY
SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
NO. 04-2019
IN COMPLIANCE WITH CPUC DECISION 18-11-050
SUBMITTED OCTOBER 31, 2019

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# PACIFIC GAS AND ELECTRIC COMPANY
# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
# NO. 04-2019
# IN COMPLIANCE WITH CPUC DECISION 18-11-050

## I. Introduction

Pacific Gas and Electric Company (PG&E or the Company) submits this fourth Safety Culture and Governance Quarterly Report (Report) in compliance with California Public Utilities Commission (CPUC or Commission) Decision 18-11-050.[1] In that decision, the Commission directed PG&E to implement the recommendations of the Commission's Safety and Enforcement Division (SED), as set forth in a report prepared by NorthStar Consulting Group (NorthStar), no later than July 1, 2019, and to serve quarterly reports on the status of its implementation and ongoing execution to the service list for this proceeding. In addition, in compliance with Decision (D.) 19-06-008, adopted by the Commission on June 13, 2019, PG&E and PG&E Corporation also provide details of safety-specific training, education, and support given to the PG&E and PG&E Corporation Board of Directors (BOD).

PG&E collaborated closely with SED and NorthStar on the form and content of PG&E's previous quarterly Reports, and this Report is consistent with the agreed-upon approach. This Report provides an update on PG&E's ongoing execution and sustainability of NorthStar's recommendations between July 1, 2019, and September 30, 2019. Additionally, this Report discusses BODs safety training, education, and support for the same time period, and the One PG&E Occupational Health and Safety Five-Year Plan (One PG&E Plan) and associated safety performance metrics.

This Report is organized as follows:

- Executive Summary
- Implementation Update
- Sustainability Update
- Board of Directors Reporting
- One PG&E Plan and Key Safety Metrics

In the past quarter, PG&E's BOD appointed Andrew M. Vesey as Chief Executive Officer (CEO) and President of the Utility and subsequently also elected him as a member of the PG&E BOD. Mr. Vesey has more than 35 years of diverse utility experience, and his remit is to help PG&E improve its safety and operational performance. Prior to joining PG&E, Mr. Vesey served as the Managing Director and CEO of Sydney-based AGL Energy Limited, an integrated Australian energy company serving about 3.7 million electric and natural gas

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[1] See Order Instituting Investigation (OII) on the Commission's Own Motion to Determine Whether Pacific Gas and Electric Company and PG&E Corporation's Organizational Culture and Governance Prioritize Safety (I.15-08-019).

customers and operating 20 percent of the country's power generation capacity. As AGL's top leader, he committed to closing all of the company's coal-fired generation by 2050. Before AGL, Mr. Vesey also served in a number of successively greater leadership roles at energy companies such as AES Corporation, where he was the Chief Operating Officer, and Entergy Corporation and Niagara Mohawk Power Corporation, where he served in senior leadership positions. Mr. Vesey also spent a number of years as an energy industry consultant and leader at firms that included FTI Consulting and Ernst & Young. He also served as Managing Director and CEO of Melbourne-based CitiPower in Australia.

Mr. Vesey reports to the Utility BOD and has responsibility for all aspects of PG&E's operations, including Safety, Electric Operations, Gas Operations, Generation (including Diablo Canyon Power Plant (DCPP), and Customer Care.

## II. Executive Summary

In this fourth update to the CPUC, we are highlighting several areas that show how PG&E is focused on improving safety and quality at the source of the work we do. Specifically, the report notes several steps taken to develop leadership capabilities, build expertise at multiple levels of the company, and provide coaching and feedback to improve performance.

The investment being made in PG&E's workforce reflects our belief that programs alone are insufficient to protect our workforce and the public. It must be—and is—reinforced by expectations of proper procedures and rules, ensuring employees feel comfortable speaking up with concerns and ideas, and workers not only stopping jobs when it's no longer safe, but following essential controls so that we start work only when it's safe to do so.

We have increased our time and investment into reporting and tracking tools to assess our progress. This includes building new dashboards that provide leaders better visibility into safety performance, and updating our primary observation tool to make it more efficient for users. These enhancements and more, underscore our commitment to a culture that values learning and continuous improvement.

With this approach in place, we have seen improvements in certain areas of employee safety. Of note, the quality and timeliness of corrective actions—our responses to incidents and near hits to avoid recurrence—is ahead of goal, as is timely reporting of injuries.

However, we remain in lower quartiles across our key performance measures and know there is still much progress to make. Although a great deal of value-added work has been accomplished in the time since the Safety OII recommendations, it is recognized that PG&E's performance in workforce safety does not meet expectations. PG&E remains challenged by a large workload in upgrading our equipment, the implementation of a thorough and effective Community Wildfire Safety Program, and safe operations in a changing environment. PG&E is further challenged by recent changes in senior leadership, lack of clarity in some of our safety procedures and standards, and creating enough time for leaders to be present in the field reinforcing and coaching on safety.

PG&E is monitoring the ongoing execution and sustainability of the NorthStar recommendations that have a sustainability component and are ongoing in nature. In a few areas, PG&E is implementing improvements stemming from the independent sustainability assessment[2] of NorthStar recommendations performed in the second quarter. See Section IV of this Report for more details on these efforts.

In D.19-06-008, the Commission directed PG&E to provide certain BOD-related information "in the quarterly reports submitted to SED pursuant to D.18-11-050." Information in compliance with this requirement is provided in Section V of this Report.

Consistent with PG&E's previous quarterly Reports, Section VI of this Report has a progress update on the One PG&E Plan, including third quarter safety performance.

Attachment 1 to this Report contains the Completion Narrative for two NorthStar recommendations (one implementation plan) reviewed and approved by PG&E's Internal Audit (IA) department in the third quarter.

Attachment 2 to this Report provides a Glossary of Safety Terms.

## III. Implementation Update

PG&E provides more information on its implementation of two NorthStar recommendations under the implementation plan "F-2 Supervisor in the Field." The Completion Narrative[3] was approved by PG&E's IA department as part of the Safety OII governance process.[4] This plan is not only designed to increase the time that leaders spend in the field with their employees, but to use that time to model and support safe behaviors and practices via regular open dialogue. The plan has strong support from PG&E's senior leadership and a robust sustainability component, as described in the Completion Narrative. See Attachment 1 for more details.

As described in the previous quarterly Report,[5] PG&E is implementing a new process to verify the ongoing execution of its Safety OII plans in MetricStream, a new enterprise compliance management tool. The Safety OII Program Management Office (PMO) piloted the MetricStream platform with a sample of Safety OII plans. The full roll-out and change management efforts will take place in the next quarter and will inform subsequent quarterly reports to the Commission.

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**2** As described in PG&E's third quarterly Report (Section IV, pp. 10-11), in conversations with NorthStar, representatives expressed concern over whether the implemented recommendations have been operationalized and sustained. Accordingly, PG&E tasked an independent assessment team from DCPP to review each of the 65 NorthStar recommendations directed at PG&E and associated plans to evaluate implementation and sustainability of the actions. This was completed and files with the CPUC.

**3** A Completion Narrative is developed to evidence completion and demonstrate sustainability of plans as part of the governance process.

**4** Final approval received on October 1, 2019.

**5** See, e.g., PG&E's third quarterly Report, pp. 11-12.

For this fourth quarterly Report, the PMO confirmed the sustainability of actions for the NorthStar's recommendations that have a sustainability component and are ongoing in nature directly with the Plan Owners and Sponsors.

## IV. Sustainability Update

1. Summary of Improvements

PG&E assessed the sustainability of its plans to address NorthStar's initial recommendations. That assessment--performed in the second quarter and summarized in PG&E's third Report—highlighted several opportunities to improve process adoption, tools, and documentation. In response to the assessment, PG&E has taken the following actions:

- Improved communications for the One PG&E Plan. Information about the One PG&E Plan is now prominently featured on PG&E's Safety and Health (S&H) intranet page, discussed in Line of Business (LOB) Safety Summits, and communicated to employees via PG&E's Daily Digest all-employee newsletter and LOB Leader packets.
- PG&E's Power Generation refresher training reviews and updates are governed by HR-08 Technical Refresher Training Policy. In addition, Power Generation is creating a governance charter as an important step in establishing the overall governance program.
- PG&E enhanced its safety observation tool, SafetyNet, to make it easier to enter data and extract learnings from the system. This tool helps sharing of best practices across the enterprise.
- PG&E developed a Safety Observation Dashboard to enhance visibility and provide consistency of observations on a monthly basis. PG&E is aligning roles and responsibilities for the Field Safety Specialists (FSS) and deepening the engagement with participating LOBs through the FSS performance goals for 2019.
- PG&E is simplifying and automating the process to identify and monitor safety-related expenditures. This should improve the timeliness and accuracy of reporting and provide a clear line of sight from identified risks to spending for associated controls and mitigations.

The Safety OII PMO is working closely with Plan Owners and Sponsors and monitoring the improvement efforts through completion.

2. Changes to PG&E Execution of Plans

As recommended by NorthStar, PG&E will continue to report to the Commission on any significant changes that might affect the sustainability of the recommendations.

In early 2019, PG&E redesigned its Business Plan Review (BPR) meetings to focus on a smaller number of key safety, operational, and financial metrics, providing additional qualitative and quantitative data to enable more substantive discussions for each metric. While PG&E did not track all prior Short-Term Incentive Plan (STIP) metrics in the enterprise BPR forum as result, it did track all but one metric in other leadership forums, such as in its Executive Safety Committee meetings and in Senior Vice President LOB

leadership meetings. Going forward, PG&E will resume tracking former STIP metrics and trending in its BPR discussions, as well as discuss them in its November Quarterly Business Review (QBR) discussion.

PG&E is also providing an update on its Integrated Planning Process, which was directly referenced in NorthStar's recommendation to better link Session D to Session 1 and 2 (VI-4).

Given that the Chapter 11 process and unknown outcomes made long-term planning difficult, PG&E changed its planning process in 2019. The revised 2019 planning process consisted of Session D (risk planning), which focused on emerging risks and on making faster, sustainable risk-reduction and compliance progress; a QBR process run for Quarter 1 and Quarter 3 to focus on near-term performance, execution and results; and Session C (talent review and succession planning). Risk remains a central focus of the planning process, and each QBR includes a risk component to identify any challenges and/or support needed to meet enterprise risk reduction goals. PG&E expects to re-institute a revised, long-term planning process in 2020 that continues to strongly link Session D and risk evaluation to its near- and long-term business planning activities.

## V. Board of Directors Reporting

In D.19-06-008, the Commission directed PG&E to provide the following information in the quarterly reports submitted to SED pursuant to D.18-11-050:

1) Non-confidential versions of the minutes of all board meetings and safety committee meetings.
2) All training, education or other support on safety that PG&E and PG&E Corporation are providing to board members so that they can adequately perform their duties on safety issues.[6]

### A. BOD and Safety and Nuclear Committee Meeting Minutes

There are no new responsive documents for BODs or Safety and Nuclear Oversight (SNO) Committee meetings held on or after June 13, 2019 (the effective date of D.19-06-008).

Meeting minutes for the BODs and SNO Committees must be formally reviewed and approved by the relevant governance body prior to finalization. The timing for this process varies, and in many cases the minutes will be finalized in a different quarter than the quarter in which the meeting was held.

Given this timing, PG&E intends to include in these quarterly reports non-confidential versions of any approved minutes from BODs or SNO Committee meetings held on or after June 13, 2019, to the extent such materials have not been provided in connection with a prior quarterly report.

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**6** D.19-06-008, *mimeo*, p. 4.

## B. BOD Safety-Related Training

PG&E is submitting information regarding "all training, education or other support on safety that PG&E and PG&E Corp." provided "to board members to ensure that they can adequately perform their duties on safety issues".

- Starting during the third quarter of 2019, in-person regular meetings of the BODs and the SNO Committees have included a safety tailboard similar to those presented to employees. Topics covered during the third quarter of 2019 included: (1) electrical backfeed, (2) gas pipeline solids, (3) dog bite prevention, and (4) marijuana grow site hazards.
- In July 2019, SNO Committees also received a report on safety culture.
- In September 2019, the BODs received briefings from PG&E's management regarding the Community Wildfire Safety Program and from the Chair of the Compliance and Public Policy (CPP) Committee of the PG&E Corporation Board regarding the CPP Committee's second quarter 2019 Oversight Report on PG&E's progress against the 2019 Wildfire Safety Plan.
- In July, August, and September 2019, the SNO Committees reviewed summaries of open high-risk audit issues with operational risks, including safety, and the status of action plans to address these issues. Examples include issues that were identified in IA's evaluation of controls and processes relating to: (1) the gas carrier pipe checklist (a safety-focused checklist designed to test for the presence of plastic pipe prior to welding and prevent uncontrolled releases of gas), (2) the electric and hydro Supervisory Control and Data Acquisition systems, (3) the brake inspection program for regulated vehicles and equipment, (4) distribution wood pole asset management, (5) the dam surveillance, monitoring, and inspection program, and (6) cathodic protection systems designed to protect gas facilities from corrosion.
- In September 2019, the SNO Committees received a report regarding PG&E and PG&E Corporation's Enterprise and Operational Risk Management program risk oversight process. The SNO Committees also received reports on top enterprise risks, including large uncontrolled water release, nuclear core-damaging event, and loss of containment-transmission pipeline failure.
- In September 2019, the SNO Committees also a received: (1) an Electric Operations update on distribution subsurface equipment risk, (2) performance and operational updates on nuclear generation and power generation, and (3) a Gas Operations update on the Ridgecrest earthquake.
- In September 2019, the SNO Committees received a safety report, which included a review of a contractor fatality incident and a review of performance in the areas of workforce safety, motor vehicle safety, and public safety.
- During the third quarter of 2019, consistent with the directors' commitment to each conduct at least three site visits per year, non-employee directors

of PG&E and PG&E Corporation made various field visits and facility tours to meet with employees, observe employees and contractors performing work in the field, and tour safety training facilities and operating facilities. Activities during the third quarter included: (1) visiting various job sites to observe vegetation management, system hardening, and electric work being done by field employees and contractors, (2) touring the Cresta Powerhouse, (3) touring the Gas Safety Academy, (4) touring the Wildfire Safety Operations Center, (5) visiting the Oakport Service Center and meeting with gas and electric crews, (6) attending the Lineman's Rodeo where employees compete in various events where safety is the most important factor, and (7) touring the Livermore Training Center.

## VI. One PG&E Occupational Health and Safety Five-Year Plan and Key Safety Metrics

### A. Introduction

The One PG&E Plan encompasses three substantive safety categories—Employee Safety, Contractor Safety and Motor Vehicle Safety—and the Enterprise Safety Management System (ESMS), as well as eight focus areas to facilitate execution and reporting.

### B. Employee Safety

#### 1. Musculoskeletal Disorders (MSD), Sprains and Strains

PG&E's MSD program supports the prevention of injury though changes and re-design of five key programs (office, vehicle, industrial ergonomics, Industrial Athlete, and stretch program) by:

a) Redesigning the processes for more efficiency, providing employees with access to sports medicine trained professionals to assist with discomfort quickly for better resolution. Currently, the Industrial Athlete Program is piloting enhancements within Gas Operations, including increasing the amount of time trainers spend in the field, focusing on work areas with the highest physical demands, and improving data recording via SafetyNet.

b) Identifying the most physically demanding tasks, assessing the risk, introducing mitigations to those for risk reduction, then re-designing tasks and engineering controls.

c) Deploying software across the enterprise that allows PG&E office ergonomics to identify high-risk populations, thereby managing risks and reducing injuries in a targeted way.

d) Incorporating ergonomics into the design phase for new vehicles, ensuring that employees have a better fit and working conditions, and reducing the amount of discomfort reports.

Key activities that occurred during the third quarter of 2019 include:

- Working with LOBs to deploy Industrial Athlete specialists in the field to support supervisors and employees. In working with Gas

Operations, approximately 90 employees were seen, and 2,075 ergonomic observations were performed between June 1 and September 30, 2019. The approach resulted in coaching on body positioning (shoulder, elbow and neck), lifting, and material handling, mainly due to equipment, tools, and the environment. Grassroots teams, leaders, and ergonomic specialists identify and review potential solutions and tools to reduce muscle strain.

- Conducted meetings with the Customer Care Contact Center leaders to review the office ergonomic process and identify opportunities to improve the process. The opportunities include educating the LOB ergonomic leads on the "how-to" of the reporting system, increasing the knowledge of external evaluators on PG&E's processes, and clarifying the roles between the LOB and S&H evaluators. The work is in progress and expected to be completed in January 2020.
- Enhanced the Stretch and Flex program with an integrated tool that is efficient, user-friendly, and customizable. The tool will include a self-serve feature whereby groups can create custom posters demonstrating stretches that meet their workplace needs. Expected launch is in November 2019.

**2. Safety Leadership**

All employees who are new to operational leadership positions (which includes union represented crew leaders who work in a capacity that has Serious Injury or Fatality (SIF) potential) will be required to attend Safety Leadership Development (SLD) workshops by the end of 2019.

PG&E's FSSs conduct Safety Culture observations using the SafetyNet observation tool. The Safety Culture observation checklist was developed from the concepts and skills taught in the SLD workshops and incorporated into the SafetyNet observation tool. FSSs are now actively using it, and the observations should provide lessons learned and opportunities that may result in enhancements to the SLD workshops.

PG&E continues to advance the concepts of Operational Learning and Learning Teams by training additional facilitators who work with front-line employees to learn about how work is performed, address challenges and barriers to success, and develop sustainable solutions to safety and operational related issues.

PG&E is looking for new ways to integrate the skills and language from the SLD Program into new and existing safety programs, such as Leader in the Field (LIF), to build and reinforce PG&E's desired safety culture.

Key activities that occurred during the third quarter of 2019 include:

- Eleven additional individuals from various LOBs have received academic training on Learning Team facilitation, two of whom have since participated in Learning Teams as Learning Team facilitators. Learning Teams have been stood up in PG&E's operational LOBs.

- Safety Leadership program leads supported the roll-out of LIF by co-authoring LIF program documentation to include language specific to the SLD program and Safety Leadership.

### 3. Serious Injury and Fatality Prevention

PG&E's SIF Prevention Program focuses on the specific exposures that lead to serious injuries at PG&E. Initial analysis of SIF data found 22 exposure factors, many of which are common across LOBs.

PG&E identifies incidents with SIF potential through the review of all injuries and near hits. By focusing investigative resources on incidents with SIF potential, PG&E is better positioned to identify the conditions that led to the incident and learn from our employees. This supports the development of corrective actions to reduce the likelihood of recurrence. This is the same process for SIF actuals, which are for serious injuries or fatalities.

Through training and process simplification. PG&E is improving the quality of investigations and corrective actions. This includes identifying the critical steps (i.e., processes or human actions) that could result in a SIF; assessing the extent of the condition throughout PG&E to examine if the same or similar equipment, conditions, or processes exist elsewhere; using human performance tools to identify "what" versus "who" failed; using operational learning to gain in-depth understanding on how work happens; and ensuring that corrective actions are specific, measurable, achievable, realistic, and sustainable. PG&E is seeing this translate into above-goal performance in timeliness and quality of corrective actions.

Third-party evaluations of the completed investigations continue to show improvement. Investigation results and corrective actions are managed in the Corrective Action Program to drive timely completion and effectiveness. In addition, all SIF incidents are communicated to all employees for their awareness.

Key activities that occurred during the third quarter of 2019 include:

- Completed 13 SIF potential investigations, including 8 injuries, 3 Motor Vehicle Incidents (MVI) with 1 Gas Operations and 1 Power Generation injury, 1 equipment damage and 1 Near Hit.
- Opened 7 new SIF and SIF potential investigations.
- Three SIF actual Electric Operations investigations involving contractors:
  - A subcontractor groundman performing work was in a trench when the wall of the trench gave way and collapsed on top of him.
  - Two contractors working on an electric transmission project in steep terrain in Plumas County apparently fell from an insulated work platform attached to a transmission pole. One of the men died and the other was injured.
  - An Osmose crew member was drilling a pilot hole, and while hammering the half inch lag bolt into the pilot hole, it contacted

remnants of the pilot drill bit which remained inside the pole, causing the half inch lag bolt to spring back at and strike the employee in the eye.

- SIF potential investigations including 1 MVI, 1 injury resulting in transportation to emergency, 1 equipment damage and 1 Near Hit.

**4. Injury Management**

PG&E is enhancing its Injury Management programs, including timely injury reporting, Return to Work (RTW), physician outreach, on-site medical clinic model, and piloting a new program called Fit4U for employees with multiple injuries to improve their overall well-being and prevent future injuries.

PG&E has established a RTW Task Program that allows employees to return to work with medical restrictions that might otherwise prevent them from working. According to a RAND[7] study completed in 2010, having a return to work program is associated with a 15-week reduction in the average injury duration.

Key activities that occurred during the third quarter of 2019 include:

- Placed 29 employees with medical restrictions and an inability to perform their regular positions into temporary task assignments within the RTW Task Program. This resulted in injured employees being able to heal while working, which studies have shown reduces recovery time. It also resulted in increased productivity.
- Twenty-seven eligible employees (with multiple injuries/claims) participated in the second phase of the Fit4U pilot, which ended on September 30, 2019. Participant results from Phase 1 and Phase 2 will be analyzed in November 2019 and will guide a recommendation to expand the program companywide if determined to be feasible.
- A Request for Proposal (RFP) for the Nurse Care Line service was completed and recommendations are being reviewed and considered. The 2019 target for timeliness of injury reporting is 72 percent and PG&E has achieved 75.6 percent year-to-date (YTD).
- On-site clinic expansion Project Kickoff was launched with one medical provider vendor for implementation in San Ramon and Concord in the fourth quarter of 2019 and first quarter of 2020, as the first step towards expanding the availability of on-site health care.

**5. Health and Wellness**

PG&E's Health and Wellness programs use employee education and engagement to help improve employee overall well-being and reduce risks of health conditions and injuries. Summary reports of the health status of our workforce show that 50 percent have at least one chronic condition,

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**7** RAND is a nonprofit, nonpartisan research organization that helps improve policy and decision making through research and analysis.

and individuals with at least one chronic condition are up to three times more likely to be injured on the job.

To address this risk, PG&E is promoting healthy lifestyles by improving access and awareness of available health and wellness programs and resources.

Key activities that occurred during the third quarter of 2019 include:

- Launched a replacement mobile and online Health and Wellness portal in mid-August that builds healthy habits across all areas of well-being to drive long-term health. Features include activities such as team healthy habit challenges, nutritional guides, health coaching and a sleep guide. Employee enrollment in the replacement portal has steadily increased since inception. As of September 30, approximately 680 employees (3%) had enrolled. Year-over-year trending of adoption and utilization is limited since Provant, the former vendor, went bankrupt in the third quarter of 2018.
- Over 18,000 employees (84%) completed a health screening as of September 30, 2019. When an employee understands his/her health risks, then (s)he can take action by seeing a primary care doctor, stopping use of tobacco products, and taking advantage of health coaching or mental health support programs like the Employee Assistance Program.
- Provided educational venues to employees on mindfulness and suicide prevention, and launched an opioid awareness campaign.
- On-boarded new Wellness Ambassadors who volunteer to support, lead, or engage in PG&E health and wellness activities at their location. There are 345 Wellness Ambassadors across the company.

PG&E has identified key performance metrics tied to the Employee Safety focus areas above. We recognize that our performance is falling short, especially in the event that employees sustain injuries that restrict their work activity ("Days Away Restricted or Transferred" and "Lost Work Days" performance). To address this challenge, we are taking action to change the Safety Observation program and to align the FSSs with leaders in field to improve the understanding of hazards, identification of controls, and most importantly, to provide coaching to our leaders. Additionally, PG&E is increasing the number of clinics, introducing mobile nurses, and increasing the time the Industrial Athlete specialists spend with leaders and employees in the field.

For 2018 to 2019 year-over-year comparison, SIF potentials have increased in Electric Operations and Gas Operations. We are also experiencing same or similar incidents occurring, including dropped objects and truck booms encroaching into energized lines. PG&E is in the process of evaluating SIF potential events from 2017-2019 to determine whether appropriate or adequate controls are in place.

Table 1 below summarizes key metrics performance and established targets for 2018-2020. Figure 1 below provides current performance with respect to employee safety metrics as of September 30, 2019.

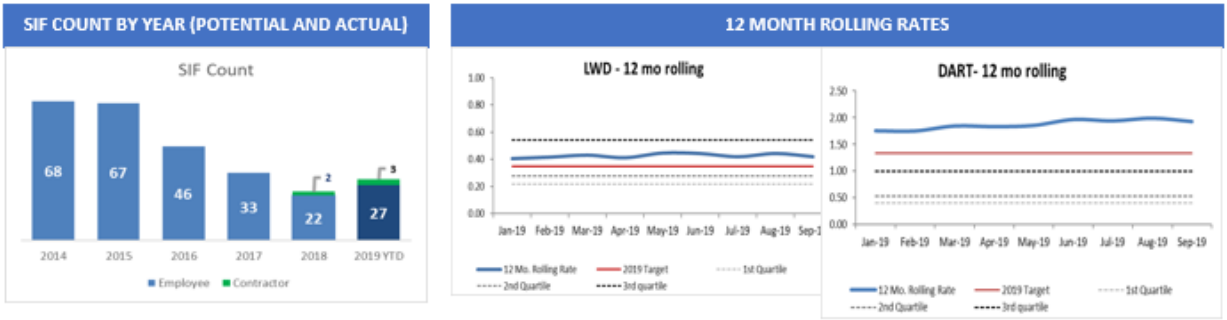
**TABLE 1**
**2018 - 2020 PERFORMANCE AND ESTABLISHED TARGETS**

| Key Metrics Performance | 2018 Actual | 2019 Target | 2020 Target |
|---|---|---|---|
| SIF: # of Employee Serious Injuries & Fatalities | 24[(a)] | Track Only[(b)] | Track Only |
| SIF Prevention: SIF Timely Corrective Action Completion | 90% | 90% | 90% |
| SIF Prevention: SIF Quality of Corrective Actions | 12 | 12 | 12 |
| Injury Management: Lost Work Day Cases Count | 90 | 81 | 70 |
| Sprains/Strains: DART[(c)] Case Count | 416 | 308 | 198 |
| Sprains/Strains: OSHA[(d)] Case Rate | 675 | Track Only | Track Only |
| H&W: Workforce Unavailable Due to Health | 7.9% | 7.7% | 7.5% |
| Injury Management: Timely Reporting of Injuries | 75% | 72% | 72% |

(a) 2018 SIF actuals have been updated from 25 to 24. One SIF event was moved to non-SIF category as it did not meet the criteria for a serious event.
(b) No target set for this metric.
(c) Days Away, Restricted or Transferred.
(d) Occupational Safety and Health Administration.

**FIGURE 1**
**CURRENT PERFORMANCE AS OF SEPTEMBER 30, 2019**

| Metric | RAG | YTD Actual | YTD Prior Year | EOY Target |
|---|---|---|---|---|
| Serious Injury or Fatality (SIF) Count Actual and Potential | | 30 | 17 | |
| SIF % Timely Corrective Action Completion (12 mo. rolling) | | 93% | 96% | 90.0% |
| SIF Quality of Corrective Actions (12 mo. rolling) | | 12.8 | 11.6 | 12.0 |
| Lost Workday (LWD) Count | | 68 | 65 | 81 |
| DART Injury Count | | 349 | 330 | 308 |




## C. Contractor Safety

PG&E's Contractor Safety Program requires contractors performing medium- and high-risk work to meet minimum pre-qualification requirements in order to perform work on behalf of PG&E. All primary contractors and subcontractors performing medium- and high-risk work (roughly

2,200 individual contractor companies that employ approximately 21,000 employees) have been assessed using a thorough pre-qualification safety review process with PG&E's vendor ISNetworld.

Since the pre-qualification process is designed for businesses with three or more years in business, PG&E performs a Management and Organization Assessment (MOA) of contractors who are new in business (less than three years) or have experienced rapid growth (significant increase in employees) to review management oversight of safety programs and employee training.

As part of the Contractor Safety Program, PG&E's LOBs have implemented contractor oversight procedures that establish how they will implement the requirements of the program. Such procedures include reviewing safety plans, conducting safety observations, and completing post-project evaluations.

As part of the governance of the program, PG&E's S&H Organization conducts regular compliance assessments to ensure that the program is being implemented by the LOB and to identify any gaps.

Key activities that occurred during the third quarter of 2019 include:

- Communicated Cal/OSHA 5141.1. Protection from Wildfire Smoke emergency regulation to contractors and required them to have compliant, written safety programs and training.
- Launched the OSHA Training Qualification platform in ISNetworld to track contractor trainings.
- Conducted 51 LOB compliance assessments on the implementation of their LOB Contractor Safety procedures.
- Twenty-one MOAs were conducted and approved.

Table 2 below summarizes key metrics performance in 2018-2020. Figure 2 below provides current performance with respect to contractor safety metrics as of September 30, 2019.

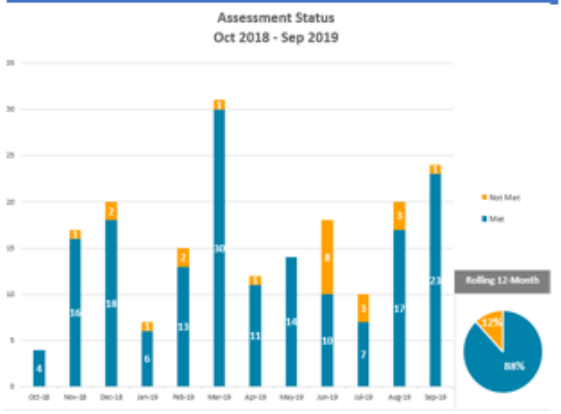
**TABLE 2**
**2018 - 2020 PERFORMANCE**

| Key Metrics Performance | 2018 Actual | 2019 (YTD) | 2020 |
|---|---|---|---|
| # of Contractor Serious Injuries & Fatalities | 3 | 3 | Track Only |
| % of Contractor Assessments with Non-Conformance Findings | 10.3% | 13.4% | Track Only |

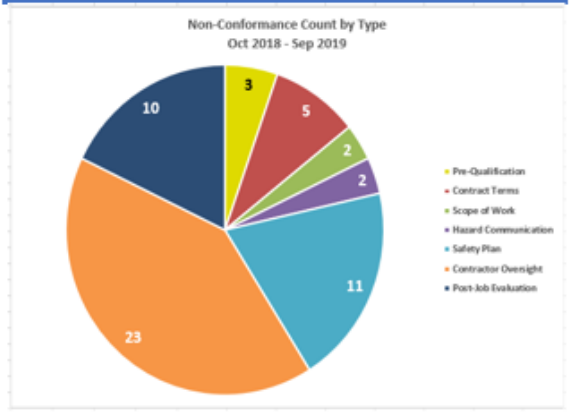
**FIGURE 2**
**CURRENT PERFORMANCE AS OF SEPTEMBER 30, 2019[(a)]**

| Metric | RAG | YTD Actual | YTD Prior Year | EOY Target |
|---|---|---|---|---|
| % Contractor Assessments with Non-Conformance Findings | | 13.2% | 11.2% | |

**ASSESSMENT STATUS**




**NON-CONFORMANCE COUNT BY TYPE**




(a) An assessment is determined to be not met if one or more non-conformances are found.

## D. Motor Vehicle Safety

PG&E's Motor Vehicle Safety program is increasing its focus on reducing the severity of incidents to mitigate harm to employees and the public. PG&E has begun to leverage the use of technology and data to inform opportunities for driver feedback and interventions to reduce risks associated with driver behaviors. Despite these efforts, PG&E has experienced an increased number of serious and preventable incidents this year. This is an area of concern that PG&E is focused on understanding and developing actions to mitigate the risk of incidents. To address the frequency and types of incidents PG&E drivers are involved in, PG&E is improving availability of data to field leaders to enable targeted risk assessments and promote focused leadership reviews and driver coaching.

Key activities that occurred during the third quarter of 2019 include:

- Drafted post-accident review process and solicited LOB feedback for implementation and enterprise-wide approach.
- Developed Safe Backing web-based training to reinforce and demonstrate company policy and best practices to all employees who drive for company business. Course is expected to be finalized and available in the Company's learning management system in the fourth quarter of 2019.
- Demos of two additional vendors were conducted as part of the RFP for vehicle safety technology that was launched in the second quarter.

- Increased visibility and reporting of driver motor vehicle incident history. Combined complaint calls and incidents in LOB leader reports to enable better risk identification and coaching opportunities with drivers.

Table 3 below summarize key metrics performance in 2018-2020. Figure 3 provides current performance with respect to motor vehicle safety metrics as of September 30, 2019.

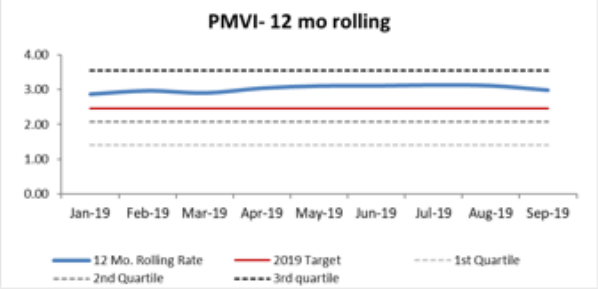
**TABLE 3**
**2018–2020 PERFORMANCE AND ESTABLISHED TARGETS**

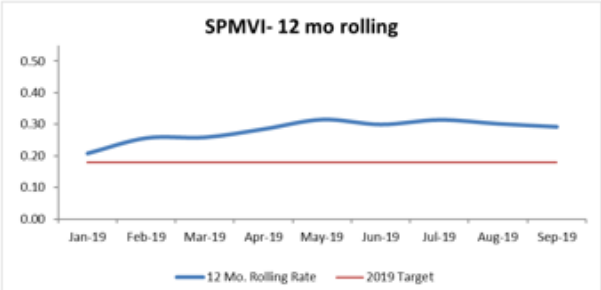
| Key Metrics Performance | 2018 Actuals | 2019 Target | 2020 Target |
|---|---|---|---|
| SPMVI Count | 27 | 26 | 25 |
| PMVI Count | 400 | 352 | 302 |

**FIGURE 3**
**CURRENT PERFORMANCE AS OF SEPTEMBER 30, 2019**

| Metric | RAG | YTD Actual | YTD Prior Year | EOY Target |
|---|---|---|---|---|
| Preventable Motor Vehicle Count (PMVI) | | 305 | 278 | 352 |
| Serious Preventable Motor Vehicle Count (SPMVI) | | 36 | 19 | 26 |

12 MONTH ROLLING RATES




## E. Safety Management System

In the 2019 update to the NorthStar report, NorthStar recommended PG&E "develop a comprehensive safety strategy" based on its assessment that "a Corporate Safety Plan was developed but does not include all aspects of safety" and that "NorthStar continues to be concerned about silos" in PG&E's approach to safety. PG&E acknowledges NorthStar's concerns and PG&E senior leadership committed to develop the ESMS to define how PG&E consistently manages all safety domains under a single, comprehensive governance framework. PG&E held a cross-functional session with safety and operational leaders and defined the primary focus areas for the ESMS. The ESMS will establish governance and oversight of:

- Public safety practices, which primarily includes asset management.
- Occupational Health and Safety practices, which primarily affect workforce safety for employees and contractors.

- Environmental management practices, which affect the S&H of the environment, the public, and our workforce.
- Safety-related business functions, which support all of the practices outlined above.

To support ESMS definition, PG&E completed the following activities:

- Developed a proposal to design and implement a capability and maturity model to help consistently measure progress of the ESMS efforts. This effort will leverage and scale up work already done in Gas Operations.
- A corporate-level Safety Policy has been drafted and routed to PG&E senior leadership for review.
- An outline for the corporate ESMS Standard has been drafted and will incorporate definitions from the capability and maturity model as it is developed.
- A high-level roadmap and more detailed project plan with proposed resources and controls to define and deploy the ESMS that meets that scope.

The new Utility CEO acknowledged and reinforced the importance of the ESMS by committing a team to report to him in order to execute the plan. The team will focus on the following five foundational standards:

- Enterprise Safety Management System
- Public Safety
- Workforce Safety
- Safety Culture
- Management of Change

By January of 2020, these foundational standards will be drafted by the team, reviewed by senior leadership, and published across the enterprise. The team will prepare additional plans for further implementation consistent with publication.

## VII. Conclusion

PG&E is committed to continuing to improve its safety culture and performance. While we have made progress, we have more work to do. The areas of opportunity identified by NorthStar in its Final Report and in its First Update are at the core of a strong and proactive safety culture that requires a consistent “One PG&E” approach and a comprehensive strategy focused on improving safety performance, aligning different organizations, and reaching every employee. PG&E looks forward to continuing this important work and providing the Commission with quarterly updates on its progress.

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 1

# COMPLETION NARRATIVE

PACIFIC GAS AND ELECTRIC COMPANY
Attachment 1
Completion narrative

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# PACIFIC GAS AND ELECTRIC COMPANY

# RECOMMENDATIONS F-2_includes V-4

**Recommendation F-2**
The need for clear definition of supervisory requirements, including an assessment of workload requirements, ongoing field monitoring efforts and time requirements, and associated staffing levels.
**Recommendation V-4**
Reevaluate staffing, roles, responsibilities and work requirements to increase Supervisor's time in the field supervising crews.

**Recommendation Summary:** This recommendation, created by NorthStar Consulting but strongly supported by PG&E, has two parts, both aimed at dramatically increasing the amount of time our operations leaders spend in the field with our most important assets; the men and women performing work on our behalf.
**Recommendation F-2**, the need for clear definition of supervisory requirements, including an assessment of workload requirements, ongoing field monitoring efforts and time requirements and associated staffing levels, intends to alleviate the administrative and management burdens currently affecting our field supervisor's ability to optimize their time in the field.
**Recommendation V-4,** a reevaluation of staffing roles, responsibilities and work requirements to increase supervisor's time in the field supervising crews, intends to calibrate span of control within our Electric, Gas and Power Generation field facing groups to ensure adequate span of control to enable supervisor's prioritizing time in the field supporting their personnel.
These recommendations, separate and distinct yet similar in principal, are significant change efforts for PG&E and led to the following approach:

Develop a Utility Policy (GOV-06) that establishes the principals of a safety and quality at the source culture (F-2)

Create a Utility Standard (GOV-3901S) that prescribes the amount of time leaders spend in the field (F-2)

Establish an SAP Time Code (1040 Field Working Time) to track leaders time in the field (F-2)

Develop additional bands within field facing supervisors job families to allow alignment with HR guidance on leadership spans, and to reduce administrative burden on supervisors (V-4)

Phase I

---

Build a change and communications plan to prepare the organization for a new way of leading (F-2, V-4)

Deploy "Leader Standard Work" across Electric, Gas and Power Generation business units to support time management for prioritization of field time (F-2)

Develop and deploy "effective coaching" training where required via Safety Leadership Development programs (F-2)

Phase II

**Phase 1 Approach:** As stated previously, this NorthStar Consulting recommendation was strongly supported by PG&E and the recommendation(s) prompted a One PG&E response to a long-standing problem. PG&E recognized a cross-business unit effort was required to make this change an organizational

imperative and commissioned a team to effect sustainable change.
The team, consisting of director level leaders in electric, gas and power generation, started by assessing “as is” conditions for field supervisors in these business units. The high-level timeline for this assessment was as follows:

| Action | Rec Item | Date | Supporting Documentation |
|---|---|---|---|
| Cross-functional team identified | F-2/V-4 | April 2018 | |
| Internal/External Benchmarking | F-2, V-4 | June 2018 | “Safety Culture and Governance OII_DR_NorthStar_940Atch05” |
| Time in Field Survey | F-2 | June 2018 | “Leader in the Field – Impact Survey Results” |
| Identification of Administrative burdens | F-2 | July 2018 | “Leader in the Field – Impact Survey Results” |
| Short Term Actions Identified (see description below) | F-2/V-4 | September 2018 | “NS_1024_Atch01_Leader in the Field” |
| Implementation Lead Identified | F-2/V-4 | December 2018 | “FW Sup in Field – Action Plan and Supporting Documents” |
| Working Committee Established | F-2/V-4 | February 2019 | “Safety Culture OII-Working Team” |
| Span of Control Review | V-4 | March 2019 | “March Spans” |
| Brief Enterprise Safety Committee-Item #7: Leader in the Field update | F-2/V-4 | March 2019 | “03.26.19 Safety Committee Materials” |
| Implementation Plan Identified | F-2/V-4 | April 2019 | ”D. Powell_Brief” |
| External benchmarking with Safety.net peer companies | F-2 | April, 2019 | ”SafetyNet Benchmarking Lead” |
| N-1 Leadership Briefing (Lewis, Powell, Soto) | F-2/V-4 | April 2019 | “SVP PreRead_LIF” |
| Create Utility Policy for Leader Time in Field | F-2 | May 2019 | ”Final_Leader in the Field_Policy” |
| Span of Control Review | V-4 | May 2019 | “May Spans” |
| Brief Enterprise Safety Committee | F-2/V-4 | May 2019 | ”Final_ESC_Deck_LIF_wtpoints” |
| Develop SAP Time Code (1040 – Field Working Time) | F-2/V-4 | June 2019 | ”Completion Narrative_SAPCode” |
| Develop Supervisor Band | V-4 | June 2019 | ”Assoc_Supervisor_Job Families” |

**Short Term Actions:** As stated previously, senior leadership strongly supported this recommendation and the team, consisting of director level leaders from Electric, Gas and Power Generation, recognized this to be a significant change effort. As a result, the team moved to implement short term actions, to effect transitional change in advance of the larger organizational imperative, commenced as early as March 2018 continuing through September 2018 to incrementally improve the amount of time leaders spend in the field. Those actions are included in the following pieces of supporting documentation:
“Leader Standard Work_Gas”
“PG ELT Leaders in the Field”
Power Gen Leaders in the Field 5MM”
Power Gen May Leader in the Field”

“Blocking time_go”

These actions included:

- Leadership support in “blocking” calendars to ensure the entire leadership prioritizes time in the field in gas operations
- Direction to the Power Generation leadership team about increasing leadership field presence
- Guidance from, and role modeling of, “Field Thursdays” across the Electric business unit by senior leadership

**Longer Term Plan:** The team recognized more was needed to deliver sustainable improvement in this mission critical imperative and, at the end of Q3, started formulating their longer-term strategy. However, the effort paused in November as a result of our Camp Fire response to Paradise, California.
In December 2018, an enterprise implementation lead was identified and onboarded to the effort. With a new executive sponsor, and enterprise implementation lead, the team met in December to plan out the longer- term strategy.

”Leader in the field working session”

Over the next several weeks the team held ideation sessions on how to solve a systemic, long-standing problem. In time, the team developed consensus on the following four improvements as part of phase I of the Leader in the Field recommendation:

1. Create a Utility Policy that establishes the principals of a safety and quality at the source culture and how supervisors support these attributes while in the field (F-2)
2. Create a Utility Standard that prescribes the amount of time leaders spend in the field with their people (F-2)
3. Establish an SAP Time Code to track leaders time in the field (F-2)
4. Revise the job families for field facing leaders in Electric, Gas and Power Generation allowing for an entry level supervisor (associate), operations supervisor (Electric), as well as a senior supervisor, to reduce administrative burdens and management obstacles preventing our leaders from being in the field (V-4)

**Rationale:** The following is the rationale for choosing these improvement items:

**Utility Policy:** PG&E lacks formal documentation or training on what leaders do while they are in the field. For several years PG&E senior leadership has articulated a strong desire for leaders to model a servant leadership approach aimed at increasing the levels of employee engagement and truly being an asset to the men and women performing work on our behalf. The following is the finalized Utility Policy GOV-06 intent to accomplish this:

”Final_Leader in the Field_Policy”

**Utility Standard:** Beyond cursory mention in job descriptions, job families and job postings, PG&E lacks a clear standard on the amount of time field

facing leaders should spend with their people. This newly created standard GOV-3901S prescribes the percentages of time each level of the organization should spend in the field and can be found here:

"GOV-1039S_Leader in the Field"

**SAP Time Code:** Until now, all management time has been "charged" to SAP Time Code 1036. PG&E has been roundly criticized, rightfully so, of the amount of time our leaders spend in the field. However, throughout the Safety Culture OII, no one can affirmatively state how much time each level of the organization spends in the field. This narrative has been framed for us because we are unable to prove differently. The implementation of SAP Time Code 1040 – Field Working Time will enable us to differentiate field time from office time and, then, problem solve those areas where we are struggling to achieve our objectives. A screen shot of this new Time Code and FAQ document are included below:

"Completion Narrative_SAPCode" and "LITF-timecoding FAQ-081519"

**Develop Supervisor Band:** Many supervisors legitimately struggle to get in the field resulting from administrative burdens or management obligations. The creation of new bands within the supervisor job families is intended to provide alternative management resource to perform some of the more mundane, administrative tasks, that are still managerial in nature, to alleviate the burden on more experienced supervisors who should be in the field. The job families where these positions will reside follows:

"Assoc_Supervisor_Job Families"

Electric Operations developed a peer supervisory role, Distribution Operations Supervisor, in August 2019. This leadership role will operate alongside existing supervisor roles and assume several duties previously held by the T200 Distribution Supervisor and other leaders. The initial candidates for the Operations Supervisor position will be oriented to the new role in September 2019. Approval to formally post and fill 20 permanent Operations Supervisor roles across EDO M&C departments was granted in August 2019.
JOB FAMILY UPDATE EFF. 8/23/19 JOB ROLES COMPARISON
"Sept2019_Roles & Responsibilities"
"Sept2019_Job Descriptions – Electric"

**Next Steps:** All of these changes are effective July 1st. However, this is a significant change effort. The items within this narrative should be considered tools, and tools alone will not change culture. The following is the communications plan for these changes:

"Leader in the field_FiveMinuteMeeting"
"2019 Leader in the Field Launch"

| Completion Date | Communications Cascade | Owner | Audience | Channel |
|---|---|---|---|---|
| early w/o 6/24 | Note to O&D in Gas, Electric and Power Gen, indicating 7/1 start; invite for con call | Powell | O&D in Gas, Electric and Power Gen | Email (Include 5M link to policy; neec charge codes) |
| w/o 6/24 | LOB Conference Call | Powell, MacAleese | O&D in Gas, Electric and Power Gen | Conference Call |
| w/o 7/1 | Director-lead conference calls | LOB directors | LOB People leaders | Conference Call |
| mid-July | Reminder about start of Leader in the Field | Corporate Comms | People leaders | Daily Digest |
| July | Updates on new Associate Supervisor openings | LOB directors | LOB People leaders | Email |
| July | New WBT on program | LOB VP | LOB People leaders | |
| August | @ Work article, featuring LOB leaders and crew | Corporate Comms | All Employees | Email/Intranet |
| *September* | *Review timesheets; discuss how program is going* | *HR LOB leads, Directors* | *LOB People leaders* | *In person* |
| October | @ Work article, featuring LOB leaders and crew | Corporate Comms | All Employees | Email/Intranet |
| *November* | *Review timesheets; discuss how program is going* | *HR LOB leads, Directors* | *LOB People leaders* | *In person* |
| December | @ Work article, featuring LOB leaders and crew | Corporate Comms | All Employees | Email/Intranet |

NOTE: LIF was featured in the company-wide Safety Leader Packet vs @ Work article for August 2019

**Sustainability:** July 1st is the start, and not the end, of this new way of leading. As stated above, the tools developed and deployed as part of Phase 1 are just that- tools. However, it is behavior that changes culture and these tools alone will not accomplish our desired outcomes. To that end, the Leader in the Field team will kick off a Phase II that will be coordinated with other corporate safety culture initiatives and inclusive of the following:

1. In partnership with Gas Lean Capability Center deliver facilitative training for all field facing leaders (Supervisors, Managers and Directors) on Leader Standard Work. Leader Standard Work is a documented set of actions, tools and behaviors that are incorporate in to daily, weekly or monthly deliverables to enable leaders to better manage time and focus on their most important assets-their people
2. In partnership with Corporate Safety, Human Resources, and in collaboration with the IBEW, re-emphasize Effective Coaching training concepts from Safety Leadership Development programs to field-facing leaders in Electric, Gas and Power Generation as determined by the business unit (all levels of leadership)
3. Review and recommend changes to compensatory time policies to ensure leaders are able to be in the field with their people.

4. Deploy Safety Leadership Development training for the officer and director team to introduce key concepts and tools on how to effectively role model our new way of leading.
5. Identify leaders who are already role models of the Leader Standard Work, Effective Coaching, and other desired safety leadership behaviors, and assign them as peer level mentors and coaches
6. Monitor adoption of leader in the field time keeping codes via monthly reporting dashboards to ensure all departments are increasing time in field and addressing identified roadblocks.

It is the team's expectation that these items will begin in July 2019, but take a significant amount of time to complete.

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 2

# GLOSSARY OF SAFETY TERMS

# ATTACHMENT 2 - GLOSSARY

**SIF Timeliness of Corrective Actions:**

The total number of Serious Injuries or Fatalities (SIF) corrective actions completed on time (as measured by the due date accepted by Line of Business Corrective Action Review Boards (CARB)) divided by the total number of SIF corrective actions past due or completed. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. This metric includes Electric Operations, Gas Operations, Generation, Information Technology (IT), Supply Chain and Customer Care, as well as any SIF actual events from any line of business. Includes corrective actions with initial due date on or before month end reporting and corrective actions with initial due date after month end reporting but already completed.

**SIF Quality of Corrective Actions:**

The quality of SIF corrective actions as determined by the corrective action quality framework created by Dr. Mark Fleming. Quality is determined by assessing whether or not the corrective actions address all incident causes identified, extent of condition, hierarchy of controls, if the corrective action's effectiveness is measurable, and if the corrective actions have appropriate timelines for completion. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. The assessment is performed by an independent third party after acceptance by Line of Business CARBs.

**SIF Index: SIF Effectiveness of Action Completion**

The effectiveness of corrective actions as measured by the number of repeat SIF Exposure Factors over a 36-month period. Only SIF incidents in Electric Operations, Gas Operations or Generation are included in this metric. Only investigations that have been approved by the Line of Business-specific CARBs are included in Long-Term Incentive Plan reporting.

**SIF Exposure Factors List**

1. Animal Attack or Bite
2. Assault or Violent Attack
3. Confined Space
4. Heavy Equipment Operation or Traffic Hazards
5. Control of Hazardous Energy
6. Dropped Object of Sufficient Mass to Cause Injury
7. Excavation
8. Hazardous Chemicals/Material
9. Heat Exposures
10. Helicopter Use
11. Welding, Grinding, Cutting, Hot Work Permits
12. Live Electrical Work
13. Grounding (Live Electrical Work Supplement)
14. Mobile Equipment Use (i.e., Lifts, Cranes, Forklifts, etc.)
15. Off-road Vehicle Use
16. Powered Tool use
17. Public Safety
18. Work at Heights (4 ft. or Greater)

19. Suspended Loads and Rigging

**SIF Exposure Rate**: SIF Exposure rate is the number of actual or potential SIF per 200,000 hours worked. Includes Electric, Gas, Generation, IT, Supply Chain, Customer Care.

