San Diego Gas & Electric Company

2020-2022 Wildfire Mitigation Plan Update

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SDGE

A Sempra Energy utility®

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Executive Summary

The COVID-19 pandemic, as well as social and political unrest, all presented significant societal challenges in 2020, while catastrophic wildfires continued to threaten communities and the environment during the year. In fact, the scale and scope of California wildfires in 2020 occurred at an unprecedented level. The California Department of Forestry and Fire Protection's (CAL FIRE) website reports that the 2020 August Complex Fire burned over one million acres, making it the largest wildfire in California history. Indeed, five of the six largest fires in California history occurred in 2020. Unfortunately, these wildfires caused deaths and the destruction of property and natural resources.

In San Diego Gas & Electric Company's (SDG&E or Company) service territory, the most significant fire of 2020 was the Valley Fire, burning 16,390 acres and causing significant property damage, as well as the interruption of electric service after burning 119 wood poles. While the ignition of the Valley Fire, and many of the other major fires of 2020, were not linked to utility equipment, these fires and their consequences nevertheless reinforce the continued importance of taking dramatic action to mitigate the risk of climate change-driven catastrophic wildfires in California, including potential utility-caused wildfires.

Safety is SDG&E's top value, and virtually no activity implicates safety more than wildfire prevention. SDG&E has focused on wildfire prevention and mitigation activities for more than a decade, and it strives to be the industry leader in this area. In the aftermath of the catastrophic October 2007 wildfires in SDG&E's service territory and across Southern California, SDG&E dedicated itself to revamping and enhancing its wildfire prevention and mitigation measures across a wide spectrum of disciplines and activities. Many of the initiatives described in this 2021 Wildfire Mitigation Plan Update (WMP or Plan), such as hardening the overhead electric system, are an outgrowth of the efforts that began after the October 2007 wildfires. And many of those initiatives were undertaken without any precedent or road map for SDG&E to follow.

A prime example is SDG&E's ability to forecast fire danger. SDG&E developed an in-house meteorology team to forecast fire danger and enable the Company to undertake advanced preparations for severe weather events. SDG&E built the first of its kind network of dense, utility-owned weather stations to provide detailed weather data across the service territory, which informs day-to-day operational decision-making at all levels of the Company. Additionally – and as a last resort when conditions warrant – SDG&E pioneered the use of de-energization (i.e., Public Safety Power Shutoffs or PSPS) to protect public safety from major wildfires. SDG&E openly shared its experience, lessons learned, and technological advancements in weather and wildfire mitigation with other investor-owned utilities (IOUs), state agencies, and stakeholders in the fire community, with the objective of improving wildfire prevention across California and the West.

An effective wildfire mitigation program includes a safe and hardened electrical grid that is rigorously inspected and maintained. Informed by meteorological data, SDG&E developed

design standards by considering the localized wind conditions for grid hardening. While SDG&E utilized PLS-CADD design tools for its transmission line designs for many years, it began applying this tool to its grid hardening work for its distribution system, which improved modeling and designs.

SDG&E also developed the Wildfire Risk Reduction Model (WRRM) to enable risk assessment and prioritize its distribution grid hardening approach. SDG&E has shared this work with other utilities, which has led to a similar statewide approach. The WRRM Operations (WRRM-Ops) tool was developed in recent years advancing the use of the WRRM model to understand fire propagation and is used during live fire incidents. In the last year and in order to reduce PSPS impacts to SDG&E's customers, grid hardening has included strategic undergrounding of the distribution system in the High Fire Threat District (HFTD) and instituting generator programs for some of the customers experiencing PSPS events.

In addition, an effective wildfire mitigation program requires a wildfire safety culture that values life-safety over reliability, and partners with stakeholders in public safety, academia, and the private sector, to form a fire-safe community. Community collaboration and customer outreach are essential. SDG&E has continued its culture of engagement with the communities who live in the HFTD through conducting Wildfire Safety Fairs and community meetings. Outreach and collaboration with community safety partners led to the development of robust communications and a camera network to assist fire agencies serving in the HFTD areas. Among the many stakeholder collaboration activities, SDG&E established a Wildfire Safety Community Advisory Council (WSCAC) comprised of leaders from the following groups in the San Diego region: public safety partners, communications and water service providers, local and tribal government officials, business groups, non-profits, Access and Functional Needs (AFN) and vulnerable communities, and academic organizations. These meetings are held quarterly and are highly regarded as an effective means to discuss wildfire issues and receive input from WSCAC members on relevant emerging community issues on wildfire safety and preparedness.

SDG&E continues to innovate and improve wildfire mitigation initiatives to keep its communities safe through situational awareness, prevention, communication, and collaboration. Despite an unusually challenging year, SDG&E advanced its wildfire mitigation initiatives in 2020 and will continue to do so in 2021, as highlighted below.