**Days Away, Restricted and Transfer (DART) Rate:** includes Occupational Safety and Health Administration (OSHA)-recordable injuries that result in lost time or restricted duty per 200,000 hours worked.

**Preventable Motor Vehicle (PMVI) Rate:** the total number of motor vehicle incidents for which the driver could have reasonably avoided, per 1 million miles driven.

**Lost Work Day Case Rate (LWD)**

This measures the number of Lost Workday (LWD) cases incurred for employees and staff augmentation per 200,000 hours worked, or for approximately every 100 employees. A LWD Case is a current year OSHA Recordable incident that has resulted in at least one LWD. An OSHA Recordable incident is an occupational (job related) injury or illness that requires medical treatment beyond first aid, or results in work restrictions, death or loss of consciousness.

**Workforce Unavailable Due to Health**

This is a percentage of PG&E's workforce that is out due to the following:

- Sick time
  - Family sick time excluded
- Short Term Disability (<1 year)
- Long Term Disability (> 1 year)
- Workers Compensation
- Family and Medical Leave Act
  - Due to one's own medical condition
- Company medical leave

**PG&E Gas and Electric**
**Advice Submittal List**
**General Order 96-B, Section IV**

AT&T
Albion Power Company
Alcantar & Kahl LLP

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
P.C. CalCom Solar
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission
California State Association of Counties
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Cenergy Power
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
County of Tehama - Department of Public Works
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

Downey & Brand
East Bay Community Energy
Ellison Schneider & Harris LLP
Energy Management Service

Engineers and Scientists of California

Evaluation + Strategy for Social Innovation
GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Charge Networks
Green Power Institute
Hanna & Morton
ICF

International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc. Linde
Los Angeles County Integrated Waste Management Task Force
Los Angeles Dept of Water & Power
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenzie & Associates

Modesto Irrigation District
Morgan Stanley
NLine Energy, Inc.
NRG Solar

Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy
Praxair

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions

SCE
SDG&E and SoCalGas

SPURR
San Francisco Water Power and Sewer
Seattle City Light
Sempra Utilities
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Utility Specialists

Verizon
Water and Energy Consulting Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
Yep Energy

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March 20, 2020

**Advice 5786-E**
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

**Subject:** **Pacific Gas and Electric Company's Quarterly Advice Letter Pursuant to Assembly Bill 1054 Regarding the Implementation of Its Approved Wildfire Mitigation Plan and Its Safety Recommendations**

Per Public Utilities Code Section 8389(e)(7), Pacific Gas and Electric Company (PG&E) hereby submits this Tier 1 Advice Letter (AL) detailing the status of its approved wildfire mitigation plan (2019 WMP)[1], recommendations of the most recent safety culture assessment[2], recommendations of the board of directors' safety committee meetings that occurred during the quarter, and a summary of the implementation of safety committee recommendations from the previous Advice Letter filing (if any), as well as other information to help illustrate the above.

## Purpose

The purpose of this AL is to comply with Public Utilities Code (PUC) Section 8389(e)(7), established by California Assembly Bill (AB) 1054, for the 4th Quarter of 2019—the second quarter following PG&E's receipt of its Initial Safety Certification on August 23, 2019.

## Background

On July 12, 2019, Governor Newsom signed AB 1054 into law adding Section 8389(e)(7) to the Public Utilities Code which requires, as one of the conditions to the executive director of the Commission issuing a safety certification, documentation of the following:

> The electrical corporation is implementing its approved wildfire mitigation plan. The electric corporation shall file a Tier 1 advice letter on a quarterly

[1] *See* Decisions (D.) 19-05-036 and (D.) 19-05-37.
[2] Pacific Gas and Electric Company's Safety Culture and Governance Quarterly Report No. 05-2019 In Compliance with CPUC Decision 18-11-050 Submitted January 30, 2020 (Safety Culture Report 05-2019).

basis that details the implementation of both its approved wildfire mitigation plan and recommendations of the most recent safety culture assessment, and a statement of the recommendations of the board of directors' safety committee meetings that occurred during the quarter. The advice letter shall also summarize the implementation of the safety committee recommendations from the electrical corporation's previous advice letter filing. If the division has reason to doubt the veracity of the statements contained in the advice letter filing, it shall perform an audit of the issue of concern.

## Q4 2019 Update

Implementation of Approved Wildfire Mitigation Plan

Based on the requirements of PG&E's 2019 WMP, PG&E tracked 53 different initiatives to mitigate catastrophic wildfire risk associated with utility facilities. PG&E provided a comprehensive status report on 2019 implementation of those initiatives to the CPUC on January 15th (which is available at https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2020/R1810007%20PGE%20WMP%20Status%20Update%201-15-20.pdf). That report noted all 53 wildfire mitigation activities were completed or on track as of the end of 2019 except for 4 items that were not completed and 3 that were substantially completed. The details of each commitment are included in that January 15th report.

Implementation of the Recommendations of Most Recent Safety Culture Assessment.

On January 31, 2020, PG&E's Safety Culture and Governance submitted its quarterly report number 05-2019 in compliance with CPUC Decision 18-11-050, for the fourth quarter of 2019. Attachment A, Safety Culture and Governance Quarterly Report, reflects the implementation of the recommendations of such safety culture assessment.

Recommendations of Board of Directors Safety Committee Meetings During Q4 2019

The PG&E Board of Directors' Safety and Nuclear Oversight (SNO) Committee is an important part of PG&E's Board-level oversight of safety, enterprise risk, and other matters. A parallel SNO Committee also concurrently exists at the PG&E Corporation Board. Details regarding the SNO Committee's duties, composition, and activities were described in last quarter's advice letter (Advice Letter 5700-E) and are not repeated here.

During the fourth quarter of 2019, the SNO Committee (and the PG&E Corporation SNO Committee) met twice, on November 19, 2019 (joint meeting with the Audit Committees and the PG&E Corporation Compliance and Public Policy Committee) and on December 10, 2019.

During the November 19, 2019 joint meeting, the SNO Committees, the Audit Committees, and the PG&E Corporation Compliance and Public Policy (CPP) Committee reviewed summaries of open high-risk audit issues with operational risks, including safety, and the status of action plans to address these issues. Examples include issues that were identified in Internal Auditing's evaluation of controls and processes relating to: (1) cathodic protection systems designed to protect gas facilities from corrosion, (2) the electric and hydro Supervisory Control and Data Acquisition systems, (3) the brake inspection program for regulated vehicles and equipment, (4) distribution wood pole asset management, and (5) the dam surveillance, monitoring, and inspection program. The Committees received reports on employee safety (including a recent employee significant injury incident), a recent contractor fatality incident, and performance in the areas of workforce safety, motor vehicle safety, and public safety. The Committees also received a report on the results of the World Association of Nuclear Operators' evaluation of the Diablo Canyon Power Plant, as well as reports on various security and physical risks.

During the December 10, 2019 joint meeting of the PG&E and PG&E Corporation SNO Committees, the Committees received a safety report, which included a review of performance in the areas of workforce safety, motor vehicle safety, and public safety. The Chairman of the independent Nuclear Safety Oversight Committee attended and provided an informational report. The SNO Committees also received reports on top enterprise risk topics and enterprise risks, including cybersecurity, climate change, and wildfire, as well as a report on wildfire considerations in gas operations, a PSPS post-event review, and performance and operational updates on nuclear generation and power generation. The SNO Committees received a written report on significant changes in laws and regulations affecting safety and operational performance.

In addition, the SNO Committee made the following specific safety-related recommendations to management during the fourth quarter of 2020:

- notify the Audit and SNO Committees if any open high-risk issues in Internal Auditing's third quarter 2019 report are not closed by the target dates identified in that report,

- evaluate whether it is practical to have field employees work in pairs instead of alone, in light of potential threats to their safety (e.g., a recent incident where an employee was shot at, threats against PG&E and executives on social media, etc.), and report findings back to the Committees,

- analyze employee Days Away, Restricted or Transferred (DART) injuries to better understand factors affecting DART results (e.g., to discern whether there are patterns as to who is getting injured and/or the types of injuries) and report findings back to the Committees, and

- consider adding Customer Care and IT data to the "Line-of-Business (LOB) Level 2 Breakdown" information in the Safety Performance Review materials that are provided to the SNO Committees, and report any decisions back to the Committees.

Implementation of Recommendations/Guidance and Direction disclosed in Advice Letter 5700-E

The following summarizes actions that management has taken to implement guidance and direction from the SNO Committees that was described in Advice Letter 5700-E for the third quarter of 2019.

- *Guidance #1: The Committee emphasized that management should work to continue to strengthen accountability and transparency in how risks inherent in the business are being managed.*

  Management has continued to refine the risk analysis methodologies associated with its Enterprise Risk Oversight Management (EORM) processes by, among other things, (1) implementing a new methodology to measure and communicate risk using a multi-attribute value function (MAVF) and enhanced bow-tie analysis, with the goal of advancing the ability to assess and prioritize risk, as well as assess progress in risk mitigation, (2) increasing accountability by better defining how cross-departmental issues play a role in the overall risk-management framework, and promoting coordination among different lines of business of risk management activities across the enterprise, and (3) revising the format for presenting risks to the SNO Committees, the PG&E and PG&E Corporation Boards, and other committees of the Boards, to more clearly present the bow-tie analysis illustrating key risk drivers and potential consequences, risk spend efficiency, data quality, any associated high-risk audit items, and progress and effectiveness of risk mitigation activities.

  Management has been working to ensure that the appropriate governance forums across the enterprise receive straightforward information on risk reduction performance with the appropriate transparency to help ensure that the results are well understood, and appropriate actions are taken. Management also is developing metrics that show, to the extent possible, a cause-effect relationship between mitigation actions and risk reduction, to help demonstrate risk reduction, and help management and the Boards better gauge the effectiveness of risk mitigation actions.

- *Guidance #2: The Committee reiterated the Board's expectations for creating visibility into the status of high-risk audits, endorsed use of standard methods for evaluating risks and communicating key drivers and controls, and requested that management continue to make improvements in the quality of data used for making risk mitigation decisions.*

  At least quarterly, management provides information regarding high-risk audits to the SNO Committees and to the Audit Committees. Management also has developed an approach to data quality improvement that uses a combination of sensitivity analysis and impact to decision making to determine the highest-priority data quality improvement opportunities. Using this approach, PG&E is establishing specific data

improvement plans for risk-based decision-making that will be tracked at senior management quarterly business reviews.

- *Guidance #3: The Committee emphasized its expectation that both strong safety culture and strong risk management program require going beyond minimum compliance obligations, and that compliance, itself, may not be a sufficient goal.*

  PG&E is committed to full compliance with applicable regulations. The company also understands that compliance may not be enough to ensure safety or manage risks inherent in its business and may need to go beyond compliance to reduce risk and ultimately to the benefit of improved safety and risk outcomes.

  For example, the company reviewed over 100 compliance inspection processes to determine which inspections were safety-related and whether compliance was enough for managing the risk. As a result, we reprioritized 31 inspections using a risk-based approach that involves (1) understanding, at a granular level, all objectives of each inspection process, and all failure modes that each inspection is intended to assess, (2) confirming the inspection approach is reasonable given the failure modes, and (3) ensuring that items identified are addressed in a timely manner. This risk-based approach was applied to all electric distribution, transmission and substation assets in Tier 2 and Tier 3 wildfire risk areas in 2019 and will continue to be used on these assets.

  Additionally, the new Independent Safety Oversight Committee (comprised of experienced individuals who are independent and external to PG&E) is charged with providing independent oversight and review of Utility operations, including not only safety and regulatory compliance, but also safety leadership and operational performance.

- *Guidance #4: The Committee emphasized its expectation that safety culture must address multiple elements of safety, including employee safety, public safety, and asset management.*

  Safety developments relating to the One PG&E Plan and the Enterprise Safety Management System during the 4th quarter of 2019 are described in Safety Culture Report 05-2019. PG&E's safety program and its recent activities have addressed aspects of employee safety, contractor safety, motor vehicle safety (employee and public), asset management and life cycles, and change management.
  PG&E also is expanding adoption of independent international standards for asset management, such as PAS 55 and ISO 55000, as well as safety maturity matrices developed by the Centre for Energy Advancement though Technological Innovation. PG&E's implementation of these standards reflects its dedication to a philosophy of continuous improvement in the areas of safety, reliability, and cost performance across the enterprise as a whole. Also, most risks on PG&E's risk register are asset-related, the mitigations for which will drive better asset management and associated

safety performance. PG&E's risk scoring methodology also has been modified to expressly require consideration of all aspects of safety and ensure risks that have the highest potential for safety consequences are the highest priority for senior management and the company.

- *Guidance #5: The Committee emphasized that PG&E leaders are responsible for creating behavioral and culture changes that lead to meaningful improvement in behavior and positive expectations regarding the safety of the work environment.*

  PG&E's leaders from the Safety and the Compliance and Ethics organizations are consulting with third-party experts regarding methods to further enhance the effectiveness of PG&E's speak up culture, which in turn can help drive cultural changes to positively impact safety performance. The consultants have identified areas for PG&E to focus on to increase "speak up" behaviors. PG&E is sharing these results with employees and developing an action plan.

  Safety developments relating to the One PG&E Plan during the 4th quarter of 2019 are described in Safety Culture Report 05-2019 and include a continuing focus on improving consistency of safety feedback from leaders to employees, engaging them in discussions on how they are working safely and offering specific guidance on how to improve.

## Protests

Anyone wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than April 9, 2020, which is 20 days after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.
The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson

Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

**Effective Date**

PG&E requests that this Tier 1 advice submittal become effective upon date of submittal, which is March 20, 2020.

**Notice**

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.18-10-007, R.18-12-005, and I.15-08-019. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Erik Jacobson
Director, Regulatory Relations

**Attachment:**
Attachment A: Safety and Culture Governance Quarterly Report

cc: Service Lists R.18-10-007, R.18-12-005, and I.15-08-019



# California Public Utilities Commission

# ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39E)

Utility type:
☑ ELC ☐ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Kimberly Loo
Phone #: (415)973-4587
E-mail: PGETariffs@pge.com
E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 5786-E

Tier Designation: 1

Subject of AL: Pacific Gas and Electric Company's Quarterly Advice Letter Pursuant to Assembly Bill 1054 Regarding the Implementation of Its Approved Wildfire Mitigation Plan and Its Safety Recommendations

Keywords (choose from CPUC listing): Compliance

AL Type: ☐ Monthly ☑ Quarterly ☐ Annual ☐ One-Time ☐ Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #:

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information:
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? ☐ Yes ☑ No

Requested effective date: 3/20/20

No. of tariff sheets: 0

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

**Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:**

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

Name: Erik Jacobson, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility Name: Pacific Gas and Electric Company
Address: 77 Beale Street, Mail Code B13U
City: San Francisco, CA 94177
State: California Zip: 94177
Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

Clear Form

Advice 5786-E
March 20, 2020

# Attachment A

## Safety and Culture Governance Quarterly Report

# PACIFIC GAS AND ELECTRIC COMPANY

# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT

# NO. 05-2019

# IN COMPLIANCE WITH CPUC DECISION 18-11-050

# SUBMITTED JANUARY 31, 2020



PACIFIC GAS AND ELECTRIC COMPANY
SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
NO. 05-2019
IN COMPLIANCE WITH CPUC DECISION 18-11-050
SUBMITTED JANUARY 31, 2020

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# PACIFIC GAS AND ELECTRIC COMPANY
# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
# NO. 05-2019
# IN COMPLIANCE WITH CPUC DECISION 18-11-050

## I. Introduction

Pacific Gas and Electric Company (PG&E or the Company) submits this fifth Safety Culture and Governance Quarterly Report (Report) in compliance with California Public Utilities Commission (CPUC or Commission) Decision (D.) 18-11-050.[1] In that decision, the Commission directed PG&E to implement the recommendations of the Commission's Safety and Enforcement Division (SED), as set forth in a report prepared by NorthStar Consulting Group (NorthStar), no later than July 1, 2019, and to serve quarterly reports on the status of its implementation and ongoing execution to the service list for this proceeding. In addition, in compliance with D. 19-06-008, adopted by the Commission on June 13, 2019, PG&E and PG&E Corporation also provide details of safety-specific training, education, and support given to the PG&E and PG&E Corporation Boards of Directors (BODs).

This Report provides an update on PG&E's ongoing execution and sustainability of NorthStar's recommendations between October 1, 2019 and December 31, 2019. Additionally, this Report discusses the BODs safety training, education, and support for the same time period, and the One PG&E Occupational Health and Safety Plan[2] (One PG&E Plan) and associated safety performance metrics.

This Report is organized as follows:

- Executive Summary
- Sustainability Update
- Board of Directors Reporting
- One PG&E Plan and Key Safety Metrics

## II. Executive Summary

PG&E continues to execute on NorthStar's numerous and important safety recommendations in order to ensure full consummation of those recommendations. And while we are making progress in a number of safety-related areas, our safety performance must continue to improve. We did not meet our safety performance goals for workforce injuries and incidents, and we are not satisfied with the results. PG&E is reviewing the One PG&E Plan and will refresh the Plan to focus on three key themes on which Operational

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1 See Order Instituting Investigation (OII) on the Commission's Own Motion to Determine Whether Pacific Gas and Electric Company and PG&E Corporation's Organizational Culture and Governance Prioritize Safety (I.15-08-019).

2 The One PG&E Occupational Health and Safety Plan is reviewed annually.

Leadership, Safety Leadership and Union leaders are aligned: (1) Safety is everyone's responsibility, (2) How leaders show up regarding safety matters, and (3) We are a rapid learning organization.

During the fourth quarter of 2019, PG&E made improvements with initiatives to get leaders in the field to talk openly about safety, and to coach on safety improvements. Senior leadership remains focused on reinforcing our culture of raising issues through personal commitment and the company's expectation that leaders listen and follow up when issues are raised. Through the company's Corrective Action Program (CAP), PG&E closed out approximately 37,000 issues raised by employees in 2019. Additionally, the Safety Observation Program and performance dashboards are helping our workforce identify risks and provide leadership coaching opportunities. During the fourth quarter, 23,893 safety observations were conducted, and 4,739 at-risk issues were identified and addressed.

On the injury management and ergonomics front, we developed programmatic improvements during the fourth quarter. We are increasing access to local health care treatment, and we provided additional On-site Prevention Specialists beginning in December. We believe these enhancements will improve early intervention and provide better case management. The program enhancements will help improve Lost Work Day (LWD) cases and Days Away, Restricted, or Transferred (DART) performance–areas where we continue to benchmark in the third and fourth quartiles.

Motor vehicle safety is another focus area to address Preventable Motor Vehicle Incidents (PMVI) performance where we are benchmarking in the third quartile. Key actions to address this include improved training and better Vehicle Safety Technology (in cab alerts). We revamped our motor vehicle backing training for 2020 and have partnered with a new vendor to provide improved technology and data reporting on Vehicle Safety Technology.

As we continue to work through the challenges in our performance on workforce safety, the Company is emphasizing clear and consistent safety procedures and standards and is establishing expectations that our leaders spend more time in the field. The Company is seeing some encouraging trends in safety performance correlated to our leaders spending more time in the field. In Power Generation, where leaders are consistently spending 30 to 50 percent of their time in the field, we observed reductions in the 3- and 6-month rolling rate across performance measures such as LWD, DART and PMVI. Discussions with the crews focus on hazard identification, how to safely mitigate risks before starting a job, and understanding the controls in place to ensure work is completed in a safe manner–especially in high-risk areas.

In D.19-06-008, the Commission directed PG&E to provide certain BOD-related information "in the quarterly reports submitted to SED pursuant to D.18-11-050." Information in compliance with this requirement is provided in Section IV of this Report.

Consistent with PG&E's previous quarterly Reports, Section V of this Report has a progress update on the One PG&E Plan, including fourth quarter safety performance.

Attachment 1 to this Report provides a Glossary of Safety Terms.

Attachment 2 to this Report includes approved BOD and Safety and Nuclear Oversight (SNO) Committee meeting minutes.

## III. Sustainability Update

PG&E continues to execute on NorthStar's recommendations and has verified the sustainability of its Safety OII plans for the period of October 1, 2019 through December 31, 2019. PG&E used its compliance management tool, MetricStream, to certify ongoing execution and adherence to the Safety OII requirements. As part of the certification process, plan owners reviewed their plans and commitments, and responded to three certification questions focused on (1) ongoing execution of plans, (2) identifying any changes to plans, and (3) certifying adherence with the Safety OII requirements. Each plan sponsor then reviewed and approved the certification along with PG&E's Safety OII Program Management Office.

## IV. Board of Directors Reporting

In D.19-06-008, the Commission directed PG&E to provide the following information in the quarterly reports submitted to SED pursuant to D.18-11-050:

1) Non-confidential versions of the minutes of all board meetings and safety committee meetings.
2) All training, education or other support on safety that PG&E and PG&E Corporation are providing to board members so that they can adequately perform their duties on safety issues.[3]

### A. BOD and Safety and Nuclear Oversight Committee Meeting Minutes

Attachment 2 to this Report includes non-confidential versions of approved minutes for the following BODs or SNO Committee meetings that were held on or after June 13, 2019[4], and for which approved minutes have not been provided in connection with a prior quarterly report.

- Meetings of the BODs of PG&E and PG&E Corporation held concurrently on the following dates:

| |
|---|
| June 14, 2019 |
| June 20-21, 2019 (two-day meeting) |
| June 27, 2019 |
| July 9, 2019 |
| July 12, 2019 |
| July 16, 2019 |

[3] D.19-06-008, *mimeo*, p. 4

[4] Effective date of D.19-06-008

| |
|---|
| July 19, 2019 |
| July 25, 2019 |
| August 2, 2019 |
| August 6, 2019 |
| August 7, 2019 |
| August 9, 2019 |
| August 12, 2019 |
| August 16, 2019 |
| August 23, 2019 |
| August 30, 2019 |
| September 6, 2019 |
| September 8, 2019 |
| September 10-11, 2019 (two-day meeting) |
| September 20, 2019 |
| September 26, 2019 |

- Meetings of the SNO Committees of the BODs of PG&E and PG&E Corporation held concurrently on the following dates:

| |
|---|
| June 20, 2019 |
| July 16, 2019 |
| August 20, 2019 |
| September 10, 2019 |

Meeting minutes for the BODs and the SNO Committees must be formally reviewed and approved by the relevant governance body prior to finalization. The timing for this process varies, and in many cases the minutes will be finalized in a different quarter than the quarter in which the meeting was held.

## B. BOD Safety-Related Training

PG&E is submitting information regarding "all training, education or other support on safety that PG&E and PG&E Corp." provided "to board members to ensure that they can adequately perform their duties on safety issues."

- During the fourth quarter of 2019, in-person regular meetings of the BODs and the SNO Committees included a safety tailboard similar to those presented to employees. Topics covered during the fourth quarter of 2019 included: (1) managing disgruntled customers, (2) flooding and high-water hazards, and (3) working safely near trees.
- In October and November 2019, the BODs received several reports on various Public Safety Power Shutoff (PSPS) events initiated by PG&E during October and November, which included discussions of PG&E's post-PSPS safety inspection and restoration process.
- In November 2019, the BODs received a report on a recent employee significant injury incident.
- In November 2019, the SNO Committees, the Audit Committees, and the PG&E Corporation Compliance and Public Policy (CPP) Committee reviewed summaries of open high-risk audit issues with operational risks,

including safety, and the status of action plans to address these issues. Examples include issues that were identified in Internal Audit's evaluation of controls and processes relating to: (1) cathodic protection systems designed to protect gas facilities from corrosion, (2) the electric and hydro Supervisory Control and Data Acquisition systems, (3) the brake inspection program for regulated vehicles and equipment, (4) distribution wood pole asset management, and (5) the dam surveillance, monitoring, and inspection program.

- In November 2019, the SNO Committees, the Audit Committees, and the PG&E Corporation CPP Committee also received a report on a recent contractor fatality incident and a recent employee significant injury incident.
- In November 2019, the SNO Committees, the Audit Committees, and the PG&E Corporation CPP Committee also received a report on employee safety.
- In November 2019, the SNO Committees, the Audit Committees, and the PG&E Corporation CPP Committee also received a safety report, which included a review of performance in the areas of workforce safety, motor vehicle safety, and public safety.
- In November 2019, the SNO Committees, the Audit Committees, and the PG&E Corporation CPP Committee also received a report on the results of the World Association of Nuclear Operators' evaluation of the Diablo Canyon Power Plant.
- In November 2019, the PG&E Corporation CPP Committee reviewed a draft of the Committee's third quarter 2019 oversight report to the BODs on PG&E's progress against its Wildfire Safety Plan.
- In December 2019, the SNO Committees received a safety report, which included a review of performance in the areas of workforce safety, motor vehicle safety, and public safety.
- In December t2019, the SNO Committees also received a report from the Chair of the independent Nuclear Safety Oversight Committee.
- In December 2019, the SNO Committees also received reports on top enterprise risk topics and enterprise risks, including cybersecurity, climate change, and wildfire.
- In December 2019, the SNO Committees also received a written report on significant changes in laws and regulations affecting safety and operational performance.
- In December 2019, the SNO Committees also received: (1) a report on wildfire considerations in gas operations, (2) a PSPS post-event review, and (3) performance and operational updates on nuclear generation and power generation.
- In December 2019, the BODs received a report on wildfire risk reduction strategy and the 2020 Wildfire Mitigation Plan.

- In December 2019, the BODs received the PG&E Corporation CPP Committee's third quarter 2019 oversight report on PG&E's progress against its Wildfire Safety Plan.
- During the fourth quarter of 2019, consistent with each director's commitment to conduct at least three site visits per year[5], non-employee directors of PG&E and PG&E Corporation made various field visits and facility tours to meet with employees, observe employees and contractors performing work in the field, and tour safety training facilities and operating facilities. Activities during the fourth quarter included: (1) visiting various job sites to observe gas pipeline replacement, electric distribution pole replacement, and other gas and electric work, (2) touring the Diablo Canyon Power Plant, (3) touring the Gas Control Center, (4) visiting the Emergency Operations Center, including visits during PSPS events, (5) touring the Applied Technology Services facility, (6) touring the Center for Gas Safety and Innovation, (7) meeting with tribal representatives and customers to discuss impacts of recent PSPS events and areas for improvement, (8) visiting the Oakport Service Center and meeting with gas and electric crews, and (9) touring the Wildfire Safety Operations Center.

## V. One PG&E Occupational Health and Safety Plan and Key Safety Metrics

### A. Introduction

The One PG&E Plan encompasses three safety categories—Employee Safety, Contractor Safety and Motor Vehicle Safety—and the Enterprise Safety Management System (ESMS), as well as eight focus areas to facilitate execution and reporting.

### B. Employee Safety

#### 1. Musculoskeletal Disorders (MSD), Sprains and Strains

PG&E's MSD program supports the prevention of injury though changes and re-design of key programs such as office, vehicle, industrial ergonomics, and Industrial Athlete program. These programs are designed to take a systematic approach of identifying the ergonomic risk factors associated with performing physical work.

In the office, PG&E uses a software that provides both subjective data (feedback on workstation set up and discomfort) and objective data (computer use, key stokes, mouse clicks) to obtain a quantified risk level for office-based employees with the potential for developing discomfort, and possible subsequent injury.

In the field, PG&E uses Electromyography (EMG) technology to quantify the physical demands of the work in order to reduce them with appropriate mitigations.

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[5] SNO Committee members commit to additional visits.

Key activities that occurred during the fourth quarter of 2019 include:

- In the office ergonomics program, PG&E conducted a gap analysis for continuous improvement. The results showed an opportunity to increase office ergonomic evaluator presence at four locations in PG&E's territory that have had higher incident and injury rates due to ergonomic risk factors. In December 2019, an evaluator was placed in Fresno to provide dedicated support in education, discomfort resolution, data analysis, and reporting.
- In the industrial ergonomics program, PG&E successfully piloted an industrial ergonomics software and obtained a license for its use. This software will allow PG&E to conduct task analyses and to quantify the injury risk level associated with physical work. This will provide PG&E with a prioritized approach to mitigating high-risk, physically demanding work in the field.
- Developed a model to increase the presence of Industrial Athlete specialists in the field to work directly with crews and supervisors on body mechanics and positioning when performing repetitive tasks. The model has been adopted in Gas Operations and will be implemented across the enterprise in the first quarter of 2020.

**2. Safety Leadership**

Safety Culture observations were conducted and recorded in SafetyNet (the enterprise-wide safety observation tool) during the 12-month period October 1, 2018 through September 30, 2019. These observations were analyzed for trends in the fourth quarter of 2019. The analysis indicated that timely and effective feedback was not consistently provided by leaders during their time in the field. The observations also showed that crews were not using a systematic approach to identifying hazards in their work environment. As a result, PG&E will focus on these two opportunities for improvement in 2020:

- More effective hazard recognition, encouraging employee use of the Hazard Identification Wheel tool[6] to assess the environment for hazards in a consistent and disciplined way.
- Consistent feedback to employees from leaders, engaging them in discussions on how they are working safely and offering specific guidance on how to improve.

The compilation and analysis of Safety Culture observations were also used to inform PG&E's Academy annual update cycle of the Safety Leadership Development Workshops[7], which will increase the emphasis on hazard recognition and leader feedback.

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**6** The tool represents ten potential hazard categories that may be encountered while performing work and is used during pre-job planning and briefs to identify hazards.

**7** Designed for employees in leadership roles who are responsible for employees in high-risk operations.

The total number of Safety Culture observations recorded was relatively small (60 in total). To increase the number of observations in the 2019-2020 time period, PG&E is planning to increase the minimum number of Safety Leadership Development observations in the Field Safety Specialists' performance goals.

### 3. Serious Injury and Fatality Prevention

PG&E investigates incidents that result in an actual employee serious injury or fatality (SIF), meaning a fatality, life-threatening or life-altering injury or illness. PG&E also investigates SIF actual events for contractors, provided they were conducting work under the supervision of PG&E, on PG&E property, or on PG&E assets.

PG&E identifies incidents with SIF potential through the review of all injuries and near hits. By investigating incidents with SIF potential, PG&E identifies conditions that led to the incident, learns from the investigation findings, develops corrective actions, and engages with employees and contractors on corrective action implementation. If a contractor has an incident that is classified as having SIF potential, the contractor performs a cause evaluation, and PG&E analyzes that evaluation to determine the extent of the condition and if any corrective actions are needed within PG&E and among contractors.

Investigation results and corrective actions are managed in CAP to drive timely completion, accountability, and effectiveness. In addition, all SIF incidents are communicated through initial and final communications to all employees for their awareness.

Key activities that occurred during the fourth quarter of 2019 include:

- PG&E completed ten cause evaluations. These include the investigations of three SIF actual events that occurred in 2019 (two of which involved serious injuries and one involved a fatality), all of which involved contractors:
    - A subcontractor groundman performing work was in a trench when the wall of the trench gave way and collapsed on him. The contractor survived the incident.
    - Two contractors working on an electric transmission project in steep terrain in Plumas County fell from an insulated work platform attached to a transmission pole. One of the contractors died and the other was injured.
    - A contractor crew member was drilling a pilot hole. While hammering the half inch lag bolt into the pilot hole, it contacted remnants of the pilot drill bit which remained inside the pole, causing the half inch lag bolt to spring back at the contractor and strike the contractor in the eye.
- Eight investigations are open, all of which are for SIF potential events.

## 4. Injury Management

PG&E has improved upon its Injury Management programs, including timely injury reporting, Return to Work (RTW), and expansion of the on-site medical clinic model.

Timeliness of injury reporting improved as compared to 2018. This allows for early intervention to mitigate the severity of injuries. The PG&E RTW Task Program was successful in bringing back employees with medical restrictions that might otherwise prevent them from returning to work. Early return to work has been shown to result in better recovery overall. The RTW Task Program encountered a challenge in obtaining timely approval of tasks by the Unions, which impacted some LOBs waiting for resources from the program. Continuing to add to the library of tasks is essential to the success of the program, and PG&E has established a new escalation process to address any delays and ensure timely placements. Plans for on-site medical clinics in Concord and San Ramon have been completed. While they were scheduled to open in the fourth quarter, PG&E ran into some obstacles such as lease constraints and vendor staffing. The clinics are expected to be operational in the first quarter of 2020.

Key activities that occurred during the fourth quarter of 2019 include:

- The Phase 2 of the Fit4U pilot, focused on those with multiple injuries/claims, concluded. Sixty three percent of employees responded to the satisfaction survey and over half reported being "very satisfied" with the program. Further program effectiveness evaluation is anticipated in the first quarter of 2020.
- PG&E's vendor, WorkCare, was awarded a one-year contract to provide Nurse Care Line services. The 2019 target for timeliness of injury reporting is 72 percent, and PG&E has achieved 75.8 percent year-to-date (YTD).
- Overall in 2019, PG&E placed 122 employees with medical restrictions and an inability to perform their regular work into temporary task assignments within the RTW Task Program. Also, the RTW Task Program saved over 4,500 lost work days in 2019. This resulted in injured employees being able to heal while working (which studies have shown reduces recovery time) and in increased productivity.

## 5. Health and Wellness

PG&E's Health and Wellness programs use employee education and engagement to help employees take action to improve their overall well-being and reduce risks of health conditions and injuries. PG&E promotes healthy lifestyles by improving access and awareness of available health and wellness resources, which include mental health and employee assistance program (EAP) services.

With the transition to Quest Diagnostics, the launch of the health screenings began October 15, 2019, two weeks later than in prior years,

and the health screening completion rates for the fourth quarter reflect that. The enrollment rates for the new health and wellness portal show a gradual increase over the third quarter. As part of the transition to any new program or process, it takes time for adoption, and we see that in the fourth quarter performance.

Key activities that occurred during the fourth quarter of 2019 include:

- Launched the 2020 voluntary employee health screening campaign with Quest Diagnostics. Approximately 10,606 employees (48%) completed a health screening as of December 31, 2019. Over the course of the campaign, it is expected that the percentage of health screenings will steadily increase. Employees have until August 31, 2020 to complete a voluntary annual health screening and tobacco test or tobacco cessation program.
- Increased employee enrollment in the new mobile and online Health and Wellness portal, administered by Virgin Pulse. As of December 31, 2019, approximately 1,500 employees (6.4%) had enrolled. The portal helps employees build healthy habits across all areas of well-being. Features include telephonic tobacco cessation coaching, team healthy habit challenges, nutritional guides, general telephonic and digital health coaching, and a sleep guide. The focus is on prevention and long-term health.
- Additional program activities include onsite EAP resources when the Emergency Operations Center was activated, educational venues to employees on preventing and reducing anxiety, mindfulness, and suicide prevention, and launched an opioid awareness campaign.

PG&E has identified key performance metrics tied to the Employee Safety focus areas above. As acknowledged earlier in the Report, PG&E is not satisfied with the results and is reviewing the One PG&E plan to improve its safety performance.

Table 1 below summarizes key metrics performance and established targets for 2018-2020. Figure 1 below provides current performance with respect to employee safety metrics as of December 31, 2019.

**TABLE 1**
**2018 - 2020 PERFORMANCE AND ESTABLISHED TARGETS**

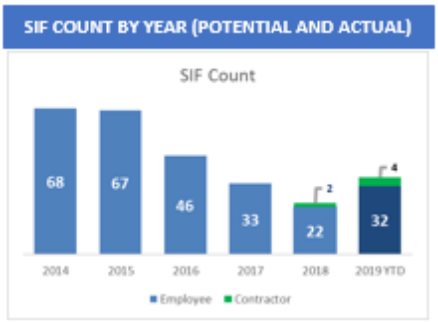
| Key Metrics Performance | 2018 Actuals | 2019 Actuals | 2020 Target |
|---|---|---|---|
| SIF: # of Employee Serious Injuries & Fatalities | 24[(a)] | 36 | Track Only[(b)] |
| SIF Prevention: SIF Timely Corrective Action Completion | 90% | 94% | 90% |
| SIF Prevention: SIF Quality of Corrective Actions | 12 | 12.9 | 12 |
| Injury Management: Lost Work Day Cases Count | 90 | 103 | 70 |
| Sprains/Strains: DART[(c)] Case Count | 416 | 480 | 198 |
| Sprains/Strains: OSHA[(d)] Case Rate | 675 | 769 | Track Only |
| H&W: Workforce Unavailable Due to Health | 7.9% | 7.8% | 7.5% |
| Injury Management: Timely Reporting of Injuries | 75% | 75.7% | 72% |

(a) 2018 SIF actuals have been updated from 25 to 24. One SIF event was moved to non-SIF category as it did not meet the criteria for a serious event.
(b) No target set for this metric.
(c) Days Away Restricted or Transferred.
(d) Occupational Health and Safety Administration.

**FIGURE 1**
**CURRENT PERFORMANCE AS OF DECEMBER 31, 2019**

EMPLOYEE SAFETY METRICS DEC 2019 PERFORMANCE

| Metric | RAG | YTD Actual | YTD Prior Year | EOY Target |
|---|---|---|---|---|
| Serious Injury or Fatality (SIF) Count Actual and Potential | | 36 | 24 | |
| SIF % Timely Corrective Action Completion | | 94% | 95% | 90.0% |
| SIF Quality of Corrective Actions | | 12.9 | 12.7 | 12.0 |
| Lost Workday (LWD) Count | | 103 | 90 | 81 |
| DART Injury Count | | 480 | 416 | 308 |
| OSHA Injury Count | | 769 | 675 | |







## C. Contractor Safety

PG&E's Contractor Safety Program requires primary contractors and subcontractors performing medium- and high-risk work to meet minimum pre-qualification requirements. The population of the contractor workforce has

increased significantly over the past three years, with roughly 2,200 individual contractor companies that employ approximately 27,000 employees performing PG&E work.

PG&E monitors the implementation of the Contractor Safety program requirements by conducting compliance assessments of the LOBs' adherence to the enterprise Contractor Safety Standard, SAFE-3001S, and their contractor oversight procedures to identify any gaps, which are referred to as non-conformances. The most significant non-conformances identified from the 208 assessments performed in 2019 were 1) safety observations not being performed by PG&E on their contractors, and 2) contractors not performing observations of their own crews. PG&E is evaluating the root cause for the lack of safety observations and will propose changes for enterprise-wide improvement.

PG&E also performs Management and Organization Assessments (MOAs) on contractors who are new in business (less than three years) or have experienced rapid growth (significant increase in employees working for PG&E) to evaluate the contractor's safety management structure.

Key activities that occurred during the fourth quarter of 2019 include:

- Contractor Safety Standard, SAFE-3001S, annual review was completed as required by the Kern Settlement Agreement. The Standard revision was published on December 18, 2019 and reflects program enhancements implemented in 2019.
- Implemented training requirements for PG&E employees who approve contractor safety plans.
- Incorporated three new web-based training courses into ISNetworld[8] to be delivered to contractor employees.
- Conducted 57 LOB compliance assessments on the implementation of the LOB Contractor Safety procedures. A total of 208 assessments were completed across the enterprise in 2019.
- Conducted 23 MOAs; 22 were approved. A total of 97 MOAs were conducted and 83 were approved in 2019.

Table 2 below summarizes key metrics performance in 2018-2020. Figure 2 below provides current performance with respect to contractor safety metrics as of December 31, 2019.

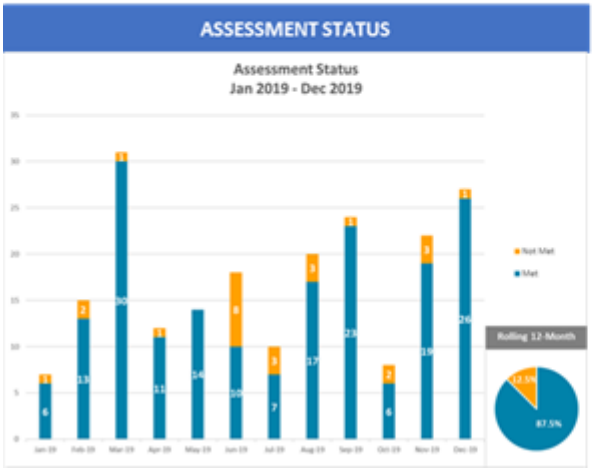
**TABLE 2**
**2018 - 2020 PERFORMANCE**

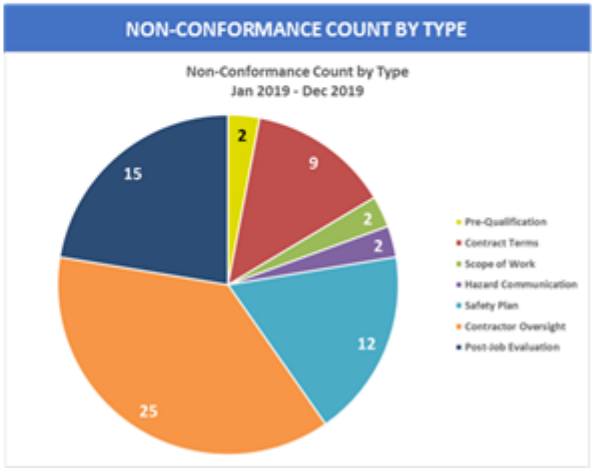
| Key Metrics Performance | 2018 Actual | 2019 Actual | 2020 |
|---|---|---|---|
| # of Contractor Serious Injuries & Fatalities | 3 | 3 | Track Only |
| % of Contractor Assessments with Non-Conformance Findings | 10.3% | 12.5% | Track Only |

8 ISNetworld is an online contractor and supplier management platform.

**FIGURE 2**
**CURRENT PERFORMANCE AS OF DECEMBER 31, 2019 [(a)]**

| Metric | RAG | YTD Actual | YTD Prior Year | EOY Target |
|---|---|---|---|---|
| % of Contractor Assessments with Non-Conformance Findings | | 12.5% | 10.3% | |




(a) An assessment is determined to be not met if one or more non-conformances are found.

## D. Motor Vehicle Safety

PG&E's Motor Vehicle Safety program is focused on preventing and reducing the risk of motor vehicle incidents to mitigate harm to employees and the public. PG&E is leveraging technology and data for driver feedback and interventions to reduce risks associated with driver behavior and improving availability of data to field leaders to enable targeted risk assessments and coaching.

In the fourth quarter, PMVI and Serious Preventable Motor Vehicle Incidents (SPMVI) performance continued to remain off target with rear-ending third party vehicles being the biggest area for improvement for SPMVI, and backing into and striking stationary objects being the largest volume of PMVI across the enterprise. Also in the fourth quarter, program enhancements and resources were initiated to help leaders and drivers focus on improvements and identified risks.

Key activities that occurred during the fourth quarter of 2019 include:

- Began the development of a comprehensive Driver History Scorecard to support leaders with post-accident reviews with a consistent, enterprise-wide approach.
- Launched Safe Backing web-based training to reinforce and demonstrate company policy and best practices for all employees who drive for company business. The course is available in the PG&E's learning management system.

- Selected a new Vehicle Safety Technology vendor with hardware installations and communications set to resume in early 2020.
- Began exploring additional phone application technology to help address PG&E's highest frequency PMVIs and support compliance with company policies.

Table 3 below summarize key metrics performance in 2018-2020. Figure 3 provides current performance with respect to motor vehicle safety metrics as of December 31, 2019.

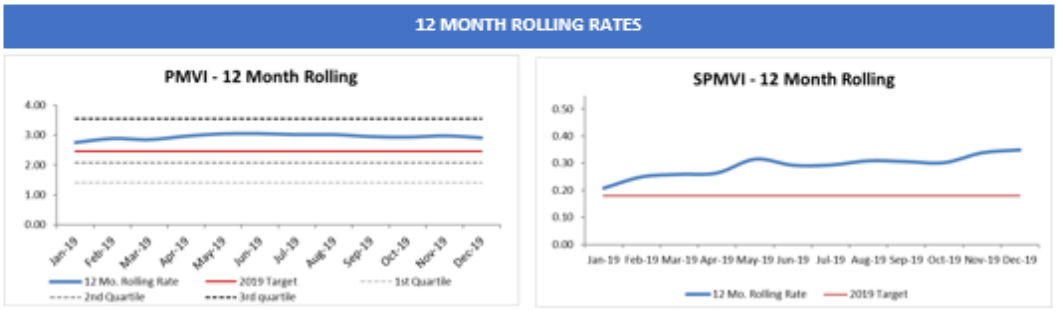
**TABLE 3**
**2018–2020 PERFORMANCE AND ESTABLISHED TARGETS**

| Key Metrics Performance | 2018 Actuals | 2019 Actuals | 2020 Target |
|---|---|---|---|
| SPMVI Count | 27 | 49 | 25 |
| PMVI Count | 400 | 409 | 302 |

**FIGURE 3**
**CURRENT PERFORMANCE AS OF DECEMBER 31, 2019**

MOTOR VEHICLE SAFETY METRICS DEC 2019 PERFORMANCE

| Metric | RAG | YTD Actual | YTD Prior Year | EOY Target |
|---|---|---|---|---|
| Preventable Motor Vehicle Count (PMVI) | | 409 | 400 | 352 |
| Serious Preventable Motor Vehicle Count (SPMVI) | | 49 | 27 | 26 |




## E. Safety Management System

In its third quarter update, PG&E outlined five foundational standards to define the Enterprise Safety Management System (ESMS) and dedicated a team to develop them starting in the fourth quarter of 2019. These standards include:

- ESMS focused on outlining scope of the management system
- Public Safety focused on maximizing public safety throughout asset life cycles
- Workforce Safety focused on employees and contractors
- Management of Change (MOC) to proactively manage safety changes

- Safety Culture expressed as Safety Values and Actions

PG&E is on track to have the standards reviewed and approved by executive leadership in the first quarter of 2020.

A key component of the ESMS is the Independent Safety Oversight Committee (ISOC). The ISOC is modeled on independent safety oversight committees that have been established and used with success in the areas of nuclear power and dam operations. It is providing independent oversight and review of the PG&E's operations, including safety and regulatory compliance, safety leadership, and operational performance. It will meet regularly and prepare reports highlighting performance for particular periods, including an annual performance evaluation.

The ISOC members are all external to PG&E except for the chair. Current ISOC members collectively have nearly 200 years of relevant experience:

- Chris Hart – 40+ years safety experience, former Chair of the National Transportation Safety Bureau, PG&E Chief Safety Advisor, ISOC Chair.
- Frank Gallaher – 50+ years utility industry experience, including former Electric Power Research Institute (EPRI) board member and Chief Operating Officer at Entergy.
- Gus Ponce – 40+ years utility industry experience, including former Exelon Director for Transmission and Substation charged with implementing Target Zero Safety Program for employees and contractors.
- Randy Lyle – 30+ year veteran of CalFire retiring as Division Chief to become program manager for San Diego Gas & Electric (SDG&E) Fire Science and Coordination Program 2007 to 2019; recipient of California Governor's Medal of Commendation.
- Lynn Walter – 30+ year California utility industry veteran and member of multiple utility safety oversight committees focused on emergency planning and response and human performance management.

In December 2019, the ISOC, led by Chris Hart, undertook a data-driven and process-focused review of wildfire safety in Electric Operations, with engagement from executives to individual field employees. The ISOC members conducted field visits, interviews, and observations, as well as reviews of documentation relating to safety performance. The ISOC provided a high level out brief to the Electric Operations and Safety, Health, ECAP and DOT senior leaders on December 13, 2019, with a final submission report for leadership review on January 10, 2020. PG&E leaders will incorporate lessons learned from the pilot review. The ISOC will scale throughout 2020 such that every area of the business is covered by a safety assurance function. As the ESMS definition and implementation continues, the ESMS will act on ISOC findings and adopt the ISOC review as an assurance activity for the ESMS.

## VI. Conclusion

PG&E is committed to improving its safety culture and performance and regaining the public's trust. The areas of opportunity identified by NorthStar in its Final Report and in its First Update are at the core of a strong and proactive safety. Such a culture requires a consistent "One PG&E" approach and a comprehensive strategy focused on improving safety performance, aligning different organizations, and reaching every employee. PG&E looks forward to continuing this important work and providing the Commission with quarterly updates on its progress.

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 1

# GLOSSARY OF SAFETY TERMS

# ATTACHMENT 1 - GLOSSARY

**SIF Timeliness of Corrective Actions:**

The total number of Serious Injuries or Fatalities (SIF) corrective actions completed on time (as measured by the due date accepted by Line of Business Corrective Action Review Boards (CARB)) divided by the total number of SIF corrective actions past due or completed. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. This metric includes Electric Operations, Gas Operations, Generation, Information Technology (IT), Supply Chain and Customer Care, as well as any SIF actual events from any line of business. Includes corrective actions with initial due date on or before month end reporting and corrective actions with initial due date after month end reporting but already completed.

**SIF Quality of Corrective Actions:**

The quality of SIF corrective actions as determined by the corrective action quality framework created by Dr. Mark Fleming. Quality is determined by assessing whether or not the corrective actions address all incident causes identified, extent of condition, hierarchy of controls, if the corrective action's effectiveness is measurable, and if the corrective actions have appropriate timelines for completion. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. The assessment is performed by an independent third party after acceptance by Line of Business CARBs.

**SIF Index: SIF Effectiveness of Action Completion**

The effectiveness of corrective actions as measured by the number of repeat SIF Exposure Factors over a 36-month period. Only SIF incidents in Electric Operations, Gas Operations or Generation are included in this metric. Only investigations that have been approved by the Line of Business-specific CARBs are included in Long-Term Incentive Plan reporting.

**SIF Exposure Factors List**

1. Animal Attack or Bite
2. Assault or Violent Attack
3. Confined Space
4. Heavy Equipment Operation or Traffic Hazards
5. Control of Hazardous Energy
6. Dropped Object of Sufficient Mass to Cause Injury
7. Excavation
8. Hazardous Chemicals/Material
9. Heat Exposures
10. Helicopter Use
11. Welding, Grinding, Cutting, Hot Work Permits
12. Live Electrical Work
13. Grounding (Live Electrical Work Supplement)
14. Mobile Equipment Use (i.e., Lifts, Cranes, Forklifts, etc.)
15. Off-road Vehicle Use
16. Powered Tool use
17. Public Safety
18. Work at Heights (4 ft. or Greater)

19. Suspended Loads and Rigging

**SIF Exposure Rate**: SIF Exposure rate is the number of actual or potential SIF per 200,000 hours worked. Includes Electric, Gas, Generation, IT, Supply Chain, Customer Care.

**Days Away, Restricted and Transfer (DART) Rate:** includes Occupational Safety and Health Administration (OSHA)-recordable injuries that result in lost time or restricted duty per 200,000 hours worked.

**Preventable Motor Vehicle (PMVI) Rate:** the total number of motor vehicle incidents for which the driver could have reasonably avoided, per 1 million miles driven.

**Lost Work Day Case Rate (LWD)**

This measures the number of Lost Workday (LWD) cases incurred for employees and staff augmentation per 200,000 hours worked, or for approximately every 100 employees. A LWD Case is a current year OSHA Recordable incident that has resulted in at least one LWD. An OSHA Recordable incident is an occupational (job related) injury or illness that requires medical treatment beyond first aid, or results in work restrictions, death or loss of consciousness.

**Workforce Unavailable Due to Health**

This is a percentage of PG&E's workforce that is out due to the following:

- Sick time
  - Family sick time excluded
- Short Term Disability (<1 year)
- Long Term Disability (> 1 year)
- Workers Compensation
- Family and Medical Leave Act
  - Due to one's own medical condition
- Company medical leave

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 2

# BOARDS OF DIRECTORS AND SAFETY AND NUCLEAR OVERSIGHT COMMITTEE MEETING MINUTES

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – June 14, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, June 14, 2019, at 10:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Directors Frederick W. Buckman and Michael J. Leffell were absent.

Also participating by telephone at the beginning of the meeting were Linda Y.H. Cheng and John A. Lowe, along with Mario A. Ponce and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Moore, Chair of the Compensation Committee, presented two organizational matters for the Board's consideration, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She reviewed the background and reasons for the proposed actions. The directors asked questions and discussed the organizational matters.

On motion made and seconded, the independent members of the Board approved revisions to the 2019 compensation package for William D. Johnson, as presented. Mr. Johnson was excused from the meeting during the Board's discussion regarding this matter.

1 [redacted]

On motion made and seconded, the following resolution was duly adopted:

BE IT RESOLVED that Janet C. Loduca, currently Senior Vice President and Interim General Counsel, is hereby elected Senior Vice President and General Counsel, effective as of May 2, 2019, and that such election is ratified as of May 2, 2019.

Mr. Lowe left the meeting, and John R. Simon, Jason P. Wells, Julie M. Kane, and Robert S. Kenney joined the meeting at this point.

Mr. Johnson presented a report on operational matters, including two recent Public Safety Power Shutoff (PSPS) events. The directors asked questions and discussed various aspects of Mr. Johnson's presentation.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory and policy matters, including possible wildfire-related legislation that could be introduced in the state legislature, management's recent meeting with California Public Utilities Commission (CPUC) staff leadership, and recent developments in the CPUC's investigation regarding the Companies' safety culture and governance. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Wells presented a report on financial matters, including possible terms that could be included in a proposed Chapter 11 plan of reorganization that would be filed by the Companies. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:35 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – June 14, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, June 14, 2019, at 10:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Directors Frederick W. Buckman and Michael J. Leffell were absent.

Also participating by telephone at the beginning of the meeting were Linda Y.H. Cheng and John A. Lowe, along with Mario A. Ponce and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Moore, Chair of the PG&E Corporation Compensation Committee, presented an organizational matter for the Board's consideration, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She reviewed the background and reasons for the proposed action. The directors asked questions and discussed the organizational matter.

On motion made and seconded, the following resolution was duly adopted:

BE IT RESOLVED that Janet C. Loduca, currently Senior Vice President and Interim General Counsel, is hereby elected Senior Vice President and General Counsel, effective as of May 2, 2019, and that such election is ratified as of May 2, 2019.

1 [redacted]

Mr. Lowe left the meeting, and John R. Simon, Jason P. Wells, Julie M. Kane, and Robert S. Kenney joined the meeting at this point.

Mr. Johnson presented a report on operational matters, including two recent Public Safety Power Shutoff (PSPS) events. The directors asked questions and discussed various aspects of Mr. Johnson's presentation.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory and policy matters, including possible wildfire-related legislation that could be introduced in the state legislature, management's recent meeting with California Public Utilities Commission (CPUC) staff leadership, and recent developments in the CPUC's investigation regarding the Companies' safety culture and governance. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Wells presented a report on financial matters, including possible terms that could be included in a proposed Chapter 11 plan of reorganization that would be filed by the Companies. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:35 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – June 20 and 21, 2019
PG&E CORPORATION

A regular meeting of the Board of Directors of PG&E Corporation (Corporation) was held beginning at 12:40 p.m. on Thursday, June 20, 2019, at the office of the Corporation, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, William D. Johnson*, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff (who joined during the meeting as noted below). Director Fred J. Fowler attended by telephone, and Mr. Wolff attended a portion of the meeting by telephone, as permitted by the Corporation's Bylaws. No director was absent.

*Mr. Johnson was elected to the Board effective upon adjournment of the Annual Meeting of Shareholders at 11:10 a.m. on Friday, June 21, 2019.

Also present at 77 Beale Street at the beginning of the meeting were John R. Simon and Linda Y.H. Cheng, along with Mario A. Ponce of Simpson, Thacher & Bartlett LLP (Simpson). Also participating by telephone at the beginning of the meeting was Nicholas S. Goldin of Simpson.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session, with Mr. Johnson, Mr. Simon, Mr. Goldin, and Mr. Ponce present during portions of the executive session meeting.

The Board concluded its executive session. Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Simon, Mr. Goldin, and Mr. Ponce present, Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed

1 [redacted]

later in the meeting, and (2) with Mr. Johnson and Mr. Simon absent, the independent directors met in executive session without any management present.

The following individuals entered the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Fong Wan, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Alejandro Vallejo, and Brian D. Wong, along with Richard Hall of Cravath, Swaine & Moore LLP (Cravath).

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane and Mr. Vallejo presented an update on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, they discussed the possible timing for the Board's court-ordered visit to San Bruno. The directors asked questions and discussed various aspects of Ms. Kane's and Mr. Vallejo's presentation.

At this point, Mr. Vallejo left the meeting, and Sumeet Singh and Scott J. Strenfel, along with Charles J. Kalil II and Erica Williams of Kirkland & Ellis LLP (Kirkland) and Kevin J. Orsini of Cravath, entered the meeting.

Mr. Lewis, Mr. Singh, and Mr. Strenfel presented an update on the Utility's Community Wildlife Safety

Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the status of vegetation management work and the Utility's implementation of a risk-informed schedule for 2019, the Utility's progress on its commitments under the 2019 Wildfire Safety Plan approved by the CPUC, and the Public Safety Power Shutoff (PSPS) events on June 8 and 9, 2019. The directors asked questions and discussed, among other matters, the Utility's vegetation management program, the 2019 Wildfire Safety Plan, and the recent PSPS events.

At this point, (1) Ms. Kay, Mr. Lewis, Mr. Wan, Mr. Welsch, Mr. Christopher, Mr. Singh, Mr. Strenfel, Mr. Kalil, and Ms. Williams left the meeting, (2) Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kenneth S. Ziman of Lazard entered the meeting, and (3) James A. Mesterharm of AlixPartners and Michael H. Torkin of Simpson joined the meeting by telephone.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Alejandro D. Wolff joined the meeting by telephone and later entered the meeting during the foregoing discussion.

James Murphy entered the meeting at this point.

Mr. Murphy presented a briefing on security matters relating to the Companies' joint Annual Meeting of Shareholders on June 21, 2019.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Wong, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Goldin, Mr. Ponce, and Mr. Torkin present.

Ms. Cheng was recalled and informed that the directors continued their discussion regarding several of the topics covered earlier in the meeting.

Mr. Johnson, Ms. Cheng, Mr. Goldin, and Mr. Torkin left the meeting at this point.

The Board recessed at 5:40 p.m. and reconvened at 8:00 a.m. on Friday, June 21, 2019, prior to the Annual Meeting of Shareholders.

The directors convened in executive session with Mr. Ponce.

Ms. Cheng was recalled and informed that the directors continued their discussion regarding various topics covered earlier in the meeting.

The following individuals entered the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, Michael A. Lewis, Janet C. Loduca, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Robert G. Armstrong, Tyler B. Gayski, Todd Hohn, Michael A. Husa, and Jan A. Nimick, along with Angela Anderson and Douglas A. Bennett of NorthStar, and Charles J. Kalil II and Christopher W. Keegan of Kirkland.

Ms. Cheng reported on the preliminary proxy tabulation results on the items of business to be voted on at the Annual Meeting of Shareholders later that morning.

Mr. Hohn introduced Mr. Gayski, Senior Field Safety Specialist of the Utility, Mr. Husa, Senior Field Safety Specialist of the Utility, and Mr. Armstrong, Corporate Safety Business Partner of the Utility, and together they provided training for the directors on field safety observations. They presented an overview of how field safety observations are conducted in the Electric Operations, Gas Operations, and Power Generation lines of business (LOB), and what hazards to be aware of. The directors asked questions and discussed, among other matters, recent field visits and facility tours that they had attended, safety hazards in the different LOBs and how they are mitigated, and the ability of employees to stop work if they have safety concerns.

Mr. Lewis, Mr. Welsch, Mr. Christopher, Mr. Armstrong, Mr. Gayski, Mr. Hohn, Mr. Husa, Mr. Nimick, Ms. Anderson, Mr. Bennett, Mr. Kalil, and Mr. Keegan left the meeting at this point.

The Board recessed at 9:35 a.m. to attend the Annual Meeting of Shareholders and reconvened at 11:40 a.m.

Mr. Johnson and Mr. Kenney presented a report on Utility operations, including a report on policy and regulatory matters. The presentation included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, Mr. Kenney discussed the evaluation currently being conducted by the City and County of San Francisco regarding options for municipalization of the Utility's electric distribution facilities, and the CPUC's expected issuance of an Order Instituting Investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Johnson's and Mr. Kenney's presentation.

Erica Williams of Kirkland entered the meeting during the foregoing presentation and discussion.

Mr. Wells reviewed the Financial and Business Highlights report for May 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Mr. Johnson presented a consent item relating to the designation of executive officers and Section 16 officers, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board adopted an amended resolution designating executive officers and Section 16 officers (see Resolution 1 in Attachment A).

Mr. Leffell, Chair of the Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meetings on May 31, 2019 and June 3, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Moore, Chair of the Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meetings on June 3, 2019 and June 14, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Schmidt, Chair of the Compliance and Public Policy Committee, presented a report on the actions taken and items discussed at the Committee's meeting on May 28 and 29, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she reported on the Committee's recommendation that the Board amend the Committee's charter to reflect its responsibility to track progress against the Utility's CPUC-approved Wildfire Safety Plan and the new terms of the Utility's probation regarding wildfire safety.

On motion made and seconded, the Board adopted amendments to the Compliance and Public Policy Committee charter, as presented (see Resolution 2 in Attachment A).

Mr. Barrera, Chair of the Finance Committee, presented a report on the actions taken and items discussed at the Committee's meeting on June 20, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Campbell, Chair of the Safety and Nuclear Oversight Committee, presented a report on the items discussed at the Committee's meeting on June 20, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Moore, Chair of the Ad Hoc Restructuring Committee, presented a report on the items discussed at the Committee's recent meetings.

Ms. Kane reported on the date proposed by the District Court for the Board's visit to San Bruno.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, and Ms. Williams were excused, and the meeting continued in executive session, with Mr. Johnson, Ms. Cheng, and Mr. Ponce present for portions of the executive session meeting.

With Mr. Johnson, Ms. Cheng, and Mr. Ponce present, the directors viewed a video from the teachers of Paradise Elementary School.

Ms. Cheng was excused at this point. She was later recalled and informed that (1) with Mr. Johnson and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:20 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

WHEREAS, Section 16 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), requires "officers" of this corporation to comply with certain reporting requirements and liability provisions with respect to their transactions in this corporation's equity securities;

WHEREAS, Item 401(b) of Regulation S-K under the Securities Act of 1933, as amended, requires the identification of "executive officers" of this corporation in its Annual Report on Form 10-K and its proxy statement;

WHEREAS, pursuant to Exchange Act Rule 3b-7, the president, any vice president in charge of a principal business unit, division, or function, any other officer who performs a policy-making function, or any other person who performs similar policy-making functions for this corporation may be identified by the corporation as an "executive officer" of the corporation;

WHEREAS, Exchange Act Rule 16a-1(f) defines an "officer" as the president, the principal financial officer, the principal accounting officer (or, if there is no principal accounting officer, the controller), any vice president in charge of a principal business unit, division, or function, any other officer who performs a policy-making function, or any other person who performs similar policy-making functions; and

WHEREAS, it is in the best interest of this corporation to identify the "officers" of this corporation for purposes of Section 16 of the Exchange Act and the "executive officers" of the corporation for identification in its Annual Report on Form 10-K and its proxy statement;

NOW, THEREFORE, BE IT RESOLVED that, effective immediately, the following officers of this corporation and, to the extent applicable, Pacific Gas and Electric Company hereby are designated as "officers" of the corporation for purposes of Section 16 of the Exchange Act and as "executive officers" of the corporation:

(1) William D. Johnson, Chief Executive Officer and President, PG&E Corporation;
(2) John R. Simon, Executive Vice President, Law, Strategy and Policy, PG&E Corporation;

(3) Jason P. Wells, Executive Vice President and Chief Financial Officer, PG&E Corporation;
(4) Julie M. Kane, Senior Vice President, Chief Ethics and Compliance Officer, and Deputy General Counsel, PG&E Corporation and Pacific Gas and Electric Company;
(5) Michael A. Lewis, Senior Vice President, Electric Operations, Pacific Gas and Electric Company;
(6) Janet C. Loduca, Senior Vice President and General Counsel, PG&E Corporation and Pacific Gas and Electric Company
(7) Dinyar B. Mistry, Senior Vice President, Human Resources and Chief Diversity Officer, PG&E Corporation and Pacific Gas and Electric Company;
(8) James M. Welsch, Senior Vice President and Chief Nuclear Officer, Pacific Gas and Electric Company; and
(9) Melvin J. Christopher, Vice President, Gas Operations, Pacific Gas and Electric Company; and

BE IT FURTHER RESOLVED that David S. Thomason, Vice President and Controller of PG&E Corporation and Vice President, Chief Financial Officer, and Controller of Pacific Gas and Electric Company, hereby is designated an "officer" of this corporation for purposes of Section 16 of the Exchange Act; and

BE IT FURTHER RESOLVED that the resolution on this subject adopted by the Board of Directors on May 16, 2019 is hereby superseded.

**Resolution 2**

WHEREAS, the Public Policy Committee of this Board of Directors was reconstituted as the Compliance and Public Policy Committee of the Board of Directors effective May 5, 2015;

NOW, THEREFORE, BE IT RESOLVED that the Compliance and Public Policy Committee shall consist of at least three directors, one of whom shall be appointed by this Board of Directors as the Committee's chair; and

BE IT FURTHER RESOLVED that (i) all members of the Compliance and Public Policy Committee shall satisfy independence and qualification criteria established by this Board of Directors, as set forth in this corporation's Corporate Governance Guidelines, (ii) at least one member shall have experience in the utility or related industries, and (iii) unless the Board of Directors determines otherwise, at least one member of each of the PG&E Corporation Audit Committee and the PG&E Corporation Safety

and Nuclear Oversight ("SNO") Committee shall serve on this Committee; and

BE IT FURTHER RESOLVED that the basic responsibilities of the Compliance and Public Policy Committee shall be to (i) assist this Board, the Board of Directors of Pacific Gas and Electric Company, and their respective Audit Committees in fulfilling the Boards' oversight responsibility for compliance with legal and regulatory requirements by this corporation and its subsidiary companies (hereinafter collectively referred to as "the corporation"); (ii) coordinate the compliance-related oversight work of the various committees of the Boards; (iii) advise and assist this Board and the Board of Directors of Pacific Gas and Electric Company with respect to public policy and corporate responsibility issues which could affect significantly the interests of the customers, shareholders, or employees of the corporation; and (iv) perform any other duties as directed by the Boards of Directors or the Audit Committees. More specifically, the Compliance and Public Policy Committee shall:

Compliance Matters

1. Review and oversee the corporation's compliance and ethics program, including, but not limited to, evaluating its effectiveness.
2. Review periodic reports from management, including, but not limited to, the Chief Ethics and Compliance Officer (the "CECO") and other operations, compliance, and legal personnel, with respect to (a) the corporation's compliance with laws, regulations, and internal policies and standards, (b) significant pending or threatened litigation and government investigations, examinations, inquiries, demands, or proceedings, in each case which raise or would be expected to raise significant compliance issues, and (c) any other significant claim or complaint alleging that the corporation is not in compliance with laws, regulations, or internal policies and standards.
3. Review (a) periodic reports with respect to internal or external compliance reviews or audits conducted by the corporation, regulators, or third parties, and (b) reports by management with respect to their work to address any significant deficiencies, findings, and recommendations identified in any such review or audit.
4. Review the corporation's statements of policy concerning conflicts of interest and general business ethics (including the codes of business conduct and/or ethics).

5. At least semiannually, meet jointly and coordinate with the Audit Committees, the PG&E Corporation SNO Committee, and the Pacific Gas and Electric Company SNO Committee to discuss the corporation's compliance program and monitor that all significant compliance issues are addressed by the appropriate Board committees, and any other topics agreed upon by those committees.
6. Coordinate with management to facilitate the regular receipt by the Boards of Directors of appropriate reports and materials regarding significant compliance issues.
7. Monitor that a consistent commitment to maintaining an effective compliance program is conveyed to employees, contractors, and other relevant stakeholders.
8. Track progress against Pacific Gas and Electric Company's Wildfire Safety Improvement Plan, as approved by the California Public Utilities Commission, and reflecting the new terms of Pacific Gas and Electric Company's probation imposed on April 3, 2019 (the "April 2019 Probation") regarding wildfire safety. The Compliance and Public Policy Committee is to report in writing to the Board of Directors of Pacific Gas and Electric Company at least quarterly, and also present orally to the Board of Directors of Pacific Gas and Electric Company at least quarterly, that company's progress in meeting the terms of the approved Wildfire Safety Improvement Plan and the terms of the April 2019 Probation and, to the extent there are shortfalls, how Pacific Gas and Electric Company will address the shortfalls.

Public Policy Matters

9. Review the corporation's policies and practices with respect to the corporation's long-term sustainability and the protection and improvement of the quality of the environment, including, but not limited to, the corporation's social, environmental, economic, climate change, and broader environmental policies and programs.
10. Review the corporation's policies and practices with respect to charitable and community service organizations and activities, and recommend to the Boards of Directors annual budgets for contributions by the corporation to non-profit organizations.
11. Review the corporation's policies and practices with respect to diversity, inclusion, and workforce development.

12. Review the corporation's policies and practices with respect to development of diverse suppliers to this corporation, as required to be reported to the California Public Utilities Commission and other government agencies.
13. Review significant societal, governmental, and environmental trends and issues which may affect the corporation's operations, and advise the Boards of Directors regarding plans and programs with respect thereto.
14. Review the corporation's political contributions. Recommend Board approval limits for political contributions to federal, state, and local candidates, measures, and initiatives. Recommend Board approval limits for funding political action committees and other organizations that may engage in activities involving elections. At the direction of the Compliance and Public Policy Committee, an annual report detailing political contributions of the corporation during the preceding year will be prepared and made available to the full Boards of Directors at the beginning of each calendar year.

BE IT FURTHER RESOLVED that the Compliance and Public Policy Committee shall fix its own time and place of meetings and shall, by a majority vote of its members, and subject to the California Corporations Code and this corporation's Articles of Incorporation and Bylaws, prescribe its own rules of procedure; and

BE IT FURTHER RESOLVED that the Compliance and Public Policy Committee shall (i) provide the CECO with direct access to the Chair of the Committee at reasonable times, and (ii) require the CECO to report to the Committee at such times and with respect to such matters as the Committee may think fit; and

BE IT FURTHER RESOLVED that the Compliance and Public Policy Committee shall (i) report regularly to the Boards of Directors on the Committee's deliberations and actions taken, and (ii) with respect to compliance oversight and related matters, report periodically to the Audit Committees; and

BE IT FURTHER RESOLVED that the Compliance and Public Policy Committee shall have the right to retain or utilize, at this corporation's expense, the services of such firms or persons as the Committee deems necessary or desirable to assist it in exercising its duties and responsibilities; and

BE IT FURTHER RESOLVED that, unless otherwise designated by the Committee, the Corporate Secretary of this corporation, or an Assistant Corporate Secretary, shall serve as secretary to the Compliance and Public Policy Committee; and

BE IT FURTHER RESOLVED that the resolution on this subject adopted by this Board on September 19, 2017 is hereby superseded.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – June 20 and 21, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A regular meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held beginning at 12:40 p.m. on Thursday, June 20, 2019, at the office of the Utility, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff (who joined during the meeting as noted below). Director Fred J. Fowler attended by telephone, and Mr. Wolff attended a portion of the meeting by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also present at 77 Beale Street at the beginning of the meeting were John R. Simon and Linda Y.H. Cheng, along with Mario A. Ponce of Simpson, Thacher & Bartlett LLP (Simpson). Also participating by telephone at the beginning of the meeting was Nicholas S. Goldin of Simpson.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session, with Mr. Johnson, Mr. Simon, Mr. Goldin, and Mr. Ponce present during portions of the executive session meeting.

The Board concluded its executive session. Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Simon, Mr. Goldin, and Mr. Ponce present, Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed later in the meeting, and (2) with Mr. Johnson and Mr. Simon absent, the independent directors met in executive session without any management present.

[1] [redacted]

The following individuals entered the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Fong Wan, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Alejandro Vallejo, and Brian D. Wong, along with Richard Hall of Cravath, Swaine & Moore LLP (Cravath).

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane and Mr. Vallejo presented an update on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, they discussed the possible timing for the Board's court-ordered visit to San Bruno. The directors asked questions and discussed various aspects of Ms. Kane's and Mr. Vallejo's presentation.

At this point, Mr. Vallejo left the meeting, and Sumeet Singh and Scott J. Strenfel, along with Charles J. Kalil II and Erica Williams of Kirkland & Ellis LLP (Kirkland) and Kevin J. Orsini of Cravath, entered the meeting.

Mr. Lewis, Mr. Singh, and Mr. Strenfel presented an update on the Utility's Community Wildlife Safety Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the status of vegetation management

work and the Utility's implementation of a risk-informed schedule for 2019, the Utility's progress on its commitments under the 2019 Wildfire Safety Plan approved by the CPUC, and the Public Safety Power Shutoff (PSPS) events on June 8 and 9, 2019. The directors asked questions and discussed, among other matters, the Utility's vegetation management program, the 2019 Wildfire Safety Plan, and the recent PSPS events.

At this point, (1) Ms. Kay, Mr. Lewis, Mr. Wan, Mr. Welsch, Mr. Christopher, Mr. Singh, Mr. Strenfel, Mr. Kalil, and Ms. Williams left the meeting, (2) Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kenneth S. Ziman of Lazard entered the meeting, and (3) James A. Mesterharm of AlixPartners and Michael H. Torkin of Simpson joined the meeting by telephone.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Alejandro D. Wolff joined the meeting by telephone and later entered the meeting during the foregoing discussion.

James Murphy entered the meeting at this point.

Mr. Murphy presented a briefing on security matters relating to the Companies' joint Annual Meeting of Shareholders on June 21, 2019.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Wong, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Goldin, Mr. Ponce, and Mr. Torkin present.

Ms. Cheng was recalled and informed that the directors continued their discussion regarding several of the topics covered earlier in the meeting.

Mr. Johnson, Ms. Cheng, Mr. Goldin, and Mr. Torkin left the meeting at this point.

The Board recessed at 5:40 p.m. and reconvened at 8:00 a.m. on Friday, June 21, 2019, prior to the Annual Meeting of Shareholders.

The directors convened in executive session with Mr. Ponce.

Ms. Cheng was recalled and informed that the directors continued their discussion regarding various topics covered earlier in the meeting.

The following individuals entered the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, Michael A. Lewis, Janet C. Loduca, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Robert G. Armstrong, Tyler B. Gayski, Todd Hohn, Michael A. Husa, and Jan A. Nimick, along with Angela Anderson and Douglas A. Bennett of NorthStar, and Charles J. Kalil II and Christopher W. Keegan of Kirkland.

Ms. Cheng reported on the preliminary proxy tabulation results on the items of business to be voted on at the Annual Meeting of Shareholders later that morning.

Mr. Hohn introduced Mr. Gayski, Senior Field Safety Specialist of the Utility, Mr. Husa, Senior Field Safety Specialist of the Utility, and Mr. Armstrong, Corporate Safety Business Partner of the Utility, and together they provided training for the directors on field

safety observations. They presented an overview of how field safety observations are conducted in the Electric Operations, Gas Operations, and Power Generation lines of business (LOB), and what hazards to be aware of. The directors asked questions and discussed, among other matters, recent field visits and facility tours that they had attended, safety hazards in the different LOBs and how they are mitigated, and the ability of employees to stop work if they have safety concerns.

Mr. Lewis, Mr. Welsch, Mr. Christopher, Mr. Armstrong, Mr. Gayski, Mr. Hohn, Mr. Husa, Mr. Nimick, Ms. Anderson, Mr. Bennett, Mr. Kalil, and Mr. Keegan left the meeting at this point.

The Board recessed at 9:35 a.m. to attend the Annual Meeting of Shareholders and reconvened at 11:40 a.m.

Mr. Johnson and Mr. Kenney presented a report on Utility operations, including a report on policy and regulatory matters. The presentation included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, Mr. Kenney discussed the evaluation currently being conducted by the City and County of San Francisco regarding options for municipalization of the Utility's electric distribution facilities, and the CPUC's expected issuance of an Order Instituting Investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Johnson's and Mr. Kenney's presentation.

Erica Williams of Kirkland entered the meeting during the foregoing presentation and discussion.

Mr. Wells reviewed the Financial and Business Highlights report for May 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Mr. Johnson presented a consent item relating to the designation of executive officers and Section 16 officers, as described in the materials that had been

provided to the directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board adopted an amended resolution designating executive officers and Section 16 officers (see Resolution 1 in Attachment A).

Mr. Leffell, Chair of the PG&E Corporation Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meetings on May 31, 2019 and June 3, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Moore, Chair of the PG&E Corporation Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meetings on June 3, 2019 and June 14, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Schmidt, Chair of the PG&E Corporation Compliance and Public Policy Committee, presented a report on the actions taken and items discussed at the Committee's meeting on May 28 and 29, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she reported on the Committee's recommendation that the PG&E Corporation Board amend the Committee's charter to reflect its responsibility to track progress against the Utility's CPUC-approved Wildfire Safety Plan and the new terms of the Utility's probation regarding wildfire safety.

Mr. Barrera, Chair of the PG&E Corporation Finance Committee, presented a report on the actions taken and items discussed at the Committee's meeting on June 20, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Campbell, Chair of the Safety and Nuclear Oversight Committee, presented a report on the items discussed at the Committee's meeting on June 20, 2019, as described in the materials that had been provided to the

directors in advance of the meeting and that are included in the records of this Board.

Ms. Moore, Chair of the PG&E Corporation Ad Hoc Restructuring Committee, presented a report on the items discussed at the Committee's recent meetings.

Ms. Kane reported on the date proposed by the District Court for the Board's visit to San Bruno.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, and Ms. Williams were excused, and the meeting continued in executive session, with Mr. Johnson, Ms. Cheng, and Mr. Ponce present for portions of the executive session meeting.

With Mr. Johnson, Ms. Cheng, and Mr. Ponce present, the directors viewed a video from the teachers of Paradise Elementary School.

Ms. Cheng was excused at this point. She was later recalled and informed that (1) with Mr. Johnson and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:20 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

WHEREAS, Section 16 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), requires "officers" of this company to comply with certain reporting requirements and liability provisions with respect to their transactions in this company's equity securities;

WHEREAS, Item 401(b) of Regulation S-K under the Securities Act of 1933, as amended, requires the identification of "executive officers" of this company in its Annual Report on Form 10-K and its proxy statement;

WHEREAS, pursuant to Exchange Act Rule 3b-7, the president, any vice president in charge of a principal business unit, division, or function, any other officer who performs a policy-making function, or any other person who performs similar policy-making functions for this company may be identified by the company as an "executive officer" of the company;

WHEREAS, Exchange Act Rule 16a-1(f) defines an "officer" as the president, the principal financial officer, the principal accounting officer (or, if there is no principal accounting officer, the controller), any vice president in charge of a principal business unit, division, or function, any other officer who performs a policy-making function, or any other person who performs similar policy-making functions; and

WHEREAS, it is in the best interest of this company to identify the "officers" of this company for purposes of Section 16 of the Exchange Act and the "executive officers" of the company for identification in its Annual Report on Form 10-K and its proxy statement;

NOW, THEREFORE, BE IT RESOLVED that, effective immediately, the following officers of this company and, to the extent applicable, PG&E Corporation hereby are designated as "officers" of the company for purposes of Section 16 of the Exchange Act and as "executive officers" of the company:

(1) William D. Johnson, Chief Executive Officer and President, PG&E Corporation
(2) John R. Simon, Executive Vice President, Law, Strategy and Policy, PG&E Corporation;
(3) Jason P. Wells, Executive Vice President and Chief Financial Officer, PG&E Corporation;

(4) Loraine M. Giammona, Senior Vice President and Chief Customer Officer, Pacific Gas and Electric Company;
(5) Julie M. Kane, Senior Vice President, Chief Ethics and Compliance Officer, and Deputy General Counsel, PG&E Corporation and Pacific Gas and Electric Company;
(6) Kathleen B. Kay, Senior Vice President and Chief Information Officer, Pacific Gas and Electric Company;
(7) Michael A. Lewis, Senior Vice President, Electric Operations, Pacific Gas and Electric Company;
(8) Janet C. Loduca, Senior Vice President and General Counsel, PG&E Corporation and Pacific Gas and Electric Company;
(9) Dinyar B. Mistry, Senior Vice President, Human Resources and Chief Diversity Officer, PG&E Corporation and Pacific Gas and Electric Company;
(10) Fong Wan, Senior Vice President, Energy Policy and Procurement, Pacific Gas and Electric Company;
(11) James M. Welsch, Senior Vice President and Chief Nuclear Officer, Pacific Gas and Electric Company;
(12) Melvin J. Christopher, Vice President, Gas Operations, Pacific Gas and Electric Company; and
(13) David S. Thomason, Vice President and Controller, PG&E Corporation and Vice President, Chief Financial Officer, and Controller, Pacific Gas and Electric Company; and

BE IT FURTHER RESOLVED that the resolution on this subject adopted by the Board of Directors on May 16, 2019 is hereby superseded.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - June 27, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, June 27, 2019, at 2:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Directors Nora Mead Brownell and Frederick W. Buckman were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, Swaine & Moore LLP.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[1] 

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Jeffrey L. Bleich joined the meeting during the foregoing discussion, and Mr. Karotkin left the meeting after the discussion.

Mr. Kenney presented a report on regulatory and policy matters, including the CPUC's issuance of an Order Instituting Investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Ms. Kane presented a report on the Utility's probation in connection with the federal criminal case related to the 2010 San Bruno explosion. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hort, Mr. Karotkin, and Mr. Orsini were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

Ms. Cheng was recalled and informed that the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:45 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – June 27, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, June 27, 2019, at 2:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Directors Nora Mead Brownell and Frederick W. Buckman were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, Swaine & Moore LLP.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Jeffrey L. Bleich joined the meeting during the foregoing discussion, and Mr. Karotkin left the meeting after the discussion.

Mr. Kenney presented a report on regulatory and policy matters, including the CPUC's issuance of an Order Instituting Investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Ms. Kane presented a report on the Utility's probation in connection with the federal criminal case related to the 2010 San Bruno explosion. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hort, Mr. Karotkin, and Mr. Orsini were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

Ms. Cheng was recalled and informed that the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:45 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - July 9, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Tuesday, July 9, 2019, at 9:45 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, Christopher A. Foster, Robert S. Kenney, and William V. Manheim, along with Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, James A. Mesterharm of AlixPartners, Mario A. Ponce and Michael H. Torkin of Simpson Thacher & Bartlett LLP (Simpson), and Henry Weissmann of Munger, Tolles & Olson LLP (Munger).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) director Eric D. Mullins, as well as Christopher M. Patterson, along with Paul C. Curnin of Simpson, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, joined the meeting, and (2) Mr. Bleich, Mr. Johnson, Mr. Liang, Ms. Mielle, Mr. Kenney, Mr. Torkin, and Mr. Ziman left the meeting.

Mr. Simon, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Foster, Mr. Kenney, Mr. Manheim, Mr. Patterson, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, and Mr. Weissmann were excused, and the meeting continued in executive session with Mr. Curnin and Mr. Ponce present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:25 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - July 9, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Tuesday, July 9, 2019, at 9:45 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, Christopher A. Foster, Robert S. Kenney, and William V. Manheim, along with Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, James A. Mesterharm of AlixPartners, Mario A. Ponce and Michael H. Torkin of Simpson Thacher & Bartlett LLP (Simpson), and Henry Weissmann of Munger, Tolles & Olson LLP (Munger).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) director Eric D. Mullins, as well as Christopher M. Patterson, along with Paul C. Curnin of Simpson, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, joined the meeting, and (2) Mr. Bleich, Mr. Johnson, Mr. Liang, Ms. Mielle, Mr. Kenney, Mr. Torkin, and Mr. Ziman left the meeting.

Mr. Simon, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Foster, Mr. Kenney, Mr. Manheim, Mr. Patterson, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, and Mr. Weissmann were excused, and the meeting continued in executive session with Mr. Curnin and Mr. Ponce present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:25 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – July 12, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, July 12, 2019, at 2:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, Christopher A. Foster, Robert S. Kenney, William V. Manheim, and Christopher M. Patterson, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Christian C. Tempke of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane presented a report on the Utility's probation in connection with the federal criminal case related to the 2010 San Bruno explosion. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Kenney reported on the appointment of Marybel Batjer as the new President of the California Public Utilities Commission.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – July 12, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, July 12, 2019, at 2:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, Christopher A. Foster, Robert S. Kenney, William V. Manheim, and Christopher M. Patterson, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Christian C. Tempke of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane presented a report on the Utility's probation in connection with the federal criminal case related to the 2010 San Bruno explosion. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Kenney reported on the appointment of Marybel Batjer as the new President of the California Public Utilities Commission.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - July 16, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Tuesday, July 16, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson (who joined during the meeting as noted below), Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting was Linda Y.H. Cheng, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

Director William D. Johnson joined the meeting during the executive session.

The Board concluded its executive session. Ms. Cheng was recalled and informed that (1) with Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the independent directors met in executive session without any management present, and (2) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the directors discussed the statewide wildfire fund that would be established under AB 1054 (Wildfire Fund).

1 [redacted]

Mr. Johnson presented management's recommendation that the Utility participate in the Wildfire Fund. The directors asked questions and discussed the recommendation.

On motion made and seconded, the Board concurred with the Utility's participation in the Wildfire Fund, as presented.

At this point, Ms. Moore left the meeting, and the following individuals joined the meeting: John R. Simon, Julie M. Kane, Janet C. Loduca, Robert S. Kenney, William V. Manheim, and Christopher M. Patterson, along with Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP (Weil), and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Mielle left the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:30 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - July 16, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Tuesday, July 16, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson (who joined during the meeting as noted below), Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting was Linda Y.H. Cheng, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

Director William D. Johnson joined the meeting during the executive session.

The Board concluded its executive session. Ms. Cheng was recalled and informed that (1) with Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the independent directors met in executive session without any management present, and (2) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the directors discussed the statewide wildfire fund that would be established under AB 1054 (Wildfire Fund).

1 [redacted]

Mr. Johnson presented management's recommendation that the Utility participate in the Wildfire Fund. The directors asked questions and discussed the recommendation.

On motion made and seconded, the Board concurred with the Utility's participation in the Wildfire Fund, as presented.

At this point, Ms. Moore left the meeting, and the following individuals joined the meeting: John R. Simon, Julie M. Kane, Janet C. Loduca, Robert S. Kenney, William V. Manheim, and Christopher M. Patterson, along with Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP (Weil), and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Mielle left the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:30 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - July 19, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, July 19, 2019, at 10:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Director Nora Mead Brownell was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Christian C. Tempke of Lazard, and Stephen Karotkin, Jessica Liou, and Richard W. Slack of Weil, Gotshal & Manges LLP.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory matters, including the recent appointment of Marybel Batjer as President of the California Public Utilities Commission, and the status of the Utility's 2020 General Rate Case. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Johnson, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Ms. Liou, Mr. Orsini, Mr. Silverman, Mr. Slack, and Mr. Tempke were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

Ms. Mielle left the meeting during the executive session.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:30 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - July 19, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, July 19, 2019, at 10:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Director Nora Mead Brownell was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Christian C. Tempke of Lazard, and Stephen Karotkin, Jessica Liou, and Richard W. Slack of Weil, Gotshal & Manges LLP.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory matters, including the recent appointment of Marybel Batjer as President of the California Public Utilities Commission, and the status of the Utility's 2020 General Rate Case. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Johnson, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Ms. Liou, Mr. Orsini, Mr. Silverman, Mr. Slack, and Mr. Tempke were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

Ms. Mielle left the meeting during the executive session.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:30 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – July 25, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, July 25, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Directors Jeffrey L. Bleich and Dominique Mielle were absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Richard Hall of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson presented a report on operational matters, including a recent contractor fatality involving a lineman who fell from an insulated temporary pole-mounted platform while replacing an electric transmission pole in Plumas County. The directors asked questions and discussed various aspects of Mr. Johnson's presentation.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:00 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – July 25, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, July 25, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Directors Jeffrey L. Bleich and Dominique Mielle were absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP, Richard Hall of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson presented a report on operational matters, including a recent contractor fatality involving a lineman who fell from an insulated temporary pole-mounted platform while replacing an electric transmission pole in Plumas County. The directors asked questions and discussed various aspects of Mr. Johnson's presentation.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:00 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 2, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, August 2, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Dinyar B. Mistry and Linda Y.H. Cheng, along with Paul C. Curnin and Mario A. Ponce of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Mr. Mistry, and Mr. Curnin present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that the following discussions took place and the following actions were taken:

- Ms. Moore, Chair of the Compensation Committee, discussed an organizational matter recommended by the Committee for the Board's consideration, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She reviewed the background and reasons for the proposed action. The directors asked questions and discussed the organizational matter.

- The Board adopted the following resolution:

1 [redacted]

BE IT RESOLVED that Jessica C. Hogle is hereby elected Vice President, Federal Affairs, effective August 1, 2019.

Mr. Mistry left the meeting, and the following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Robert S. Kenney, along with Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane then presented a report on the Utility's probation in connection with the federal criminal case related to the 2010 San Bruno explosion. This included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she discussed a memorandum recently filed by the Utility responding to the District Court's request for information.

Mr. Kenney presented a report on regulatory and policy matters, including the CPUC's investigation relating to the 2017 Northern California wildfires.

At this point, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Orsini, Mr. Silverman, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Simon, Mr. Curnin, and Mr. Ponce present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Simon, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, (2) with Mr. Johnson, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (3) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:40 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 2, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, August 2, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Dinyar B. Mistry and Linda Y.H. Cheng, along with Paul C. Curnin and Mario A. Ponce of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Mr. Mistry, and Mr. Curnin present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that Ms. Moore, Chair of the PG&E Corporation Compensation Committee, discussed an organizational matter recommended by the Committee for the PG&E Corporation Board's consideration.

Mr. Mistry left the meeting, and the following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Robert S. Kenney, along with Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

[1] [redacted]

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane then presented a report on the Utility's probation in connection with the federal criminal case related to the 2010 San Bruno explosion. This included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she discussed a memorandum recently filed by the Utility responding to the District Court's request for information.

Mr. Kenney presented a report on regulatory and policy matters, including the CPUC's investigation relating to the 2017 Northern California wildfires.

At this point, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Orsini, Mr. Silverman, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Simon, Mr. Curnin, and Mr. Ponce present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Simon, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, (2) with Mr. Johnson, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (3) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:40 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 6, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Tuesday, August 6, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang (who joined during the meeting as noted below), Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting was Linda Y.H. Cheng, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that the independent directors met in executive session without any management present.

Director Kenneth Liang joined the meeting during the foregoing executive session.

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, Janet C. Loduca, and Robert S. Kenney, along with Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and

[1] [redacted]

Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Eric D. Mullins and Julie M. Kane joined the meeting during the foregoing discussion.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

Mr. Barrera, Ms. Mielle, and Mr. Mullins left the meeting during the foregoing executive session.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:35 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 6, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Tuesday, August 6, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang (who joined during the meeting as noted below), Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting was Linda Y.H. Cheng, along with Paul C. Curnin, Mario A. Ponce, and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Curnin, Mr. Ponce, and Mr. Torkin present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that the independent directors met in executive session without any management present.

Director Kenneth Liang joined the meeting during the foregoing executive session.

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, Janet C. Loduca, and Robert S. Kenney, along with Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and

[1] [redacted]

Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Eric D. Mullins and Julie M. Kane joined the meeting during the foregoing discussion.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Torkin present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

Mr. Barrera, Ms. Mielle, and Mr. Mullins left the meeting during the foregoing executive session.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:35 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 7, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Wednesday, August 7, 2019, at 3:45 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Directors Cheryl F. Campbell and Dominique Mielle were absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:25 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 7, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Wednesday, August 7, 2019, at 3:45 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Directors Cheryl F. Campbell and Dominique Mielle were absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:25 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 9, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, August 9, 2019, at 7:30 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Director Dominique Mielle was absent.

Also participating by telephone at the beginning of the meeting were Dinyar B. Mistry and Linda Y.H. Cheng, along with Ravi Purushotham and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Mr. Mistry, Mr. Purushotham, and Mr. Torkin present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that the following discussions took place:

- Ms. Moore, Chair of the Compensation Committee, discussed an organizational matter recommended by the Committee for the Utility Board's consideration.

- The directors discussed the Companies' non-employee director compensation program.

Mr. Mistry left the meeting, and the following individuals joined the meeting at this point: Julie M. Kane, Janet C. Loduca, and Robert S. Kenney, along with

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Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Buckman left the meeting during the foregoing discussion.

Ms. Kane then presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the Utility's community service obligations under the terms of probation. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

At this point, Mr. Johnson, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin,

Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Purushotham and Mr. Torkin present.

Ms. Cheng was recalled and informed that, without management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:15 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 9, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, August 9, 2019, at 7:30 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Director Dominique Mielle was absent.

Also participating by telephone at the beginning of the meeting were Dinyar B. Mistry and Linda Y.H. Cheng, along with Ravi Purushotham and Michael H. Torkin of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Mr. Mistry, Mr. Purushotham, and Mr. Torkin present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that the following discussions took place and the following actions were taken:

- Ms. Moore, Chair of the PG&E Corporation Compensation Committee, discussed an organizational matter recommended by the Committee for the Board's consideration, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She reviewed the background and reasons for the proposed action. The directors asked questions and discussed the organizational matter.

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- The Board adopted the following resolution:
  BE IT RESOLVED that Andrew M. Vesey is hereby elected Chief Executive Officer and President, effective upon hire and contingent on satisfying the Utility's pre-employment requirements.

- The independent members of the Board approved compensation for Mr. Vesey. Details of the compensation action are contained in a document filed with the secretary.

- The directors discussed the Companies' non-employee director compensation program.

Mr. Mistry left the meeting, and the following individuals joined the meeting at this point: Julie M. Kane, Janet C. Loduca, and Robert S. Kenney, along with Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Buckman left the meeting during the foregoing discussion.

Ms. Kane then presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the Utility's community service obligations under the terms of probation. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

At this point, Mr. Johnson, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Purushotham and Mr. Torkin present.

Ms. Cheng was recalled and informed that, without management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:15 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 12, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Monday, August 12, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Frederick W. Buckman (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Director Jeffrey L. Bleich was absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Nathan Mooney, Eli Silverman, and Kenneth S. Ziman of Lazard, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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During the foregoing discussion, (1) director Frederick W. Buckman joined the meeting, and (2) Mr. Wells and Ms. Kane left the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:15 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 12, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Monday, August 12, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Frederick W. Buckman (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Director Jeffrey L. Bleich was absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Nathan Mooney, Eli Silverman, and Kenneth S. Ziman of Lazard, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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During the foregoing discussion, (1) director Frederick W. Buckman joined the meeting, and (2) Mr. Wells and Ms. Kane left the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:15 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 16, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, August 16, 2019, at 10:30 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Directors Jeffrey L. Bleich, William D. Johnson, and Kenneth Liang were absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. This included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she discussed a recent District Court order relating to a letter report submitted to the court by the federal Monitor. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

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[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Mielle, Ms. Kane, and Mr. Orsini left the meeting during the foregoing discussion.

Mr. Wells presented a report on financial matters, including the investment community's reaction to the Companies' release of second quarter 2019 financial results.

At this point, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:30 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 16, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, August 16, 2019, at 10:30 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Directors Jeffrey L. Bleich, William D. Johnson, and Kenneth Liang were absent.

Also participating by telephone at the beginning of the meeting were Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. This included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she discussed a recent District Court order relating to a letter report submitted to the court by the federal Monitor. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

[1] [redacted]

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Mielle, Ms. Kane, and Mr. Orsini left the meeting during the foregoing discussion.

Mr. Wells presented a report on financial matters, including the investment community's reaction to the Companies' release of second quarter 2019 financial results.

At this point, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:30 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 23, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, August 23, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Liang left the meeting during the foregoing discussion.

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed management's recent discussions with the federal Monitor, and the District Court order relating to the Monitor's letter report. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent

directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:15 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 23, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, August 23, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Liang left the meeting during the foregoing discussion.

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed management's recent discussions with the federal Monitor, and the District Court order relating to the Monitor's letter report. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent

directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:15 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - August 30, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, August 23, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff (who joined during the meeting as noted below) attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, Ravi Purushotham, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) director Alejandro D. Wolff joined the meeting, and (2) Mr. Mullins and Mr. Ziman left the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Silverman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Ponce, Mr. Purushotham, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued

their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:50 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – August 30, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, August 23, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff (who joined during the meeting as noted below) attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, Ravi Purushotham, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) director Alejandro D. Wolff joined the meeting, and (2) Mr. Mullins and Mr. Ziman left the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Silverman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Ponce, Mr. Purushotham, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued

their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:50 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 6, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, September 6, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:40 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – September 6, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, September 6, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:40 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 8, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Sunday, September 8, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Director Eric D. Mullins was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Brownell noted Kenneth Liang's resignation from the Board effective September 7, 2019, and expressed the Board's appreciation for his service.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Paul C. Curnin and Ravi Purushotham of Simpson joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board approved the Companies' joint plan of reorganization (Plan) in substantially the form presented at this meeting, and authorized and directed the officers of the Corporation to file the Plan with the Bankruptcy Court.

On motion made and seconded, the Board approved the form of Chapter 11 backstop commitment letter substantially on the terms discussed with the Board, and authorized and directed the officers of the Corporation to negotiate, execute, and deliver Chapter 11 backstop commitment letters in substantially the form presented at this meeting.

On motion made and seconded, the Board authorized the officers of the Corporation to make such filings and take such actions as necessary or advisable to carry out the foregoing.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:05 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 8, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Sunday, September 8, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Director Eric D. Mullins was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Brownell noted Kenneth Liang's resignation from the Board effective September 7, 2019, and expressed the Board's appreciation for his service.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Paul C. Curnin and Ravi Purushotham of Simpson joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board approved the Companies' joint plan of reorganization (Plan) in substantially the form presented at this meeting, and authorized and directed the officers of the Utility to file the Plan with the Bankruptcy Court.

On motion made and seconded, the Board authorized the officers of the Utility to make such filings and take such actions as necessary or advisable to carry out the foregoing.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:05 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 10 and 11, 2019
PG&E CORPORATION

A regular meeting of the Board of Directors of PG&E Corporation (Corporation) was held beginning at 2:30 p.m. on Tuesday, September 10, 2019, at the office of the Corporation, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Meridee A. Moore, Eric D. Mullins, and Kristine M. Schmidt. Directors Dominique Mielle and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also present at 77 Beale Street at the beginning of the meeting was Linda Y.H. Cheng, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson, Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed later in the meeting.

The following individuals entered the meeting at this point: Andrew M. Vesey, John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Sumeet Singh, and Jan A. Nimick, along with Charles J. Kalil II of Kirkland & Ellis LLP (Kirkland).

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Mr. Nimick presented a safety tailboard on marijuana grow site hazards. The directors asked questions and discussed various aspects of his presentation.

Mr. Nimick left the meeting at this point.

Mr. Wells reviewed the Financial and Business Highlights report for August 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Ms. Giammona presented an overview of Community Choice Aggregation (CCA) and the California Public Utilities Commission's (CPUC) Code of Conduct governing the treatment of Community Choice Aggregators. The presentation included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Ms. Giammona's presentation.

Mr. Wolff left the meeting during the foregoing presentation and discussion.

At this point, (1) the following individuals entered the meeting: Evan R. Chesler and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Stephen Karotkin of Weil, Gotshal & Manges LLP (Weil), and Eli Silverman and Kenneth S. Ziman of Lazard, and (2) Richard Hall of Cravath joined the meeting by telephone.

Mr. Lewis and Mr. Singh presented an update on the Utility's Community Wildlife Safety Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the Utility's continuing progress in enhancing its readiness and responsiveness to the threat of potential wildfires across its service territory; enhancements and improvements in the Utility's real-time monitoring and intelligence capabilities; new and enhanced safety measures related to the Utility's Wildfire Safety Inspection Program (WSIP), enhanced vegetation management (EVM) work, and system hardening work; and progress related to Public Safety

Power Shutoff (PSPS) readiness, communications, and process enhancements. The directors asked questions and discussed, among other matters, risk reduction measures related to potential fire ignition prevention, factors considered in PSPS decision-making, PSPS-related communications, and the Utility's EVM and system hardening work.

At this point, (1) Ms. Giammona, Ms. Kay, Mr. Lewis, Mr. Mistry, Mr. Wan, Mr. Welsch, Mr. Christopher, Mr. Singh, and Mr. Kalil left the meeting, and (2) Brad D. Brian of Munger, Tolles & Olson LLP joined the meeting by telephone.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, (1) Mr. Kenney, Mr. Brian, Mr. Chesler, Mr. Hall, Mr. Karotkin, Mr. Orsini, and Mr. Ziman left the meeting, and (2) Mr. Kalil re-entered the meeting.

Ms. Mielle, Chair of the Audit Committee, presented a report on the actions taken and items discussed at the Committee's meetings on July 23, 2019 and August 5, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Schmidt, Chair of the Compliance and Public Policy Committee, presented a report on the items discussed at the Committee's meetings on July 16 and 17, 2019 and August 23, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that

are included in the records of this Board. Among other things, she presented the Committee's second quarter 2019 report to the Board on the Utility's progress against its Wildfire Safety Plan.

Mr. Kalil left the meeting at this point.

Ms. Moore, Chair of the Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meeting on July 26, 2019 and September 9, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she reported on the Committee's recommendation that the independent members of the Board (1) approve the treatment of 2019 Long-Term Incentive Plan (LTIP) awards for the PG&E Corporation Chief Executive Officer (CEO) under various post-service and post-change in control scenarios, and (2) delegate authority to the PG&E Corporation Senior Vice President, Human Resources to implement these awards.

Mr. Qusba left the meeting during the foregoing presentation and discussion.

On motion made and seconded, the independent directors (1) approved the treatment of 2019 LTIP awards for the PG&E Corporation CEO under various post-service and post-change in control scenarios, and (2) delegated authority to the PG&E Corporation Senior Vice President, Human Resources to implement these awards, as presented.

Mr. Barrera, Chair of the Finance Committee, presented a report on the actions taken and items discussed at the Committee meeting held earlier in the day, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board approve expenditures to fund pre-planning activities for Diablo Canyon Power Plant's (Diablo Canyon) transition from operating to decommissioning status immediately after plant shutdown, as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board approved expenditures for the Diablo Canyon decommissioning and environmental remediation project, as presented.