Risk Assessment and Mapping

SDG&E continues its ongoing development and implementation of the WRRM and WRRM Ops models that began in collaboration with Technosylva in 2013. These models have become a template for the development of similar models across the state. The WRRM model and WRRM Ops have and will continue to serve the need to understand the wildfire risk from electric grid assets and fire propagation. While WRRM and WRRM Ops continue to play a critical role in understanding the fire risk, SDG&E recognized a need for a model with the capability to analyze circuit segments for risk of wildfire and PSPS impacts, as well as calculate

risk spend efficiency (RSE) scores for mitigation initiatives. To meet that need, SDG&E developed a new model in 2020 named Wildfire Next Generation System (WiNGS). While it is in the first year of development, WiNGS is expected to help prioritize SDG&E's grid hardening mitigations in the coming years.

Situational Awareness and Forecasting

As a result of the hottest summer on record, well below normal rainfall, and nine Red Flag Warnings issued for the SDG&E service territory, the risk of catastrophic wildfires was significant in 2020. Due to fire weather conditions in 2020, SDG&E initiated an above-normal number of PSPS events. But SDG&E was well prepared for the weather and climate-driven events of 2020 through the significant enhancements it made to its situational awareness and forecasting capabilities before the start of the season.

SDG&E's weather station network, the world's first utility-owned network of its kind, is foundational to SDG&E's ability to understand and predict the potential impact of extreme fire weather events and the localized impacts on the communities in the service territory. In 2020, SDG&E installed 30 additional weather stations, which was the largest expansion of the network since 2011, increasing the footprint to 220 stations across the service territory, providing enhanced situational awareness. The additional information generated by this equipment, which is shared with first responders and academia, enables SDG&E to further sectionalize circuits and decrease the footprint of PSPS when weather conditions permit. These additional stations, as well as the existing weather stations, were also upgraded in 2020 to enable wind speed reporting every 30 seconds, rather than every 10 minutes. This additional data has served to decrease the total customers impacted by PSPS by demonstrating in many cases that high wind gusts were very brief and isolated in nature such that de-energizations were not necessary in those instances.

In addition, in 2020, SDG&E integrated an artificial intelligence (AI) forecasting system for 59 of the circuit segments that serve communities in the highest risk fire areas. SDG&E's ability to implement this technology stems from recording weather observations every 10 minutes for over 10 years, which has given SDG&E nearly one billion observations to train AI. These new predictive technology models help increase the accuracy of weather forecasts, which are used to inform the public and fire agencies of the latest weather conditions and help reliably prevent wildfires. Due to the initial success and performance of this forecasting methodology in 2020, SDG&E will continue to build and expand this program moving forward.

Lastly, SDG&E made significant strides to establishing new academic partnerships with four institutions in 2020 to advance fire science, weather science, data science, and climate science in the region as it pertains to better understanding and mitigating wildfire risk. These partnerships were foundational to the establishment of SDG&E's Fire Science Lab in 2020, which will serve as an innovative hub moving forward and a place to foster the science-based talent development required to serve the needs of the industry into the future.

Grid Design and System Hardening

SDG&E's grid hardening initiatives began after the 2007 fires in its service territory. Since then, SDG&E has completed over 400 miles of transmission lines and over 800 miles of distribution lines. With a focus on wildfire risk and reducing PSPS impacts, there were several grid hardening accomplishments in 2020. Overhead hardening continued to progress with the completion of 48.8 miles of transmission and 157.6 miles of distribution. After developing the required work methods and construction standards, two miles of covered conductor were installed, paving the way for more installations in future years.

SDG&E also completed its first 30 miles of underground work in the HFTD. Over the next 10 years, in order to continue to reduce wildfire risk and mitigate PSPS impacts to customers, SDG&E expects to expand the scope of undergrounding work in the HFTD.

Microgrids complement SDG&E's grid hardening portfolio by mitigating PSPS event impacts to customers. Four microgrid locations were deployed in 2020, keeping customers energized after a PSPS event. These microgrids are designed to have the renewable solutions in service in 2021 but provided conventional generators in a temporary configuration in 2020.

SDG&E continues to explore targeted customer offerings to mitigate the customer impact of PSPS events. For instance, in 2020, SDG&E provided 1,409 portable battery-powered backup generators to customers enrolled in the Medical Baseline (MBL) Program through its Generator Grant Program (GGP). SDG&E also provided the opportunity for over 28,000 customers in both Tiers 2 and 3 of the HFTD to download an instant rebate coupon to aid in the purchase of an off the shelf portable backup generator through the Generator Assistance Program. In total, over 1,300 customers benefitted from the coupons and ultimately made a purchase in 2020. The final component of SDG&E's backup generator strategy focuses on permanent backup generation for customers who reside in areas most prone to PSPS and least likely to benefit from other more costly grid hardening initiatives. In 2020, SDG&E installed 75 permanent propane powered backup generators for customers in Tier 3 of the HFTD that seamlessly transition from grid power to generator power through an automatic transfer switch.