Ms. Campbell, Chair of the Safety and Nuclear Oversight Committee, presented a report on the items discussed at the Committee's meetings on July 16, 2019, August 20, 2019, and September 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Moore, Chair of the Ad Hoc Restructuring Committee, presented a report on the items discussed at the Committee's recent meetings.

Ms. Mielle left the meeting at this point.

The Board recessed at 5:10 p.m. and reconvened at 7:30 a.m. on Wednesday, September 11, 2019.

At this point, (1) director Alejandro D. Wolff joined the meeting by telephone, (2) the following individuals entered the meeting: Loraine M. Giammona, Kathleen B. Kay, Michael A. Lewis, Dinyar B Mistry, Fong Wan, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Sumeet Singh, and Alejandro Vallejo, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson, and Charles J. Kalil, II and Christopher W. Keegan of Kirkland, and (3) Mark R. Filip of Kirkland joined the meeting by videoconference.

Ms. Kane introduced Mr. Filip, the Utility's federal Monitor, as well as Mr. Kalil and Mr. Keegan, members of the Monitor team. Mr. Filip presented an update on the Utility's monitorship. Among other things, he discussed the letter report submitted by the Monitor to the District Court on July 26, 2019, the Monitor team's vegetation management field inspections, the Monitor team's ability to communicate openly with the Utility and its employees, and the Monitor's ongoing evaluation of the Utility's gas transmission integrity management work, safety culture, and compliance and ethics program. The directors asked questions and discussed various aspects of Mr. Filip's presentation.

Ms. Mielle joined the meeting by telephone during the foregoing presentation and discussion.

At this point, (1) Ms. Giammona, Ms. Kay, Mr. Lewis, Mr. Mistry, Mr. Wan, Mr. Welsch, Mr. Christopher, Mr. Kenney, Mr. Singh, Mr. Vallejo, Mr. Filip, Mr. Kalil, and Mr. Keegan left the meeting, (2) the following individuals entered the meeting: Evan R. Chesler, Kelsie Docherty, and Kevin J. Orsini of Cravath, Stephen Karotkin of Weil, and James A. Mesterharm of AlixPartners, and (3) Kenneth S. Ziman of Lazard joined the meeting by telephone.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) Brian M. Wong and Eli Silverman entered the meeting, and (2) Richard Hall joined the meeting by telephone.

On motion made and seconded, the Board authorized and directed the officers of the Corporation to negotiate revisions to the Chapter 11 backstop commitment letters substantially on the terms discussed with the Board.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board authorized and directed the officers of the Corporation to amend the joint plan of reorganization that the Companies filed with the Bankruptcy Court on September 9, 2019 to reflect any settlement that the Companies reach with the insurance subrogation claimants, and to file the amended plan with the Bankruptcy Court.

On motion made and seconded, the Board authorized the officers of the Corporation to make such filings and take such actions as necessary or advisable to carry out the foregoing.

Mr. Kenney re-entered the meeting at this point.

Mr. Kenney presented a report on legislative and regulatory matters, including a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he discussed potential legislation regarding Wildfire Victim Recovery Bonds (equity contribution bonds), and the status of various proceedings at the CPUC.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Mielle and Mr. Silverman left the meeting during the foregoing discussion.

Mr. Vesey, Mr. Kenney, Mr. Chesler, Ms. Docherty, Mr. Hall, Mr. Karotkin, Mr. Orsini, Mr. Mesterharm, and Mr. Ziman left the meeting at this point.

Mr. Leffell, Chair of the Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meetings on July 26, 2019, August 13, 2019, and September 9, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Utility Board elect Andrew M. Vesey as a director of the Utility.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, and Ms. Cheng were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present for portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:25 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 10 and 11, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A regular meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held beginning at 2:30 p.m. on Tuesday, September 10, 2019, at the office of the Utility, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Meridee A. Moore, Eric D. Mullins, and Kristine M. Schmidt. Directors Dominique Mielle and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also present at 77 Beale Street at the beginning of the meeting was Linda Y.H. Cheng, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson, Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed later in the meeting.

The following individuals entered the meeting at this point: Andrew M. Vesey, John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Sumeet Singh, and Jan A. Nimick, along with Charles J. Kalil II of Kirkland & Ellis LLP (Kirkland).

1 [redacted]

Mr. Nimick presented a safety tailboard on marijuana grow site hazards. The directors asked questions and discussed various aspects of his presentation.

Mr. Nimick left the meeting at this point.

Mr. Wells reviewed the Financial and Business Highlights report for August 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Ms. Giammona presented an overview of Community Choice Aggregation (CCA) and the California Public Utilities Commission's (CPUC) Code of Conduct governing the treatment of Community Choice Aggregators. The presentation included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Ms. Giammona's presentation.

Mr. Wolff left the meeting during the foregoing presentation and discussion.

At this point, (1) the following individuals entered the meeting: Evan R. Chesler and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Stephen Karotkin of Weil, Gotshal & Manges LLP (Weil), and Eli Silverman and Kenneth S. Ziman of Lazard, and (2) Richard Hall of Cravath joined the meeting by telephone.

Mr. Lewis and Mr. Singh presented an update on the Utility's Community Wildlife Safety Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the Utility's continuing progress in enhancing its readiness and responsiveness to the threat of potential wildfires across its service territory; enhancements and improvements in the Utility's real-time monitoring and intelligence capabilities; new and enhanced safety measures related to the Utility's Wildfire Safety Inspection Program (WSIP), enhanced vegetation management (EVM) work, and system hardening work; and progress related to Public Safety

Power Shutoff (PSPS) readiness, communications, and process enhancements. The directors asked questions and discussed, among other matters, risk reduction measures related to potential fire ignition prevention, factors considered in PSPS decision-making, PSPS-related communications, and the Utility's EVM and system hardening work.

At this point, (1) Ms. Giammona, Ms. Kay, Mr. Lewis, Mr. Mistry, Mr. Wan, Mr. Welsch, Mr. Christopher, Mr. Singh, and Mr. Kalil left the meeting, and (2) Brad D. Brian of Munger, Tolles & Olson LLP joined the meeting by telephone.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, (1) Mr. Kenney, Mr. Brian, Mr. Chesler, Mr. Hall, Mr. Karotkin, Mr. Orsini, and Mr. Ziman left the meeting, and (2) Mr. Kalil re-entered the meeting.

Ms. Mielle, Chair of the Audit Committee, presented a report on the actions taken and items discussed at the Committee's meetings on July 23, 2019 and August 5, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Schmidt, Chair of the PG&E Corporation Compliance and Public Policy Committee, presented a report on the items discussed at the Committee's meetings on July 16 and 17, 2019 and August 23, 2019, as described in the materials that had been provided to the directors in

advance of the meeting and that are included in the records of this Board. Among other things, she presented the Committee's second quarter 2019 report to the Board on the Utility's progress against its Wildfire Safety Plan.

Mr. Kalil left the meeting at this point.

Ms. Moore, Chair of the PG&E Corporation Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meeting on July 26, 2019 and September 9, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Mr. Qusba left the meeting during the foregoing presentation and discussion.

Mr. Barrera, Chair of the PG&E Corporation Finance Committee, presented a report on the actions taken and items discussed at the Committee meeting held earlier in the day, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board approve expenditures to fund pre-planning activities for Diablo Canyon Power Plant's (Diablo Canyon) transition from operating to decommissioning status immediately after plant shutdown, as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board approved expenditures for the Diablo Canyon decommissioning and environmental remediation project, as presented.

Ms. Campbell, Chair of the Safety and Nuclear Oversight Committee, presented a report on the items discussed at the Committee's meetings on July 16, 2019, August 20, 2019, and September 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Moore, Chair of the PG&E Corporation Ad Hoc Restructuring Committee, presented a report on the items discussed at the Committee's recent meetings.

Ms. Mielle left the meeting at this point.

The Board recessed at 5:10 p.m. and reconvened at 7:30 a.m. on Wednesday, September 11, 2019.

At this point, (1) director Alejandro D. Wolff joined the meeting by telephone, (2) the following individuals entered the meeting: Loraine M. Giammona, Kathleen B. Kay, Michael A. Lewis, Dinyar B Mistry, Fong Wan, James M. Welsch, Melvin J. Christopher, Robert S. Kenney, Sumeet Singh, and Alejandro Vallejo, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson, and Charles J. Kalil II and Christopher W. Keegan of Kirkland, and (3) Mark R. Filip of Kirkland joined the meeting by videoconference.

Ms. Kane introduced Mr. Filip, the Utility's federal Monitor, as well as Mr. Kalil and Mr. Keegan, members of the Monitor team. Mr. Filip presented an update on the Utility's monitorship. Among other things, he discussed the letter report submitted by the Monitor to the District Court on July 26, 2019, the Monitor team's vegetation management field inspections, the Monitor team's ability to communicate openly with the Utility and its employees, and the Monitor's ongoing evaluation of the Utility's gas transmission integrity management work, safety culture, and compliance and ethics program. The directors asked questions and discussed various aspects of Mr. Filip's presentation.

Ms. Mielle joined the meeting by telephone during the foregoing presentation and discussion.

At this point, (1) Ms. Giammona, Ms. Kay, Mr. Lewis, Mr. Mistry, Mr. Wan, Mr. Welsch, Mr. Christopher, Mr. Kenney, Mr. Singh, Mr. Vallejo, Mr. Filip, Mr. Kalil, and Mr. Keegan left the meeting, (2) the following individuals entered the meeting: Evan R. Chesler, Kelsie Docherty, and Kevin J. Orsini of Cravath, Stephen Karotkin of Weil, and James A. Mesterharm of AlixPartners, and (3) Kenneth S. Ziman of Lazard joined the meeting by telephone.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) Brian M. Wong and Eli Silverman entered the meeting, and (2) Richard Hall joined the meeting by telephone.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board authorized and directed the officers of the Utility to amend the joint plan of reorganization that the Companies filed with the Bankruptcy Court on September 9, 2019 to reflect any settlement that the Companies reach with the insurance subrogation claimants, and to file the amended plan with the Bankruptcy Court.

On motion made and seconded, the Board authorized the officers of the Utility to make such filings and take

such actions as necessary or advisable to carry out the foregoing.

Mr. Kenney re-entered the meeting at this point.

Mr. Kenney presented a report on legislative and regulatory matters, including a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he discussed potential legislation regarding Wildfire Victim Recovery Bonds (equity contribution bonds), and the status of various proceedings at the CPUC.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Mielle and Mr. Silverman left the meeting during the foregoing discussion.

Mr. Vesey, Mr. Kenney, Mr. Chesler, Ms. Docherty, Mr. Hall, Mr. Karotkin, Mr. Orsini, Mr. Mesterharm, and Mr. Ziman left the meeting at this point.

Mr. Leffell, Chair of the PG&E Corporation Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meetings on July 26, 2019, August 13, 2019, and September 9, 2019, as described in the materials that had been provided

to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Utility Board elect Andrew M. Vesey as a director of the Utility.

On motion made and seconded, the following resolution was duly adopted:

> BE IT RESOLVED that Andrew M. Vesey is hereby elected a director of Pacific Gas and Electric Company, effective upon adjournment of this meeting, to serve until the next annual meeting of shareholders of this company or until his successor is elected and qualified, except in the case of Mr. Vesey's death, resignation, or removal.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, and Ms. Cheng were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present for portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:25 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 20, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, September 20, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, and Kristine M. Schmidt attended by telephone, as permitted by the Utility's Bylaws. Director Alejandro D. Wolff was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren and Richard Hall of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Moore joined the meeting during the foregoing discussion, and Mr. Bleich left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane then presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed a recent hearing regarding the letter report submitted by the Monitor to the District Court on July 26, 2019. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Vesey presented a report on operational matters. Among other things, he discussed a potential Public Safety Power Shutoff (PSPS) event that could be declared during the following week, forecasted weather conditions, the Utility's plans to activate its Emergency Operations Center later in the day, and various activities being undertaken to prepare for a potential PSPS event. The directors asked questions and discussed various aspects of Mr. Vesey's presentation.

Ms. Mielle left the meeting during the foregoing presentation.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:05 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – September 20, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, September 20, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Kenneth Liang, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Andrew M. Vesey attended by telephone, as permitted by the Utility's Bylaws. Director Alejandro D. Wolff was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren and Richard Hall of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

1 [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Moore joined the meeting during the foregoing discussion, and Mr. Bleich left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane then presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed a recent hearing regarding the letter report submitted by the Monitor to the District Court on July 26, 2019. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Vesey presented a report on operational matters. Among other things, he discussed a potential Public Safety Power Shutoff (PSPS) event that could be declared during the following week, forecasted weather conditions, the Utility's plans to activate its Emergency Operations Center later in the day, and various activities being undertaken to prepare for a potential PSPS event. The directors asked questions and discussed various aspects of Mr. Vesey's presentation.

Ms. Mielle left the meeting during the foregoing presentation.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:05 a.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 26, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, September 26, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson (who joined during the meeting as noted below), Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Dinyar B. Mistry and Linda Y.H. Cheng, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session, with Mr. Vesey, Mr. Mistry, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

The Board concluded its executive session. Ms. Cheng was recalled and informed that the following discussions took place and the following actions were taken:

- With Mr. Mistry, Mr. Curnin, Mr. Ponce, and Mr. Qusba present:
  - o Ms. Moore, Chair of the Compensation Committee, discussed two organizational matters recommended by the Committee for the Utility Board's consideration.

[1] [redacted]

- Andrew M. Vesey joined the meeting, and Mr. Mistry left the meeting at this point.

- With Mr. Vesey, Mr. Curnin, Mr. Ponce, and Mr. Qusba present:

  - Ms. Moore, Chair of the Compensation Committee, discussed the Committee's recommendation that the Board approve a change to the compensation for the Corporation's non-employee directors, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She reviewed the background and reasons for the proposed action. The directors asked questions and discussed the Corporation's non-employee director compensation program.

  - The Board adopted resolutions implementing a change to the compensation for the Corporation's non-employee directors, as presented (see Resolutions 1 and 2 in Attachment A).

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, and Janet C. Loduca, along with Brad D. Brian of Munger, Tolles & Olson LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the initiation on September 23, 2019 of a Public Safety Power Shutoff (PSPS) event, customer impacts, the post-PSPS inspection and restoration process, Community Resource Centers opened by the Utility in affected counties, and feedback from customers and government agencies with respect to the Utility's performance during the PSPS events. The directors asked questions and discussed various aspects of Mr. Vesey's presentation.

[THE FOLLOWING PARAGRAPH CONTAINs ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director William D. Johnson and Robert S. Kenney joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren,

Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:40 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

BE IT RESOLVED that the currently specified 2019 annual grant of restricted stock unit awards to non-employee directors of PG&E Corporation (the "Corporation") under the PG&E Corporation 2014 Long-Term Incentive Plan ("LTIP") shall be replaced with a grant of equity having an equivalent value in the reorganized Corporation following the Corporation's emergence from Chapter 11; and

BE IT FURTHER RESOLVED that, beginning January 1, 2020, non-employee directors shall be eligible to participate in the LTIP under the terms and conditions of that plan, as adopted by this Board and as may be amended from time to time; and

BE IT FURTHER RESOLVED that, to the extent that there is conflict between this resolution and the resolution adopted by the Board of Directors on December 20, 2017 regarding director compensation, such conflicting portions of the December 20, 2017 resolution are hereby superseded.

**Resolution 2**

WHEREAS, the PG&E Corporation 2014 Long-Term Incentive Plan ("LTIP") currently provides for the automatic annual grant of restricted stock unit ("RSU") awards to non-employee directors of PG&E Corporation (the "Corporation");

WHEREAS, on January 29, 2019, the Corporation and Pacific Gas and Electric Company each filed voluntary petitions for reorganization under chapter 11, title 11 of the U.S. Bankruptcy Code ("Chapter 11 Cases") in the U.S. Bankruptcy Court for the Northern District of California;

WHEREAS, because of the Chapter 11 Cases, the Corporation currently is not authorized to grant the non-employee director RSU awards that otherwise would have been granted under the LTIP following the 2019 annual meeting of shareholders;

WHEREAS, the Compensation Committee of this Board of Directors has consulted with independent consultants regarding compensation of non-employee directors for companies that have filed petitions for reorganization, and has recommended that the Board replace the currently specified annual grant of 2019 RSU awards under the LTIP with a grant of equity in the reorganized Corporation

following the Corporation's emergence from Chapter 11, with terms and timing as presented to this Board; and

WHEREAS, the Board of Directors will consider an amendment to the LTIP or the establishment of a new equity incentive plan to effectuate the grant of the new 2019 equity award;

NOW, THEREFORE, BE IT RESOLVED that the currently specified annual grant of 2019 RSU awards under the LTIP shall be replaced with a grant of equity in the reorganized Corporation following the Corporation's emergence from Chapter 11, with terms and timing as presented to this Board, and the Board of Directors shall consider an amendment to the LTIP or the establishment of a new equity incentive plan to effectuate the grant of the new 2019 equity awards.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING - September 26, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, September 26, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson (who joined during the meeting as noted below), Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Dinyar B. Mistry and Linda Y.H. Cheng, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey and Ms. Cheng were excused, and the meeting was convened in executive session, with Mr. Vesey, Mr. Mistry, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

The Board concluded its executive session. Ms. Cheng was recalled and informed that the following discussions took place and the following actions were taken:

- With Mr. Mistry, Mr. Curnin, Mr. Ponce, and Mr. Qusba present:

  - Ms. Moore, Chair of the PG&E Corporation Compensation Committee, discussed two organizational matters recommended by the Committee for the Utility Board's consideration, as described in materials that had been provided to the directors in advance of the meeting and

[1] [redacted]

that are included in the records of this Board. She reviewed the background and reasons for the proposed action. The directors asked questions and discussed the organizational matters.

- The independent members of the Board approved a revised compensation package for Andrew M. Vesey, Chief Executive Officer and President of the Utility, effective upon Bankruptcy Court approval. Details of the compensation action are contained in a document filed with the secretary.

- Mr. Vesey joined the meeting at this point.

- With Mr. Vesey, Mr. Mistry, Mr. Curnin, Mr. Ponce, and Mr. Qusba present, the Board adopted the following resolution:

  BE IT RESOLVED that Melvin B. Christopher, currently Vice President, Gas Operations, is hereby elected Senior Vice President, Gas Operations, effective October 1, 2019.

- Mr. Mistry left the meeting at this point.

- With Mr. Vesey, Mr. Curnin, Mr. Ponce, and Mr. Qusba present:

  - Ms. Moore, Chair of the PG&E Corporation Compensation Committee, discussed the Committee's recommendation that the PG&E Corporation Board approve a change to the compensation for the Corporation's non-employee directors, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She reviewed the background and reasons for the proposed action. The directors asked questions and discussed the Corporation's non-employee director compensation program.

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, Julie M. Kane, and Janet C. Loduca, along with Brad D. Brian of Munger, Tolles & Olson LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil,

Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the initiation on September 23, 2019 of a Public Safety Power Shutoff (PSPS) event, customer impacts, the post-PSPS inspection and restoration process, Community Resource Centers opened by the Utility in affected counties, and feedback from customers and government agencies with respect to the Utility's performance during the PSPS events. The directors asked questions and discussed various aspects of Mr. Vesey's presentation.

[THE FOLLOWING PARAGRAPH CONTAINs ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director William D. Johnson and Robert S. Kenney joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:40 p.m.

Linda Y.H. Cheng

LINDA Y.H. CHENG
Secretary

**PG&E Gas and Electric**
**Advice Submittal List**
**General Order 96-B, Section IV**

AT&T
Albion Power Company
Alcantar & Kahl LLP

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
P.C. CalCom Solar
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission
California State Association of Counties
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Cenergy Power
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

Downey & Brand
East Bay Community Energy
Ellison Schneider & Harris LLP
Energy Management Service

Engineers and Scientists of California

Evaluation + Strategy for Social Innovation
GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Power Institute
Hanna & Morton
ICF

IGS Energy

International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc.

Los Angeles County Integrated Waste Management Task Force
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenzie & Associates

Modesto Irrigation District
NLine Energy, Inc.
NRG Solar

Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions

SCE
SDG&E and SoCalGas

SPURR
San Francisco Water Power and Sewer
Seattle City Light
Sempra Utilities
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Utility Specialists
Water and Energy Consulting Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
Yep Energy

Pacific Gas and Electric Company®

**Erik Jacobson**
Director
Regulatory Relations

Pacific Gas and Electric Company
77 Beale St., Mail Code B13U
P.O. Box 770000
San Francisco, CA 94177

Fax: 415-973-3582

April 30, 2020

**Advice 5817-E**
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

**Subject:** **Pacific Gas and Electric Company's Quarterly Advice Letter Pursuant to Assembly Bill 1054 Regarding the Implementation of Its Approved Wildfire Mitigation Plan and Its Safety Recommendations**

Per Public Utilities Code Section 8389(e)(7), Pacific Gas and Electric Company (PG&E) hereby submits this Tier 1 Advice Letter (AL) detailing the status of its approved wildfire mitigation plan, recommendations of the most recent safety culture assessment, recommendations of the board of directors' safety committee meetings that occurred during the quarter, and a summary of the implementation of safety committee recommendations from the previous Advice Letter filing (if any), as well as other information to help illustrate the above.

## Purpose

The purpose of this AL is to comply with Public Utilities Code (PUC) Section 8389(e)(7), established by California Assembly Bill (AB) 1054, for the first quarter of 2020—the third quarter following PG&E's receipt of its Initial Safety Certification on August 23, 2019.

## Background

On July 12, 2019, Governor Newsom signed AB 1054 into law adding Section 8389(e)(7) to the Public Utilities Code which requires, as one of the conditions to the executive director of the Commission issuing a safety certification, documentation of the following:

> The electrical corporation is implementing its approved wildfire mitigation plan. The electric corporation shall file a Tier 1 advice letter on a quarterly basis that details the implementation of both its approved wildfire mitigation plan and recommendations of the most recent safety culture assessment, and a statement of the recommendations of the board of directors' safety committee meetings that occurred during the quarter. The advice letter shall also summarize the implementation of the safety committee recommendations from the electrical corporation's previous advice letter

filing. If the division has reason to doubt the veracity of the statements contained in the advice letter filing, it shall perform an audit of the issue of concern.

## Q1 2020 Update

Implementation of Approved Wildfire Mitigation Plan (WMP)

PG&E filed its 2020 WMP with the CPUC's Wildfire Safety Division (WSD) on February 7, 2020[1]. As of the end of the first quarter, the WSD's review of PG&E's (and other utility's) WMP remains underway with an anticipated approval in late May or early June. As such, PG&E does not have an approved 2020 WMP at this time. Nonetheless, PG&E committed to a number of specific targets in the proposed 2020 WMP and is working towards completing that work while the WMP is reviewed. Status against those key work targets for 2020 year-end completion through the end of the first quarter is below. Despite the impacts of COVID-19 mitigation measures, PG&E is generally on track through the end of the first quarter and remains committed to the original targets outlined in the 2020 WMP. PG&E's workplan incorporates a planned ramp up from the first quarter into increased work completion pace in the second and third quarter of the year.

| Plan Area | Wildfire Mitigation Activity | Actual Units | Target Units | % Complete Through Q1 |
|---|---|---|---|---|
| Vegetation Management | Enhanced Vegetation Management (line miles) | 573 | 1,800 | 32% |
| Grid Design and System Hardening | System Hardening (line miles) | 45 | 221 | 20% |
| | Butte County Rebuild (Underground line miles) | 3 | 20 | 15% |
| | Temporary Microgrids (operationally ready microgrids) | 0 | 4 to 10 | 0% [2] |
| | Distribution Segmentation (automated devices) | 91 | 592 | 15% |
| | Transmission Line Switches | 6 | 23 | 26% |
| Asset Management and Inspections | Transmission HFTD Enhanced Inspections (structures) | 82 | ~22K | 0% [3] |
| | Distribution HFTD Enhanced Inspections (poles) | 4,450 | ~344K | 1% [3] |
| | Substation HFTD Enhanced Inspections | 0 | ~105 | 0% [3] |
| Situational Awareness | Weather Stations | 36 | 400 | 9% |
| | HD Cameras | 19 | 200 | 10% |

[1] PG&E's 2020 WMP is available at www.pge.com/wildfiremitigationplan.

[2] Preparation work is in flight for microgrids to reduce Public Safety Power Shutoffs (PSPS) customer impacts, units will not be confirmed until operationally ready.

[3] Asset Inspections planned to begin in earnest in the second quarter.

Implementation of the Recommendations of Most Recent Safety Culture Assessment.

On April 30, 2020, PG&E submitted its sixth Safety Culture and Governance quarterly report for the first quarter of 2020, in compliance with CPUC Decision 18-11-050. Attachment A, Safety Culture and Governance Quarterly Report No. 06-2020, details PG&E's implementation of recommendations from its most recent safety culture assessments.

Recommendations of Board of Directors Safety Committee Meetings During Q4 2019

The PG&E Board of Directors' Safety and Nuclear Oversight (SNO) Committee is an important part of PG&E's Board-level oversight of safety, enterprise risk, and other matters. A parallel SNO Committee also concurrently exists at the PG&E Corporation Board. Details regarding the SNO Committee's duties, composition, and activities were described in a prior quarter's advice letter (Advice Letter 5700-E) and are not repeated here.

During the first quarter of 2020, the SNO Committee (and the PG&E Corporation SNO Committee) met three times, on February 11, 2020 (concurrent session with the PG&E Corporation and PG&E Company Audit Committees), on February 20, 2020, and on March 27, 2020.

During the February 11, 2020 meeting, the SNO Committees and Audit Committees reviewed summaries of open high-risk audit issues with operational risks, including safety, and the status of action plans to address these issues. Examples include issues that were identified in Internal Audit's evaluation of controls and processes relating to: (1) access to customer gas facilities for atmospheric corrosion inspections, (2) electric transmission and distribution asset management, inspections, and repairs, (3) the electric and hydro Supervisory Control and Data Acquisition (SCADA) systems, (4) the brake inspection program for regulated vehicles and equipment, (5) contractor safety oversight and monitoring, and (6) monitoring and verification of "grade zero" gas distribution leak survey results.

During the February 20, 2020 joint meeting of the PG&E and PG&E Corporation SNO Committees, the Committees reviewed a safety report, which included a discussion of a serious injury or fatality (SIF) event, a safety tailboard presentation (similar in style and content to safety educational information provided to employees generally), and a review of the One PG&E Safety Plan. The Committees received and discussed a presentation relating to PSPS mitigation efforts as part of the 2020 WMP, a report regarding the Gas Operations Compliance and Risk Mitigation plan, and a report regarding the Generation line of business (LOB) operating results (including safety performance). The Committees reviewed summaries of two top enterprise risks – the risk of a loss of containment in gas facilities due to a cross bore event, and the risk of motor vehicle safety incidents involving PG&E vehicles or vehicles operated on behalf of PG&E – and a top enterprise risk topic

– records and information management. The Committees also received a written report on PG&E's 2019 safety program and performance.

During the March 27, 2020 joint meeting of the PG&E and PG&E Corporation SNO Committees, the Committees reviewed summaries of the following top enterprise risks: the risk of an employee workplace safety incident, the risk of a contractor workplace safety incident, and the risk of a loss of containment at a natural gas storage containment well or reservoir.

In addition, the SNO Committee made the following specific safety-related recommendations to management during the first quarter of 2020:

- Regularly provide the Committees PG&E's Days Away, Restricted or Transferred (DART) rate with 30-, 60-, and 90-day averages. Provide the Committees further updates on how leadership is faring in terms of improving results.

- Provide a cost/benefits analysis of new PG&E medical clinics in urban areas after rollout.
- Consider appropriateness of practices regarding disciplinary action decisions.

- Continue to expedite risk reduction activities relating to the potential consequences of a cross bore event (despite a low find rate that is consistent with the find rate of other utilities), recognizing that this will be a long-term process.

- Improve PG&E's ability to track commitments it is making in regulatory filings.

- Develop a comprehensive strategy for data integrity and records management, including IT solutions.

- Consider developing tools to simplify how employees work in the field with an eye towards reducing distractions among field workers.

- Review agreements with contractors to understand how safety is addressed, and evaluate whether the agreements appropriately incentivize and reward strong safety performance and penalize poor safety records.

- Understand and evaluate all types of safety infractions.

<u>Implementation of Recommendations/Guidance and Direction disclosed in Advice Letter 5786-E</u>

The following summarizes actions that management has taken to implement guidance and direction from the SNO Committees that was described in Advice Letter 5786-E for the fourth quarter of 2019.

- Recommendation #1: Notify the Audit and SNO Committees if any open high-risk issues in Internal Audit's third quarter 2019 report are not closed by the target dates identified in that report.

  Management's response: Management has incorporated the recommended information into its periodic reports to the Committees regarding auditing results.

- Recommendation #2: Evaluate whether it is practical to have field employees work in pairs instead of alone, in light of potential threats to their safety (e.g., a recent incident where an employee was shot at, threats against PG&E and executives on social media, etc.), and report findings back to the Committees.

  Management's response: Each of the three operational LOBs have conducted the recommended evaluation. Lone workers continue to exist in the Electric Operations LOB, Gas Operations LOB to a limited extent, and in the Power Generation LOB, and it is not practical to fully eliminate lone workers in all instances.

  However, each LOB has policies in place to enhance employee safety – including for lone employees – in instances with heightened potential of third-party threats. In the case of PSPS, Power Generation leaders implemented a no lone worker expectation due to increased third-party aggressive behavior incidents with our employees in the field, and Gas Operations has instituted policies to pair employees up who are interacting with customers or are working in areas with known animosity towards PG&E. Electric Operations leaders support pairing up, as appropriate during increased periods of sensitivity and social unrest.

  In addition, efforts to add individuals to crew complements must consider company efforts to maintain employee safety and social distancing in response to the COVID-19 pandemic.

- Recommendation #3: Analyze employee DART injuries to better understand factors affecting DART results (e.g., to discern whether there are patterns as to who is getting injured and/or the types of injuries) and report findings back to the Committees.

  Management's Response: Management has conducted this analysis and is expected to provide its findings to the SNO Committees in the next quarter. The Safety and Health department analyzed 2019 DART case data, looking at the number of cases and DART rates, distribution of cases and rates among business lines, location of cases, nature of injuries, and types of occupations with the highest number of cases, and the distribution of DART cases during 2015-2019 in different age groups and different levels of experience. These results indicated that certain populations of employees were experiencing higher incidences of DART cases than others, and that the majority of DART cases were due to sprains and strains.

To address the findings, several efforts are underway to review the populations with higher DART cases and enhance injury prevention services and early intervention care for employees, many of which have been discussed with the SNO Committees.

- Recommendation #4: Consider adding Customer Care and IT data to the "LOB Level 2 Breakdown" information in the Safety Performance Review materials that are provided to the SNO Committees, and report any decisions back to the Committees.

  Management's Response: Management has added the requested information to its safety review materials for the Committees.

**Protests**

Anyone wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than May 20, 2020, which is 20 days after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.
The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting

factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

**Effective Date**

PG&E requests that this Tier 1 advice submittal become effective upon date of submittal, which is April 30, 2020.

**Notice**

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.18-10-007, R.18-12-005, and I.15-08-019. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Erik Jacobson
Director, Regulatory Relations

**Attachment:**
Attachment A: Safety and Culture Governance Quarterly Report

cc: Service Lists R.18-10-007, R.18-12-005, and I.15-08-019



# California Public Utilities Commission

# ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39E)

Utility type:
☑ ELC ☐ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Kimberly Loo
Phone #: (415)973-4587
E-mail: PGETariffs@pge.com
E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 5817-E

Tier Designation: 1

Subject of AL: Pacific Gas and Electric Company's Quarterly Advice Letter Pursuant to Assembly Bill 1054 Regarding the Implementation of Its Approved Wildfire Mitigation Plan and Its Safety Recommendations

Keywords (choose from CPUC listing): Compliance

AL Type: ☐ Monthly ☑ Quarterly ☐ Annual ☐ One-Time ☐ Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #:

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information:
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? ☐ Yes ☑ No

Requested effective date: 4/30/20

No. of tariff sheets: 0

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

**Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:**

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

Name: Erik Jacobson, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility Name: Pacific Gas and Electric Company
Address: 77 Beale Street, Mail Code B13U
City: San Francisco, CA 94177
State: California Zip: 94177
Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

Clear Form

Advice 5817-E
April 30, 2020

# Attachment A

## Safety and Culture Governance Quarterly Report

# PACIFIC GAS AND ELECTRIC COMPANY

# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT

# NO. 06-2020

# IN COMPLIANCE WITH CPUC DECISION 18-11-050

# SUBMITTED APRIL 30, 2020



PACIFIC GAS AND ELECTRIC COMPANY
SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
NO. 06-2020
IN COMPLIANCE WITH CPUC DECISION 18-11-050
SUBMITTED APRIL 30, 2020

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# PACIFIC GAS AND ELECTRIC COMPANY
# SAFETY CULTURE AND GOVERNANCE QUARTERLY REPORT
# NO. 06-2020
# IN COMPLIANCE WITH CPUC DECISION 18-11-050

## I. Introduction

Pacific Gas and Electric Company (PG&E or the Company) submits this sixth Safety Culture and Governance Quarterly Report (Report) in compliance with California Public Utilities Commission (CPUC or Commission) Decision (D.) 18-11-050.[1] In that decision, the Commission directed PG&E to implement the recommendations of the Commission's Safety and Enforcement Division (SED), as set forth in a report prepared by NorthStar Consulting Group (NorthStar), no later than July 1, 2019, and to serve quarterly reports on the status of its implementation and ongoing execution to the service list for this proceeding. In addition, in compliance with D. 19-06-008, adopted by the Commission on June 13, 2019, PG&E and PG&E Corporation also provide details of safety-specific training, education, and support given to the PG&E and PG&E Corporation Boards of Directors (BODs).

This Report provides an update on PG&E's ongoing execution and sustainability of NorthStar's recommendations between January 1, 2020 and March 31, 2020. Additionally, this Report discusses the BODs' safety training, education, and support for the same time period, and the One PG&E Occupational Health and Safety Plan[2] (One PG&E Plan) and associated safety performance metrics.

This Report is organized as follows:

- Executive Summary
- Sustainability Update
- Board of Directors' Reporting
- One PG&E Plan and Key Safety Metrics

## II. Executive Summary

In this sixth update to the Commission, PG&E certifies the ongoing execution of NorthStar's recommendations that are summarized in Section III of the Report.

As part of PG&E's commitment to strengthening public and workforce safety, Francisco Benavides was appointed as Vice President and Chief Safety Officer (CSO) by the BODs for both PG&E Corporation and the Utility effective March 9. Mr. Benavides brings over 30 years of experience to PG&E and has held senior

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1 See Order Instituting Investigation (OII) on the Commission's Own Motion to Determine Whether Pacific Gas and Electric Company and PG&E Corporation's Organizational Culture and Governance Prioritize Safety (I.15-08-019).

2 The One PG&E Occupational Health and Safety Plan is reviewed annually.

leadership positions over safety, health and environmental functions with global companies. Mr. Benavides reports directly to PG&E Corporation's Chief Executive Officer (CEO) and the BODs' Safety and Nuclear Oversight (SNO) Committees. Mr. Benavides is responsible for developing the company's workforce and public safety strategy.

During the first quarter of 2020, PG&E experienced three serious injuries or fatalities (SIF). One contract employee lost his life and two employees sustained serious injuries. This is unacceptable. No one should lose their life or sustain a life-threatening or life-altering injury while performing work for PG&E. PG&E is taking actions to bring a sense of urgency, improve the investigation process and increase the data collection on the cause of incidents. PG&E will implement strategies to reduce serious injuries and the rate of high-potential incidents as a part of a multi-year safety strategy being developed by the new CSO.

To improve workforce safety and learn from safety incidents as soon as they occur, PG&E has improved its communication process with a Safety Flash. The goal of the Safety Flash is to increase enterprise learning opportunities by rapidly sharing safety incidents and key takeaways with employees to prevent recurring safety incidents. The focus is on safety incidents arising from hazards that exist in more than one Line of Business (LOB).

A key part of PG&E's safety efforts involves the Leader in the Field (LIF) program, which has a goal of ensuring that field-facing supervisors make a time commitment of 50% of base hours to provide safety and quality at the source of the work we execute. Across all supervisors, year-to-date time in the field has increased from 27% to 33%. For managers, year-to-date performance similarly improved from 16% to 18%. Within the specific LOBs: Power Generation time in the field increased from 38% to 39%, Electric Operations increased from 28% to 35%, and Gas Operation increased from 24% to 30%. In light of the recent stay-at-home orders issued due to the COVID-19 pandemic, PG&E leaders with field personnel that provides essential services are utilizing virtual meetings when possible and following social distancing practices when in the field to protect the health and safety of PG&E employees and customers.

Another part of PG&E's overarching strategy for workforce safety is to improve access to health care for our employees at the time they need it. Getting quicker care has shown to reduce the severity of injuries. On January 21, 2020, we started deploying Mobile Medics in locations across our service area with the highest occupational injury risk. The Mobile Medics service dispatches an Emergency Medical Technician (EMT) to employees who report an injury where they are at the time of the injury, whether it be in the field at a job site or at a PG&E work facility. The EMT provides an evaluation, first aid care and telemedicine. If a higher level of care is necessary, the EMT will refer the employee to a health clinic. By the end of March, Mobile Medics services were available in Fresno and Sacramento; future locations include Auburn, Stockton, Paradise, San Jose, Bakersfield and Santa Rosa areas. PG&E will review implementation data on the roll-out and will provide an update in the next Report.

In 2019, PG&E formed the Independent Safety Oversight Committee (ISOC) to provide external oversight of our safe work practices. In the first quarter of 2020, PG&E responded to a report by the ISOC, described in the prior quarterly Report.[3] The first ISOC report focused on processes related to wildfire public safety risks in Electric Operations. The ISOC team evaluated five programs: Enhanced Vegetation Management; System Hardening; the Wildfire Safety Inspection program; the Public Safety Power Shutoff program; and real time monitoring and intelligence. The major areas for improvement identified by the ISOC were the lack of effective collaboration within PG&E and with external stakeholders on permitting practices, lack of effective work and resource planning, lack of accurate and trustworthy data, and lack of effective change management. PG&E appointed owners for each of these areas during the first quarter of 2020 in order to develop and execute a gap closure plan and liaised with the ISOC on the proposed plans. The action owners began reporting out progress on these plans to the Utility CEO and the CSO. The ISOC team will review progress against that gap closure plan in subsequent meetings with PG&E.

In D.19-06-008, the Commission directed PG&E to provide certain BOD-related information "in the quarterly reports submitted to SED pursuant to D.18-11-050." Information in compliance with this requirement is provided in Section IV of this Report.

Consistent with PG&E's previous quarterly Reports, Section V of this Report has a progress update on the One PG&E Plan, including first quarter safety performance.

Attachment 1 to this Report provides a Glossary of Safety Terms.

Attachment 2 to this Report includes approved BOD and SNO Committee meeting minutes.

## III. Sustainability Update

PG&E continues to execute on NorthStar's recommendations and has verified the sustainability of its Safety OII plans for the period of January 1, 2020, through March 31, 2020. Temporary gaps occurred in the execution of one PG&E Safety OII plan (F-5 _Best Practice Coordination, which includes IV-5_IV-6_IV-7_V-1_V-2_V-5), and PG&E has taken actions to address them as described in Section III (C).

All but two PG&E Safety OII plans are considered implemented and ongoing, and compliance with the NorthStar recommendations is certified by the Plan Owners and Sponsors quarterly. The two plans that do not require ongoing

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**3** See PG&E's "Safety Culture and Governance Quarterly Report No. 05-2019," submitted on January 31, 2020.

execution are IX-4 Speak-up Effectiveness[4] and VIII-8 OQ Feasibility Study,[5] with a one-time compliance certification in the fourth quarter of 2019.

Compliance certifications for the first quarter of 2020 are shown in Table 1 below, and the status of the additional NorthStar recommendations is provided in Table 2.

**A. Ongoing Execution and Sustainability**

**Table 1**

**Matrix of Sustainability Plans[6]**

| | PG&E Implementation Plan | Certification Due Date | Certification Status[7] | Approver | Initial Implementation |
|---|---|---|---|---|---|
| 1 | Safety Culture and Governance OII - F-2 _Supv in the Field_includes V-4 | 03/31/2020 | Certified | Jan Nimick | Report No. 04-2019 |
| 2 | Safety Culture and Governance OII - F-3 SLD includes VIII-1 | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019<br>Report No. 03-2019 |
| 3 | Safety Culture and Governance OII - F-4 _Comprehensive Safety Strategy_includes III-2_III-3_V-3 | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 4 | Safety Culture and Governance OII - F-5 _Best Practice Coordination_includes IV-5_IV-6_IV-7 V-1 V-2 V-5 | 03/31/2020 | Not Certified[8] | Roy Vlaovich | Report No. 01-2018 |
| 5 | Safety Culture and Governance OII - III-1 Board Qualifications | 03/31/2020 | Certified | Brian Wong | Report No. 01-2018 |
| 6 | Safety Culture and Governance OII - IV-2 CSO Org Position | 03/31/2020 | Certified | Brian Wong | Report No. 01-2018 |
| 7 | Safety Culture and Governance OII - F-1 OII Implementation Plan | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 8 | Safety Culture and Governance OII - IX-1 Safety Communication | 03/31/2020 | Certified | Keith Stephens | Report No. 01-2018 |
| 9 | Safety Culture and Governance OII - IX-2 Safety Culture Metrics | 03/31/2020 | Certified | David Hatton | Report No. 01-2018 |
| 10 | Safety Culture and Governance OII - IX-3 Reach Every Employee | 03/31/2020 | Certified | Julie Kane | Report No. 01-2018 |
| 11 | Safety Culture and Governance OII - III-5 IA Safety Role | 03/31/2020 | Certified | Stephen Cairns | Report No. 01-2018 |

4 See completion narrative in PG&E's "Safety Culture and Governance Quarterly Report No. 01-2018", submitted on December 30, 2018.

5 See completion narrative in PG&E's "Safety Culture and Governance Quarterly Report No. 03-2019", submitted on July 31, 2019.

6 Additional recommendations from NorthStar's Report – First Update (March 29, 2019) are certified in MetricStream under the plans in scope for the assessment (F-1, F-2, F-3, F-4, III-1, and IX-1). See implementation details in Table 2.

7 MetricStream compliance certification status.

8 See description of the identified gaps and remediation plan in Section III (C) below.

| | PG&E Implementation Plan | Certification Due Date | Certification Status[7] | Approver | Initial Implementation |
|---|---|---|---|---|---|
| 12 | Safety Culture and Governance OII - IV-3 _Safety Dept Roles and Responsibilities_includes IV-4 | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 13 | Safety Culture and Governance OII - IV-1 _CSO Experience | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 14 | Safety Culture and Governance OII - VI -1 _Separate Safety Expenditures-RAMP | 03/31/2020 | Certified | Stephanie Williams | Report No. 01-2018 |
| 15 | Safety Culture and Governance OII - VI – 2 _Safety IPP includes III-4 | 03/31/2020 | Certified | Jan Nimick | Report No. 02-2019 |
| 16 | Safety Culture and Governance OII - VI -3 _Risk and Bus Case Planning | 03/31/2020 | Certified | Jan Nimick | Report No. 02-2019 |
| 17 | Safety Culture and Governance OII - VI -4 _PPM for Power Gen | 03/31/2020 | Certified | Andrew Abranches | Report No. 03-2019 |
| 18 | Safety Culture and Governance OII - VI -5 _Session D Link to Sessions 1 and 2 | 03/31/2020 | Certified | Janaize Markland | Report No. 02-2019 |
| 19 | Safety Culture and Governance OII - VII-1 _STIP and LTIP Metrics includes VII-4 VII-5 | 03/31/2020 | Certified | John Lowe | Report No. 02-2019 |
| 20 | Safety Culture and Governance OII - VII-2 _Former STIP metric tracking | 03/31/2020 | Certified | Stephanie Williams | Report No. 01-2018 |
| 21 | Safety Culture and Governance OII - VII-3 _LTIP Safety Weight | 03/31/2020 | Certified | John Lowe | Report No. 02-2019 |
| 22 | Safety Culture and Governance OII - VII-6 _BPR Metrics | 03/31/2020 | Certified | Stephanie Williams | Report No. 01-2018 |
| 23 | Safety Culture and Governance OII - VII-7 _Expanded Best Practice Sharing | 03/31/2020 | Certified | Jan Nimick | Report No. 02-2019 |
| 24 | Safety Culture and Governance OII - VIII-10 _PwrGen Training Completion | 03/31/2020 | Certified | Chris Pickett | Report No. 01-2018 |
| 25 | Safety Culture and Governance OII - VIII-11 _PwrGen Refresher Training | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 26 | Safety Culture and Governance OII - VIII-2 _Field-first Training Profiles | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 27 | Safety Culture and Governance OII - VIII-3 _SLD 360 | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 28 | Safety Culture and Governance OII - VIII-4 _Mandatory Refresher Training | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 29 | Safety Culture and Governance OII - VIII-5 _Human Performance Training | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 30 | Safety Culture and Governance OII - VIII-6 _OQ Status Reporting | 03/31/2020 | Certified | Evelina Cowsert | Report No. 01-2018 |
| 31 | Safety Culture and Governance OII - VIII-7 _2014 OQ Review | 03/31/2020 | Certified | Evelina Cowsert | Report No. 03-2019 |
| 32 | Safety Culture and Governance OII - VIII-9 _PwrGen Apprentice Program | 03/31/2020 | Certified | Chris Pickett | Report No. 03-2019 |
| 33 | Safety Culture and Governance OII - X-1 _SEMS-CAP Integration | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |

| | PG&E Implementation Plan | Certification Due Date | Certification Status[7] | Approver | Initial Implementation |
|---|---|---|---|---|---|
| 34 | Safety Culture and Governance OII - X-2 _CAP-NH Costs and Benefits | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 35 | Safety Culture and Governance OII - X-3 _CAP-NH Reporting Benefits | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 36 | Safety Culture and Governance OII - X-4 _IA Review of Serious Incident Investigations | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 37 | Safety Culture and Governance OII - X-5 _WGE Documentation Improvement | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 38 | Safety Culture and Governance OII - X-6 _Central Repository for Investigation info | 03/31/2020 | Certified | Wayne Edmiston | Report No. 01-2018 |
| 39 | Safety Culture and Governance OII - X-7 _ Safety Communication Protocol | 03/31/2020 | Certified | Diane Thurman | Report No. 01-2018 |
| 40 | Safety Culture and Governance OII - X-8 _Cause Evaluation Process includes X-9 | 03/31/2020 | Certified | Wayne Edmiston | Report No. 02-2019 |
| 41 | Safety Culture and Governance OII - XI-1 _Surprise Inspections for Cont Safety | 03/31/2020 | Certified | Roy Vlaovich | Report No. 01-2018 |
| 42 | Safety Culture and Governance OII - XI-2 _Solely Responsible Cont Language | 03/31/2020 | Certified | Jamie Martin | Report No. 01-2018 |
| 43 | Safety Culture and Governance OII - XI-3 _Cont Incident Closure Criteria | 03/31/2020 | Certified | Roy Vlaovich | Report No. 01-2018 |
| 44 | Safety Culture and Governance OII - XI-4 _Cont Safety best Practice Sharing | 03/31/2020 | Certified | Roy Vlaovich | Report No. 02-2019 |
| 45 | Safety Culture and Governance OII - XI-5 _LOB Guidelines for Cont Safety | 03/31/2020 | Certified | Roy Vlaovich | Report No. 02-2019 |
| 46 | Safety Culture and Governance OII - XI-6 _PwrGen Contractor On-boarding | 03/31/2020 | Certified | Jan Nimick | Report No. 01-2018 |
| 47 | Safety Culture and Governance OII - V-6 _Reduce Overall Mileage | 03/31/2020 | Certified | Paula Gerfen | Report No. 02-2019 |

### B. Additional NorthStar Recommendations

At the request of SED, NorthStar performed a secondary assessment of six PG&E Safety OII plans, established in response to recommendations from NorthStar's original report,[9] and included a set of additional recommendations in the NorthStar Report - First Update.[10] PG&E agreed with the additional recommendations and embraced the opportunity to further improve its safety culture and governance. Details and supporting documentation related to these additional recommendations were provided to NorthStar in response to data

[9] NorthStar Report, issued on May 8, 2017.

[10] NorthStar Report - First Update, issued on March 29, 2019.

request # 1087, submitted on December 17, 2019. The current status of PG&E's implementation of these additional recommendations is provided in Table 2 below.

Three additional recommendations under PG&E's Safety OII plan F-2 Supervisors in the Field, which includes V-4, are still being implemented.

- *Increase the number of Supervisors in Electric Operations, Gas Operations and Power Generation field operations to comply with Corporate Procedure HR-2010-P01 thereby limiting the span of direct reports to a maximum of 1:20.*

  PG&E continues to increase the number of leaders in Electric Operations, Gas Operations, and Power Generation, and to focus on increasing the understanding of the importance of leaders spending more time in the field. In the first quarter of 2020, the three organizations added a total of 48 leaders, thus decreasing the span of direct reports. Quarterly reports from Human Resources Data Analytics show that less than 10% of leaders are out of span as of this Report.

- *Move completed work review to the jobsite, allowing for immediate feedback before electronic records and paperwork are finalized.*

  As a standard practice, Gas Operations and Power Generation review work as it is being performed, allowing for supervisor jobsite work review and immediate feedback, therefore having a "completed work review."

  As NorthStar noted, Electric Operation's two-step practice to a completed work review, which includes a return to the work site to assess quality, may impact the supervisors' time in the field. To address the comment, the System Inspection group is actively piloting an approach to limit the need for supervisor "post work review" in the field. System Inspections is implementing mobile technology to enable work quality analysis and data trending, without "post work review" or field work verification. This shift will allow for the number of supervisor post-work field verification to be reduced, allowing supervisors to have more time with their crews.

- *Reduce travel requirements for field personnel and supervisors who are frequently assigned to work or attend meetings outside their normal work locations.*

  PG&E has reduced the frequency of travel and added remote attendance options for large business meetings, such as All Hands and All Employee Calls. PG&E has also worked to provide regionalized sessions for key in-person meetings such as Safety Summits, Grassroots Safety Meetings, Listening Sessions, and Workplan Overviews. These shifts in leadership practice help limit the travel demand on field leaders while still including them in core business discussions.

  Additionally, PG&E's Plan of Reorganization provides a vision of regionalized operating structures. This will help to reduce the demand for out-of-area travel to meetings.

## Table 2

## Matrix of Additional NorthStar Recommendations and PG&E's Implementation Status

| | PG&E Implementation Plan | NorthStar Recommendation | Status |
|---|---|---|---|
| 1 | **F-1_OII Implementation Plan** | Institute version control over, and include dates for the implementation plans, completion narratives, sustainability plans and for the IA sign-off process. | Implemented Under Existing Plan |
| 2 | **F-1_OII Implementation Plan** | Increase the rigor and formality over target completion date changes, status changes and scope changes associated with the implementation of NorthStar's recommendations. Review the implementation status of all recommendations to ensure all elements of the recommendations have been addressed or PG&E's modifications have been documented and justified. | Implemented Under Existing Plan |
| 3 | **F-1_OII Implementation Plan** | Develop processes to ensure the sustainability of the implementation of NorthStar's recommendations. | Implemented Under Existing Plan |
| 4 | **F-1_OII Implementation Plan** | In addition to the status of the implementation of NorthStar's recommendations, continue to report to the Commission on any significant changes that might affect the sustainability of the recommendations. | Implemented Under Existing Plan |
| 5 | **F-1_OII Implementation Plan** | Report to the Commission on a quarterly basis the status of the One PG&E Operational Health & Safety (OH&S) Plan and associated metrics (in process). | Implemented Under Existing Plan |
| 6 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Increase CSO oversight and governance over public and other aspects of safety to mitigate potential silos and ensure risks are adequately addressed. | Implemented Under Existing Plan |
| 7 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Communicate results of Internal Audit (IA) safety-related audits and LOB management response to Safety, Health and Enterprise CAP (reporting to the CSO). | Milestones Complete |
| 8 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Include the Generation Safety Lead in routine meetings between Electric Operations and Gas Operations and Safety & Health regarding the implementation of OH&S plan. | Implemented Under Existing Plan |
| 9 | **F-4 Comprehensive Safety Strategy _includes III-2_III-3_V-3** | Conduct an annual (or biennial) blue sky strategic safety planning exercise to concentrate on the changing environment, potential risks and threats. The exercise should force a comprehensive analysis of all safety-related opportunities and threats and a formal, proactive action plan. The planning exercise should:<br>• Consider the environmental, financial, political, technological, infrastructure, public, workforce and other risks and safety advancements.<br>• Include executives, management and potentially the BODs.<br>• Be facilitated by an outside expert.<br>• Cover ALL potential contributors to safety. | Implemented Under Existing Plan |
| 10 | **F-2_Supv in the Field_includes V-4** | Increase the number of Supervisors in Electric Operations, Gas Operations and Power Generation field operations to comply with Corporate Procedure HR-2010-P01 thereby limiting the span of direct reports to a maximum of 1:20. | Plan in Progress |

| | PG&E Implementation Plan | NorthStar Recommendation | Status |
|---|---|---|---|
| 11 | **F-2_Supv in the Field_includes V-4** | Commit to a target level of dedicated time in supervisors calendars each week for time in the field; guidance will remain flexible for each LOB to take into consideration the different job functions and geographic work considerations. | Implemented Under Existing Plan |
| 12 | **F-2_Supv in the Field_includes V-4** | Transfer administrative tasks such as scheduling of work, training and paperwork review, from the Supervisor to the office-based staff. | Implemented Under Existing Plan |
| 13 | **F-2_Supv in the Field_includes V-4** | Formalize Gas, Electric, and Power Generation management expectations for supervisors spending time in the field and communicate techniques for how to reduce impediments in each LOB thereby increasing time in the field. | Implemented Under Existing Plan |
| 14 | **F-2_Supv in the Field_includes V-4** | Move completed work review to the jobsite, allowing for immediate feedback before electronic records and paperwork are finalized. | Plan in Progress |
| 15 | **F-2_Supv in the Field_includes V-4** | Reduce travel requirements for field personnel and supervisors who are frequently assigned to work or attend meetings outside their normal work locations. | Plan in Progress |
| 16 | **F-3_SLD_includes VIII-1** | Continue to provide Crew Lead Safety Leadership training courses for employees that move into Crew Lead positions. Automatically include Crew Lead Safety Leadership training in the training profiles for new crew leads. | Implemented Under Existing Plan |
| 17 | **F-3_SLD_includes VIII-1** | On an annual basis, revise Safety Leadership Development (SLD) training to address any areas of concern identified in the review of SafetyNet observation data. | Milestones Complete |
| 18 | **III-1_Board Qualifications** | Report any changes in the Board of Director (BOD) skills matrix, and any changes to the composition of the BOD to the CPUC. | Implemented Under Existing Plan |
| 19 | **III-1_Board Qualifications** | Continue to update the BOD on safety and other significant industry issues. | Implemented Under Existing Plan |
| 20 | **III-1_Board Qualifications** | Encourage BOD members to inquire and challenge PG&E executives to ensure a robust governance process. Revise PG&E Corp.'s Governance Guidelines to include expectations for Directors. As an example, see the Sempra Energy Corporate Governance Guidelines. Among other items, the Sempra Energy Guidelines include the following:<br>• Maintain an attitude of constructive skepticism, ask relevant, incisive, probing questions and engage in direct and forthright discussions with the Board and management.<br>• Develop and maintain a broad understanding of the corporation's business and risk profile, its strategic, financial and operating opportunities and plans, and its internal control systems and disclosure controls and procedures, including environmental, and health and safety systems and procedures.…<br>• Balance prompt action with thorough deliberations, prioritize matter requiring attention, gather sufficient information, engage in open discussion, invite differing views, evaluate the benefits and risks of various courses of action and support the acceptance of prudent business risks to permit informed and timely decision making. | Milestones Complete |

| | PG&E Implementation Plan | NorthStar Recommendation | Status |
|---|---|---|---|
| 21 | **IX-1_Safety Communication** | Implement the recommendations identified in the outside vendor's communications audit. | Milestones Complete |
| 22 | **IX-1_Safety Communication** | Revise the communications plan as necessary to address any safety and health issues that are identified in recent and on-going Premier surveys and associated analyses | Implemented Under Existing Plan |

## C. Changes to PG&E Execution of Plans

As recommended by NorthStar, PG&E will continue to report to the Commission on any significant changes that might affect the sustainability of the recommendations.

- Under PG&E's Safety OII plan F-5_Best Practice Coordination, which includes IV-5_IV-6_IV-7_V-1_V-2_V-5 recommendations, Electric Operations hired approximately 50 Field Safety Specialist (FSS) at the end of 2019 to primarily perform contractor safety observations to replace contract FSS. During the first quarter of 2020, PG&E identified areas in which these recommendations were not being followed due to a lack of awareness of the requirements. To ensure that all LOBs are aware of the NorthStar recommendations, Safety, Health, ECAP and DOT (SHED) will reiterate these requirements by utilizing Daily Digest. Additionally, SHED is working with Electric Operations to resolve the areas of concern.
    - IV-6, Roles and Responsibilities - A highly detailed division of safety responsibilities was created and utilized, but with the establishment of the Electric Operations FSS team and the re-purposing of the SHED FSS team, it is no longer applicable. Discussions have begun and a refreshed, high-level division of responsibilities has been agreed to.
    - IV-7 and V-5, Training - SHED developed a five-year training plan consistent with the response to these Safety OII recommendations. Electric Operations will create a training plan to meet this requirement. SHED will develop a process to close the awareness gap.
    - IV-5, Safety Certifications - SHED committed to either hiring new FSS with safety certifications or requiring them to obtain such certifications within one year of hire. Electric Operations will have all FSS obtain a Certified Utility Safety Professional (CUSP) certification during 2020. A control in the hiring process is being implemented. The job profiles for the FSS job family have been updated with the certification requirements. These will be published in May 2020 and all other FSS job descriptions will be removed from the system.
    - F-5, Greater Coordination between Corporate Safety and LOBs - A regular weekly coordination meeting was established as part of the initial implementation of this recommendation. Due to personnel changes in late 2019, this meeting ceased but frequent ad-hoc communication continued. Beginning in May 2020, a similar meeting will be reinstated.

- V1, Best Practices and V-5 Safety Support at the Supervisor/Foreperson Level - Both recommendations were unaffected by the changes.

- PG&E anticipates changes to Safety OII plan VII-1 - STIP and LTIP Metrics, which includes VII-4 and VII-5. Currently, PG&E does not have 2020 Short Term Incentive Plan (STIP) that has received Bankruptcy Court approval. As required under the Chapter 11 reorganization filing, a proposed STIP plan for 2020 was submitted to the Bankruptcy court on January 31, 2020.

## IV. Board of Directors Reporting

In D.19-06-008, the Commission directed PG&E to provide the following information in the quarterly reports submitted to SED pursuant to D.18-11-050:

1) Non-confidential versions of the minutes of all BOD and safety committee meetings.
2) All training, education or other support on safety that PG&E and PG&E Corporation are providing to Board members so that they can adequately perform their duties on safety issues.[11]

### A. BOD and SNO Committee Meeting Minutes

Attachment 2 to this Report includes non-confidential versions of approved minutes for the following BOD or SNO Committee meetings that were held on or after June 13, 2019,[12] and for which approved minutes have not been provided in connection with a prior quarterly report.

- Meetings of the BODs of PG&E and PG&E Corporation were held concurrently on the following dates:

| |
|---|
| October 4, 2019 |
| October 11, 2019 |
| October 17, 2019 |
| October 24, 2019 |
| October 27, 2019 |
| November 1, 2019 |
| November 6, 2019 |
| November 12, 2019 |
| November 15, 2019 |
| November 16, 2019 |
| November 21, 2019 |
| December 2, 2019 |
| December 4, 2019 |
| December 5, 2019 |
| December 10-11, 2019 |
| December 12, 2019 |

[11] D.19-06-008, *mimeo*, p. 4

[12] Effective date of D.19-06-008.

| |
|---|
| December 13, 2019 |
| December 15, 2019 |
| December 19, 2019 |
| December 30, 2019 |

- Meetings of the SNO Committees of the BODs of PG&E and PG&E Corporation were held concurrently on the following dates:

| |
|---|
| November 19, 2019 (concurrent with Audit and CPP Committees) |
| December 10, 2019 |

Meeting minutes for the BODs and the SNO Committees must be formally reviewed and approved by the relevant governance body prior to finalization. The timing for this process varies, and in many cases the minutes will be finalized in a different quarter than the quarter in which the meeting was held.

## B. BOD Safety-Related Training

PG&E is submitting information regarding "all training, education or other support on safety that PG&E and PG&E Corp." provided "to board members to ensure that they can adequately perform their duties on safety issues."

- During the first quarter of 2020, consistent with the directors' commitment to each conduct at least three site visits per year, non-employee directors of PG&E and PG&E Corporation made various field visits and facility tours to meet with employees, observe employees and contractors performing work in the field, and tour safety training facilities and operating facilities. Activities during the first quarter of 2020 included individual directors (1) visiting various job sites to observe locate and mark work and other gas and electric work, and (2) visiting the Sacramento Customer Contact Center and meeting with customer service employees.
- In January 2020, the PG&E Corporation Compliance and Public Policy (CPP) Committee received a report on PG&E's fourth quarter 2019 Wildfire Safety Plan progress.
- In February 2020, the PG&E Corporation CPP Committee reviewed a draft of the Committee's fourth quarter 2019 oversight report to the BODs on PG&E's progress against its Wildfire Safety Plan.
- In January and February 2020, the PG&E Corporation CPP Committee received a report regarding the companies' Wildfire Mitigation Plan.
- In February 2020, the Audit Committees and the SNO Committees reviewed summaries of open high-risk audit issues with operational risks, including safety, and the status of action plans to address these issues: (1) the electric and hydro Supervisory Control and Data Acquisition systems, (2) the brake inspection program for regulated vehicles and equipment, (3) electric transmission and distribution asset management, inspection, and repairs, (4) contractor safety oversight in gas operations and power generation, (5) access for atmospheric corrosion inspections, and (6) distribution leak surveys.

- In February 2020, the PG&E Corporation CPP Committee received a report on the wildfire maturity model.
- In February 2020, the SNO Committees received a safety report, which included a review of the One PG&E Safety Plan and a serious injury and fatality update.
- In February 2020, the SNO Committees also received a report regarding public safety power shutoff mitigation efforts under the Wildfire Mitigation Plan.
- In February 2020, the SNO Committees also received reports on top enterprise risk topics and enterprise risks, including cybersecurity, cross-core loss of containment from gas distribution facilities, records and information management, and motor vehicle safety incidents.
- In February 2020, the BODs received the PG&E Corporation CPP Committee's fourth quarter 2019 oversight report on PG&E's progress against its Wildfire Safety Plan.
- In March 2020, the SNO Committees received reports on top enterprise risk topics and enterprise risks, including potential loss of containment at natural gas storage wells or reservoirs, employee workforce safety incidents, and contractor workforce safety incidents.
- During the first quarter of 2020, in-person regular meetings of the BODs and the SNO Committees included a safety tailboard similar to those presented to employees. Topics covered during the first quarter of 2020 included (1) rattlesnake awareness and (2) poison oak prevention and awareness.

## V. One PG&E Occupational Health and Safety Plan and Key Safety Metrics

### A. Introduction

The One PG&E Plan encompasses Employee Safety, Contractor Safety, Motor Vehicle Safety, and the Enterprise Safety Management System (ESMS), as well as eight focus areas to facilitate execution and reporting. The One PG&E Safety Plan was revised and reviewed on February 20, 2020. As the CSO sets the Company's workforce safety strategy going forward, this plan will continue to be factored in.

### B. Employee Safety

#### 1. Safety Management System

PG&E is committed to developing and adopting the ESMS to define how PG&E consistently manages all safety domains under a single, comprehensive governance framework. The ESMS will establish governance and oversight of public safety practices, which primarily includes asset management; occupational health and safety practices, which primarily affect workforce safety; environmental management practices; and safety-related business functions, which support the practices outlined above. See Table 3 for progress in the first quarter of 2020.

**Table 3**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Implement Enterprise Safety Management System | •Implement the ESMS by 2022.<br>•Including third party certification. | •Drafted key policies and standards to define the ESMS for the company. |
| Independent Safety Oversight Committee | •Implement an ISOC to provide safety assurance across PG&E by December 31, 2020. | •Received and responded to initial ISOC report covering Electric Operations.<br>•Published enterprise ISOC standard.<br>•Confirmed ISOC visit schedule and members for 2020 visits and implementation (impact of coronavirus TBD). |
| Management of Change | •Implement Management of Change (MOC) software within Gas Operations by December 31, 2020.<br>•Implement MOC software in its Electric Operations and Dam Operations by December 31, 2021.<br>•Provide an annual report on the procurement, development, and implementation of MOC software for PG&E's operations to the SED and the Office of the Safety Advocates (OSA) at the CPUC and/or OSA's successor.<br>•The first report will cover activities performed during 2020 and be presented to SED, OSA, and/or OSA's successor by July 1, 2021. | •Drafted a policy and standard for enterprise MOC that defines MOC requirements for implementation in a software system.<br>•Established an owner for enterprise MOC implementation. |
| Safety Culture | •Implement a safety culture consistent with safety leadership commitments. | •Drafted definition of safety culture around safety values and actions.<br>•Established an owner for enterprise safety values and actions implementation. |

## 2. Musculoskeletal Disorders (MSD), Sprains and Strains

PG&E's MSD program supports the prevention of injury though changes and re-design of key programs such as office, vehicle, industrial ergonomics, and the Industrial Athlete program. These programs are designed to take a systematic approach to identifying the ergonomic risk factors associated with performing physical work. See Table 4 for progress in the first quarter of 2020.

## Table 4

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Office Ergonomics | •Work with each LOB to proactively identify leading indicators that could result in injury.<br>•Reduce the number of evaluators and increase their hours to have a smaller more streamlined cohesive support staff.<br>•Establish weekly meetings with evaluators to understand and address situations and share best practices.<br>•Refine reporting in case management.<br>•Use data to conduct predictive analysis.<br>•Pilot centralized ordering for efficiencies. | •Analysis of current data shows that approximately 30% employees are not current on their annual training and 45% have identified issues that have not been resolved. The gap has been attributed to the training being housed in vendor software while acknowledgment of completion is in PG&E's system. To resolve the issue, PG&E is linking the 2 systems.<br>•Additional analysis of data revealed that 45% of employees have identified issues that have not been resolved. To assist employees, PG&E is taking a proactive approach of scheduling workstation evaluations, beginning with the highest risk, and those with most issues, employees.<br>•Evaluator team has been restructured to have 9 full-time evaluators allowing for better case management and quality assurance. This is a shift from fragmented model of 30 part-time evaluators, which caused delays in the past. |
| Industrial Athlete | •Train all industrial athlete specialist in industrial ergonomics software.<br>•Develop heat maps to overlay data to reflect impact of services.<br>•Focus on field workforce only. | •All industrial athletes began training in January 2020 on software and industrial ergonomic principles. The objective is to expand the number of evaluations occurring across the enterprise to create a robust data source with a hierarchical risk-rating system to address industrial ergonomics. |
| Industrial Ergonomics | •Perform assessments based on injury data.<br>•Partner with LOB on risk mitigations using electromyographical (EMG) data.<br>•Broaden program to risk-based approach addressing musculoskeletal health hazards. | •Industrial ergonomics - Communications and partnership across all LOBs to understand and incorporate industrial ergonomics into daily work practices continues to grow. Each year shows approximately a 20 percent increase in request for industrial ergonomic evaluations.<br>•12 specialists were trained on the industrial software and are using it to capture quantitative data on work task.<br>•Humantech industrial ergonomics software is in place with HR attribute build out. Systematically working with all LOBs and grassroot teams to capture data on work. |
| Vehicle Ergonomics | •Revise vehicle ergonomic evaluation process. Focus on objective, quantitative data.<br>•Develop form in software.<br>•Partner with Transportation Services on process, procedures and vehicle design. | •Trained new industrial athlete specialists on vehicle ergonomics.<br>•Continued partnership with fleet to ensure that vehicle ergonomics principles are discussed, and where feasible, incorporated up front versus a later retrofit. This has shown significant 70% reduction in reports of discomfort on new vehicle where ergonomics was incorporated on design process. |

### 3. Safety Leadership

All employees who are new to operational leadership positions are required to attend Safety Leadership Development (SLD) workshops within 90 days of being profiled for the training. The profiling occurs automatically when an employee assumes a new leadership role. PG&E is looking for ways to integrate the skills and language from the SLD Program into other safety programs, such as LIF, to build and reinforce PG&E's desired safety culture. See Table 5 for progress in the first quarter of 2020.

**Table 5**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Safety Leadership Development Workshops | •Ensure PG&E Academy curriculum is aligned with Operational Learning/SLD priorities. | •The SLD program is in a self-sustaining mode. Major themes from the analysis of SLD observations were incorporated during the annual update cycle and implemented in January of 2020. Thirty-two new leaders completed the training in the first quarter. |
| SLD Observations | •Promote the use of SLD observation checklist to guide and inform LIF engagements. | •Corporate Field Safety provided feedback to the LOBs and FSS on the SLD observation results to assist with continuous improvement. |
| Learning Teams | •Learning teams have now been turned over to LOBs to conduct as needed. | •The goal for Learning Teams is for LOBs to establish and maintain the capacity to conduct Learning Teams when appropriate. Diablo Canyon Power Plant and Supply Chain have embraced Learning Teams, and Gas Operations and Information Technology are piloting Learning Teams. |
| Operational Learning | •Refine Operational Learning tools and processes. | •Team formed in the first quarter to prioritize Operational Learning initiatives. |
| Strategy & Prevention Debriefs | •Collaborate with communications and LOB field-facing leaders to develop a method to consistently deliver critical information to the appropriate audience in a timely manner. | •To improve the effectiveness and speed of sharing incident learnings, a Safety Flash protocol and standard template were developed. |

### 4. Serious Injury and Fatality Prevention

PG&E investigates incidents that result in an actual employee SIF, meaning a fatality, a life-threatening or life-altering injury or illness. PG&E also identifies incidents with SIF potential to understand the conditions that led to the incident, learn from the investigation findings, and develop corrective actions. PG&E investigates SIF actual events for contractors, provided that they were conducting work under the supervision of PG&E, on PG&E property, or on PG&E assets. See Table 6 for progress in the first quarter of 2020.

**Table 6**

| Work stream | Objectives [13] | Q1 2020 Progress |
|---|---|---|
| SIF Investigations | •Improve SIF and Cause Evaluation (CE) processes and tools. | •Review of SIF investigation guidelines, policies, procedures, standards, and manuals in parallel with reviewing all CE guidelines, policies, procedures, standards and manuals to identify redundancies, inconsistencies, and gaps. |
| | •Improve timeliness and clarity of SIF-related communications to provide actionable intelligence to LOBs. | •New approval process has reduced several days of lag time in sharing information about SIF incidents when they first occur and once an investigation has been completed. |
| | •Analyze SIF investigations and share key learnings. | •Evaluated all SIF-Potential incidents to identify any safety successes to share with LOBs. |
| Safety Observations | •Expand user population in SafetyNet. | •Completed internal SafetyNet audit and identified issues causing less-than-optimal data. |
| | •Evaluation of SafetyNet tool and product enhancements. | •Created in-depth plan and initiated re-launch of the SafetyNet tool. |
| | •Increase ownership of SafetyNet within the LOBs. | •Engaged LOBs and gathered SafetyNet revision requirements from Shared Services, SHED, Materials, and Power Generation. |
| | •Identify additional training & support materials. | •Onboarded and trained four employees to support Safety Observations team activities. |
| Near Hit | •Identify and develop a strategy and plan for Near Hits for the enterprise. | •Onboarded new program lead to re-launch the Near Hits program.<br>•Implemented "Near Hits at Home" mechanism to collect and analyze near hits for remote workers during COVID-19 shelter-in-place directives. |

## 5. Injury Management

PG&E provides a number of Injury Management programs, such as timely injury reporting, a Return to Work (RTW) Task Program, on-site medical clinics, and Mobile Medics, to improve employees' overall well-being, and to promote early return to work. Early intervention and convenient access to care helps to reduce the severity of injuries and leads to better outcomes. In addition, PG&E's RTW Task Program allows employees to return to work with medical restrictions that might otherwise prevent them from working. See Table 7 for progress in the first quarter of 2020.

**13** The Essential Controls program was suspended in the fourth quarter of 2019 with resources focused on process improvements in other programs that provide greater impact on safety, such as SIF investigations and the SafetyNet observation tool.

**Table 7**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Timely Reporting | •Continue targeted leadership conversations.<br>•Improve employee experience. | •Nurse Care Line: 4% improvement year-to-date (YTD) in timely reporting, as compared to same time last year.<br>•YTD timely reporting: 77% |
| RTW Task Program | •Provide additional return to work opportunities.<br>•Reduce unavailable workforce and lost work days (LWD). | • Placed 33 employees into task assignments.<br>• Saved 748 LWD by returning employees to work who otherwise would have remained off work.<br>• Added 3 new assignments into Task Bank.<br>• Finalized Task Bank procedures. |
| On-site Clinics | •Provide convenient access to primary and urgent care and wellness services for both work-related and non-work-related injuries and conditions. | •Concord Gateway clinic opened in January of 2020.<br>•San Francisco General Office, Fresno, and San Carlos onsite clinics continue to provide health services. |
| Fit4U Pilot Program | •Prevent repeat injuries.<br>•Long Term Program Goals - Reduce Workers' Compensation claims (count, duration, cost).<br>•Improve long-term overall health and well-being through a lifestyle change | •Following the September 2019 conclusion of the Fit4U pilot, the data has been maturing which will allow for analysis and decision regarding the program effectiveness (expected in the second quarter). |
| Mobile Medics | •More immediate, convenient, on-location medical care for employees.<br>•Prevent work-related discomfort, pain or injuries from worsening. | •Mobile Medics in place in Fresno and Sacramento |

## 6. Health and Wellness

PG&E's Health and Wellness (H&W) programs use employee education and engagement to help employees take action to improve their overall well-being and to reduce risks of health conditions and injuries. PG&E promotes healthy lifestyles by improving access to and awareness of available H&W resources, which include mental health and Employee Assistance Program (EAP) services. See Table 8 for progress in the first quarter of 2020.

**Table 8**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Health Screenings | •Maintain >80% participation.<br>•Expand awareness of lab and physician screening options. | •As of the first quarter of 2020, 16,944 employees (77%) have completed their health screenings. |
| Health Coaching | •Reduce workforce health and safety risks by providing access to telephonic, onsite and digital health coaching support. | •Redesigned and simplified digital health coaching offering.<br>•Onsite health coaching - 120 employees completed onsite appointments.<br>•Transitioned onsite health coaching to telephonic due to workforce shelter-in-place/remote work order. |
| Health Promotion | •Provide total wellbeing solution for PG&E's workforce through H&W portal/application.<br>•Drive workforce awareness and engagement in wellness programs and benefits through Wellness Ambassador Network. | •H&W portal enrollment – 2,316 (10%) employees enrolled.<br>•Launched 4-week step-based Team Challenge to promote awareness.<br>•Monthly H&W Roundup newsletters to Wellness Ambassadors and Safety leads; COVID-19 resources highlighted.<br>• The program has 353 Wellness Ambassadors as of the first quarter of 2020. |
| Mental Health Support | •Increase awareness and enhance support for mental health conditions as a health and safety risk factor.<br>•Deploy new mindfulness resilience resources.<br>•Grow Peer Volunteer Program (PVP) to cover all LOBs and service territory. | • Department of Transportation (DOT) communication re: Kaiser substance use disorder treatment coverage.<br>• Support employees during shelter-in-place via telemedicine, communications, webinars, remote access to onsite EAPs.<br>• Virtual mindfulness sessions to support employees during shelter-in-place and "Mindfulness for Sleep" webinar.<br>• PVP Quarterly Meeting in February 2020. |
| Telemedicine | •Promote Anthem and Kaiser telemedicine programs. | •2020 YTD telemedicine visits - 367 total all modes, 328 registrations.<br>• Increased telemedicine communications due to COVID-19, shelter-in-place/remote work order. |
| Condition Management | •Expand Knova Solutions program for Human Capital Risk (HUI) risk scores from top 5% to top 20%, include dependents | •Utilization as of March 2020 - total enrollment 794; 560 employees and 234 dependents with high health risks. |

PG&E has identified key performance metrics tied to the Employee Safety focus areas above. In 2020, PG&E is focusing on a few key metrics that are meaningful indicators of safety performance. As a result, the following metrics have been removed from the quarterly reports:

- OSHA[14]
- LWD Case Count
- SIF Timeliness of Corrective Actions
- SIF Quality of Corrective Actions
- Workforce Unavailable due to Health
- Timely Reporting of Injuries

The metrics that were removed are still tracked and available for leadership reporting as needed.

PG&E established Days Away, Restricted or Transferred (DART) targets for 2020 to move the rate from 4th quartile to 3rd quartile. The company continues to see challenges with SIF events (actual and potential), repetitive motion injuries in the contact centers and strains from lifting, pulling and pushing in field workers. The company is reviewing the historical SIF data including investigations, incident history and Corrective Action Program (CAP) closure to inform a strategy for eliminating SIF and reducing the rate of high-risk incidents. Efforts are underway to reduce the non-serious and repetitive motion injuries including expanded clinics, mobile medics, on-site ergonomic specialists and expansion of the industrial athlete program.

Table 9 below summarizes key metrics performance and established targets for 2018 - 2020. Figure 1 below provides current performance with respect to employee safety metrics as of March 31, 2020.

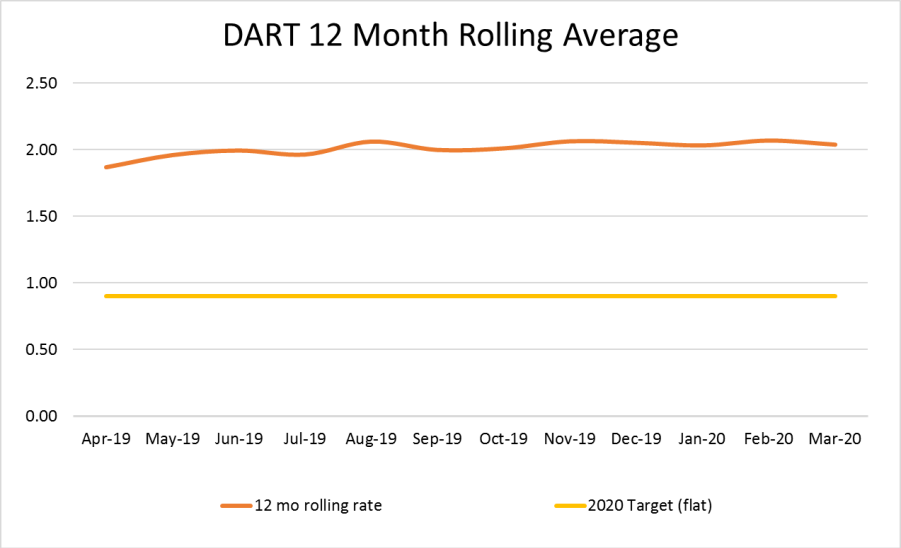
**TABLE 9**
**2018 - 2020 PERFORMANCE AND ESTABLISHED TARGETS**

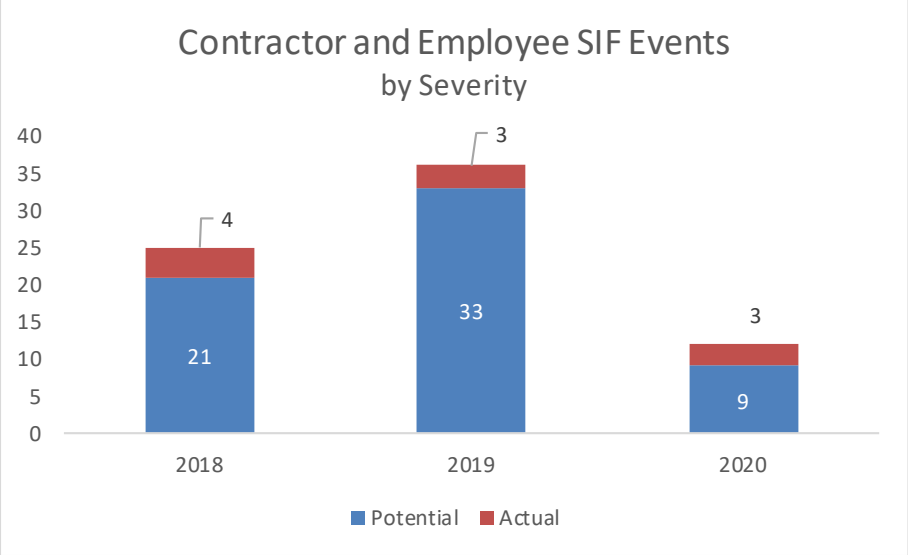
| Metric | 2018 | | 2019 | | 2020* | | |
|---|---|---|---|---|---|---|---|
| | Actual | Target | Actual | Target | YTD Actual | YTD Target | EOY Target |
| Employee SIF Count (Actual and Potential) | 22 | | 33 | | 11 | | |
| DART Case Count | 1.81 | 1.88 | 2.05 | 1.34 | 2.04 | 1.77 | 0.90 |

**2020 rates and targets are based on 12 month rolling rates*

**14** Occupational Safety and Health Administration

**FIGURE 1**
**CURRENT PERFORMANCE AS OF MARCH 31, 2020**




## C. Contractor Safety

PG&E's Contractor Safety Program requires primary contractors and subcontractors performing medium- and high-risk work to meet minimum pre-qualification requirements. PG&E monitors the implementation of the program requirements by conducting compliance assessments in the LOBs and performing Management and Organization Assessments (MOAs) on contractors who are new in business (less than three years) or have experienced rapid growth (significant increase in employees working for PG&E). See Table 10 for progress in the first quarter of 2020.

## Table 10

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Training & Qualifications | •Develop and implement new training requirements for PG&E employees and contractors. | • Tracking Contractor Safety Program training completions for contractors and PG&E employees.<br>•ISN Badging: Requiring contractors to track their worker's OSHA training (EOY 2020 completion date; ~ 20% of contractors have completed).<br>•Added three additional PG&E safety orientations in ISN for contractors. |
| Field Observations | •Utilize PG&E observation tool for capturing safety observations on contractors. | • 17,610 Field Observations were conducted and feedback provided. |
| Contractor Safety Forums | •Communicate and share PG&E's safety culture. | • 18 LOB workstreams began planning their 2020 Contractor Safety Forums, to be completed by year end. |
| Program Scope/Contractor Management | •Utilize ISN to track increase in contractor workers and contractors that are in business less than three years.<br>•Establish requirements for minimum Safety Officers on projects.<br>•Increase safety oversight in the field. | • 22 MOA assessments were conducted to evaluate the contract safety management structure.<br>• Implemented a new field safety inspection team to perform field audits on contractors. Eleven inspections completed with 6 non-compliance findings identified, with 4 of them high-risk. High-risk findings have been communicated to the contractors. Contractors are expected to complete a Corrective Action Plan identifying short- and long-term corrective actions to prevent recurrence. |

Table 11 below summarizes key metrics performance in 2018 - 2020. Figure 2 below provides current performance with respect to contractor safety metrics as of March 31, 2020.

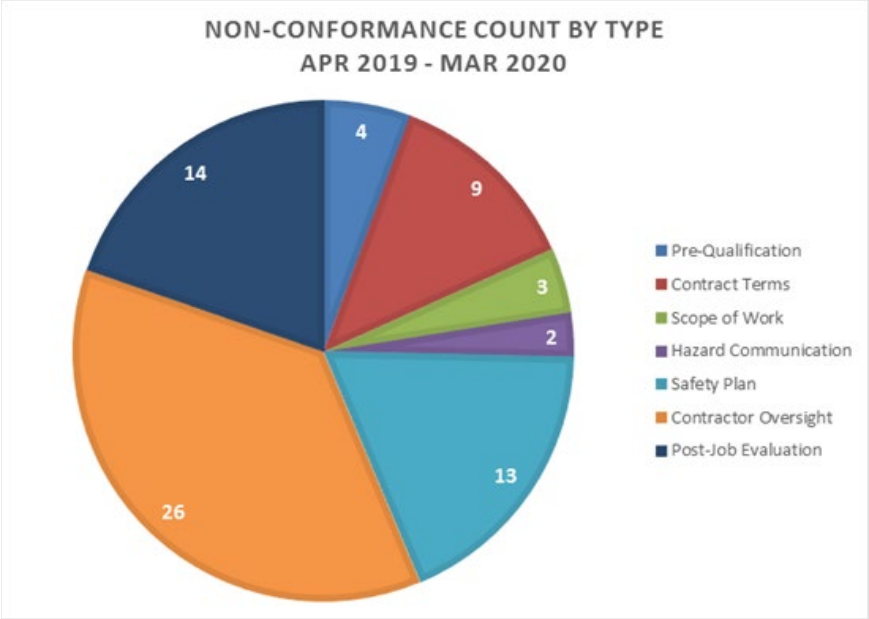
**TABLE 11**
**2018 - 2020 PERFORMANCE**

| Metric | 2018 | | 2019 | | 2020 | | |
|---|---|---|---|---|---|---|---|
| | Actual | Target | Actual | Target | YTD Actual | YTD Target | EOY Target |
| Contractor SIF Count (a) | 3 | | 3 | | 1 | | |
| % of Contractor Assessments with Non-Conformance Findings (b) | 10.3% | | 12.5% | | 11.1% | | |

(a) PG&E only tracks SIF Actual events for Contractors.

(b) An assessment is determined to be not met if one or more non-conformances are found.

**FIGURE 2**
**CURRENT PERFORMANCE AS OF MARCH 31, 2020 (a)**




(a) An assessment is determined to be not met if one or more non-conformances are found.

## D. Motor Vehicle Safety

PG&E's Motor Vehicle Safety program is focused on preventing and reducing the risk of motor vehicle incidents (MVI) to mitigate harm to employees and the public. PG&E is leveraging technology and data for driver feedback and interventions to reduce risks associated with driver's behavior and improving availability of data to field leaders to enable targeted risk assessments and coaching. See Table 12 for progress in the first quarter of 2020.

**Table 12**

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| 360 App | •360 Walk Around App - Mobile application designed to require 360-degree walkaround prior to driving. Developed for non-regulated company drivers. | •Launched kickoff meetings and development sessions with IT to develop requirements, specifications, and initial design of the application. |
| UCLA Risk Assessment | •Partnering with UCLA to conduct risk assessment of the MVS Program. Desired outcomes will be to identify gaps, and to inform future mitigations, alternatives, and program recommendations. | •First draft reviewed with team and feedback provided to UCLA. UCLA is working on the updated analysis, recommendations, and final report. |
| Safe Backing Training | •Safe Backing Training (TECH-9161) - This course is for all company drivers and reviews safe backing principles, company policies, and proper use of spotter/backers. Available to all PG&E employees. | •Course was developed and is available to all employees in PG&E's My Learning portal. |
| Vehicle Safety | •Vehicle Safety Technology (VST) Installation and Activation: PG&E's Transportation Services will | •Pilot installations of 337 devices delayed due to the COVID-19 response. |

| Work stream | Objectives | Q1 2020 Progress |
|---|---|---|
| Technology (VST) | install and activate VST in all on-road PG&E owned vehicles (approx. 10,000) by the end of 2022. The technology will provide better visibility into the risk assessment process. | |
| Post Incident Review | •Post Incident Review - Procedure outlines leadership requirements to perform a consistent review of available information and corrective actions of an employee following an MVI. This procedure is designed to provide employees with timely coaching and reduce overall risk. The procedure will be rolled out enterprise wide with a dashboard for leaders to have access to a single source containing multiple data points related to driver/vehicle risk. Estimated implementation by 2021. | •Partnered with various stakeholders to facilitate agreement and consensus on required actions and details involved in the procedure |

In 2020, PG&E is focusing on key metrics that are indicators of safety performance. As a result, the following metric has been removed from the quarterly reports:

- Serious Preventable Motor Vehicle Incident (SPMVI) Count

The SPMVI metric is still tracked and available for leadership reporting as needed.

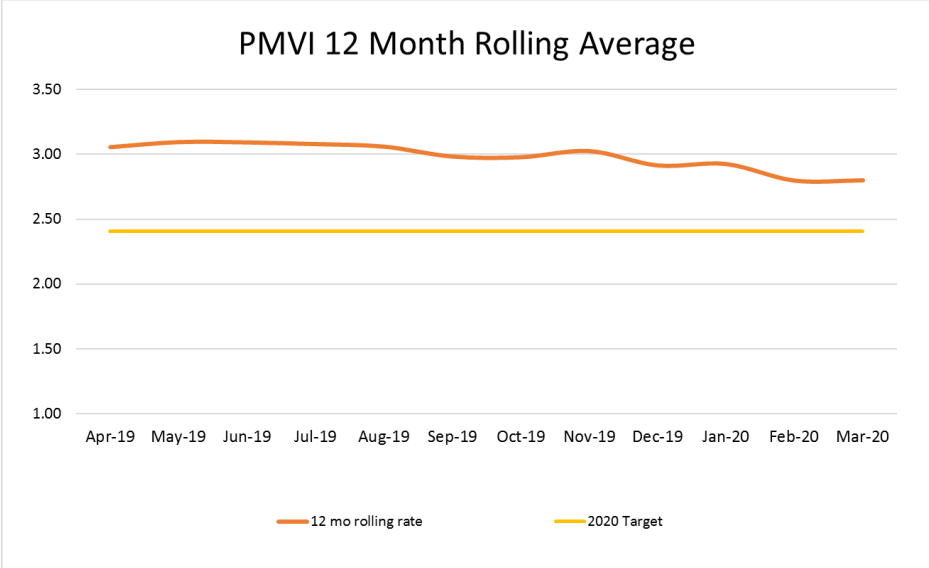
Table 13 below summarizes key metrics performance in 2018 - 2020. Figure 3 provides current performance with respect to motor vehicle safety metrics as of March 31, 2020. The preventable motor vehicle incidents (PMVI) rate is improving with first quarter results only slightly above target.

**TABLE 13**
**2018–2020 PERFORMANCE AND ESTABLISHED TARGETS**

| Metric | 2018 | | 2019 | | 2020* | | |
|---|---|---|---|---|---|---|---|
| | Actual | Target | Actual | Target | YTD Actual | YTD Target | EOY Target |
| PMVI Case Count | 2.79 | 2.34 | 2.91 | 2.45 | 2.80 | 2.79 | 2.41 |

**2020 rates and targets are based on 12 month rolling rates*

**FIGURE 3**
**CURRENT PERFORMANCE AS OF MARCH 31, 2020**




## E. Conclusion

PG&E is committed to improving its safety culture and performance and regaining the public's trust. The areas of opportunity identified by NorthStar in its Final Report and in its First Update are at the core of a strong and proactive safety culture. PG&E looks forward to continuing this important work and providing the Commission with quarterly updates on its progress.

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 1

# GLOSSARY OF SAFETY TERMS

# ATTACHMENT 1 - GLOSSARY

**SIF Timeliness of Corrective Actions:**

The total number of Serious Injuries or Fatalities (SIF) corrective actions completed on time (as measured by the due date accepted by Line of Business Corrective Action Review Boards (CARB)) divided by the total number of SIF corrective actions past due or completed. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. This metric includes Electric Operations, Gas Operations, Generation, Information Technology (IT), Supply Chain and Customer Care, as well as any SIF actual events from any line of business. Includes corrective actions with initial due date on or before month end reporting and corrective actions with initial due date after month end reporting but already completed.

**SIF Quality of Corrective Actions:**

The quality of SIF corrective actions as determined by the corrective action quality framework created by Dr. Mark Fleming. Quality is determined by assessing whether or not the corrective actions address all incident causes identified, extent of condition, hierarchy of controls, if the corrective action's effectiveness is measurable, and if the corrective actions have appropriate timelines for completion. A SIF corrective action is one that is tied to a SIF actual or potential injury or near hit. The assessment is performed by an independent third party after acceptance by Line of Business CARBs.

**SIF Index: SIF Effectiveness of Action Completion**

The effectiveness of corrective actions as measured by the number of repeat SIF Exposure Factors over a 36-month period. Only SIF incidents in Electric Operations, Gas Operations or Generation are included in this metric. Only investigations that have been approved by the Line of Business-specific CARBs are included in Long-Term Incentive Plan reporting.

**SIF Exposure Factors List**

1. Animal Attack or Bite
2. Assault or Violent Attack
3. Confined Space
4. Heavy Equipment Operation or Traffic Hazards
5. Control of Hazardous Energy
6. Dropped Object of Sufficient Mass to Cause Injury
7. Excavation
8. Hazardous Chemicals/Material
9. Heat Exposures
10. Helicopter Use
11. Welding, Grinding, Cutting, Hot Work Permits
12. Live Electrical Work
13. Grounding (Live Electrical Work Supplement)
14. Mobile Equipment Use (i.e., Lifts, Cranes, Forklifts, etc.)
15. Off-road Vehicle Use
16. Powered Tool use
17. Public Safety
18. Work at Heights (4 ft. or Greater)

19. Suspended Loads and Rigging

**SIF Exposure Rate**: SIF Exposure rate is the number of actual or potential SIF per 200,000 hours worked. Includes Electric, Gas, Generation, IT, Supply Chain, Customer Care.

**Days Away, Restricted and Transfer (DART) Rate:** includes Occupational Safety and Health Administration (OSHA)-recordable injuries that result in lost time or restricted duty per 200,000 hours worked.

**Preventable Motor Vehicle (PMVI) Rate:** the total number of motor vehicle incidents for which the driver could have reasonably avoided, per 1 million miles driven.

**Lost Work Day Case Rate (LWD)**

This measures the number of Lost Workday (LWD) cases incurred for employees and staff augmentation per 200,000 hours worked, or for approximately every 100 employees. A LWD Case is a current year OSHA Recordable incident that has resulted in at least one LWD. An OSHA Recordable incident is an occupational (job related) injury or illness that requires medical treatment beyond first aid, or results in work restrictions, death or loss of consciousness.

**Workforce Unavailable Due to Health**

This is a percentage of PG&E's workforce that is out due to the following:

- Sick time
  - Family sick time excluded
- Short Term Disability (<1 year)
- Long Term Disability (> 1 year)
- Workers Compensation
- Family and Medical Leave Act
  - Due to one's own medical condition
- Company medical leave

# PACIFIC GAS AND ELECTRIC COMPANY

# ATTACHMENT 2

# BOARDS OF DIRECTORS AND SAFETY AND NUCLEAR OVERSIGHT COMMITTEE MEETING MINUTES

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 4, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, October 4, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, and Linda Y.H. Cheng, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, and Mario A. Ponce of Simpson Thacher & Bartlett LLP, Richard Hall, Christopher J. Kelly, Kevin J. Orsini, and George E. Zobitz of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Buckman, Mr. Brian, and Mr. Orsini left the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Cheng, Mr. Hall, Mr. Hort, Mr. Kelly, Ms. Liou, Mr. Mesterharm, Mr. Ziman, and Mr. Zobitz were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Goldin, and Mr. Ponce present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Goldin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the

independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:15 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 4, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, October 4, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, and Linda Y.H. Cheng, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, and Mario A. Ponce of Simpson Thacher & Bartlett LLP, Richard Hall, Christopher J. Kelly, Kevin J. Orsini, and George E. Zobitz of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Buckman, Mr. Brian, and Mr. Orsini left the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Cheng, Mr. Hall, Mr. Hort, Mr. Kelly, Ms. Liou, Mr. Mesterharm, Mr. Ziman, and Mr. Zobitz were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Curnin, Mr. Goldin, and Mr. Ponce present during portions of the executive session meeting.

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LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 11, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility] was held on Friday, October 11, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies] Board of Directors.

Directors Richard R. Barrera (who joined during the meeting as noted below), Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell (who joined during the meeting as noted below), Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Janet C. Loduca, and Linda Y.H. Cheng, along with Paul C. Curnin and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

The meeting was convened in executive session with Mr. Johnson, Mr. Vesey, Mr. Simon, Ms. Loduca, Ms. Cheng, Mr. Curnin, and Mr. Qusba present.

Ms. Schmidt, on behalf of Mr. Leffell, Chair of the PG&E Corporation Nominating and Governance Committee, discussed the Committee's recommendation relating to the size of the Companies' respective Boards of Directors, determinations by the Boards regarding the independence and qualifications of two candidates for the Boards, and the election of the two candidates to the Boards, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She and Mr. Leffell reviewed the background and reasons for the proposed actions, including the

[1] [redacted]

background and experience of each candidate. The directors asked questions and discussed the proposed actions.

Directors Richard R. Barrera and Michael J. Leffell joined the meeting during the foregoing discussion.

On motion made and seconded, the Board adopted a resolution (1) amending the Bylaws so that the exact number of directors is set by a Board resolution, (2) fixing the exact number of directors at 16 to accommodate the election of William L. Smith and John M. Woolard as directors, (3) affirming the Board's determinations regarding Mr. Smith's and Mr. Woolard's independence and qualifications, and (4) electing Mr. Smith and Mr. Woolard to the Board, effective upon the adjournment of this meeting (see Resolution 1 in Attachment A).

The Board concluded its executive session. The following individuals joined the meeting at this point: Julie M. Kane and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Timothy G. Cameron, C. Daniel Haaren, Richard Hall, Christopher J. Kelly, and George E. Zobitz of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin and Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 9, 2019 across portions of its service area, customer impacts, the status of the safety inspection and restoration process, the performance of the Utility's website during the PSPS event, and media coverage relating to the PSPS event. The directors asked questions and discussed, among other matters, customer sentiment regarding the PSPS event, the Companies' PSPS communications plan, and several directors' visits to the Utility's Emergency Operations Center during the PSPS event.

Jason P. Wells, along with Kevin J. Orsini of Cravath, joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Schmidt and Mr. Curnin left the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the terms of the debt commitment letters substantially on the terms discussed with the Board, and authorized and directed the officers of the Utility to negotiate, execute, and deliver debt commitment letters in substantially the form presented at this meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Ms. Campbell, Mr. Wells, and Mr. Orsini left the meeting, and Ms. Schmidt rejoined the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:00 a.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

Bylaw Amendment

BE IT RESOLVED that, effective immediately, Section 1 of Article II of the Bylaws of this company is hereby amended as follows:

1. **Number.** The Board of Directors of this Company shall consist of such number of directors, not less than nine (9) nor more than seventeen (17). The exact number of directors shall be ~~fifteen (15) until changed,~~ within the limits specified above, fixed from time to time by ~~an amendment to this Bylaw~~ a resolution duly adopted by the Board of Directors~~or the shareholders~~.

Size of Board of Directors

BE IT RESOLVED that the exact number of directors of this corporation shall be fixed at 16.

Director Candidate Independence and Qualifications

WHEREAS, following a candidate search process, this Board of Directors has identified two new director candidates to serve on the Board of this company: William L. Smith and John M. Woolard;

WHEREAS, each of the above-named candidates has submitted a completed 2019 Screening Questionnaire for Director Candidates and a completed 2019 Questionnaire for Director Candidates (together, the "D&O Questionnaires"); and

WHEREAS, the Board has considered the above-named candidates' responses to the D&O Questionnaires, in light of the various regulatory requirements relating to the independence and qualifications of Board members;

NOW, THEREFORE, BE IT RESOLVED that the Board hereby affirmatively determines that William L. Smith and John M. Woolard are each (1) independent, as independence is defined in this company's Corporate Governance Guidelines, including the categorical independence standards adopted by the Board, and including the requirement that an independent director not have material relationships with the company, and (2) independent for purposes of service on the Audit Committee, as "independence" is defined in Rule 10A-3(b)(1) under the Securities Exchange Act of 1934 and Sections 801(g) and 803(B)(2)(a)(i) of the NYSE American Company Guide; and

BE IT FURTHER RESOLVED that the Board affirms its belief that each of the above-named individuals is "financially literate;" and

BE IT FURTHER RESOLVED that the officers and counsel of this company are hereby jointly and severally authorized and directed to provide any required written affirmation or certification on behalf of the company to the NYSE American that the Board has made such determinations regarding the independence and required qualifications of each candidate, if elected, as described above.

Election of Directors

BE IT RESOLVED that William L. Smith and John M. Woolard are hereby each elected a director of Pacific Gas and Electric Company, effective upon adjournment of this meeting, to serve until the next annual meeting of shareholders of this company until his successor is elected and qualified, except in the case of his death, resignation, or removal.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 11, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, October 11, 2019, at 8:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera (who joined during the meeting as noted below), Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell (who joined during the meeting as noted below), Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Janet C. Loduca, and Linda Y.H. Cheng, along with Paul C. Curnin and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

The meeting was convened in executive session with Mr. Johnson, Mr. Vesey, Mr. Simon, Ms. Loduca, Ms. Cheng, Mr. Curnin, and Mr. Qusba present.

Ms. Schmidt, on behalf of Mr. Leffell, Chair of the Nominating and Governance Committee, discussed the Committee's recommendation relating to the size of the Companies' respective Boards of Directors, determinations by the Boards regarding the independence and qualifications of two candidates for the Boards, and the election of the two candidates to the Boards, as described in materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. She and Mr. Leffell reviewed the background and reasons for the proposed actions, including the background and experience of each candidate. The directors asked questions and discussed the proposed actions.

[1] [redacted]

Directors Richard R. Barrera and Michael J. Leffell joined the meeting during the foregoing discussion.

On motion made and seconded, the Board adopted a resolution (1) fixing the exact number of directors at 15 to accommodate the election of William L. Smith and John M. Woolard as directors, (2) affirming the Board's determinations regarding Mr. Smith's and Mr. Woolard's independence and qualifications, and (3) electing Mr. Smith and Mr. Woolard to the Board, effective upon the adjournment of this meeting (see Resolution 1 in Attachment A).

The Board concluded its executive session. The following individuals joined the meeting at this point: Julie M. Kane and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Timothy G. Cameron, C. Daniel Haaren, Richard Hall, Christopher J. Kelly, and George E. Zobitz of Cravath, Swaine & Moore LLP (Cravath), Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin and Jessica Liou of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 9, 2019 across portions of its service area, customer impacts, the status of the safety inspection and restoration process, the performance of the Utility's website during the PSPS event, and media coverage relating to the PSPS event. The directors asked questions and discussed, among other matters, customer sentiment regarding the PSPS event, the Companies' PSPS communications plan, and several directors' visits to the Utility's Emergency Operations Center during the PSPS event.

Jason P. Wells, along with Kevin J. Orsini of Cravath, joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Schmidt and Mr. Curnin left the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the terms of the debt commitment letters substantially on the terms discussed with the Board, and authorized and directed the officers of the Corporation to negotiate, execute, and deliver debt commitment letters in substantially the form presented at this meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Ms. Campbell, Mr. Wells, and Mr. Orsini left the meeting, and Ms. Schmidt rejoined the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:00 a.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

Size of Board of Directors

BE IT RESOLVED that the exact number of directors of this corporation shall be fixed at 15.

Director Candidate Independence and Qualifications

WHEREAS, following a candidate search process, this Board of Directors has identified two new director candidates to serve on the Board of this corporation: William L. Smith and John M. Woolard;

WHEREAS, each of the above-named candidates has submitted a completed 2019 Screening Questionnaire for Director Candidates and a completed 2019 Questionnaire for Director Candidates (together, the "D&O Questionnaires"); and

WHEREAS, the Board has considered the above-named candidates' responses to the D&O Questionnaires, in light of the various regulatory requirements relating to the independence and qualifications of Board members;

NOW, THEREFORE, BE IT RESOLVED that the Board hereby affirmatively determines that William L. Smith and John M. Woolard are each (1) independent, as independence is defined in Section 303A.02 of the NYSE Listed Company Manual (taking into account the Compensation Committee factors set forth in Section 303A.02(a)(ii) of the NYSE Listed Company Manual) and as provided in the categorical independence standards adopted by the Board, including the requirement that an independent director not have material relationships with the corporation, and (2) independent for purposes of service on the Audit Committee, as "independence" is defined in Rule 10A-3(b)(1) under the Securities Exchange Act of 1934 and Section 303A.07 of the NYSE Listed Company Manual; and

BE IT FURTHER RESOLVED that the Board affirms its belief that each of the above-named individuals is "financially literate;" and

BE IT FURTHER RESOLVED that the officers and counsel of this corporation are hereby jointly and severally authorized and directed to provide any required written affirmation or certification on behalf of the corporation to the NYSE that the Board has made such determinations regarding the independence and required qualifications of each candidate, if elected, as described above.

Election of Directors

BE IT RESOLVED that William L. Smith and John M. Woolard are hereby each elected a director of PG&E Corporation, effective upon adjournment of this meeting, to serve until the next annual meeting of shareholders of this corporation or until his successor is elected and qualified, except in the case of his death, resignation, or removal.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 17, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, October 17, 2019, at 8:45 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Nora Mead Brownell and Frederick W. Buckman were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson referred to the letters that Governor Newsom and California Public Utilities Commission (CPUC) President Marybel Batjer sent him on October 14, 2019 regarding the October 9-12, 2019 Public Power Shutoff Program (PSPS) event, and discussed the responses that he would send later in the day to Governor Newsom and President Batjer, and the Companies' PSPS communications plan.

[1] [redacted]

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba

present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the independent directors met in executive session without any management present.

Director Eric D. Mullins joined the meeting by telephone during the foregoing executive session with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:15 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 17, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, October 17, 2019, at 8:45 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Nora Mead Brownell and Frederick W. Buckman were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Mr. Johnson, Chief Executive Officer of the Corporation (in the absence of Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson referred to the letters that Governor Newsom and California Public Utilities Commission (CPUC) President Marybel Batjer sent him on October 14, 2019 regarding the October 9-12, 2019 Public Power Shutoff Program (PSPS) event, and discussed the responses that he would send later in the day to Governor Newsom and President Batjer, and the Companies' PSPS communications plan.

[1] [redacted]

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba

present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson and Mr. Vesey absent, the independent directors met in executive session without any management present.

Director Eric D. Mullins joined the meeting by telephone during the foregoing executive session with Mr. Johnson, Mr. Vesey, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 10:15 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 24, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, October 24, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Richard R. Barrera was absent.

Also participating by telephone at the beginning of the meeting were Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 23, 2019, customer impacts, the status of the safety inspection and restoration process, process improvements implemented after the PSPS event earlier in the month, the performance of the Utility's website and call center during the PSPS event, Community Resource Centers opened by the Utility in affected counties, the potential for another PSPS event during the coming weekend, and the Kincade fire that began in Sonoma County on October 23, 2019. The directors asked questions and discussed, among other matters, the

[1] [redacted]

Kincade fire, and the potential PSPS event that might be initiated during the coming weekend.

Jason P. Wells joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Bleich and Mr. Hort left the meeting during the foregoing discussion. Mr. Brian left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 24, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, October 24, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Richard R. Barrera was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on October 23, 2019, customer impacts, the status of the safety inspection and restoration process, process improvements implemented after the PSPS event earlier in the month, the performance of the Utility's website and call center during the PSPS event, Community Resource Centers opened by the Utility in affected counties, the potential for another PSPS event during the coming weekend, and the Kincade fire that began in Sonoma County on October 23, 2019. The directors asked questions and discussed, among other matters, the

[1] [redacted]

Kincade fire, and the potential PSPS event that might be initiated during the coming weekend.

Jason P. Wells joined the meeting during the foregoing presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Bleich and Mr. Hort left the meeting during the foregoing discussion. Mr. Brian left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 27, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Sunday, October 27, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Andrew M. Vesey was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Ziman left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – October 27, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Sunday, October 27, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Ziman left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 1, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, November 1, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Frederick W. Buckman was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson noted that the Governor's office announced a press conference later in the day to address the Governor's "call for fundamental change to PG&E" and to "lay out a path forward to ensure the overly broad application of Public Safety Power Shutoffs (PSPS) will never happen again." He commented on the Governor's request for a meeting with the Companies' management and advisors the following week.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the PSPS events that the Utility initiated on October 23, October 26, and

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October 29, 2019; customer impacts; the Utility's efforts to reduce PSPS impacts in the future; instances of weather-related equipment damage and hazards that have been identified in post-PSPS inspections; the post-PSPS inspection and restoration process; and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed, among other matters, customer impacts of the recent PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory and legislative matters. Among other things, he discussed the California Public Utilities Commission's (CPUC) expected issuance of an Order Instituting Investigation (OII) relating to the PSPS events initiated by the California investor-owned utilities (IOU) in September and October 2019; the possibility of state legislation authorizing the CPUC to temporarily appoint a Public Administrator to oversee the management of the Utility; the possibility of a special state legislative session to address wildfires, PSPS programs, and homeowners insurance cancellations; an upcoming State Senate Energy, Utilities, and Communications Committee oversight hearing on IOUs' PSPS programs; the CPUC's OII regarding the Companies' joint plan of reorganization; and discovery requests in the CPUC's OII regarding the Companies' safety culture and governance.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:45 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 1, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, November 1, 2019, at 1:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Frederick W. Buckman was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson noted that the Governor's office announced a press conference later in the day to address the Governor's "call for fundamental change to PG&E" and to "lay out a path forward to ensure the overly broad application of Public Safety Power Shutoffs (PSPS) will never happen again." He commented on the Governor's request for a meeting with the Companies' management and advisors the following week.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the PSPS events that the Utility initiated on October 23, October 26, and

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October 29, 2019; customer impacts; the Utility's efforts to reduce PSPS impacts in the future; instances of weather-related equipment damage and hazards that have been identified in post-PSPS inspections; the post-PSPS inspection and restoration process; and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed, among other matters, customer impacts of the recent PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory and legislative matters. Among other things, he discussed the California Public Utilities Commission's (CPUC) expected issuance of an Order Instituting Investigation (OII) relating to the PSPS events initiated by the California investor-owned utilities (IOU) in September and October 2019; the possibility of state legislation authorizing the CPUC to temporarily appoint a Public Administrator to oversee the management of the Utility; the possibility of a special state legislative session to address wildfires, PSPS programs, and homeowners insurance cancellations; an upcoming State Senate Energy, Utilities, and Communications Committee oversight hearing on IOUs' PSPS programs; the CPUC's OII regarding the Companies' joint plan of reorganization; and discovery requests in the CPUC's OII regarding the Companies' safety culture and governance.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 2:45 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 6, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Wednesday, November 6, 2019, at 5:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Michael J. Leffell and Eric D. Mullins were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, Robert S. Kenney, and David S. Thomason, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, Henry Weissmann of Munger, Tolles & Olson LLP, and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The directors discussed a recent employee safety incident involving two linemen who were injured as a result of an electrical arc flash that occurred when a crew was replacing insulators on an energized transmission line in Vacaville.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Thomason, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 6:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 6, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Wednesday, November 6, 2019, at 5:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Frederick W. Buckman, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Michael J. Leffell and Eric D. Mullins were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, Robert S. Kenney, and David S. Thomason, along with Paul C. Curnin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, Henry Weissmann of Munger, Tolles & Olson LLP, and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPHS CONTAIN ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The directors discussed a recent employee safety incident involving two linemen who were injured as a result of an electrical arc flash that occurred when a crew was replacing insulators on an energized transmission line in Vacaville.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Thomason, Mr. Hall, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present during portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Mr. Qusba present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 6:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 12, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Tuesday, November 12, 2019, at 1:35 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, and Alejandro D. Wolff attended by telephone, as permitted by the Utility's Bylaws. Director John M. Woolard was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Brownell noted Frederick W. Buckman's resignation from the Board effective November 12, 2019, and expressed the Board's appreciation for his service.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 12, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Tuesday, November 12, 2019, at 1:35 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, and Alejandro D. Wolff attended by telephone, as permitted by the Corporation's Bylaws. Director John M. Woolard was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation), presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Brownell noted Frederick W. Buckman's resignation from the Board effective November 12, 2019, and expressed the Board's appreciation for his service.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 15, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, November 15, 2019, at 8:10 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Andrew M. Vesey was absent.

Also participating by telephone at the beginning of the meeting were Janet C. Loduca and Linda Y.H. Cheng, along with Timothy G. Cameron and Evan R. Chesler of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Ms. Loduca, Mr. Cameron, Mr. Chesler, Mr. Curnin, Mr. Goldin, Mr. Karotkin, Mr. Ponce, and Mr. Qusba present.

The Board concluded its executive session.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, and Julie M. Kane, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall of Cravath, Gregory Hort and Kenneth S. Ziman of Lazard, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the federal Monitor's recent activities and evaluation of the Utility's 2019 Wildfire Safety Plan, and the District Court's recent decision regarding the Utility's community service obligations under the terms of probation.

At this point, Mr. Johnson, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Cameron, Mr. Chesler, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the independent directors continued their discussion

regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 15, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, November 15, 2019, at 8:10 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Janet C. Loduca and Linda Y.H. Cheng, along with Timothy G. Cameron and Evan R. Chesler of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Stephen Karotkin of Weil, Gotshal & Manges LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Ms. Cheng was excused, and the meeting was convened in executive session with Mr. Johnson, Ms. Loduca, Mr. Cameron, Mr. Chesler, Mr. Curnin, Mr. Goldin, Mr. Karotkin, Mr. Ponce, and Mr. Qusba present.

The Board concluded its executive session.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

The following individuals joined the meeting at this point: John R. Simon, Jason P. Wells, and Julie M. Kane, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall of Cravath, Gregory Hort and Kenneth S. Ziman of Lazard, and James A. Mesterharm of AlixPartners.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Kane presented a report on the Utility's monitorship and probation in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the federal Monitor's recent activities and evaluation of the Utility's 2019 Wildfire Safety Plan, and the District Court's recent decision regarding the Utility's community service obligations under the terms of probation.

At this point, Mr. Johnson, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Brian, Mr. Cameron, Mr. Chesler, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that with Mr. Curnin, Mr. Goldin, Mr. Ponce, and Mr. Qusba present, the independent directors continued their discussion

regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 16, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Saturday, November 16, 2019, at 10:05 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey (who joined during the meeting as noted below), Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Eric D. Mullins was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca and Linda Y.H. Cheng, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Andrew M. Vesey joined the meeting during the foregoing discussion.

On motion made and seconded, the Board authorized and directed the officers of the Corporation to negotiate revisions to the equity backstop commitment letters substantially on the terms discussed with the Board.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:05 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 16, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Saturday, November 16, 2019, at 10:05 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Eric D. Mullins was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca and Linda Y.H. Cheng, along with Paul C. Curnin, Nicholas S. Goldin, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Andrew M. Vesey joined the meeting during the foregoing discussion.

On motion made and seconded, the Board authorized and directed the officers of the Corporation to negotiate revisions to the equity backstop commitment letters substantially on the terms discussed with the Board.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:05 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 21, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, November 21, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Cheryl F. Campbell and Michael J. Leffell were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin and Mario A. Ponce of Simpson Thacher & Bartlett LLP, C. Daniel Haaren of Cravath, Swaine & Moore LLP, Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on November 20, 2019, customer impacts, the post-PSPS inspection and restoration process, incidents of weather-related equipment damage and hazards that have been identified in post-PSPS inspections, the Utility's communications and coordination with the California Department of Forestry and Fire Protection and the California Governor's Office of Emergency Services, and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed,

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among other matters, customer feedback regarding the October and November PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

Ms. Kane presented a report on the Utility's monitorship in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the Companies' invitation to the federal Monitor to attend the Board meeting and/or the PG&E Corporation Compliance and Public Policy Committee in December. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Kenney presented a report on regulatory matters. Among other things, he discussed the status of discussions with the California Public Utilities Commission (CPUC) and other parties regarding the potential settlement of the Utility's 2020 General Rate Case as well as the CPUC's investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Bleich left the meeting during the foregoing presentation.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, and Mr. Ponce present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:30 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – November 21, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, November 21, 2019, at 12:00 noon. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Fred J. Fowler, William D. Johnson, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Cheryl F. Campbell and Michael J. Leffell were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Paul C. Curnin and Mario A. Ponce of Simpson Thacher & Bartlett LLP, C. Daniel Haaren of Cravath, Swaine & Moore LLP, Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, and James A. Mesterharm of AlixPartners.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Public Safety Power Shutoff (PSPS) event that the Utility initiated on November 20, 2019, customer impacts, the post-PSPS inspection and restoration process, incidents of weather-related equipment damage and hazards that have been identified in post-PSPS inspections, the Utility's communications and coordination with the California Department of Forestry and Fire Protection and the California Governor's Office of Emergency Services, and Community Resource Centers opened by the Utility in affected counties. The directors asked questions and discussed,

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among other matters, customer feedback regarding the October and November PSPS events.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

Ms. Kane presented a report on the Utility's monitorship in connection with the federal criminal case related to the 2010 San Bruno explosion. Among other things, she discussed the Companies' invitation to the federal Monitor to attend the Board meeting and/or the Compliance and Public Policy Committee in December. The directors asked questions and discussed various aspects of Ms. Kane's presentation.

Mr. Kenney presented a report on regulatory matters. Among other things, he discussed the status of discussions with the California Public Utilities Commission (CPUC) and other parties regarding the potential settlement of the Utility's 2020 General Rate Case as well as the CPUC's investigation relating to the 2017 Northern California wildfires. The directors asked questions and discussed various aspects of Mr. Kenney's presentation.

Mr. Bleich left the meeting during the foregoing presentation.

At this point, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Johnson, Mr. Curnin, and Mr. Ponce present.

Ms. Cheng was recalled and informed that with Mr. Johnson, Mr. Curnin, and Mr. Ponce present, the directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 1:30 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 2, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Monday, December 2, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Fred J. Fowler, William L. Smith, and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken and David Hindman of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Itzhak Gartenberg, Andrew Shannahan, and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Matthew Goren and Stephen Karotkin of Weil, Gotshal & Manges LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Joshua M. Mester of Jones Day, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed recent discussions that the Companies and certain of the Corporation's shareholders have had with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire; and potential terms of such a

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settlement. The representatives of Knighthead, who had participated as representatives of the Corporation's shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, Mr. Shannahan, and Mr. Wagner left the meeting at this point.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 2, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Monday, December 2, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Fred J. Fowler, William L. Smith, and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken and David Hindman of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Itzhak Gartenberg, Andrew Shannahan, and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Matthew Goren and Stephen Karotkin of Weil, Gotshal & Manges LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Joshua M. Mester of Jones Day, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed recent discussions that the Companies and certain of the Corporation's shareholders have had with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire; and potential terms of such a

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settlement. The representatives of Knighthead, who had participated as representatives of the Corporation's shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, Mr. Shannahan, and Mr. Wagner left the meeting at this point.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 4, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Wednesday, December 4, 2019, at 3:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, and Andrew M. Vesey attended by telephone, as permitted by the Utility's Bylaws. Directors Alejandro D. Wolff and John M. Woolard were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Timothy G. Cameron, C. Daniel Haaren, and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Itzhak Gartenberg and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed the status of discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire. The representatives of Knighthead, who had participated as representatives of the Corporation's

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shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

At this point, Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting. Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kevin J. Orsini of Cravath and Eli Silverman of Lazard joined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:35 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 4, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Wednesday, December 4, 2019, at 3:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and William L. Smith attended by telephone, as permitted by the Corporation's Bylaws. Directors Alejandro D. Wolff and John M. Woolard were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, and Linda Y.H. Cheng, along with Timothy G. Cameron, C. Daniel Haaren, and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Paul C. Curnin, Nicholas S. Goldin, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Itzhak Gartenberg and Thomas A. Wagner of Knighthead Capital Management LLC (Knighthead), Gregory Hort of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, James A. Mesterharm of AlixPartners, and Henry Weissmann of Munger, Tolles & Olson LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Karotkin, and Mr. Wagner led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. Among other things, they discussed the status of discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement of the Chapter 11 cases and prepetition non-subrogation wildfire-related claims, as well as claims arising from the 2016 Ghost Ship fire. The representatives of Knighthead, who had participated as representatives of the Corporation's

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shareholders in certain of the discussions with the Tort Claimants Committee, the Governor's office, and other parties regarding the potential settlement, were invited to provide the Board with their views on the potential settlement with these parties and discussions relating thereto.

At this point, Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting. Kenneth S. Ziman of Lazard joined the meeting during the foregoing discussion.

The directors asked questions regarding the matters discussed earlier in the meeting, and a discussion ensued.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Kevin J. Orsini of Cravath and Eli Silverman of Lazard joined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:35 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 5, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, December 5, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, Andrew M. Vesey, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors William L. Smith and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with John R. Boken of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Itzhak Gartenberg of Knighthead Capital Management LLC (Knighthead), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Simon, Mr. Hall, Mr. Karotkin, Thomas A. Wagner (who joined the meeting during the discussion), and Mr. Weissmann led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. This included a discussion of certain materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed key terms of a proposed settlement with the Tort Claimants Committee, certain attorneys representing individual wildfire claimants, and certain of the

[1] [redacted]

Corporation's shareholders to resolve prepetition non-subrogation claims related to the 2017 and 2018 wildfires, the 2015 Butte fire, and the 2016 Ghost Ship fire; the timeframe for entering into a Restructuring Support Agreement with the parties to the settlement; and next steps. The directors asked questions, and a discussion ensued.

Thomas A. Wagner of Knighthead joined the meeting during the foregoing discussion. In the foregoing discussion, Mr. Wagner, who had participated as a representative of the Corporation's shareholders in certain of the discussions with representatives of the Tort Claimants Committees and other parties regarding the proposed settlement, was invited to provide the Board with his perspective on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board adopted a resolution authorizing the execution of a Restructuring Support Agreement with the parties to the settlement (see Resolution 1 in Attachment A).

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

BE IT RESOLVED that that the officers of the Utility be, and each of them hereby is, authorized, empowered, and directed, by and on behalf of the Utility, (1) to execute and deliver the Restructuring Support Agreement by and among the Companies, the Tort Claimants Committee, certain attorneys for fire victims, and certain of the Corporation's shareholders, in substantially the form presented to the Board, and (2) to perform all such acts and things, to execute, file, deliver or record in the name and on behalf of the Utility, all such certificates, instruments, agreements, or other documents, and to make all such payments as they, in their judgment, or in the judgment of any one or more of them, may deem necessary, advisable, or appropriate in order to carry out the purpose and intent of this resolution and/or all of the transactions contemplated therein or thereby, the authorization therefor to be conclusively evidenced by the taking of such action or the execution and delivery of such certificates, instruments, agreements, or documents.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 5, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, December 5, 2019, at 4:30 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors William L. Smith and Alejandro D. Wolff were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with John R. Boken of AlixPartners, Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Richard Hall and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), Itzhak Gartenberg of Knighthead Capital Management LLC (Knighthead), Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, Joshua M. Mester of Jones Day, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

Mr. Johnson, Mr. Simon, Mr. Hall, Mr. Karotkin, Thomas A. Wagner (who joined the meeting during the discussion), and Mr. Weissmann led a discussion regarding the Companies' Chapter 11 cases, the 2017 Northern California wildfires, and the 2018 Camp fire. This included a discussion of certain materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed key terms of a proposed settlement with the Tort Claimants Committee, certain attorneys representing

[1] [redacted]

individual wildfire claimants, and certain of the Corporation's shareholders to resolve prepetition non-subrogation claims related to the 2017 and 2018 wildfires, the 2015 Butte fire, and the 2016 Ghost Ship fire; the timeframe for entering into a Restructuring Support Agreement with the parties to the settlement; and next steps. The directors asked questions, and a discussion ensued.

Thomas A. Wagner of Knighthead joined the meeting during the foregoing discussion. In the foregoing discussion, Mr. Wagner, who had participated as a representative of the Corporation's shareholders in certain of the discussions with representatives of the Tort Claimants Committees and other parties regarding the proposed settlement, was invited to provide the Board with his perspective on the potential settlement with these parties and discussions relating thereto.

Mr. Gartenberg, Mr. Mester, and Mr. Wagner left the meeting after the discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

On motion made and seconded, the Board adopted a resolution authorizing the execution of a Restructuring Support Agreement with the parties to the settlement (see Resolution 1 in Attachment A).

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 5:55 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

BE IT RESOLVED that that the officers of the Corporation be, and each of them hereby is, authorized, empowered, and directed, by and on behalf of the Corporation, (1) to execute and deliver the Restructuring Support Agreement by and among the Companies, the Tort Claimants Committee, certain attorneys for fire victims, and certain of the Corporation's shareholders, in substantially the form presented to the Board, and (2) to perform all such acts and things, to execute, file, deliver or record in the name and on behalf of the Corporation, all such certificates, instruments, agreements, or other documents, and to make all such payments as they, in their judgment, or in the judgment of any one or more of them, may deem necessary, advisable, or appropriate in order to carry out the purpose and intent of this resolution and/or all of the transactions contemplated therein or thereby, the authorization therefor to be conclusively evidenced by the taking of such action or the execution and delivery of such certificates, instruments, agreements, or documents.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 10 and 11, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A regular meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held beginning at 4:50 p.m. on Tuesday, December 10, 2019, at the office of the Utility, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors. The first portion of the meeting was held concurrently with a meeting of the Compliance and Public Policy (CPP) Committee of the PG&E Corporation Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard. Directors Jeffrey L. Bleich, Fred J. Fowler, and Dominique Mielle attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also present at 77 Beale Street at the beginning of the meeting were John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, Linda Y.H. Cheng, Jane K. Yura, Eric Montizambert, and Alejandro Vallejo, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar Consulting Group (NorthStar), Paul C. Curnin, Mario A. Ponce, Sandeep Qusba, and Sara A. Ricciardi of Simpson, Thacher & Bartlett LLP, and Mark R. Filip and Charles J. Kalil II of Kirkland & Ellis LLP (Kirkland).

Quorum present, Ms. Schmidt, Chair of the PG&E Corporation CPP Committee meeting, presided as chair of the concurrent meeting with that committee. Ms. Cheng served as secretary of the meeting.

Mr. Filip and Mr. Kalil presented an update on the Utility's monitorship. They referred to the update that Mr. Filip presented to the Boards of Directors at their meeting on September 11, 2019, and discussed, among other things, the Monitor team's ongoing vegetation management

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field inspections; the expected timeframe for issuance of the Monitor's third report; the open dialogue and communications between the Monitor team and PG&E management and employees; the Monitor team's electric distribution infrastructure and asset inspections during 2019 and planned electric infrastructure and asset inspections in 2020; the Monitor team's observations regarding the Utility's recent Public Safety Power Shutoff events and emergency preparedness efforts; and the Monitor team's ongoing evaluation of the Utility's gas transmission integrity management work, data integrity, and compliance and ethics program. The directors asked questions and discussed various aspects of Mr. Filip's and Mr. Kalil's presentation.

Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Giammona, Ms. Kane, Ms. Kay, Mr. Lewis, Ms. Loduca, Mr. Mistry, Mr. Wan, Mr. Welsch, Ms. Cheng, Ms. Yura, Mr. Montizambert, Mr. Vallejo, Ms. Anderson, Mr. Bennett, and Mr. D. Smith were excused from the meeting, and the meeting continued in executive session, with Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present during portions of the executive session meeting.

After the executive session, Ms. Schmidt informed Ms. Cheng that the following discussions took place:

- With Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors discussed the Monitor's team's views and observations regarding various aspects of the Utility's operations and culture. Ms. Mielle, Mr. Filip, and Mr. Kalil then left the meeting.

- With Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

Mr. Mullins and Mr. Qusba left the meeting at this point.

The meeting recessed at 5:35 p.m. and reconvened at 8:45 a.m. on Wednesday, December 11, 2019.

At this point, Mr. Johnson re-entered the meeting, and Ms. Mielle and Mr. Mullins rejoined the meeting by telephone.

Ms. Brownell, Chair of the Board of the Corporation, presided over the remainder of the meeting.

The meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present, (1) Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed later in the meeting, and (2) the directors discussed various matters that would be covered later in the meeting.

The following individuals entered the meeting at this point: Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, and Walter R. Posey, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar, Charles J. Kalil II of Kirkland, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Mr. Posey presented a safety tailboard on working safely near trees. The directors asked questions and discussed various aspects of his presentation.

Mr. Posey left the meeting at this point.

The directors discussed various field visits and safety observations and facility tours that they had attended, as well as the tour of the Diablo Canyon Power Plant that several directors would be attending the following day.

Mr. Wells reviewed the Financial and Business Highlights report for November 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Utility's work to restore service in response to power outages caused by a recent winter storm.

At this point, (1) Ms. Kay, Mr. Mistry, and Mr. Welsch left the meeting, (2) the following individuals entered the meeting: Robert S. Kenney, Peter E. Kenny, and Sumeet Singh, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), and (3) Richard Hall of Cravath joined the meeting by telephone.

Mr. Lewis, Mr. Kenny, and Mr. Singh presented an update on the Utility's Community Wildlife Safety Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the Utility's continuing progress in enhancing its readiness and responsiveness to the threat of potential wildfires across its service territory; the Utility's wildfire risk reduction strategy; 2019 fire ignition trends; the Utility's progress in completing the commitments made in its 2019 Wildfire Safety Plan (WSP); enhanced risk analysis that is being incorporated into the development of the Utility's 2020 Wildfire Mitigation Plan (WMP); and the Utility's activities to minimize the scope, duration, and frequency of future PSPS events. The directors asked questions and discussed, among other matters, the Utility's enhanced vegetation management and system hardening work, the Utility's progress in completing its commitments under the 2019 WSP, and the Utility's 2020 WMP.

Mr. Bleich left the meeting during the foregoing presentation and discussion. Mr. Lewis, Mr. Wan, Mr. Welsch, Mr. Kenney, Mr. Kenny, Mr. Singh, Ms. Anderson, Mr. Bennett, Mr. Kalil, and Mr. D. Smith left the meeting after the presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Brian and Mr. Orsini left the meeting, and Fong Wan, Christopher A. Foster, and Katherine K. Davis entered the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]





[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Sandeep Qusba of Simpson entered the meeting, and Mr. Barrera left the meeting. Mr. Vesey, Mr. Wan, Mr. Foster, and Ms. Davis left the meeting after the discussion.

Ms. Cheng presented consent items relating to (1) the number of directors on the Board, (2) election of an Assistant Corporate Secretary, and (3) approval of minutes, all as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board adopted a resolution fixing the number of authorized directors at 15 (see Resolution 1 in Attachment A).

On motion made and seconded, the Board adopted a resolution electing an Assistant Corporate Secretary (see Resolution 2 in Attachment A).

On motion made and seconded, the Board approved the minutes of the Board meetings held on June 14, 2019, June 20 and 21, 2019, June 27, 2019, July 9, 2019, July 12, 2019, July 16, 2019, July 19, 2019, and July 25, 2019.

In the absence of Mr. Barrera, Chair of the PG&E Corporation Finance Committee, Mr. Wells presented a report on the actions taken and items discussed at the Committee’s meetings on November 15, 2019, November 25, 2019, and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee’s recommendation that the Board concur with the 2020 preliminary operating expense

and capital expenditure budgets contained in the preliminary 2020 Financial Performance Plan, as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board. He referred to materials that had been provided to the directors in advance of the meeting regarding the Butte County Rebuild Program (Program), and stated that management will return to the Finance Committee and the Boards in early 2020 with an updated Program cost estimate and an updated proposal for approval of Program expenditures.

On motion made and seconded, the Board concurred with the preliminary operating expense and capital expenditure budgets contained in the 2020 Financial Performance Plan, as presented.

Ms. Schmidt, Chair of the PG&E Corporation CPP Committee, presented a report on the items discussed at the Committee's meetings on November 25, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she presented the Committee's third quarter 2019 report to the Board on the Utility's progress against its Wildfire Safety Plan.

At this point, Mr. Brian, Mr. Karotkin, Mr. Orsini, and Mr. Weissmann left the meeting, and Mr. Kalil re-entered the meeting.

Mr. Leffell, Chair of the PG&E Corporation Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meeting held earlier in the day, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board (1) appoint (a) William L. Smith to the PG&E Corporation Compensation Committee, the PG&E Corporation Finance Committee, and the PG&E Corporation and Utility Safety and Nuclear Oversight (SNO) Committees, and (b) John M. Woolard to the PG&E Corporation CPP Committee and the PG&E Corporation Nominating and Governance Committee, and (2) amend the Corporate Governance Guidelines to (a) add a new "Expectations for Directors" section, and (b) revise the "Characteristics of Directors" section to add meeting attendance as a consideration for re-nominating

incumbent directors, all as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board appointed Mr. Smith to the SNO Committee, as presented.

On motion made and seconded, the Board approved amendments to the Corporate Governance Guidelines, as presented.

Ms. Moore, Chair of the PG&E Corporation Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 1, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she reported on the Committee's recommendation that the independent members of the Board (1) approve the treatment of 2019 Long-Term Incentive Plan (LTIP) awards for the Utility Chief Executive Officer (CEO) under various post-service and post-change in control scenarios, and (2) delegate authority to the Senior Vice President, Human Resources to implement awards reflecting these terms, as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the independent directors (1) approved the treatment of 2019 LTIP awards for the Utility CEO under various post-service and post-change in control scenarios, and (2) delegated authority to the Senior Vice President, Human Resources to implement awards reflecting these terms, as presented.

Ms. Mielle, Chair of the Audit Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 5, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Campbell, Chair of the SNO Committee, presented a report on the items discussed at the Committee's concurrent meeting with the Audit Committee and the PG&E Corporation Compliance and Public Policy Committee on November 19, 2019 and the SNO Committee's meeting on

December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Hall, Mr. Kalil, Mr. Mesterharm, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present for portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

WHEREAS, on November 12, 2019, Frederick W. Buckman informed this Board of Directors (the "Board") of his intent to resign from the Board and the Board of PG&E Corporation, effective immediately;

WHEREAS, in light of Mr. Buckman's resignation, the Board believes it is in the best interest of this company and its shareholders to fix a new number of directors constituting the Board;

WHEREAS, pursuant to Article II, Section 1 of this company's Bylaws, the number of directors constituting the Board shall be within the limits specified in the Bylaws, fixed from time to time by a resolution duly adopted by the Board; and

WHEREAS, pursuant to Article II, Section 1 of the Bylaws, the number of directors on the Board shall not be less than nine (9) nor more than seventeen (17);

NOW, THEREFORE, BE IT RESOLVED that the exact number of directors of this company shall be fixed at 15.

**Resolution 2**

BE IT RESOLVED that J. Ellen Conti is hereby elected Assistant Corporate Secretary, effective as of December 9, 2019.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 10 and 11, 2019
PG&E CORPORATION

A regular meeting of the Board of Directors of PG&E Corporation (Corporation) was held beginning at 4:50 p.m. on Tuesday, December 10, 2019, at the office of the Corporation, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors. The first portion of the meeting was held concurrently with a meeting of the Compliance and Public Policy (CPP) Committee of the PG&E Corporation Board of Directors.

Present at 77 Beale Street were directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Michael J. Leffell, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard. Directors Jeffrey L. Bleich, Fred J. Fowler, and Dominique Mielle attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also present at 77 Beale Street at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, Linda Y.H. Cheng, Jane K. Yura, Eric Montizambert, and Alejandro Vallejo, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar Consulting Group (NorthStar), Paul C. Curnin, Mario A. Ponce, Sandeep Qusba, and Sara A. Ricciardi of Simpson, Thacher & Bartlett LLP, and Mark R. Filip and Charles J. Kalil II of Kirkland & Ellis LLP (Kirkland).

Quorum present, Ms. Schmidt, Chair of the CPP Committee meeting, presided as chair of the concurrent meeting with that committee. Ms. Cheng served as secretary of the meeting.

Mr. Filip and Mr. Kalil presented an update on the Utility's monitorship. They referred to the update that Mr. Filip presented to the Boards of Directors at their meeting on September 11, 2019, and discussed, among other things, the Monitor team's ongoing vegetation management

[1] [redacted]

field inspections; the expected timeframe for issuance of the Monitor's third report; the open dialogue and communications between the Monitor team and PG&E management and employees; the Monitor team's electric distribution infrastructure and asset inspections during 2019 and planned electric infrastructure and asset inspections in 2020; the Monitor team's observations regarding the Utility's recent Public Safety Power Shutoff events and emergency preparedness efforts; and the Monitor team's ongoing evaluation of the Utility's gas transmission integrity management work, data integrity, and compliance and ethics program. The directors asked questions and discussed various aspects of Mr. Filip's and Mr. Kalil's presentation.

Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Giammona, Ms. Kane, Ms. Kay, Mr. Lewis, Ms. Loduca, Mr. Mistry, Mr. Wan, Mr. Welsch, Ms. Cheng, Ms. Yura, Mr. Montizambert, Mr. Vallejo, Ms. Anderson, Mr. Bennett, and Mr. D. Smith were excused from the meeting, and the meeting continued in executive session, with Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present during portions of the executive session meeting.

After the executive session, Ms. Schmidt informed Ms. Cheng that the following discussions took place:

- With Mr. Curnin, Mr. Filip, Mr. Kalil, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors discussed the Monitor's team's views and observations regarding various aspects of the Utility's operations and culture. Ms. Mielle, Mr. Filip, and Mr. Kalil then left the meeting.

- With Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

Mr. Mullins and Mr. Qusba left the meeting at this point.

The meeting recessed at 5:35 p.m. and reconvened at 8:45 a.m. on Wednesday, December 11, 2020.

At this point, Mr. Johnson re-entered the meeting, and Ms. Mielle and Mr. Mullins rejoined the meeting by telephone.

The meeting continued in executive session with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present.

The Board concluded its executive session. Ms. Cheng was recalled and informed that, with Mr. Johnson, Mr. Curnin, Mr. Ponce, and Ms. Ricciardi present, (1) Mr. Johnson reported on recent developments at the Companies and provided an overview of matters that would be discussed later in the meeting, and (2) the directors discussed various matters that would be covered later in the meeting.

The following individuals entered the meeting at this point: Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Dinyar B. Mistry, Fong Wan, James M. Welsch, and Walter R. Posey, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar, Charles J. Kalil II of Kirkland, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Mr. Posey presented a safety tailboard on working safely near trees. The directors asked questions and discussed various aspects of his presentation.

Mr. Posey left the meeting at this point.

The directors discussed various field visits and safety observations and facility tours that they had attended, as well as the tour of the Diablo Canyon Power Plant that several directors would be attending the following day.

Mr. Wells reviewed the Financial and Business Highlights report for November 2019, which was included in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. The directors asked questions and discussed various aspects of Mr. Wells' presentation.

Mr. Vesey presented a report on operational matters. Among other things, he discussed the Utility's

work to restore service in response to power outages caused by a recent winter storm.

At this point, (1) Ms. Kay, Mr. Mistry, and Mr. Welsch left the meeting, (2) the following individuals entered the meeting: Robert S. Kenney, Peter E. Kenny, and Sumeet Singh, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath), and (3) Richard Hall of Cravath joined the meeting by telephone.

Mr. Lewis, Mr. Kenny, and Mr. Singh presented an update on the Utility's Community Wildlife Safety Program, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed the Utility's continuing progress in enhancing its readiness and responsiveness to the threat of potential wildfires across its service territory; the Utility's wildfire risk reduction strategy; 2019 fire ignition trends; the Utility's progress in completing the commitments made in its 2019 Wildfire Safety Plan (WSP); enhanced risk analysis that is being incorporated into the development of the Utility's 2020 Wildfire Mitigation Plan (WMP); and the Utility's activities to minimize the scope, duration, and frequency of future PSPS events. The directors asked questions and discussed, among other matters, the Utility's enhanced vegetation management and system hardening work, the Utility's progress in completing its commitments under the 2019 WSP, and the Utility's 2020 WMP.

Mr. Bleich left the meeting during the foregoing presentation and discussion. Mr. Lewis, Mr. Wan, Mr. Welsch, Mr. Kenney, Mr. Kenny, Mr. Singh, Ms. Anderson, Mr. Bennett, Mr. Kalil, and Mr. D. Smith left the meeting after the presentation and discussion.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

At this point, Mr. Brian and Mr. Orsini left the meeting, and Fong Wan, Christopher A. Foster, and Katherine K. Davis entered the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, Sandeep Qusba of Simpson entered the meeting, and Mr. Barrera left the meeting. Mr. Vesey, Mr. Wan, Mr. Foster, and Ms. Davis left the meeting after the discussion.

Ms. Cheng presented consent items relating to (1) the number of directors on the Board, (2) election of an Assistant Corporate Secretary, and (3) approval of minutes, all as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board adopted a resolution fixing the number of authorized directors at 14 (see Resolution 1 in Attachment A).

On motion made and seconded, the Board adopted a resolution electing an Assistant Corporate Secretary (see Resolution 2 in Attachment A).

On motion made and seconded, the Board approved the minutes of the Board meetings held on June 14, 2019, June 20 and 21, 2019, June 27, 2019, July 9, 2019, July 12, 2019, July 16, 2019, July 19, 2019, and July 25, 2019.

In the absence of Mr. Barrera, Chair of the Finance Committee, Mr. Wells presented a report on the actions taken and items discussed at the Committee's meetings on November 15, 2019, November 25, 2019, and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board concur with the 2020 preliminary operating expense and capital expenditure budgets contained in the preliminary 2020 Financial Performance Plan, as described in materials that had been provided to directors in advance of the

meeting and that are included in the records of this Board. He referred to materials that had been provided to the directors in advance of the meeting regarding the Butte County Rebuild Program (Program), and stated that management will return to the Finance Committee and the Boards in early 2020 with an updated Program cost estimate and an updated proposal for approval of Program expenditures.

On motion made and seconded, the Board concurred with the preliminary operating expense and capital expenditure budgets contained in the 2020 Financial Performance Plan, as presented.

Ms. Schmidt, Chair of the CPP Committee, presented a report on the items discussed at the Committee's meetings on November 25, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, she presented the Committee's third quarter 2019 report to the Board on the Utility's progress against its Wildfire Safety Plan.

At this point, Mr. Brian, Mr. Karotkin, Mr. Orsini, and Mr. Weissmann left the meeting, and Mr. Kalil re-entered the meeting.

Mr. Leffell, Chair of the Nominating and Governance Committee, presented a report on the actions taken and items discussed at the Committee's meeting held earlier in the day, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, he reported on the Committee's recommendation that the Board (1) appoint (a) William L. Smith to the Compensation Committee, the Finance Committee, and the PG&E Corporation and Utility Safety and Nuclear Oversight (SNO) Committees, and (b) John M. Woolard to the CPP Committee and the Nominating and Governance Committee, and (2) amend the Corporate Governance Guidelines to (a) add a new "Expectations for Directors" section, and (b) revise the "Characteristics of Directors" section to add meeting attendance as a consideration for re-nominating incumbent directors, all as described in materials that had been provided to directors in advance of the meeting and that are included in the records of this Board.

On motion made and seconded, the Board appointed Mr. Smith to the Compensation Committee, the Finance Committee, and the SNO Committee, and Mr. Woolard to the CPP Committee and the Nominating and Governance Committee, as presented.

On motion made and seconded, the Board approved amendments to the Corporate Governance Guidelines, as presented.

Ms. Moore, Chair of the Compensation Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 1, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Mielle, Chair of the Audit Committee, presented a report on the actions taken and items discussed at the Committee's meetings on November 5, 2019 and December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

Ms. Campbell, Chair of the SNO Committee, presented a report on the items discussed at the Committee's concurrent meeting with the Audit Committee and the Compliance and Public Policy Committee on November 19, 2019 and the SNO Committee's meeting on December 10, 2019, as described in the materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board.

The secretary noted that, in advance of the meeting, the directors had been provided privileged materials prepared at the direction of Ms. Loduca regarding legal matters. The materials are included in the records of this Board.

At this point, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Hall, Mr. Kalil, Mr. Mesterharm, and Mr. Ziman were excused, and the meeting continued in executive session, with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present for portions of the executive session meeting.

Ms. Cheng was recalled and informed that (1) with Mr. Johnson, Mr. Curnin, Mr. Ponce, Mr. Qusba, and Ms. Ricciardi present, the directors continued their discussion regarding several of the topics covered earlier in the meeting, and (2) with Mr. Johnson absent, the independent directors met in executive session without any management present.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 3:15 p.m.

LINDA Y.H. CHENG
Secretary

**ATTACHMENT A**

**Resolution 1**

WHEREAS, on November 12, 2019, Frederick W. Buckman informed this Board of Directors (the "Board") of his intent to resign from the Board and the Board of Pacific Gas and Electric Company, effective immediately;

WHEREAS, in light of Mr. Buckman's resignation, the Board believes that it is in the best interest of this corporation and its shareholders to fix a new number of directors constituting the Board;

WHEREAS, pursuant to Article II, Section 1 of this corporation's Bylaws, the number of directors constituting the Board shall be within the limits specified in the Corporation's Articles of Incorporation, fixed from time to time by a resolution duly adopted by the Board; and

WHEREAS, pursuant to Article Third, Section 1 of the Articles of Incorporation, the number of directors on the Board shall not be less than eight (8) nor more than fifteen (15);

NOW, THEREFORE, BE IT RESOLVED that the exact number of directors of this corporation shall be fixed at 14.

**Resolution 2**

BE IT RESOLVED that J. Ellen Conti is hereby elected Assistant Corporate Secretary, effective as of December 9, 2019.

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 12, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, December 12, 2019, at 10:15 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Jeffrey L. Bleich, Fred J. Fowler, Michael J. Leffell, Eric D. Mullins, and Andrew M. Vesey were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Eileen O. Chan, along with C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP, James A. Mesterharm of AlixPartners, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Chan left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 12, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, December 12, 2019, at 10:15 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, William D. Johnson, Dominique Mielle, Meridee A. Moore, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Jeffrey L. Bleich, Fred J. Fowler, Michael J. Leffell, and Eric D. Mullins were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng, and Eileen O. Chan, along with C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP, James A. Mesterharm of AlixPartners, Sandeep Qusba of Simpson Thacher & Bartlett LLP, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Loduca, with the participation of Mr. Johnson, Mr. Simon, [redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Ms. Chan left the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 11:30 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 13, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Friday, December 13, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell (who joined during the meeting as noted below), Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, Andrew M. Vesey (who joined during the meeting as noted below), and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director Alejandro D. Wolff was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken of AlixPartners, C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Stephen Karotkin of Weil, Gotshal & Manges LLP, Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson), and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Cheryl F. Campbell joined the meeting during the foregoing discussion.

Mr. Bleich, Mr. Leffell, and Ms. Schmidt left the meeting at this point.

The meeting recessed at 10:55 a.m. and reconvened at 3:30 p.m.

The following individuals joined the meeting at this point: directors Eric D. Mullins and Andrew M. Vesey, along with Brad D. Brian of Munger, Tolles & Olson LLP, Gregory Hort of Lazard, James A. Mesterharm of AlixPartners, Kevin J. Orsini of Cravath, and Mario A. Ponce of Simpson.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Jeffrey L. Bleich rejoined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 13, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Friday, December 13, 2019, at 9:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell (who joined during the meeting as noted below), Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins (who joined during the meeting as noted below), Kristine M. Schmidt, William L. Smith, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director Alejandro D. Wolff was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, and Linda Y.H. Cheng, along with John R. Boken of AlixPartners, C. Dan Haaren and Richard Hall of Cravath, Swaine & Moore LLP (Cravath), Stephen Karotkin of Weil, Gotshal & Manges LLP, Sandeep Qusba of Simpson Thacher & Bartlett LLP (Simpson), and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Cheryl F. Campbell joined the meeting during the foregoing discussion.

On motion made and seconded, the Board authorized and directed the officers of the Corporation to negotiate revisions to the equity backstop commitment letters substantially on the terms discussed with the Board.

Mr. Bleich, Mr. Leffell, and Ms. Schmidt left the meeting at this point.

The meeting recessed at 10:55 a.m. and reconvened at 3:30 p.m.

The following individuals joined the meeting at this point: director Eric D. Mullins and Andrew M. Vesey, along with Brad D. Brian of Munger, Tolles & Olson LLP, Gregory Hort of Lazard, James A. Mesterharm of AlixPartners, Kevin J. Orsini of Cravath, and Mario A. Ponce of Simpson.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Jeffrey L. Bleich rejoined the meeting during the foregoing discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:00 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 15, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Sunday, December 15, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle (who joined during the meeting as noted below), Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Dan Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Dominique Mielle joined the meeting during the foregoing discussion.

After the discussion, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Wong, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Ponce and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:50 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 15, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Sunday, December 15, 2019, at 11:00 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, William D. Johnson, Michael J. Leffell, Dominique Mielle (who joined during the meeting as noted below), Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William L. Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. No director was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Brian M. Wong, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, C. Dan Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Mario A. Ponce and Sandeep Qusba of Simpson Thacher & Bartlett LLP.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[1] 



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Director Dominique Mielle joined the meeting during the foregoing discussion.

After the discussion, Mr. Johnson, Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Wong, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hort, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Ponce and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 12:50 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 19, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Thursday, December 19, 2019, at 8:05 a.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich (who joined during the meeting as noted below), Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William Smith, Andrew M. Vesey, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Utility's Bylaws. Director William D. Johnson was absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

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[1] [redacted]

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[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory matters, including the status of (1) the CPUC's cost of capital proceeding, and (2) the settlement agreements relating to the Utility's 2020 General Rate case and the CPUC's investigation relating to the 2017 Northern California wildfires and the 2018 Camp fire.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

David Hindman of AlixPartners joined the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the minutes of the Board meetings held on August 2, 2019, August 6, 2019, August 7, 2019, August 9, 2019, August 12, 2019, August 16, 2019, August 23, 2019, and August 30, 2019.

At this point, (1) Mr. Leffell left the meeting, (2) Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hindman, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Director Jeffrey L. Bleich joined the meeting during the foregoing executive session discussion.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

At this point, (1) the following individuals joined the meeting: Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Jamie L. Martin, and Brooke A. Reilly, along with Mr. Hindman, Mr. Mesterharm, and Patryk Szafranski of AlixPartners, and (2) Mr. Curnin left the meeting.

Mr. Hindman, Mr. Mesterharm, and Mr. Szafranski presented a report on cost savings opportunities, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed guideposts for costs savings opportunities and discussions, the Companies' ongoing spend reduction efforts, the Program Management Office (PMO) process for spend reductions, progress made toward the Companies' 2020 spend reduction target, and proposed spend reduction strategies. The directors asked questions and discussed, among other matters, the PMO process, various spend reduction categories and initiatives, and potential focus areas for future discussion with the Board.

Mr. Mullins and Mr. Woolard left the meeting during the foregoing presentation and discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:35 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 19, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Thursday, December 19, 2019, at 8:05 a.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Jeffrey L. Bleich (who joined during the meeting as noted below), Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, Kristine M. Schmidt, William Smith, Alejandro D. Wolff, and John M. Woolard attended by telephone, as permitted by the Corporation's Bylaws. Director William D. Johnson was absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Julie M. Kane, Janet C. Loduca, Linda Y.H. Cheng, and Robert S. Kenney, along with Brad D. Brian of Munger, Tolles & Olson LLP, Paul C. Curnin, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, C. Daniel Haaren, Richard Hall, and Kevin J. Orsini of Cravath, Swaine & Moore LLP, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Eli Silverman and Kenneth S. Ziman of Lazard.

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

Mr. Kenney presented a report on regulatory matters, including the status of (1) the CPUC's cost of capital proceeding, and (2) the settlement agreements relating to the Utility's 2020 General Rate case and the CPUC's investigation relating to the 2017 Northern California wildfires and the 2018 Camp fire.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

David Hindman of AlixPartners joined the meeting during the foregoing discussion.

On motion made and seconded, the Board approved the minutes of the Board meetings held on August 2, 2019, August 6, 2019, August 7, 2019, August 9, 2019, August 12, 2019, August 16, 2019, August 23, 2019, and August 30, 2019.

At this point, (1) Mr. Leffell left the meeting, (2) Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Ms. Cheng, Mr. Kenney, Mr. Brian, Mr. Haaren, Mr. Hall, Mr. Hindman, Mr. Karotkin, Mr. Mesterharm, Mr. Orsini, Mr. Silverman, and Mr. Ziman were excused, and the meeting continued in executive session with Mr. Curnin, Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Director Jeffrey L. Bleich joined the meeting during the foregoing executive session discussion.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

At this point, (1) the following individuals joined the meeting: Mr. Vesey, Mr. Simon, Mr. Wells, Ms. Kane, Ms. Loduca, Jamie L. Martin, and Brooke A. Reilly, along with Mr. Hindman, Mr. Mesterharm, and Patryk Szafranski of AlixPartners, and (2) Mr. Curnin left the meeting.

Mr. Hindman, Mr. Mesterharm, and Mr. Szafranski presented a report on cost savings opportunities, which included a discussion of materials that had been provided to the directors in advance of the meeting and that are included in the records of this Board. Among other things, they discussed guideposts for costs savings opportunities and discussions, the Companies' ongoing spend reduction efforts, the Program Management Office (PMO) process for spend reductions, progress made toward the Companies' 2020 spend reduction target, and proposed spend reduction strategies. The directors asked questions and discussed, among other matters, the PMO process, various spend reduction categories and initiatives, and potential focus areas for future discussion with the Board.

Mr. Mullins and Mr. Woolard left the meeting during the foregoing presentation and discussion.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 9:35 a.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 30, 2019
PACIFIC GAS AND ELECTRIC COMPANY

A special telephonic meeting of the Board of Directors of Pacific Gas and Electric Company (Utility) was held on Monday, December 30, 2019, at 3:00 p.m. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, William Smith, Andrew M. Vesey, Alejandro D. Wolff, and John Woolard attended by telephone, as permitted by the Utility's Bylaws. Directors Jeffrey L. Bleich, William D. Johnson, and Kristine M. Schmidt were absent.

Also participating by telephone at the beginning of the meeting were John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng and William V. Manheim, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]

[redacted]

[1] [redacted]



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) Ms. Brownell, Ms. Campbell, Mr. Vesey, Mr. Hort, and Mr. Mesterharm left the meeting, and (2) Richard Hall of Cravath joined the meeting and later left the meeting.

After the discussion, (1) Mr. Barrera left the meeting, and (2) Mr. Simon, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Manheim, Mr. Brian, Mr. Karotkin, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:55 p.m.

LINDA Y.H. CHENG
Secretary

PRIVILEGED AND CONFIDENTIAL[1]

BOARD MEETING – December 30, 2019
PG&E CORPORATION

A special telephonic meeting of the Board of Directors of PG&E Corporation (Corporation) was held on Monday, December 30, 2019, at 3:00 p.m. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) Board of Directors.

Directors Richard R. Barrera, Nora Mead Brownell, Cheryl F. Campbell, Fred J. Fowler, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, Eric D. Mullins, William Smith, Alejandro D. Wolff, and John Woolard attended by telephone, as permitted by the Corporation's Bylaws. Directors Jeffrey L. Bleich, William D. Johnson, and Kristine M. Schmidt were absent.

Also participating by telephone at the beginning of the meeting were Andrew M. Vesey, John R. Simon, Jason P. Wells, Janet C. Loduca, Linda Y.H. Cheng and William V. Manheim, along with Brad D. Brian and Henry Weissmann of Munger, Tolles & Olson LLP, Erica M. Egenes, Mario A. Ponce, and Sandeep Qusba of Simpson Thacher & Bartlett LLP, Gregory Hort, Eli Silverman, and Kenneth S. Ziman of Lazard, Stephen Karotkin of Weil, Gotshal & Manges LLP, James A. Mesterharm of AlixPartners, and Kevin J. Orsini of Cravath, Swaine & Moore LLP (Cravath).

Quorum present, Ms. Brownell, Chair of the Board of the Corporation, presided as chair of the concurrent meeting. Ms. Cheng served as secretary of the meeting.

[THE FOLLOWING PARAGRAPH CONTAINS ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL INFORMATION.]



[1] 



[END OF PRIVILEGED AND CONFIDENTIAL INFORMATION.]

During the foregoing discussion, (1) Ms. Brownell, Ms. Campbell, Mr. Vesey, Mr. Hort, and Mr. Mesterharm left the meeting, and (2) Richard Hall of Cravath joined the meeting and later left the meeting.

After the discussion, (1) Mr. Barrera left the meeting, and (2) Mr. Simon, Mr. Wells, Ms. Loduca, Ms. Cheng, Mr. Manheim, Mr. Brian, Mr. Karotkin, Mr. Orsini, Mr. Silverman, Mr. Weissmann, and Mr. Ziman were excused, and the meeting continued in executive session with Ms. Egenes, Mr. Ponce, and Mr. Qusba present.

Ms. Cheng was recalled and informed that, without any management present, the independent directors continued their discussion regarding several of the topics covered earlier in the meeting.

There being no further business presented for action, on motion made and seconded, the meeting was adjourned at 4:55 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PACIFIC GAS AND ELECTRIC COMPANY

November 19, 2019

A telephonic meeting of the Safety and Nuclear Oversight (SNO) Committee of the Board of Directors of Pacific Gas and Electric Company (Utility) was held at 12:15 p.m. on Tuesday, November 19, 2019. The meeting was held concurrently with a meeting of the PG&E Corporation (Corporation and, together with the Utility, the Companies) SNO Committee, the PG&E Corporation Compliance and Public Policy (CPP) Committee, and the Companies' respective Audit Committees.

SNO Committee members Jeffrey L. Bleich (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, Eric D. Mullins, and Kristine M. Schmidt attended by telephone, as permitted by the Utility's Bylaws. Committee member Nora Mead Brownell was absent.

Also participating by telephone at the beginning of the meeting were directors Richard R. Barrera, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, and Alejandro D. Wolff, as well as Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Janet C. Loduca, Fong Wan, James M. Welsch, Stephen J. Cairns, Linda Y.H. Cheng, David S. Thomason, Wondy S. Lee, Eric Montizambert, James T. Murphy, and Jan A. Nimick, along with Timothy J. Gillam and Jean-Denis Ncho-Oguie of Deloitte & Touche LLP, Charles J. Kalil II of Kirkland & Ellis LLP, and Mario A. Ponce of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Campbell, Chair of the SNO Committees, presided over the concurrent meeting. Ms. Cheng served as secretary of the concurrent meeting.

Mr. Nimick presented a safety tailboard on managing customer satisfaction. The Audit, CPP, and SNO Committee members (Committee Members) asked questions and discussed various aspects of Mr. Nimick's presentation.

Ms. Giammona introduced Mr. Murphy, Senior Director, Corporate Security of the Utility. Mr. Murphy presented a report on corporate security, which included a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the evolving physical security landscape; the Corporate Security

organization’s focus on protecting the Companies’ employees, facilities, and customers; the Companies’ strategies for mitigating security risks, including continued capital investments in technology, automation, and artificial intelligence; the Companies’ physical security risk management program; various physical security metrics; and security engagement during Public Safety Power Shutoff (PSPS) events. The Committee Members asked questions and discussed, among other matters, employee safety during PSPS events, and security and safety protocols for employees working in the field.

Nicholas S. Goldin of Simpson joined the meeting during the foregoing presentation and discussion. After the presentation and discussion, Mr. Murphy left the meeting, and Christine Cowsert, Clifford J. Gleicher, and Lise H. Jordan joined the meeting.

Following an introduction by Ms. Kane, Mr. Gleicher presented a report regarding noncompliance (e.g., notices of violations), which included a discussion with Ms. Jordan and Ms. Cowsert of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. The Committee Members asked questions and discussed, among other matters, compliance programs in the Electric Operations and Gas Operations lines of business.

Mr. Vesey left the meeting during the foregoing presentation and discussion. Mr. Gleicher, Ms. Jordan, and Mr. Kalil left the meeting after the presentation and discussion.

Mr. Welsch presented a report on the results of the World Association of Nuclear Operators’ (WANO) evaluation of the Diablo Canyon Power Plant (Diablo Canyon). This included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the plant’s overall performance rating, areas for improvement identified by WANO, and strengths in practices and accomplishments noted by WANO. The Committee Members asked questions and discussed various aspects of Mr. Welsch’s presentation.

At this point, Christopher A. Pezzola joined the meeting, and Mr. Kalil rejoined the meeting.

Mr. Pezzola presented a report on results of audits performed by Internal Auditing (IA) during the third quarter of 2019, which included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the results of these audits, and the status of work completed with respect to the 2019 IA Work Plan. The Committee Members asked questions and discussed various aspects of Mr. Pezzola's presentation.

Mr. Pezzola left the meeting, and Jamie L. Martin entered the meeting at this point.

Mr. Cairns and Ms. Martin presented a report on contract management and third-party risk management, two of the enterprise risk topics in the Companies' Enterprise and Operational Risk Management (EORM) program. This presentation included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. They described the risk topics and discussed, among other things, risk controls and mitigations. The Committee Members asked questions and discussed, among other matters, the Companies' procurement and contracting processes, actions taken by the Companies to address contract management and third-party risk management issues, and next steps.

SNO Committee member Jeffrey L. Bleich joined the meeting during the foregoing presentation and discussion.

Ms. Martin left the meeting, and Kenneth J. Wells entered the meeting at this point.

Mr. Nimick presented a report on two recent safety incidents: (1) a contractor fatality involving a lineman contractor who drove off a public dirt road at a high elevation while working near Garberville, and (2) an employee significant injury incident resulting from an electrical arc flash. The Committee Members asked questions and discussed the incidents.

Mr. Nimick, Mr. Wells, Mr. Wan, Ms. Cowsert, and Mr. Welsch presented a report on employee safety, which included

a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, they discussed safety as the Companies' top priority, and strategies for improving employee safety. The Committee Members asked questions and discussed, among other matters, employee injury statistics and next steps.

During the foregoing presentation and discussion, Mr. Vesey rejoined the meeting, and Ms. Moore and Mr. Goldin left the meeting.

Mr. Vesey reported on a potential PSPS event that could be initiated during the next several days.

The secretary noted that, in advance of the meeting, the Committee Members had been provided a written report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety.

There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:30 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PG&E CORPORATION

November 19, 2019

A telephonic meeting of the Safety and Nuclear Oversight (SNO) Committee of the Board of Directors of PG&E Corporation (Corporation) was held at 12:15 p.m. on Tuesday, November 19, 2019. The meeting was held concurrently with a meeting of the Pacific Gas and Electric Company (Utility and, together with the Corporation, the Companies) SNO Committee, the PG&E Corporation Compliance and Public Policy (CPP) Committee, and the Companies' respective Audit Committees.

SNO Committee members Jeffrey L. Bleich (who joined during the meeting as noted below), Cheryl F. Campbell, Fred J. Fowler, Eric D. Mullins, and Kristine M. Schmidt attended by telephone, as permitted by the Corporation's Bylaws. Committee member Nora Mead Brownell was absent.

Also participating by telephone at the beginning of the meeting were directors Richard R. Barrera, Michael J. Leffell, Dominique Mielle, Meridee A. Moore, and Alejandro D. Wolff, as well as Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Janet C. Loduca, Fong Wan, James M. Welsch, Stephen J. Cairns, Linda Y.H. Cheng, David S. Thomason, Wondy S. Lee, Eric Montizambert, James T. Murphy, and Jan A. Nimick, along with Timothy J. Gillam and Jean-Denis Ncho-Oguie of Deloitte & Touche LLP, Charles J. Kalil II of Kirkland & Ellis LLP, and Mario A. Ponce of Simpson Thacher & Bartlett LLP (Simpson).

Quorum present, Ms. Campbell, Chair of the SNO Committees, presided over the concurrent meeting. Ms. Cheng served as secretary of the concurrent meeting.

Mr. Nimick presented a safety tailboard on managing customer satisfaction. The Audit, CPP, and SNO Committee members (Committee Members) asked questions and discussed various aspects of Mr. Nimick's presentation.

Ms. Giammona introduced Mr. Murphy, Senior Director, Corporate Security of the Utility. Mr. Murphy presented a report on corporate security, which included a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the evolving physical security landscape; the Corporate Security

organization’s focus on protecting the Companies’ employees, facilities, and customers; the Companies’ strategies for mitigating security risks, including continued capital investments in technology, automation, and artificial intelligence; the Companies’ physical security risk management program; various physical security metrics; and security engagement during Public Safety Power Shutoff (PSPS) events. The Committee Members asked questions and discussed, among other matters, employee safety during PSPS events, and security and safety protocols for employees working in the field.

Nicholas S. Goldin of Simpson joined the meeting during the foregoing presentation and discussion. After the presentation and discussion, Mr. Murphy left the meeting, and Christine Cowsert, Clifford J. Gleicher, and Lise H. Jordan joined the meeting.

Following an introduction by Ms. Kane, Mr. Gleicher presented a report regarding noncompliance (e.g., notices of violations), which included a discussion with Ms. Jordan and Ms. Cowsert of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. The Committee Members asked questions and discussed, among other matters, compliance programs in the Electric Operations and Gas Operations lines of business.

Mr. Vesey left the meeting during the foregoing presentation and discussion. Mr. Gleicher, Ms. Jordan, and Mr. Kalil left the meeting after the presentation and discussion.

Mr. Welsch presented a report on the results of the World Association of Nuclear Operators’ (WANO) evaluation of the Diablo Canyon Power Plant (Diablo Canyon). This included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the plant’s overall performance rating, areas for improvement identified by WANO, and strengths in practices and accomplishments noted by WANO. The Committee Members asked questions and discussed various aspects of Mr. Welsch’s presentation.

At this point, Christopher A. Pezzola joined the meeting, and Mr. Kalil rejoined the meeting.

Mr. Pezzola presented a report on results of audits performed by Internal Auditing (IA) during the third quarter of 2019, which included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed the results of these audits, and the status of work completed with respect to the 2019 IA Work Plan. The Committee Members asked questions and discussed various aspects of Mr. Pezzola's presentation.

Mr. Pezzola left the meeting, and Jamie L. Martin entered the meeting at this point.

Mr. Cairns and Ms. Martin presented a report on contract management and third-party risk management, two of the enterprise risk topics in the Companies' Enterprise and Operational Risk Management (EORM) program. This presentation included a discussion of materials that had been provided to the Committee Members in advance of the meeting and that are included in the records of this Committee. They described the risk topics and discussed, among other things, risk controls and mitigations. The Committee Members asked questions and discussed, among other matters, the Companies' procurement and contracting processes, actions taken by the Companies to address contract management and third-party risk management issues, and next steps.

SNO Committee member Jeffrey L. Bleich joined the meeting during the foregoing presentation and discussion.

Ms. Martin left the meeting, and Kenneth J. Wells entered the meeting at this point.

Mr. Nimick presented a report on two recent safety incidents: (1) a contractor fatality involving a lineman contractor who drove off a public dirt road at a high elevation while working near Garberville, and (2) an employee significant injury incident resulting from an electrical arc flash. The Committee Members asked questions and discussed the incidents.

Mr. Nimick, Mr. Wells, Mr. Wan, Ms. Cowsert, and Mr. Welsch presented a report on employee safety, which included

a discussion of materials that had been provided to Committee Members in advance of the meeting and that are included in the records of this Committee. Among other things, they discussed safety as the Companies' top priority, and strategies for improving employee safety. The Committee Members asked questions and discussed, among other matters, employee injury statistics and next steps.

During the foregoing presentation and discussion, Mr. Vesey rejoined the meeting, and Ms. Moore and Mr. Goldin left the meeting.

Mr. Vesey reported on a potential PSPS event that could be initiated during the next several days.

The secretary noted that, in advance of the meeting, the Committee Members had been provided a written report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety.

There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:30 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PACIFIC GAS AND ELECTRIC COMPANY

December 10, 2019

A regular meeting of the Safety and Nuclear Oversight (SNO) Committee of the Board of Directors of Pacific Gas and Electric Company (Utility) was held at 12:40 p.m. on Tuesday, December 10, 2019, at the office of the Utility, 77 Beale Street, San Francisco, California. The meeting was held concurrently with a meeting of the PG&E Corporation(Corporation and, together with the Utility, the Companies) SNO Committee.

Present at 77 Beale Street were Committee members Nora Mead Brownell, Cheryl F. Campbell, Eric D. Mullins, and Kristine M. Schmidt. Committee member Jeffrey L. Bleich attended by telephone, as permitted by the Utility's Bylaws. Committee member Fred J. Fowler was absent.

Also present at 77 Beale Street at the beginning of the meeting were directors Richard R. Barrera, Michael J. Leffell, Meridee A. Moore, Kristine M. Schmidt, Alejandro D. Wolff, and John M. Woolard, as well as William D. Johnson, Andrew M. Vesey, John R. Simon, Jason P. Wells, Loraine M. Giammona, Julie M. Kane, Kathleen B. Kay, Michael A. Lewis, Janet C. Loduca, Fong Wan, James M. Welsch, Stephen J. Cairns, Linda Y.H. Cheng, Christine Cowsert, Jane K. Yura, and Jan A. Nimick, along with Angela Anderson, Douglas A. Bennett, and Darrell Smith of NorthStar Consulting Group. Also participating by telephone at the beginning of the meeting was Sydney Schneider of Kirkland & Ellis LLP.

Quorum present, Ms. Campbell presided over the meeting. Ms. Cheng served as secretary of the meeting.

Mr. Nimick presented a safety tailboard on flooding and high water hazards. The Committee members asked questions and discussed various aspects of his presentation.

Mr. Nimick then presented a report on the Companies' 2019 safety program, including performance targets and metrics for workforce, motor vehicle, and public safety. The presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of the Committee. The Committee members asked questions and discussed, among other

matters, the Companies' 2019 year-to-date performance on various safety metrics.

Mr. Barrera left the meeting during the foregoing presentation and discussion. Sumeet Singh and Mark Quinlan entered the meeting after the presentation and discussion.

Ms. Cowsert presented a report on wildfire considerations in the Utility's gas operations, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, she discussed the Gas Operations organization's risk management activities related to both the likelihood of gas assets starting a wildfire and the consequences of a wildfire impacting gas assets. The Committee members asked questions and discussed various aspects of Ms. Cowsert's presentation.

Ms. Cowsert left the meeting, and Martin Strasburger, along with Gary L. Parkey of the Diablo Canyon Power Plant's (Diablo Canyon) Nuclear Safety and Oversight Committee (NSOC), entered the meeting at this point.

Mr. Quinlan referred to the Public Safety Power Shutoff (PSPS) events executed by the Utility in October and November 2019, and presented a post-event review. This included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed how the Utility scopes PSPS events to minimize customer impact, instances of weather-related damage and hazards that were found in post-PSPS inspections, lessons learned and areas for improvement, and feedback received from external agencies. The Committee members asked questions and discussed, among other matters, weather-related damage and hazard findings, and positive feedback received from the California Department of Forestry and Fire Protection.

Mr. Quinlan left the meeting at this point.

Mr. Parkey, Chair of the NSOC, presented a briefing on the NSOC's activities, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed Diablo Canyon's

positive attributes, NSOC 2019 Executive Summary items, and 2020 NSOC focus areas. The Committee members asked questions and discussed various aspects of Mr. Parkey's presentation.

Mr. Welsch presented a report on nuclear generation and power generation operations, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Among other things, he discussed Diablo Canyon's and the Power Generation organization's respective year-to-date safety performance, and the Utility's actions to mitigate risks associated with dam safety. The Committee members asked questions and discussed various aspects of Mr. Welsch's presentation. Ms. Campbell noted that she and several other directors would be touring Diablo Canyon later in the week.

Mr. Parkey left the meeting, and Christopher P. Benjamin entered the meeting at this point.

Mr. Strasburger presented an update on the Companies' cybersecurity program, which included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. Mr. Cairns noted that cyber attack is one of the enterprise risk topics in the Companies' Enterprise and Operational Risk Management (EORM) program. Among other things, Mr. Strasburger discussed actions taken by the Companies in response to the evolving cybersecurity risk landscape, the Companies' risk mitigation priorities, and the Companies' cybersecurity capabilities. The Committee members asked questions and discussed various aspects of Mr. Strasburger's presentation.

Mr. Strasburger left the meeting, and Jessica C. Hogle joined the meeting by telephone at this point.

Ms. Hogle and Mr. Benjamin presented a report on risk management activities associated with climate change/climate resilience, one of the key enterprise risk topics in the Companies' EORM program. This presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. They described the risk topic, and discussed, among other things, impacts on various enterprise

risks, and risk mitigations. The Committee members asked questions and discussed various aspects of Ms. Hogle's and Mr. Benjamin's presentation.

Ms. Hogle and Mr. Benjamin left the meeting at this point.

Mr. Singh presented a report on risk management activities associated with wildfire risk, one of the key enterprise risks addressed in the Companies' EORM program. This presentation included a discussion of materials that had been provided to the Committee members in advance of the meeting and that are included in the records of this Committee. He described the risk, and discussed, among other things, risk drivers and risk mitigations, including various programs and activities under the Utility's Community Wildfire Safety Program. The Committee members asked questions and discussed, among other matters, the Utility's wildfire mitigation activities, including the PSPS program and enhanced vegetation management work.

Mr. Singh left the meeting at this point.

Ms. Campbell referred to the materials provided to the Committee members prior to the meeting relating to risk management activities associated with motor vehicle safety incidents, and stated that the presentation on this topic would be deferred to a future meeting.

On motion made and seconded, the minutes of the meetings of the Committee held on June 20, 2019, July 16, 2019, August 20, 2019, and September 10, 2019 were approved.

The secretary noted that, in advance of the meeting, the Committee members had been provided the following written materials: (1) a summary of significant changes in laws and regulations affecting safety and operational performance, (2) Internal Auditing's proposed 2020 Audit Plan, and (3) the SNO Committees' 2020 work plan.

There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:55 p.m.

LINDA Y.H. CHENG
Secretary

SAFETY AND NUCLEAR OVERSIGHT COMMITTEE OF THE
BOARD OF DIRECTORS OF PG&E CORPORATION

December 10, 2019

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There being no further business presented for action, on motion made, seconded, and carried, the meeting was adjourned at 2:55 p.m.

LINDA Y.H. CHENG
Secretary

**PG&E Gas and Electric**
**Advice Submittal List**
**General Order 96-B, Section IV**

AT&T
Albion Power Company
Alcantar & Kahl LLP

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission
California State Association of Counties
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Cenergy Power
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

Downey & Brand
East Bay Community Energy
Ellison Schneider & Harris LLP
Energy Management Service
Engineers and Scientists of California

GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Power Institute
Hanna & Morton
ICF
IGS Energy
International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc.

Los Angeles County Integrated Waste Management Task Force
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenzie & Associates

Modesto Irrigation District
NLine Energy, Inc.
NRG Solar

Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions

SCE
SDG&E and SoCalGas

SPURR
San Francisco Water Power and Sewer
Seattle City Light
Sempra Utilities
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Water and Energy Consulting Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
Yep Energy

Pacific Gas and Electric Company®

**Erik Jacobson**
Director
Regulatory Relations

Pacific Gas and Electric Company
77 Beale St., Mail Code B13U
P.O. Box 770000
San Francisco, CA 94177

Fax: 415-973-3582

December 2, 2019

**Advice 5703-E**
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

**Subject:** **Tier 3 Advice Letter "Reports of Possible Off Ramps"**

## Purpose

This Tier 3 Advice Letter is being submitted in compliance with the Guidance Decision on 2019 Wildfire Mitigation Plans Submitted Pursuant to Senate Bill 901, Decision 19-05-036 (Decision), Ordering Paragraph (OP) 1 to describe "any concerns about the effectiveness of any program" in Pacific Gas and Electric Company's (PG&E") Wildfire Mitigation Plan (WMP).[1]

## Background

The Decision provides that within six months of its effective date, the "electrical corporations named as respondents shall file [a] Tier 3 Advice Letter entitled 'Reports on Possible Off Ramps,' describing any concerns about the effectiveness of any program of their individual Wildfire Mitigation Plans."[2] The "report shall clearly describe the concern, contain a specific proposal for action, including if applicable a recommendation to reduce or end the specific mitigation identified, and include any expert or other authoritative information available on the efficacy of the mitigation."[3]

## Concerns with Effectiveness of Programs

PG&E has not identified concerns about the effectiveness of the programs identified in its approved 2019 WMP.

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1 Decision, OP 1.
2 *Id*.
3 *Id*.

## Execution of Mitigations

As identified in the Second Amendment to PG&E's Wildfire Mitigation Plan (filed April 25, 2019) and several subsequent, periodic updates to the CPUC and the service list, several risk factors impacting the execution of wildfire mitigation activities, that were generally identified in PG&E's WMP (namely table 9 at pp. 39-46), have been experienced. As a result, specific modifications to mitigation timelines or targets to address specific external conditions that PG&E encountered in its implementation of its WMP have been identified and communicated.[4] None of these modifications to program timelines constitute a concern about the effectiveness of the mitigations, but rather a reflection of necessary execution timelines given external factors.

## Resolution

PG&E is filing this Tier 3 Advice Letter in compliance with the Decision. However, PG&E does not have concerns with the effectiveness of any programs outlined in its 2019 WMP and has not raised any such concerns in this Tier 3 Advice Letter. Therefore, PG&E would be amenable if the Commission disposes of this Tier 3 Advice Letter accordingly.

## Protests

Anyone wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than December 23, 2019, which is 21[5] days after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

[4] Second Amendment, p. 1.
[5] The 20-day protest period concludes on a weekend, therefore, PG&E is moving this date to the following business day.

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

**Effective Date**

PG&E requests that this Tier 3 advice submittal become effective upon Commission approval.

**Notice**

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.18-10-007. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Erik Jacobson
Director, Regulatory Relations

cc: Service List R.18-10-007



California Public Utilities Commission

# ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39E)

Utility type:
☑ ELC ☐ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Kimberly Loo
Phone #: (415)973-4587
E-mail: PGETariffs@pge.com
E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 5703-E

Tier Designation: 3

Subject of AL: Tier 3 Advice Letter "Reports of Possible Off Ramps"

Keywords (choose from CPUC listing): Compliance

AL Type: ☐ Monthly ☐ Quarterly ☐ Annual ☐ One-Time ☑ Other: Every 6 Months

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #: D.19-05-036

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information:
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? ☑ Yes ☐ No

Requested effective date:

No. of tariff sheets: 0

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

**Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:**

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

Name: Erik Jacobson, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility Name: Pacific Gas and Electric Company
Address: 77 Beale Street, Mail Code B13U
City: San Francisco, CA 94177
State: California Zip: 94177
Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

Clear Form

**PG&E Gas and Electric**
**Advice Submittal List**
**General Order 96-B, Section IV**

AT&T
Albion Power Company
Alcantar & Kahl LLP

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
P.C. CalCom Solar
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission
California State Association of Counties
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Cenergy Power
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
County of Tehama - Department of Public Works
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

Downey & Brand
East Bay Community Energy
Ellison Schneider & Harris LLP
Energy Management Service

Engineers and Scientists of California

Evaluation + Strategy for Social Innovation
GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Charge Networks
Green Power Institute
Hanna & Morton
ICF

International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc. Linde
Los Angeles County Integrated Waste Management Task Force
Los Angeles Dept of Water & Power
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenzie & Associates

Modesto Irrigation District
Morgan Stanley
NLine Energy, Inc.
NRG Solar

Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy
Praxair

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions

SCE
SDG&E and SoCalGas

SPURR
San Francisco Water Power and Sewer
Seattle City Light
Sempra Utilities
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Utility Specialists

Verizon
Water and Energy Consulting Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
Yep Energy

**Erik Jacobson**
Director
Regulatory Relations

Pacific Gas and Electric Company
77 Beale St., Mail Code B13U
P.O. Box 770000
San Francisco, CA 94177

Fax: 415-973-3582

June 1, 2020

**Advice 5837-E**
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

**Subject:** Reports of Possible Off Ramps

## Purpose

This Tier 3 Advice Letter is being submitted in compliance with the Guidance Decision on 2019 Wildfire Mitigation Plans Submitted Pursuant to Senate Bill 901, Decision 19-05-036 (Decision), Ordering Paragraph (OP) 1 to describe "any concerns about the effectiveness of any program" in Pacific Gas and Electric Company's (PG&E") Wildfire Mitigation Plan (WMP).[1] This is PG&E's second Report on Possible Off Ramps.

## Background

The Decision provides that within six months and twelve months of its effective date, the "electrical corporations named as respondents shall file [a] Tier 3 Advice Letter entitled 'Reports on Possible Off Ramps,' describing any concerns about the effectiveness of any program of their individual Wildfire Mitigation Plans."[2] The "report shall clearly describe the concern, contain a specific proposal for action, including if applicable a recommendation to reduce or end the specific mitigation identified, and include any expert or other authoritative information available on the efficacy of the mitigation."[3]

PG&E submitted its first Report on Possible Offramps on December 2, 2019, in which we reported that no concerns regarding the effectiveness of our programs had been identified. In the Commission Decision 20-03-004 for Phase 2 of Rulemaking 18-10-007, the Commission approved with limitations PG&E's first Report on Possible Off Ramps[4].

[1] Decision, OP 1.
[2] *Id.*
[3] *Id.*
[4] D.20-03-004, Ordering Paragraph 23

**Impacts of COVID-19**

PG&E takes seriously the threat of the novel coronavirus (COVID-19) pandemic and is taking measures to protect the health and safety of our customers and our workforce while continuing to provide safe and reliable service and execute on our WMP initiatives. We are also closely monitoring the impact of COVID-19 on our suppliers and third-party vendors to the extent it is affecting them being able to deliver the required equipment and services planned for in our WMP. While these impacts do not necessarily inform the effectiveness of our WMP initiatives, it has altered the specific approaches, formats and timing of a number of business activities, including WMP initiatives, to date. A prime example is PG&E's 2020 Customer Outreach and Awareness Campaign. PG&E initially planned to hold in-person open houses in communities within its service territory that are located in High Fire Threat District (HFTD) areas. Due to the current pandemic, PG&E has altered its open house format from in-person to online webinars to enable continued community outreach while keeping our customers and community safe during the current pandemic. Similarly, since the filing of the 2020 WMP in February PG&E has created multiple deployment strategies for Community Resource Centers (CRCs) during PSPS events, including permanent structures, temporary facilities, open-air tents or vehicle-based mobile CRCs, that can be leveraged depending on the circumstances, including COVID-conditions, in the PSPS-impacted community.

PG&E remains committed to delivering on its essential work to reduce wildfire risk and will continue to adjust its execution strategy to appropriately balance the safety considerations of our customers and communities in response to COVID-19 and the 2020 wildfire season. Draft Resolution WSD-002 contemplates that execution challenges could arise as a result of the current pandemic and requires the utilities to file a report within 60 days of the Resolution being approved by the Commission on the impacts of COVID-19 on the work being performed in the 2020 WMPs. PG&E will provide further detail on the impacts of COVID-19 in that report.

**Concerns with Effectiveness of Programs**

PG&E has not identified concerns about the effectiveness of the programs in its 2020 WMP, which Draft Resolutions WSD-002 and WSD-003 have proposed conditional approval and will be considered at the June 11, 2020 Commission meeting. While PG&E's 2020 WMP has updated and superseded the 2019 WMP, PG&E has also not identified concerns about the effectiveness of the programs identified in its approved 2019 WMP.

**Resolution**

PG&E is filing this Tier 3 Advice Letter in compliance with the Decision. However, PG&E does not have concerns with the effectiveness of any programs outlined in its 2020 or 2019 WMPs and has not raised any such concerns in this Tier 3 Advice Letter.

Therefore, PG&E would be amenable if the Commission disposes of this Tier 3 Advice Letter accordingly.

**Protests**

*****Due to the COVID-19 pandemic and the shelter at home orders, PG&E is currently unable to receive protests or comments to this advice letter via U.S. mail or fax. Please submit protests or comments to this advice letter to EDTariffUnit@cpuc.ca.gov and PGETariffs@pge.com*****

Anyone wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than June 22, 2020, which is 21 days[5] after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the

[5] The 20-day protest period concludes on a weekend, therefore, PG&E is moving this date to the following business day.

following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

**Effective Date**

Pursuant to General Order (GO) 96-B, Rule 5.3, this advice letter is submitted with a Tier 3 designation. PG&E requests that this Tier 3 advice submittal become effective upon Commission approval.

**Notice**

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.18-10-007. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Erik Jacobson
Director, Regulatory Relations

cc: Service List R.18-10-007



# California Public Utilities Commission

# ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39E)

Utility type:
☑ ELC ☐ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Kimberly Loo
Phone #: (415)973-4587
E-mail: PGETariffs@pge.com
E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 5837-E

Tier Designation: 3

Subject of AL: Reports of Possible Off Ramps

Keywords (choose from CPUC listing): Compliance

AL Type: ☐ Monthly ☐ Quarterly ☐ Annual ☐ One-Time ☑ Other: Every 6 Months

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #: D.19-05-036

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information:
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? ☑ Yes ☐ No

Requested effective date: No. of tariff sheets: 0

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

**Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:**

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

Name: Erik Jacobson, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility Name: Pacific Gas and Electric Company
Address: 77 Beale Street, Mail Code B13U
City: San Francisco, CA 94177
State: California Zip: 94177
Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

Clear Form

**PG&E Gas and Electric**
**Advice Submittal List**
**General Order 96-B, Section IV**

AT&T
Albion Power Company
Alcantar & Kahl LLP

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission
California State Association of Counties
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Cenergy Power
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

Downey & Brand
East Bay Community Energy
Ellison Schneider & Harris LLP
Energy Management Service
Engineers and Scientists of California

GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Power Institute
Hanna & Morton
ICF
IGS Energy
International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc.

Los Angeles County Integrated Waste Management Task Force
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenzie & Associates

Modesto Irrigation District
NLine Energy, Inc.
NRG Solar

Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions

SCE
SDG&E and SoCalGas

SPURR
San Francisco Water Power and Sewer
Seattle City Light
Sempra Utilities
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Water and Energy Consulting Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
Yep Energy

Pacific Gas and Electric Company®

**Erik Jacobson**
Director
Regulatory Relations

Pacific Gas and Electric Company
77 Beale St., Mail Code B13U
P.O. Box 770000
San Francisco, CA 94177

Fax: 415-973-3582

July 5, 2019

**Advice 4117-G/5582-E**
(Pacific Gas and Electric Company ID U 39 M)

Public Utilities Commission of the State of California

**Subject:** **Plan for the Communication of Fire and Weather Data And Modeling Information As Required by Decision 19-05-037, Ordering Paragraph 11**

Pursuant to Ordering Paragraph 11 of Decision (D.) 19-05-037, issued by the California Public Utilities Commission (CPUC or Commission) on June 4, 2019, Pacific Gas and Electric Company (PG&E) submits this Tier 1 Advice Letter (AL) providing its plan for communicating the fire and weather data and modeling information from its Wildfire Safety Operations Center (WSOC) in real-time during potential or actual emergency events to affected agencies, governments, and first responders.

In this AL, PG&E provides the following information: (1) an overview of the WSOC tools and information; (2) PG&E's current and future plans for communicating WSOC information; (3) the process for communicating WSOC tools and information; and (4) additional communications during emergency events.

## 1. Overview of WSOC Tools and Information

PG&E's WSOC monitors potential fire threats across its service area in real-time and coordinates prevention and response efforts. The WSOC is staffed 24 hours a day, primarily during wildfire season, and operational at other times of the year depending on conditions. The analysts that staff the WSOC are a highly qualified team composed of individuals knowledgeable in fire science, electric and gas operations, meteorology, dispatch services, and other related fields.

The WSOC provides real-time monitoring of conditions leveraging on-the-ground field teams, PG&E weather stations, live camera feeds, satellite data capture, emergency alert systems and social media from agencies such as CAL FIRE, National Weather Service (NWS), National Oceanic and Atmospheric Association (NOAA), California Highway Patrol (CHP) and local public safety authorities.

Weather monitoring and forecasting is one of the most important inputs into the WSOC, including how weather feeds into PG&E's daily Fire Danger Forecast (a Utility-specific

risk index). To further advance forecasting capabilities, PG&E is expanding its network of weather stations to monitor and forecast weather conditions and better assess where extreme weather with potential wildfire danger could occur. This will allow PG&E to respond quickly and appropriately to keep communities, employees, and customers safe. Data collected by the weather stations is streamed in real-time and is available to state and local agencies and the public through online sources such as the National Weather Service and MesoWest (mesowest.utah.edu). With these weather stations, PG&E is able to capture localized data related to temperature, wind speeds and humidity levels to provide improved awareness of current fire danger conditions.

Similarly, PG&E is expanding the number of high-definition (HD) cameras available to improve real-time awareness. PG&E makes these cameras available to the public through the AlertWildfire network. AlertWildfire is a consortium of 3 universities: The University of Nevada, Reno (UNR); University of California San Diego (UCSD); and the University of Oregon (UO). The AlertWildfire network provides access to state-of-the-art Pan-Tilt-Zoom (PTZ) fire cameras and associated tools to help firefighters and first responders: (1) discover/locate/confirm fire ignition, (2) quickly scale fire resources up or down appropriately, (3) monitor fire behavior through containment, (4) during firestorms, help evacuations through enhanced situational awareness, and (5) ensure contained fires are monitored appropriately through their demise. Additional background and access to these cameras is available at http://www.alertwildfire.org/.

In addition to these tools, PG&E is actively expanding the resources available to enhance real-time situational awareness regarding active fires, wildfire potential risk and related factors. This includes satellite fire detection technology and a fire spread model. These two technologies have yet to be fully implemented at PG&E, but show significant promise in enhancing our future capabilities in understanding fire risk, conditions and appropriate responses.

## 2. PG&E's Current and Future Plans for Communicating WSOC Information

As noted above, PG&E's weather station data and HD camera feeds are already publicly available through third party websites. PG&E also has additional data sharing processes in place or currently under development to share WSOC information to affected agencies, governments, and first responders.

- **Full-time California Office of Emergency Services (CalOES) data sharing:** PG&E has a full-time representative from its Emergency Preparedness & Response (EP&R) team embedded with CalOES at the State Warning Center to maintain alignment and situational awareness for all hazards and incidents that may impact either organization. Under normal, non-emergency, conditions this individual, on duty Monday-Friday 0800-1700, is positioned in the "Sitcell" (as labeled by CalOES) and is tasked with communicating PG&E's outlook for the next 5-7 days including potential inclement weather (storms, fire weather, etc.). This outlook leverages PG&E tools to project how the incoming weather can potentially affect PG&E assets and how we are preparing to respond. In addition,

as PG&E incidents occur, this position is responsible to proactively advise the CalOES Warning Center. Through this EP&R representative PG&E shares with CalOES the WSOC forecasting tools including PG&E's Fire Danger Forecasts (Utility Risk Index) and Storm Outage Prediction Project (SOPP) model.

- **Public Safety Power Shutoff (PSPS) Portal:** To help cities, counties, tribes, agencies, and emergency responders respond to PSPS events, PG&E has established a secure data transfer portal to provide event-specific information in advance of and during an event. The information will include estimated start time of a potential PSPS event, forecasted weather duration, estimated time range to full restoration, number of customers, including volume of medical baseline and critical facilities, in the potentially impacted area, and maps (shapefiles and KMZs) that include boundaries of the area subject to de-energization and affected circuits. Additional event-specific data, including names and addresses of potentially impacted medical baseline customers and critical facilities within a jurisdiction, is available with a signed and fully-executed non-disclosure agreement.

- **Electric Public Safety Specialists (PSSs):** The WSOC coordinates closely with the Public Safety Specialists to share intelligence with local agencies and partners on fires and the potential impacts to PG&E assets. The PSSs are PG&E's liaisons to first responders during emergency response incidents. The PSS team will communicate and share information, for example PG&E operations updates and fire maps overlaid with PG&E assets, locally with the impacted agency(ies). During significant fire responses, the PSSs will serve as PG&E's agency representatives at base camps and share intelligence between PG&E field operations and the authority having jurisdiction (AHJ).

- **Real-time weather monitoring module on pge.com:** PG&E is developing a module that will be embedded with the pge.com webpage to provide increased detail to the weather conditions and forecasts that PG&E is viewing. For example, under development is a red/yellow/green indicator map of the likelihood of a PSPS being called for specific areas within PG&E territory. Combining information from PG&E's weather stations and the National Weather Service this website is anticipated to provide graphical information regarding wind speed & gusts, humidity levels, and temperature for PG&E's service territory. This information will be incorporated into the above-mentioned PSPS "predictor" information regularly refreshed by data from PG&E's Meteorological team.

While PG&E is working to communicate as much fire and weather data and modeling information as possible to affected agencies, governments, and first responders, there is some information which does not appear to be prudent to share, as described in more detail below. PG&E is open to discussing this matter further with the Commission and other parties.

- **PG&E's Fire Danger Ratings and Forecasts:** PG&E has discussed at length with CAL FIRE and other state agencies the pros and cons of sharing geographic wildfire risk forecasts, which are produced daily for internal use to support safe operations in potential wildfire risk areas. PG&E's daily wildfire risk forecasts, while informed by nationwide standards for evaluating wildfire risk, do not necessarily represent the universal wildfire risk forecast and are oriented toward the wildfire risk associated with utility facilities. As a result, PG&E's wildfire risk forecast may not match similar forecasts created and distributed by other authorities that do not have a utility-oriented view. CAL FIRE is the appropriate authority on fire risk forecasts and conditions. In the interest of avoiding confusion and the potential misalignment of forecasts, and in alignment with CAL FIRE being the authority on wildfire risk forecasts for the public, first responders, governmental agencies and others, PG&E does not plan to share wildfire risk forecasting data.

- **PG&E's SOPP model:** Similarly, the SOPP model is utility specific and provides forecasts of the possible damage to PG&E's utility infrastructure from forecasted weather events. This information allows PG&E to make important resource decisions about where to locate crews and appropriately scale our response staffing. However, this information has little use for non-utility operators and may actually confuse or misdirect first responders by highlighting the areas likely to experience utility asset damage, not the most at-risk overall locations for damage or hazard to people and property.

Finally, in the future, PG&E is interested in providing access for appropriate first responder audiences to additional real-time situational awareness tools and information. However, the interface and tools necessary for such data sharing have not yet been scoped or defined. Therefore, significantly more development is necessary to determine the most effective way to share this information. In particular, PG&E believes there would be value in sharing with agency and first responder partners:

- **Aircraft and satellite data:** This includes the latest satellite fire detection technology PG&E is leveraging in partnership with the Space Science and Engineering Center (fed by the GOES 16 & 17, Aqui-Modis, Terra-Modis and SuomiNPP-VIIRS satellites). Real-time information on potential fire ignitions obviously has immense benefit to first responders and fire agencies. However, the full capabilities and limitations of these tools must be adequately understood by both PG&E and any partner agencies or first responders, including the risk of improper resource deployment due to "false positives."

- **Non-wildfire information:** Historic data on burn scar areas, landslides or slope stability information, and earthquake maps may be useful in the appropriate context.

- **Fire Spread Modeling:** A new tool under development, Fire Spread Modeling can have considerable benefits in terms of understanding potential impact areas for an existing or hypothetical fire ignition. For example, during real-time emergency events (like existing wildfires) jurisdictions with a need to know (namely the AHJ with decision making authority) could be provided information on fire spread modeling outputs during scheduled conference calls. However, like all tools, this resource has limitations that must be fully understood to be safely and appropriately leveraged. For example, existing or likely fire containment is not modeled in this tool which may result in substantial differences between model outputs and true-to-life experiences. Therefore, this tool should only be deployed to true fire modeling experts who are well acquainted with its capabilities and limitations. Further, serious consideration must be given to downside risks of sharing this tool, including the risk that this tool becomes available to a bad actor who is then able to identify fire ignition locations and/or conditions with catastrophic consequences.

  Overall, while one of the most exciting tools PG&E is developing, Fire Spread Modeling is also one of the most complex and complicated. PG&E has only begun developing this tool in the last several months and needs to mature the tool and its understanding further, including fully calibrating and validating the tool inputs and outputs. In the long run, PG&E anticipates it may be willing to share this tool on a request basis, with the appropriate, well-qualified fire behavior experts.

## 3. PG&E's Process for Communicating WSOC Tools and Information

PG&E plans to execute on the following process and general timeline (pending emergency response activities and operational constraints) to partner with first responders in evaluating what tools to share and how to best share them. As noted above, several of these tools are new or still evolving, as are several aspects of the wildfire conditions and response plans for PG&E and others. As a result, PG&E must be realistic about the number of partners it can engage with during the remainder of 2019, which includes the traditional peak of wildfire season, and the expected outcomes of such an engagement. PG&E proposes the following actions to assess and develop a framework and/or tools for how to share PG&E's situational intelligence information:

- Approximately during Q3 2019[1], PG&E proposes to conduct meetings with key representatives from:
  - CAL FIRE

[1] Q3 historically coincides with the peak of wildfire season, depending on the severity, duration and resource requirements associated with this year's wildfire season, it may not be possible to complete this level of engagement during Q3.

  - CalOES (including the State Warning Center)
  - United States Forest Service (USFS)
  - CPUC (if the Commission is interested in participating)
- These meetings would include:
  - PG&E's WSOC and Meteorology teams sharing information and performing demos of PG&E's existing tools;
  - External agencies sharing what their information needs are;
  - External agencies sharing sources of intelligence they leverage that may be useful to PG&E; and,
  - PG&E and external agencies discussing a process and/or interface that would be mutually beneficial for sharing information for planning and real-time purposes
- Based on these inputs, starting in Q4 2019 and beyond, PG&E would:
  - Develop, with input and engagement from agency partners, the long-term sharing processes;
  - Communicate policies and procedures to key agency partners prior to any data sharing process or tool implementation; and,
  - Explore and/or begin technology development, as applicable, using agile development methodology

As PG&E's processes mature and initial partnerships with state-wide agencies evolve, PG&E is very interested in expanding engagement to Local Fire Departments, as well. Given time and resource constraints, including the realistic likelihood that some wildfire response activities will consume the focus of resources for all parties, PG&E does not expect to be able to meaningfully engage Local Fire Departments in the first phase of outreach discussed above.

In addition, PG&E is aware of, and will evaluate as appropriate, near-term solutions that may be available to fast-track some or all of the above discussed data sharing. For example, PG&E is aware of and has discussed at length CalOES' "SCOUT" tool that is currently leveraged to share information across agencies. PG&E does not currently have access to this tool to completely understand and evaluate it. If access can be granted, the SCOUT tool may provide a near-term, or even long-term, solution for some or all of the scope of data sharing being considered.

**4. Additional Communications and Data Sharing during Emergency Situations**

As outlined in its Company Emergency Response Procedure (CERP), PG&E may activate its Emergency Operations Center (EOC) for several reasons that could include an outage affecting a large number of customers, wildfires, earthquakes, or newsworthy, large-scale and/or dual-commodity incidents. PG&E's EP&R Director, in consultation with the Line(s) of Business affected as a result an emergency, makes the decision to open the EOC to support an incident. Upon activation of the EOC the EP&R team makes notifications to the CalOES Warning Center and the CPUC.

If PG&E's EOC is activated, there are the additional communication processes to share real-time data during emergencies. For example, during a potential PSPS event, PG&E's meteorology department holds regular calls with the NWS and Predictive Services to discuss current weather conditions and their potential impacts. In addition, during potential PSPS events, PG&E holds daily calls with state agencies including the CPUC, CAL FIRE, CalOES, and the Governor's office, as well as calls with regional agencies of the potentially affected areas, to keep them informed regarding the potential event and PG&E's current forecasts and outlook. While weather forecasts are generally discussed at a high level, these conversations are more focused on data related to the scope, timing and impacts of the potential PSPS event underway.

During a PSPS event, PG&E has coordinated with CalOES and other utilities to utilize a PSPS notification form that allows CalOES to best track the status of a PSPS event, and quickly share updates with CalOES Senior Leadership, the Governor, and local OES organizations. This form will be completed at various milestones of a PSPS (e.g. EOC activation for PSPS, decision to de-energize, etc.).

In the case of a PG&E EOC activation or a State Operations Center (SOC) activation, PG&E will staff the SOC/UOC with an additional person, the "SOC Liaison" to allow the "Sitcell" (PG&E's full-time support with the CalOES State Warning Center) for advanced planning and to act as the primary point of coordination between PG&E and all state agencies during emergencies. PG&E's SOC Liaison facilitates communication of emergency information between the PG&E EOC and the SOC and works with the SOC to request federal resources from FEMA and other federal agencies. PG&E's SOC Liaison reports to the EOC Chief of Staff within the PG&E EOC structure and works among other members of the CUEA in the Utilities Operations Center (UOC) in Mather, California.

**Protests**

Anyone wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than July 25, 2019, which is 20 days after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

## Effective Date

Pursuant to Ordering Paragraph 11 of D. 19-05-037, PG&E requests that this Tier 1 advice submittal become effective upon date of submittal, which is July 5, 2019.

## Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.18-10-007. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to

any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/

Erik Jacobson
Director, Regulatory Relations

cc: Service List for R.18-10-007



# California Public Utilities Commission

# ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39M)

Utility type:
☑ ELC ☑ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Yvonne Yang
Phone #: (415)973-2094
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EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 4117-G/5582-E

Tier Designation: 1

Subject of AL: Plan for the Communication of Fire and Weather Data And Modeling Information As Required by Decision 19-05-037, Ordering Paragraph 11

Keywords (choose from CPUC listing): Compliance

AL Type: ☐ Monthly ☐ Quarterly ☐ Annual ☑ One-Time ☐ Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #: D.19-05-037

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information: See attached Confidentiality Declaration and Matrix
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information: N/A

Resolution required? ☐ Yes ☑ No

Requested effective date: 7/5/19

No. of tariff sheets: N/A

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

**Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:**

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

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Title: Director, Regulatory Relations
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Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
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Email:

Clear Form

**PG&E Gas and Electric**
**Advice Submittal List**
**General Order 96-B, Section IV**

AT&T
Albion Power Company
Alcantar & Kahl LLP

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
P.C. CalCom Solar
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission
California State Association of Counties
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Cenergy Power
Center for Biological Diversity
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
County of Tehama - Department of Public Works
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

Downey & Brand
East Bay Community Energy
Ellison Schneider & Harris LLP
Energy Management Service

Engineers and Scientists of California

Evaluation + Strategy for Social Innovation
GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Charge Networks
Green Power Institute
Hanna & Morton
ICF

International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc. Linde
Los Angeles County Integrated Waste Management Task Force
Los Angeles Dept of Water & Power
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenzie & Associates

Modesto Irrigation District
Morgan Stanley
NLine Energy, Inc.
NRG Solar

Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy
Praxair

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions

SCE
SDG&E and SoCalGas

SPURR
San Francisco Water Power and Sewer
Seattle City Light
Sempra Utilities
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Utility Specialists

Verizon
Water and Energy Consulting Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
Yep Energy

**BEFORE THE PUBLIC UTILITIES COMMISSION**
**OF THE STATE OF CALIFORNIA**

| | |
|---|---|
| Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018) | **R.18-10-007** (Issued October 25, 2018) |

# PACIFIC GAS AND ELECTRIC COMPANY'S (U 39 E) DATA COLLECTION FOR WILDFIRE MITIGATION PLAN REPORT PURSUANT TO DECISION 19-05-036, ORDERING PARAGRAPH 2


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July 30, 2019

**BEFORE THE PUBLIC UTILIITES COMMISSION**
**OF THE STATE OF CALIFORNIA**

| | |
|---|---|
| Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018). | **R.18-10-007** (Issued October 25, 2018) |

# PACIFIC GAS AND ELECTRIC COMPANY'S (U 39 E) DATA COLLECTION FOR WILDFIRE MITIGATION PLAN REPORT PURSUANT TO DECISION 19-05-036, ORDERING PARAGRAPH 2

Pacific Gas and Electric Company ("PG&E") respectfully submits its Data Collection for Wildfire Mitigation Plans Report ("Report") as directed by the California Public Utilities Commission ("Commission") in Decision 19-05-036, Ordering Paragraph 2. PG&E's Report is included as Attachment A to this filing. Attachment B to this filing includes the Data Dictionary requested by the Commission in Ordering Paragraph 2(b).

Respectfully submitted,

ALYSSA KOO
CHARLES MIDDLEKAUFF

By: */s/ Charles Middlekauff*
CHARLES MIDDLEKAUFF

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July 30, 2019

# ATTACHMENT A

# PACIFIC GAS AND ELECTRIC COMPANY'S DATA COLLECTION FOR WILDFIRE MITIGATION PLANS REPORT

In Decision ("D.") 19-05-036, Ordering Paragraph 2, the California Public Utilities Commission ("Commission") directed that all electrical corporation respondents provide a report by July 30, 2019 that addresses six categories of information, as well as information regarding consultation with experts in data analysis. Below, Pacific Gas and Electric Company ("PG&E") provides the information request identified in D.19-05-036 and its response to each item.

In general, through the Safety Model Assessment Proceeding ("SMAP") process, PG&E worked with stakeholders to develop a robust risk assessment methodology and probabilistic view of risk. Based on this methodology, PG&E is using data from a variety of sources (listed in tables below) to determine the probability of a utility-caused wildfire and the distribution of consequences that could result from an ignition. Using this model, which also will be included in PG&E's 2020 Risk Assessment and Mitigation Phase ("RAMP") submission, PG&E is able to measure the baseline wildfire risk and, based on changes in the frequency of risk drivers resulting in ignitions, and to measure the impact its mitigation measures are having on the overall probability of a wildfire. Given the work on the SMAP risk assessment process, a reasonable measure of wildfire mitigation effectiveness could be achieved by measuring the change in the probability of a wildfire caused by PG&E assets or activities. Each of the data sets listed play a role in that probabilistic risk assessment and can result in determining a baseline probability and a forecasted mitigated probability and be able to track progress between the two. In this way, the Wildfire Operational Risk Model provides an organizing framework for the data inputs described below and synthesizes these inputs into a measure of risk.

The remainder of this Report includes the language from each of the subparts in Ordering Paragraph 2 of D.19-05-036 and PG&E's response to each of these subparts.

**a) Includes a "Data and Map Product Catalogue" that lists, identifies, and describes all datasets and map productions the electrical corporation possesses, collects and**

**maintains that could be useful in assessing the effectiveness of its Wildfire Mitigation Plan (WMP) in reducing catastrophic wildfire risk**

Table 1 below lists the datasets and map productions that PG&E is currently using that could be used to assess the effectiveness of PG&E's Wildfire Safety Plan ("Plan") in reducing wildfire risk. Table 2 lists datasets and map productions that are still in development, but that could be useful in the future to assess Plan effectiveness.

Each table identifies the dataset name and the type of data included in the dataset. Datasets can be used in various ways to assess Plan effectiveness. The third column in Tables 1 and 2 identifies one of the following five possible use cases for the data, which are further described below:

1. System Performance: These datasets include information regarding the performance of PG&E's electrical system, such as the number of outages that have occurred. The count and cause of outages is information that PG&E uses and plans to continue using to measure the safety of the electric system. Because outages can potentially result from situations that may be related to wildfire risks (*e.g.*, vegetation contacting a facility and causing an outage, etc.), this information can be useful in assessing the effectiveness of certain wildfire mitigation measures (*e.g.,* Enhanced Vegetation Management, etc.).

2. Specific Outage and Ignition Data: These datasets include information on the causes of specific outages and wildfire ignitions. This data can be used to determine the primary causes of and best approaches for mitigating wildfire risk. For example, to develop the Plan, PG&E used wildfire ignition data to identify the key drivers of wildfires and then developed programs and strategies to mitigate these drivers.[1] Outage and ignition data can also be used after the fact to determine whether the Plan measures impacted ignitions which, in certain circumstances, could cause a wildfire.

3. Identifying Vegetation Management ("VM") Work: These datasets include information regarding vegetation management work that has been performed, including inspections. Because vegetation is the leading risk in Tier 2 and Tier 3 High Fire Threat District ("HFTD") areas, this information will assist in assessing Plan effectiveness.

4. Identifying Grid Repair Work: These datasets include information regarding repair work that has been performed based on inspections. Because faulty equipment can result in wildfires, this information will assist in assessing the Plan effectiveness.

5. Developing Historical and Forecast Data: These datasets are used to capture historical weather data or develop forecasts. Historical data, such as the number of high fire danger days, or forecast data, such as meteorology, can be used to predict

[1] *See* Plan, Section 3.2.2 at pp. 22-28.

future wildfire threats and to assess whether the Plan measures are effectively addressing future forecasted risks.

Over time, all of these datasets can be used to measure the performance of work and the corresponding reduction of risk.

Finally, the last column in Tables 1 and 2 includes a brief description of the dataset. PG&E can, upon request by the Commission or parties, provide more detail regarding any of the datasets identified.

**Table 1: Data in Current Use**

| # | Dataset Name | Data Type | Use Case Assessing Effectiveness of WMPs | Description of Data |
|---|---|---|---|---|
| 1 | Utility Fire Potential Index (FPI) | Meteorological dead and live fuel moisture | Developing Historical and Forecast Data | Numerical Rating |
| 2 | VM inspections, projects and points | Vegetation | Identifying VM Work | Inspection data: forester assessment of tree health |
| 3 | Distribution inspection tag information | Asset | Identifying Grid Repair Work | Tag type, identified asset(s) |
| 4 | Transmission inspection tag information | Asset | Identifying Grid Repair Work | Tag type, identified asset(s) |
| 5 | Incident investigation data | All | Specific Outage and Ignition Data | Time, location, size, involved agencies |
| 6 | Ignition data | All | Specific Outage and Ignition Data | Time, location, size, involved agencies |
| 7 | Distribution outage data | Asset | System Performance | Time, duration, cause, location |
| 8 | Transmission outage data | Asset | System Performance | Time, duration, cause, location |
| 9 | Incident Logging and Information System (ILIS) | Field work and outage logging system | System Performance | Outage information, planned / unplanned work logs, switch logs, crew dispatch & resource allocation |
| 10 | Vegetation Management Outage Investigations | Outages | System Performance | Time, duration, cause, location |

| # | Dataset Name | Data Type | Use Case Assessing Effectiveness of WMPs | Description of Data |
|---|---|---|---|---|
| 11 | PG&E Weather Station Data | Meteorology | Developing Historical and Forecast Data | Weather Station Data From PG&E Weather Stations |

**Table 2: Data for Potential Future Use**

| # | Information Name | Date Type | Use Case Assessing Effectiveness of WMPs | Description of Data |
|---|---|---|---|---|
| 1 | REAX | Meteorology and Vegetation | Developing Historical and Forecast Data | Measure of potential for a fire to propagate |
| 2 | Egress | Transportation Infrastructure | Developing Historical and Forecast Data | Measure of availability of roads to provide evacuation from an area |
| 3 | LiDAR | Vegetation | Identifying VM Work | Aerial survey of trees: type, location and height of trees |

**b) Provides a "Data Dictionary" detailing the data tables, attribute column headers, sample attributes, alias, description, and metadata about the datasets and map products identified in a.**

The Data Dictionary is included as Attachment B to PG&E's filing.

**c) Proposes metrics to assess whether the Wildfire Mitigation Plans are having or will have the desired result (i.e. – a reduction in the risk of catastrophic wildfire)**

PG&E appreciated the direction provided by the Commission in D.19-05-037 (approving PG&E's Plan) concerning the development of metrics.[2] As the Commission explained, "[w]e expect continuous refinement of the metrics, with input from the parties, as more experience is gained under the annual WMP filing process."[3] The following metrics are or could be used to assess the effectiveness of the Plan:

| # | Proposed WMP Effectiveness Metric | WMP Mitigation Plan Category | Description of Metric | Data Needed |
|---|---|---|---|---|
| 1 | Number of Wires Down Events within HFTD areas when FPI is rated as very-high or higher | System Hardening, Inspections | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, FPI, distribution and transmission outage data |

[2] *See* D.19-05-037 at pp. 46-49 (concerning metrics).

[3] *Id*. at p. 47.

| # | Proposed WMP Effectiveness Metric | WMP Mitigation Plan Category | Description of Metric | Data Needed |
|---|---|---|---|---|
| 2 | Number of Utility Equipment Caused Ignitions in HFTD areas | System Hardening, Vegetation Management | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, Ignition data |
| 3 | Number of Vegetation Caused Outages within HFTD areas, when FPI rated as very-high or higher | System Hardening, Vegetation Management | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, FPI, distribution and transmission outage data |
| 4 | Number of Vegetation Caused Ignitions in HFTD areas | System Hardening, Vegetation Management | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, Ignition data |
| 5 | Number of Other/Animal Caused Outages in HFTD areas, when FPI is rated as very-high or higher | System Hardening, Inspections | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, Distribution and transmission outage data, FPI |
| 6 | Number of Other/Animal Caused Ignitions in HFTD areas | System Hardening, Inspections | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, Ignition data |
| 7 | Number of faults on HFTD circuits associated with contact from object or equipment failures | System Hardening, Vegetation Management, Inspections | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, transmission and distribution outage data |
| 8 | Number of Conventional Blown Fuse Events in HFTD areas | System Hardening, Vegetation Management, Inspections | Comparison of Before WMP and After WMP actions implemented | HFTD polygons, Distribution outage data |
| 9 | Number of National Fire Danger Rating System "Very Dry" and "Dry" days | N/A | Comparing increases in "Dry" and "Very Dry" days year over year and comparing with other metrics | Weather data |

PG&E looks forward to receiving feedback on these metrics from the Commission and parties and continuing to refine the metrics used to assess Plan effectiveness.

PG&E also acknowledges that starting in 2020, each investor-owned utility ("IOU") in California will be required to produce a Safety Performance Metrics report which will track the performance of several electric safety metrics focused on the safety of each IOU's

electric system.[4] PG&E would like to discuss whether or not the reporting of metrics proposed in the Plan should be consolidated with the metrics reported in the Safety Performance Metrics report.

**d) Suggests new areas of data collection that could assist in assessing WMP effectiveness and align utility data collection efforts**

PG&E continues to analyze and develop methods to improve the formulation of leading indicators to identify electric system conditions that precede both equipment failures and outages and to predict and identify fire hazard conditions. Improvements in leading indicators bring multiple benefits, including the ability to: (1) revise as needed asset maintenance and replacement plans; (2) improve inspection programs in both effectiveness and efficiency; and, (3) improve the understanding of system conditions to operate the system. Building on areas identified in PG&E's response to subpart (a), PG&E has identified the following new areas of data collection that could assist in assess Plan effectiveness:

- Additional weather station data: Meteorology data is a prime area of focus. PG&E continues to increase the coverage of its weather stations and cooperate with both national and state organizations on the ideal location for future weather stations as well as collaborating on meteorology data and models.

- Egress data: The measure of the ability for a population to evacuate a defined geographic location when a wildfire occurs.

- LiDAR collected data in Tiers 2 & 3: PG&E is conducting LiDAR patrols of all Tier 2 and 3 lines. As this data is collected, vegetation models will be enhanced with the improved identification, assessment, and tracking of vegetation near electric facilities.

- Wildfire spread model data: Wildfire spread models are the focus of many government agencies and third parties, as well as PG&E. As PG&E collectively works to better understand and prevent wildfires, the data sets and models associated with this work will continue to evolve and PG&E anticipates cyclic updates in this area.

- Asset model data: Asset models can help better anticipate areas of the electric grid that have a higher probability of failure to improve prioritization of work plans.

With improved meteorology data, vegetation data, and asset data, the ability of predictive models to assess the probability and risk of asset failure, outages, ignitions, and wildfires are improved. PG&E is developing a framework for operational predictive models for both the transmission and distribution systems. Some of these models are part of the toolset for determining the need for Public Safety Power Shutoff ("PSPS") activations. As these models are asset-based, the outage probabilities are improved as assets are maintained or replaced. In this manner these models could be used to predict the effectiveness of work to reduce catastrophic wildfires.

[4] D.19-04-020, OP 1 and 2

**e) Proposes a schedule for collecting and using the data for future wildfire mitigation efforts**

As indicated above in subpart (a), PG&E is already collecting data in a number of datasets and proposes to expand the collection of information with future datasets. With regard to PG&E and other parties using this data, PG&E proposes that the Commission and stakeholders first determine a set of data requirements and potential use cases along with preferred file types to facilitate third-party use and consistency. These requirements along with a schedule for collecting and using the data could be developed by October 1, 2019.

**f) Proposes a manner of making the data available to third party researchers for the purposes of improving wildfire mitigation. Before making this filing, the electrical corporations shall consult experts in data analysis, including, if relevant, presenters at the Wildfire Technology Innovation Summit co-sponsored by this Commission on March 20-21, 2019, to ensure they gather the data in a manner that allows assessment, including using common data gathering methods across all respondent electrical corporations.**

Third-party access should be modeled after the current PG&E process for providing meteorology data through a secure web portal. The portal would require access based on a signed non-disclosure agreement and other requirements that the Commission and stakeholders might request.

PG&E has also solicited input from other third-party experts in data analysis concerning how utilities can ensure data is gathered in a manner that allows assessment, including how to utilize common data gathering methods across all respondent electrical corporations.

Specifically, PG&E has sought input from TROVE, a third-party expert in this area. Below, PG&E provides the feedback that it has received from TROVE on this issue.

***Feedback from TROVE:***

In TROVE's opinion as experts in helping utilities maximize the value in their data and delivering analytics to support data-driven, risk-informed decision making, a successful data approach can be broken into 3 categories:

1. **Data access.** First and foremost, data access for third party researchers poses a unique challenge when looking to work with utility data. Traditionally, many utilities store their data on private servers, usually spread across multiple different places throughout the organization. By compiling the relevant utility data in one cloud-based location (AWS or similar), utilities will be able to significantly reduce the burden of data access for third party researches. Additionally, by leveraging a standard platform, such as AWS, third party researchers can then easily bring their software and analytics into the secure utility environment and quickly get up to speed on the value-add research instead of spending significant up-front effort on unnecessary data transfer and setup processes.

2. **Utility Context.** PG&E and the other CA utilities will benefit significantly from active partnerships with third party analytics and data science companies who have extensive utility experience. Utility data and, more importantly, utility context can be nuanced and challenging. A data analysis without relevant utility expertise may uncover results that are irrelevant or impossible to act on if the data is analyzed without the proper context and understanding. In order for data analysis to be value-add, the third-party researchers should have a healthy balance of "new" approach (new data, new methods, new data science expertise, etc.) coupled with a foundational understanding of utility context (What is the specific business problem we are trying to solve? How might new analyses impact business operations? What contextual challenges shape the desired outcomes?).

    a. **Non-utility data.** One specific area of balancing new-ness with utility expertise is in finding experts who can combine new data sources with traditional utility data. For example, data experts who understand the data science approach of predictive hazard tree identification combined with the utility data of what risk that poses to utility assets are the perfect balance of "new" with "context" to deliver high value results for utilities. Some specific areas of expertise (by no means exhaustive) might include: predictive hazard tree analytics, bird migration and impact prediction, lightning strike risk modeling, and predictive asset failure modeling, all of which can be overlaid with grid and asset data to perform detailed risk assessment.

    b. **Detailed Customer Data.** In additional to grid-related expertise, granular customer data and analytics could be used to understand and optimize communications and engagement strategies in addition to grid hardening and traditional risk mitigation techniques. Traditionally, many utilities leverage static, demographic-based personas to understand their customers (e.g., "techie millennials," "family of four," "retirees," etc.), but best practice is to begin using "Segment of One" understanding to deliver best-in-class engagement with customers. This targeted customer engagement approach can support multiple aspects related to the overall wildfire safety approach including: data-driven approach of how to best message to customers in order to get them to adopt safety practices (maintaining defendable space, understanding the increased presence of PG&E tree trimmers, preparing for PSPS, etc.) as well as informing grid safety investments (i.e., as a minor input to customer impact, asking questions such as: Which customers are most likely to complain about PG&E tree trimming causing potential delays? Which feeders have customers more likely to have well electric water pumps in case of PSPS? etc.)

3. **Metrics.** TROVE has done significant work with utilities on using historic/reporting data to determine future risk and inform risk-mitigation strategy. One of the key lessons learned from these efforts is: if a utility is only focused on eliminating major events (i.e., "a reduction in the risk of catastrophic wildfire"), there aren't enough data points to know if the utility is moving the needle or not. Instead, utilities who adopt a data-driven approach to minimizing the risk of minor events that have the potential to turn into major events (regardless of whether or not they actually do

become major events) is a best practice that can be data-driven and can form trackable metrics. The important thing is to be proactive, not reactive. The metrics that are best for reporting are not necessarily the metrics that will be the best decision making tools see article on why CAIDI/SAIDI/SAIFI shouldn't be used for deciding where to make reliability investments. For specific reduction of the risk of wildfires, TROVE believes there are two high value lenses through which risk should be viewed.

a. A data-driven risk score of all fire starts (regardless of size) combined with risk of growth (Wildfire Hazard Map) and impact (a combination of number and types of customers in vicinity).

b. A data-driven risk score of all outages that could have caused fires (i.e., veg related outages, wire down, catastrophic transformer failure, etc.). This could be evaluated both location agnostic and/or with a similar overlay of risk of growth and impact as outlined in #3a.

Tracking both of these metrics would help provide some consistency from year to year. Eliminating fire starts is the key metric, but if in any given year, fire starts decrease while outages increase, the utility may have simply gotten lucky in that outages didn't turn into fires at the normal expected rate. The combination of both metrics will provide richer context.

# ATTACHMENT B

# PACIFIC GAS AND ELECTRIC COMPANY'S DATA DICTIONARY

**REAX**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Probability | Probability | 5 | Relative probability of fire escaping initial attack efforts | (0-100) percentage |
| Consequence homes | Consequence_homes | 7 | Impacted number of homes | Number |
| Consequence timber | Consequence_timber | 18 | Impacted number of timbers | Number |
| Risk homes | Risk_homes | 34 | Overall risk to homes | Number (1-100) |
| Risk timber | Risk_timber | 56 | Overall risk to timber | Number (1-100) |

**Outage Producing Winds (OPW)**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Latitude | Lat | 34.18475925 | Latitude coordinate | Number |
| Longitude | Long | -118.9445101 | Longitude coordinate | Number |
| OPW | OPW | 23 | Outage Producing Wind | Percentage |
| Date | Date | MM/DD/YYYY | Date | Date |

**Egress**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Lat | Lat | 34.18475925 | Latitude coordinate | Number |
| Long | Long | -118.9445101 | Longitude coordinate | Number |
| Egress Factor vHFTD | Egress Factor vHFTD | 36846.23603 | Product of the Egress factor algorithm | Number |

**LiDAR**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| tree_id | tree_id | W120620080N38494844 | Unique tree ID | Mixed text and numbers |
| latitude | latitude | 34.18475925 | Latitude coordinate | Number |
| longitude | longitude | -118.9445101 | Longitude coordinate | Number |
| line_id | line_id | 163751102 | Line ID along which tree is located | Text |
| line_name | line_name | PINE GROVE 1102 | Line name along which tree is located | Text |
| division | division | ST | PG&E division | Text |
| d2w_af | d2w_af | 77.22 | Distance from tree branch to line | Number |
| ovr | ovr | -42.65 | Feet that the tree would exceed the line if it were to fall | Number |
| fall_in | fall_in | Yes | Boolean indicator whether tree would reach the line if it fell | Boolean |

**VM Outage**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| cRptNumber | Outage Rpt. Num: | 19-0080033 | System generated outage report number | cRptNumber |
| cCircuit | Circuit: | 253571115 | Circuit where outage occurred | cCircuit |
| populated by ILIS, not stored in our database | Equipment Condtion: | Normal | ILIS report of equipment condition | populated by ILIS, not stored in our database |
| nCustomers | ILIS CESO: | 15 | #Customers Experiencing Sustained Outages | nCustomers |
| sSRA | SRA: | no | outage location in SRA | sSRA |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| cLocation | Outage Location: | (N/OF CGC 417976451413) 179 N SUNNYSIDE | Description of outage location | cLocation |
| dOutageDate | Outage Date / Time: | 7/22/2019 | Outage date and time | dOutageDate |
| cLineType | Line Type (D): | Primary | Voltage/Line Description | cLineType |
| cInspector | Inspector: | Earl Remily | Outage report inspector name | cInspector |
| cDivCode | Divison: | Fresno | Outage division | cDivCode |
| cSSD | EquipID | D9023 | Source Side Device affected by outage | cSSD |
| dInspDate | Insp. Date: | 7/23/2019 | Date of outage inspection | dInspDate |
| bLocFound | Did you find where the outage occurred? | Yes | Did outage inspector find outage site? | bLocFound |
| cNotFoundReason | Reason: | No Evidence of Outage | Reason inspector did not find outage | cNotFoundReason |
| bDolipCauseCorrect | Was outage vegetation related? | Yes | Indicates whether outage was vegetation related | bDolipCauseCorrect |
| bLocMarked | Was there wire on ground or object? | no | Indicates whether wire was on ground or object | bLocMarked |
| nLat | Lat: | 36.4445 | Outage latitiude | nLat |
| nLon | Lon: | -119.4127 | Outage longitude | nLon |
| bAvoidable | Outage was avoidable | No | Indicates whether outage was avoidable or not | bAvoidable |
| cDOLIP_Cause | Original Cause in ILIS | Tree-Branch Fell on Line | Cause per ILIS report | cDOLIP_Cause |
| cWorkReq | WR for listed tree that caused outage | SRNC1016878 | Work request that contains the VMD record that has the tree that caused the outage | cWorkReq |
| bTreeFound | Was Tree or Branch Found? | Yes | Indicates if tree that caused the outage was found in the field. | bTreeFound |
| cSpecies | Species | Deodora Cedar | Tree species that was involved in the outage | cSpecies |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| nHeight | Height (ft): | 56 | Tree Height | nHeight |
| nDBH | DBH (in): | 20 | Tree Diameter at Breast Height | nDBH |
| nDistance | Distance of tree trunk from lines: | 16 ft | Distance of tree trunk from power lines | nDistance |
| cWeather | Weather at time of outage | Overcast | Description of weather at the time of the outage | cWeather |
| cConstruction | Construction Type | Crossarm | Conductor construction type | cConstruction |
| nTotalSplices | Total # splices in span (all phases): | 2 | Number of splices in conductors in the span | nTotalSplices |
| nMaxSplices | Max splices individual phase: | 2 | Maximum number of splices in an individual phase | nMaxSplices |
| cInsulation | Insulation | Bare Wire | Insulation/non insulation type | cInsulation |
| cDOLIP_Reason | Detail from ILIS | Tree Wire Down | Outage detail info from the ILIS report | cDOLIP_Reason |
| cReason | Describe Tree Condition and Reasons for Outage (Required): | HEALTHY TREE HAD A GREEN LIMB BREAK AND SAG ONTO THE PRIMARY LINES. NO VISABLE DECAY. | Free text description of outage conditions | cReason |
| cCause | Cause of Outage | Wind blew tree into line | Radio button choices for cause of outage | cCause |
| nTreeFail_ft | ft. from attachment | 10 | Distance of broken branch from attachment | nTreeFail_ft |
| nTreeFail_dbh | in diameter at break | 24 | Diameter of tree at break on trunk failure | nTreeFail_dbh |
| cPartyName | Party | A&A Tree Care | Name of third party contractor involved in outage | cPartyName |
| cShutdown | Reason of Shutdown | Planned | Reason if a shutdown occurred | cShutdown |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| | | | | |
| cRptNumber | Outage Rpt. Num: | 19-0080033 | System generated outage report number | cRptNumber |
| cCircuit | Circuit: | 253571115 | Circuit where outage occurred | cCircuit |
| cLocation | Outage Location: | (N/OF CGC 417976451413) 179 N SUNNYSIDE | Description of outage location | cLocation |
| dOutageDate | Outage Date / Time: | 7/22/2019 | Outage date and time | dOutageDate |
| cLineType | Line Type : | Primary | Voltage/Line Description | cLineType |
| cDivCode | Divison: | Fresno | Outage division | cDivCode |
| cSSD | SSD | D9023 | Source Side Device affected by outage | cSSD |
| cTreeRoad | Was tree adjacent to road: | in road cut | Description of tree location | cTreeRoad |
| cTreeCreek | Did creek or river undermine tree? | No | Description of tree near creek | cTreeCreek |
| cTreeSlide | Was tree in a slide? | No | Indicates if tree was affected by a mudslide | cTreeSlide |
| cSoil | Soil in tree vicinity | Good Condition | Description of soil in tree area | cSoil |
| cTerrain | Terrian/Topography | Valley Bottom | Description of terrain at site of tree | cTerrain |
| cSlope | <15% | <15% | Descripton of slope on site of tree | cSlope |
| cTreeAge | Age of Tree | 0-25 | Estimated tree age | cTreeAge |
| cTreeNative | Was tree native? | Yes | Determines if tree was planted or native | cTreeNative |
| cTreeLean | Was tree leaning toward line? | slight | Indicates tree lean relative to conductor | cTreeLean |
| cTreeHealth | Did tree show evidence of decline? | Slight | Indicates decline in tree | cTreeHealth |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| cDeclineComment | Describe evidence of decline | decay at area of failure | Free text description of tree decline | cDeclineComment |
| bTreeDead | Was failed part or was whole tree dead? | Yes | Condition of tree | bTreeDead |
| cTreeRotInside | Defect indicators present (outside log)? | slight | defect description | cTreeRotInside |
| cTreeRotOutside | Defect present (inside log)? | moderate | defect description | cTreeRotOutside |
| cTreeBlownOver | Did wind cause failure? | No | indicates wind caused failure | cTreeBlownOver |
| cWindDirection | Wind direction? (blowing from) | SE | indicates wind direction | cWindDirection |
| cSnowLoadFailure | Did snow load cause failure? | Yes | Indicates snow load failure | cSnowLoadFailure |
| nHTRSTreeScore | HTRS Tree Score (Optional): | 6 | Hazard Tree Rating System score | nHTRSTreeScore |
| nHTRSImpactScore | HTRS Impact Score (Optional): | 3 | Hazard Tree Rating System score | nHTRSImpactScore |
| cLimbOrig | Original location of tree limb: | Not Overhang | Limb failure information | cLimbOrig |
| cLimbLength | Length of tree limb: | Medium | Limb failure information | cLimbLength |
| cLimbBreadth | Breadth of tree limb at widest point: | small | Limb failure information | cLimbBreadth |
| cLimbAngle | Angle of tree limb at attachment: | large | Limb failure information | cLimbAngle |
| cLimbCanopy | Position of tree limb in canopy: | Lower | Limb failure information | cLimbCanopy |

**VM Inspections Projects**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Status | STATUS | Tree Work Complete | status of project area | Text |
| Inspection Date | INS_DATE | Date | date of inspection | Date |
| Underbuild | UNDERBUILD | no | transmission lines also present on pole | Text |
| Coastal Redwood Excptn | RWD_EXC | no | coastal redwood exception to clearance being applied | Text |
| Wood Management | WOOD_MAN | yes | wood management needed | Text |
| WM Comments | WM_COMMENTS | brush only, leave wood | comments about wood management | Text |
| Line Kill | LINE_KILL | no | lines need to be de-energized to perform work | Text |
| Riparian | RIPARIAN | yes | project falls in riparian area | Text |
| Caltrans | CALTRANS | no | on Caltrans property | Text |
| Encroach. Permit | ENC_PERMIT | not needed | encroachment permit needed | Text |
| Permit | PERMIT | no | special environmental permitting  needed | Text |
| AMMs | AMMS | no | avoidance and minimization measures apply | Text |
| BMPs | BMPS | yes | best management practices apply | Text |
| Tree Work Date | WORK_DATE | Date | Date work conducted | Date |
| TW Comments | TW_COMMENTS | Text | tree work comments | Text |
| Point ID | POINT_ID | Text | Location information | Text |
| PARCEL_ID | PARCEL_ID | Long Integer | Location information | Long Integer |
| Circuit Name | CIRCUITNAME | Text | Circuit name where tree resides | Text |
| Region | REGION | Text | PG&E designated region | Text |
| Parcel Name | PARCEL_NAME | Text | Name of parcel where tree located | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Site Address | SITE_ADDRESS | Text | Address where tree located (if exists) | Text |
| Property City | PROPERTY_CITY | Text | City where tree located | Text |
| Conductor to Sky | COND_SKY | Text | clear all vegetation above conductors | Text |
| Conductor to Ground | COND_GROUND | Text | clear all vegetation below conductors | Text |
| Tree Trims | FCST_TREE_TRIM | Long Integer | number of trees listed for trimming | Long Integer |
| Tree Removals | FCST_TREE_REMO | Long Integer | number of trees listed for removal | Long Integer |
| Actl Tree Removals | ACT_TREE_REMO | Long Integer | number of trees trimmed | Long Integer |
| Actl Tree Trims | ACT_TREE_TRIM | Long Integer | number of trees removed | Long Integer |

**VM Inspections Points**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Change_From_AWRR_To_EVM | Change from AWRR to EVM | | | Text |
| STATUS | Status | | | Text |
| INS_DATE | Inspection Date | 5/10/2017 | Date of inspection | Date |
| VEG_TYPE | Veg Type | Hazard Tree | category of work needed | Text |
| SPECIES | Species | Valley Oak | species of tree | Text |
| DIAMETER | Tree Diameter | 25 | Tree diameter at breast height (inches) | Text |
| HEIGHT | Tree Height | 85 | Tree height estimation (feet) | Long Integer |
| PRESCRIP | Prescription | OV_Overhang | tree work prescribed | Text |
| UNDERBUILD | Underbuild | no | Line with underbuild | Text |
| RWD_EXC | Coastal Redwood Excptn | no | coastal redwood exception to clearance being applied | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| WOOD_MAN | Wood Management | yes | wood management needed | Text |
| WM_COMMENTS | WM Comments | brush only, leave wood | comments about wood management | Text |
| CRANE | Crane Required | No | Crane required | Text |
| TRAFFIC | Traffic Control | yes | Traffic control required | Text |
| LINE_KILL | Line Kill | no | lines need to be de-energized to perform work | Text |
| RIPARIAN | Riparian | yes | project falls in riparian area | Text |
| CALTRANS | Caltrans | no | on Caltrans property | Text |
| ENC_PERMIT | Encroach. Permit | not needed | encroachment permit needed | Text |
| PERMIT | Permit | no | special environmental permitting needed | Text |
| AMMS | AMMs | no | avoidance and minimization measures apply | Text |
| BMPS | BMPs | yes | best management practices apply | Text |
| WORK_DATE | Tree Work Date | Date | Date work conducted | Date |
| TW_COMMENTS | TW Comments | tree work comments | Text | tree work comments |
| POINT_ID | Point ID | Text | Location information | Text |
| PARCEL_ID | PARCEL_ID | Long Integer | Location information | Long Integer |
| CIRCUITNAME | Circuit Name | Text | Circuit name where tree resides | Text |
| REGION | Region | Text | PG&E designated region | Text |
| PARCEL_NAME | Parcel Name | Text | Name of parcel where tree located | Text |
| SITE_ADDRESS | Site Address | Text | Address where tree located (if exists) | Text |
| PROPERTY_CITY | Property City | Text | City where tree located | Text |

**Weather Station Data**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Timestamp | Timestamp | 07/21/2019 17:00 UTC | Weather data collected by weather stations | Date |
| wind speed | wind speed | S 18 MPH | Direction and Wind speed in Miles per hour | Text and Number |
| temperature | temperature | 66 F | Temperature in degrees Fahrenheit | Number |
| relative humidity | relative humidity | 60% | Percent humidity | Number |

**Distribution inspection tag information**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Catalog Prof | Catalog Prof | ZN-ECOHN | | Text |
| Object Code Text | Object Code Text | Ground | | Text |
| Priority | Priority | E | Tag priority | Text |
| Notification | Notification | 117001106 | Notification index number | Number |
| Equipment | Equipment | 100457633 | Equipment ID | Number |
| Latitude | Latitude | 38.02815 | Latitude coordinate | Number |
| Longitude | Longitude | -121.6142 | Longitude coordinate | Number |

**Transmission outage data**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Facility | Facility | Maricopa-Copus | Line name | Text |
| Date Out | Date Out | 01/08/17 | Date of event | Date |
| Time Out | Time Out | 12:49 | Time of event | Time |
| ET WD | ET WD | YES | Wire-Down or not | Boolean |
| Durn (hr:min) | Durn (hr:min) | 0:52 | Duration of the outage in hours | Time |
| Durn (mins) | Durn (mins) | 52 | Duration of outage in minutes | Time |
| Date In | Date In | 01/08/17 | Date of restoration | Date |
| Time In | Time In | 13:41 | Time of restoration | Time |
| Cause Category | Cause Category | Weather | Cause | Text |
| Cause Detail | Cause Detail | Rain | Additional cause detail | Text |
| Secondary Cause | Secondary Cause | INSL | Additional cause detail | Text |

**Incident investigation data (EIR)**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| | EI_nbr | EI120418A | Electric Incident Number which is PG&E's reference number | text |
| Time Incident Occurred | Incid time | 4/18/2012 10:01 | Incident Tie | date |
| HTL Time Reported | HTL rpt time | 4/18/2012 11:30 | This is the time that the call was recorded on the hotline voicemail. | date |
| HTL Report Status | HTL rpt status | On Time | This is the hotline status that PG&E reported to | text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| | | | the CPUC within the time limits | |
| HTL Report Remarks | HTL rpt remarks | Driving to work when first page hit at 0624. Received a second page 0638. Arrived at office and started working the page when another page hit at 0643. J.D. | Notes or comments from the person who left a voice message on the hotline phone number. | text |
| Determination ***(Rptbl)*** | Rptbl. determ. | 41017.48958 | Date and time that the On-call person determined that the electric incident was reportable to the CPUC. | date |
| Remarks ***(Rptbl)*** | Rptbl. remarks | KGO TV @ 0333, KPIX TV @ 0422, KRON TV @ 0441, KTVU TV @ 0446 & 0511. | Notes or comments from the person who left a voice message on the hotline phone number. | text |
| Reported By | Rptd by | MEI3 | This is the PG&E Lan ID of the person who reported the electric incident to the CPUC. | text |
| Reported On - Primary | Rptd on (pri) | 41017.50139 | This is the date and time PG&E reported the electric incident to the CPUC. | date |
| CPUC Recipient | CPUC recipient | CPUC Website | This is the platform in which it was reported to the CPUC - website, voice message, etc. | text |
| Last Update By | tblElectricIncid_Header.Last update by | A0B1 | Person (Lan ID) of who last updated the Electric Incident Header | text |
| Report Type | Rpt Typ | Final | This references the report type status as Initial, Final, or Amended | text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Incident Type | Incid Typ | Media A | This is the electric incident type: Media, Injury/Fatality, Property Damage, Airstrike (AS), or Operator Judgement (OJ) | text |
| Description | Description | under the Media criteria: KGO, KTVU and KPIX. | This is the desciption of the electric incident: who, what, how, when, and why | text |
| Location | Location | 3rd and Castro Streets | Location of Incident (address if applicable) | text |
| City code | City code | Oakland | City Code - PG&E's internal coding | text |
| City | City | Oakland | Incident City | text |
| County | County | Alameda | Incident County | text |
| District Name | District Name | Oakland | PG&E used to have territory divided into districts. | text |
| Division Name | Division Name | East Bay | PG&E uses Divisions to track geographical locations of cities. | text |
| Area | Area | 2 | PG&E used to have territory divided into Areas which were comprised of multiple divisions. | number |
| Facility Type | Fac Typ | UG Primary | Facility type that was involved in the electric incident | text |
| Interruption Time | Interrupt time | 41017.41736 | Interruption time if an outage occurred from the electric incident | date |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Restore Time | Restore time | 41017.45556 | Restoration time for affected customer(s) from the electric incident | date |
| Total Customer Outage | Total Cust Out | 3853 | Total affected customer without power from the electric incident | number |
| Injured Party Information | Injured party info | No injuries reported. | Injured party information - PG&E generally leaves this blank | text |
| Property Damage Estimate | Prop dam est | $145,000.00 | If known, estimated costs of property damage | number |
| Report Response | Rpt Resp | A0B1 | This is the person who leads (responsible) the 20-day report that gets submitted to the CPUC. | text |
| Report Due | Rpt due | Wednesday, May 16, 2012 | This is the date that the 20-day report is due to the CPUC. | date |
| Report Sent | Rpt sent | 5/16/2012 | This is the date that the 20-day report is submitted to the CPUC. | date |
| Last Update On ***(tblElectricIncid_Reports)*** | tblElectricIncid_Reports.Last update on | 5/16/2012 | This is the date that the electric incident had an update/edit done. | date |
| Last Update By ***(tblElectricIncid_Reports)*** | tblElectricIncid_Reports.Last update by | A0B1 | This is the person who last updated/edited the electric incident. | text |
| Incident Year | incidentYear | 2012 | This is the year of the electric incident. | number |

**Utility Fire Potential Index (FPI)**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Date | Date | 7/1/2019 | Date | date |
| FIA | FIA | 100 | FIA Identifier | number |
| Rating | Rating | Very High | Utility Fire Potential Index rating | text |

**Transmission inspection tag information**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Reference Number | Reference Number | 20190225-1899105365 | Inspection reference number | Text |
| Form Name | Form Name | 500kV Climbing Inspection Form and Tower Diagrams | | Text |
| SAP Structure ID# | SAP Structure ID # | 40659289 | | Number |
| Structure # | Structure # | 036/182 | | Number |
| Line Name | Line Name | FULTON-PUEBLO-115KV | | Text |
| Voltage | Voltage | 115 | | Number |
| Latitude | Latitude | 38.4973 | | Number |
| Longitude | Longitude | -122.64106 | | Number |
| Form Submit Date | Form Submit Date | May 21, 2019 5:24:43 PM PDT | | Date |
| Drone Inspection | Drone Inspection | Yes | | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Inspection order # | Inspection order # | 43677989 | | Number |
| Notification # | Notification # | 116476880 | | Number |
| Steel or Nonsteel inspection? | Steel or Nonsteel inspection? | Steel | | Text |
| Steel structure type | Steel structure type | Lattice Steel | | Text |
| Bird Nest Present | Bird Nest Present | No | | Text |
| Bird/Animal mitigation needed | Bird/Animal mitigation needed | No | | Text |
| Bird/Animal guards in poor condition | Bird/Animal guards in poor condition | No | | Text |
| Cell antennas attachments | Cell antennas attachments | N/A | | Text |
| Structure is out of plumb, twisted or leaning | Structure is out of plumb, twisted or leaning | No | | Text |
| Ground wire in poor condition | Ground wire in poor condition | N/A | | Text |
| Vegetation present, impacting structure, requiring removal | Vegetation present, impacting structure, requiring removal | No | | Text |
| High voltage signs missing or installed incorrectly | High voltage signs missing or installed incorrectly | No | | Text |
| Tower No. missing | Tower No. missing | No | | Text |
| Anti-climbing guard needed | Anti-climbing guard needed | N/A | | Text |
| Climbing steps installed incorrectly or missing | Climbing steps installed incorrectly or missing | No | | Text |
| Climbing steps in poor condition | Climbing steps in poor condition | No | | Text |
| Damaged members | Damaged members | N/A | | Text |
| Damaged | Damaged crossarm/framing | N/A | | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| crossarm/framing | | | | |
| TSP structure damage | TSP structure damage | N/A | | Text |
| Loose or missing members | Loose or missing members | N/A | | Text |
| Damaged bolts | Damaged bolts | N/A | | Text |
| Loose bolts | Loose bolts | N/A | | Text |
| Missing bolts | Missing bolts | N/A | | Text |
| Tower Finish Type | Tower Finish Type | N/A | | Text |
| Galvanized or paint finish in poor condition | Galvanized or paint finish in poor condition | N/A | | Text |
| Working eyes and shackles show significant wear | Working eyes and shackles show significant wear | N/A | | Text |
| Tower/FAA lighting | Tower/FAA lighting | N/A | | Text |
| Tower/FAA lighting not properly working or damaged | Tower/FAA lighting not properly working or damaged | N/A | | Text |
| Condition Code | Condition Code | 3 | | 1=No Visual Damage<br>2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Stub and Splice plate condition | Stub and Splice plate condition | 3 | | 1=No Visual Damage<br>2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Steel members | Steel members including | 3 | | 1=No Visual Damage |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| including attachments condition | attachments condition | | | 2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Anchor section applicable | Anchor section applicable | No | | Text |
| Guy Anchor head buried | Guy Anchor head buried | No | | Text |
| Concrete 6” or less above ground line | Concrete 6” or less above ground line | N/A | | Text |
| Concrete cracked or deteriorated | Concrete cracked or deteriorated | N/A | | Text |
| Anchor rod damaged | Anchor rod damaged | N/A | | Text |
| Earth around foundation eroded, soil movement, slide | Earth around foundation eroded, soil movement, slide | N/A | | Text |
| TSP anchor bolt in poor condition | TSP anchor bolt in poor condition | N/A | | Text |
| Anchor condition | Anchor condition | N/A | | 1=No Visual Damage<br>2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Steel structure foundation type | Steel structure foundation type | Concrete/Piles | | Text |
| Concrete steel interface buried? | Concrete steel interface buried? | No | | Text |
| Concrete 6” or less above ground line | Concrete 6” or less above ground line | No | | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Concrete cracked or deteriorated | Concrete cracked or deteriorated | No | | Text |
| Rebar exposed | Rebar exposed | No | | Text |
| Stub in concrete not sealed and water proofed | Stub in concrete not sealed and water proofed | No | | Text |
| Earth around structure eroded, soil movement, slide | Earth around structure eroded, soil movement, slide | No | | Text |
| Significant vegetation around structure? Impacting structure? | Significant vegetation around structure? Impacting structure? | No | | Text |
| Piles exposed, rotted or deteriorated? | Piles exposed, rotted or deteriorated? | No | | Text |
| Foundation under water | Foundation under water | No | | Text |
| Comments | Comments | Pond 50’ away | | Text |
| Foundation condition | Foundation condition | 3 | | 1=No Visual Damage<br>2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Guy section applicable | Guy section applicable | No | | Text |
| Guys are loose | Guys are loose | N/A | | Text |
| Guys are broken | Guys are broken | N/A | | Text |
| 6” or less of travel left in turnbuckle | 6” or less of travel left in turnbuckle | N/A | | Text |
| Preform cross ties not properly installed | Preform cross ties not properly installed | N/A | | Text |
| Guy tails not clipped | Guy tails not clipped properly | N/A | | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| properly | | | | |
| Guys insulator in poor condition | Guys insulator in poor condition | N/A | | Text |
| Guy marker missing | Guy marker missing | N/A | | Text |
| Automatic guy splice present | Automatic guy splice present | N/A | | Text |
| Guy Condition | Guy Condition | N/A | | 1=No Visual Damage<br>2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Overhead ground wire section applicable? | Overhead ground wire section applicable? | No | | Text |
| Shield wire of OPGW grounded | Shield wire of OPGW grounded | N/A | | Text |
| Shield wire or OPGW in poor condition | Shield wire or OPGW in poor condition | N/A | | Text |
| Shield wire plate in poor condition | Shield wire plate in poor condition | N/A | | Text |
| Armor rod in poor condition | Armor rod in poor condition | N/A | | Text |
| Are dampers present | Are dampers present | N/A | | Text |
| Are dampers in poor condition | Are dampers in poor condition | N/A | | Text |
| Overhead ground wire condition | Overhead ground wire condition | N/A | | Text |
| Conductor in poor condition | Conductor in poor condition | No | | Text |
| Conductor clearance or tension issue | Conductor clearance or tension issue | No | | Text |
| Jumpers in poor | Jumpers in poor condition | N/A | | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| condition | | | | |
| Jumper clearance issue | Jumper clearance issue | N/A | | Text |
| Are splices present | Are splices present | N/A | | Text |
| Automatic splice present | Automatic splice present | N/A | | Text |
| Flying bells present | Flying bells present | No | | Text |
| Spacers in poor condition | Spacers in poor condition | N/A | | Text |
| Are dampers present | Are dampers present | Yes | | Text |
| Are dampers in poor condition | Are dampers in poor condition | No | | Text |
| Marker balls in poor condition | Marker balls in poor condition | N/A | | Text |
| Conductor condition | Conductor condition | 3 | | 1=No Visual Damage<br>2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Insulators | Insulators | Non-ceramic | | Text |
| Insulator cap(s) showing signs of corrosion | Insulator cap(s) showing signs of corrosion | N/A | | Text |
| Suspension/Dead-end conductor hardware hot-end/shoe assembly in poor condition | Suspension/Dead-end conductor hardware hot-end/shoe assembly in poor condition | No | | Text |
| Suspension/Dead-in conductor hardware cold-end in poor | Suspension/Dead-in conductor hardware cold-end in poor condition | No | | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| condition | | | | |
| Insulator hanger in poor condition | Insulator hanger in poor condition | No | | Text |
| Are insulators in poor condition | Are insulators in poor condition | No | | Text |
| Insulators are out-of-plumb | Insulators are out-of-plumb | No | | Text |
| Grading/Corona rings in poor condition | Grading/Corona rings in poor condition | N/A | | Text |
| Clamps in poor condition | Clamps in poor condition | No | | Text |
| Connectors in poor condition | Connectors in poor condition | No | | Text |
| Tie wire in poor condition | Tie wire in poor condition | N/A | | Text |
| Hardware & Insulators Condition | Hardware & Insulators Condition | 3 | | 1=No Visual Damage<br>2=Light Damage<br>3=Modern Damage<br>4= Heavy Damage<br>5 =Heavy Damage w/Safety Concerns;<br>N/A =Not Present |
| Count of possible issues | Count of possible issues | 0 | | Number |
| Transmission Corrective Notification Required | Transmission Corrective Notification Required | No | | Text |

**Distribution outage data**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Division | Division | CENTRAL COAST | Division where outage occurred | text |
| Feeder Name | Feeder Name | OTTER 1101 | Feeder were outage occurred | text |
| Device | Device | FUSE | Protective device that operated | text |
| Duration | Duration | 654 | Outage duration in minutes | number |
| Basic Cause | Basic Cause | Vegetation | Cause of outage | text |
| Supplemental Cause | Supplemental Cause | Tree - fell into line | Additional cause detail | text |
| CESO | CESO | 12 | Customer experiencing sustained outage | number |
| C Min | C Min | 10,572 | Customer outage minutes | number |
| Open Point Latitude | Open Point Latitude | 36.37952 | Location Latitude | number |
| Open Point Longitude | Open Point Longitude | -121.86101 | Location Longitude | number |
| Weather | Weather | Clear;32 - 90 F | Description of weather | text |
| Failed Equipment | Failed Equipment | Conductor, Overhead | Failed asset | text |
| Failed Equipment Condition | Failed Equipment Condition | On Ground | Description of failed asset condition | text |

**Ignition data**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Fire Start Date | Fire Start Date | 02/07/18 | Start date of the event | date |
| Fire Start Time | Fire Start Time | 16:00 | Approximate start time of the event | date |
| Location Latitude | Location Latitude | 35.36426 | Location latitude of the event | number |
| Location Longitude | Location Longitude | -120.82182 | Location longitude of the event | number |
| Location: Material at origin | Location: Material at origin | Vegetation | Record of material at the origin | number |
| Location Land use at origin | Location Land use at origin | Rural | Land use description | text |
| Fire: Size | Fire: Size | .26 - 9.99 Acres | Approximate size of the fire | text |
| Fire: Suppressing Agency | Fire: Suppressing Agency | CAL FIRE | Name of agency or group that suppressed the fire | text |
| Utility Facility Identification | Utility Facility Identification | 101921689 | Utility facility ID number | number |
| Utility Facility: other Companies | Utility Facility: other Companies | Verizon | Name of other utility companies | text |
| Utility Facility: Voltage | Utility Facility: Voltage | 12,000 | Voltage level of the utility facilities | number |
| Utility Facility: Equipment involved with ignition | Utility Facility: Equipment involved with ignition | Conductor | Utility facilities involved with the ignition | text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Utility Facility: Type | Utility Facility: Type | Overhead | Type of utility facilities involved with the ignition | text |
| Outage: Was there an outage | Outage: Was there an outage | Yes | Was event accompanied by an outage to the electric system | text |
| Outage: Date | Outage: Date | 02/01/18 | Date of outage | date |
| Outage: Time | Outage: Time | 05:44 | Time of outage | date |
| Field Observation: Suspected Initiating Event | Field Observation: Suspected Initiating Event | Contact from Object | Description of field assessment of suspected initiated event | text |
| Field Observation: Equipment/Facility Failure | Field Observation: Equipment/Facility Failure | Conductor | Field observed utility facility failure | text |
| Field Observation: Contact from Object | Field Observation: Contact from Object | Vegetation | Additional detail on utility facility failure | text |
| Field Observation: Facility Contacted | Field Observation: Facility Contacted | Electric Facility | Additional detail on utility facility failure | text |
| Field Observation: Contributing Factor | Field Observation: Contributing Factor | Unknown | Additional detail on utility facility failure | text |

**Incident Logging and Information System (ILIS)**

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Circuit | Circuit | 182852203, VIEJO-2203 | Circuit name | Text |
| Type | Type | unplanned | Whether planned or unplanned outage | Text |
| District | District | Monterey | Location- District | Text |
| Customer Minutes | Customer minutes | 10890 | Customer minutes | Number |
| Customers CESO | Customers CESO | 22 | Customers experiencing Sustained Outage | Number |
| Active | Active | No | Whether outage is still ongoing | Text |
| Weather | Weather | Clear, 32-90 F | Weather at the time of the outage | Text |
| Interval | Interval | Sustained | Sustained or momentary outage | Text |
| Fault Type | Fault Type | Line to Ground | Description of type of fault | Text |
| EquipID | EquipID | 6187 | ID of failed equipment | NUMBER |
| Equipment Type | Equipment Type | Fuse | Name of failed equipment type | Text |
| Constructio n Type | Construction Type | OH | Overhead or underground line construction | Text |
| Equipment Condition | Equipment Condition | Connector or splice, broken, wire on the ground | Description of equipment condition by the field | Text |
| Crew notification time | Crew notification time | 01/01/19 10:12 | Time at which crew was notified | Text |
| Equipment Address | Equipment Address | Intersection of Del Ciervo & Midwood Dr, Pebble Beach | Location of event | Text |
| Fire Mitigation | Fire Mitigation | No | Whether fire suppression was required | Text |
| Cause | Cause | Vegetation, Tree fell in to the line | Description of cause as observed by the field | Text |

| Data Attribute | Attribute Column Heading | Sample Attribute | Description | Metadata |
|---|---|---|---|---|
| Distribution Wire Down | Distribution Wire Down | Yes | Whether a wire-down resulted from the outage | Text |
| Wire Down Energized | Wire Down Energized | No | Whether wire-down was energized | Text |
| Multi Damage location | Multi Damage location | No | Whether multiple damages occurred at the location of the outage | Text |
| Latitude | Latitude | 36.56762 | Location latitude | NUMBER |
| Longitude | Longitude | -121.92884 | Location longitude | NUMBER |