Asset Management and Inspections

To prevent wildfires and safely operate its grid, SDG&E conducts various mandated and discretionary asset management and inspection programs to enable identification and repair of equipment conditions. These programs include detailed cyclical inspections, infrared inspections, intrusive wood pole inspections, light detection and ranging (LiDAR) surveys, additional HFTD Tier 3 focused inspections, drone inspections, annual aerial and ground patrols, and quality assurance of inspections. New programs in 2020 included the drone inspections on the distribution and transmission grid, and infrared inspections on the distribution system. SDG&E completed drone inspections on approximately 1,450 transmission structures and over 37,000 distribution structures. SDG&E completed infrared inspections on the distribution

system for approximately 13,000 distribution structures. These new programs allowed SDG&E to more thoroughly assess the condition of its facilities.

Vegetation Management and Inspections

SDG&E continues to enhance its vegetation management activities. In 2020, the vegetation management program continued its success by conducting the activities of tracking and maintaining its database of inventory trees, routing and enhanced patrolling, pruning and removing hazardous trees, replacing unsafe trees with species compatible with powerlines, and pole brushing. This resulted in inspections of over 451,000 trees, trimming over 173,000 trees, and removing over 10,000 trees. This was the first complete year SDG&E pursued the enhanced clearance of up to 25 feet for targeted species, leading to over 13,000 trees trimmed and over 3,900 trees removed in the HFTD. SDG&E completed pole brushing on over 36,000 poles.

Grid Operations and Protocols

When an elevated or extreme fire weather conditions are forecasted, SDG&E remotely enables Sensitive Relay Profile (SRP) on its system, which is designed to make dynamic protective devices such as reclosers and circuit breakers more sensitive to faults on the overhead distribution system and activate quickly to interrupt power. SDG&E pre-identifies and maintains a list of these devices and can quickly communicate with its distribution operations control center to enable SRP when conditions warrant and in observance of wildfire safety efforts. Enhancements to this process include generating a tool that supports a yearly analysis of every device in Tier 2 or Tier 3 of the HFTD to flag SRP setpoints that need to be verified due to changing load. In 2020, reviews and updates were also completed to maintain optimal operational logic for SRP. An additional enhancement was made to improve the configuration management process and consolidate the baselining of distribution line-side settings into a single tool we use for other settings management. These enhancements provide a means to further ensure a safer grid.

After a Red Flag Warning is issued by the National Weather Service, SDG&E follows customer notification cadences mandated by the Commission, thereby making it a priority to notify public safety partners and critical facility operators prior to impacted customers and communities. These communications begin up to 72 hours prior to a potential de-energization and are sent using SDG&E's Enterprise Notification System via email, text and phone call to SDG&E customers with whom the utility has contact information, if provided by the customer. SDG&E takes additional measures to ensure all MBL customers have been notified prior to an interruption in power. This process involves calls from live agents in SDG&E's Customer Care Center and subsequent "door knocks," in which a Customer Service Field employee will visit the place of residence and personally inform the MBL residents.

To compliment the above traditional means of notification, SDG&E launched several new ways to notify and communicate with its customers in 2020. Understanding not everyone in PSPS-

impacted communities is an SDG&E account holder, or could include visitors to the region, SDG&E recognized the importance of developing alternative modes of communication. This recognition led SDG&E to launch the following new PSPS communication tactics, which are explained in greater detail in this 2021 WMP Update:

- Alerts by SDG&E PSPS phone application
- Leveraging the Nextdoor app/platform
- Changeable and moveable roadside signs
- Tribal Nation casino and school marquees
- Enhanced AM radio spots
- Expanded partnerships with 2-1-1 San Diego and 2-1-1 Orange County

Additionally, SDG&E developed access to in-language PSPS, and wildfire safety preparedness and event information designed to reach disadvantaged communities and non-English proficient audiences within the territory.

Based on applicable requirements, SDG&E conducts its public education efforts in the prevalent languages in its service territory to expand reach into under-represented communities.

Data Governance

SDG&E's data governance initiatives encompass both its enterprise-wide efforts and efforts specific to wildfire mitigation and prevention. The enterprise-wide initiative seeks to build a central data repository and establish an asset data foundation integrating key asset-related attributes to enable predictive health analyses and risk modeling and improve inspection/assessment strategies and prioritization.

With respect to wildfire mitigation, SDG&E established a data governance structure in 2020, creating the Mitigation, Measures and Metrics area within its Wildfire Mitigation and Vegetation Management department. This group developed a weekly electronic dashboard that: depicts the wildfire-related metrics established by the Wildfire Safety Division (WSD) as a measure of effectiveness of the WMP; summarizes the progress of the programs and initiatives under the WMP; details the cost capital and O&M spend on the WMP programs; provides trending on the overall effectiveness of the WMP; and includes numerous statistics on SDG&E's wildfire-related programs.

In 2020, SDG&E initiated the development of a single Company-wide database for all programs and initiatives under the WMP. This single database will incorporate analysis and process flows as they evolve within WMP initiatives to analyze the data and incorporate findings into procedures. To maintain the effectiveness and integrity of the database, at a minimum, an annual review of data sources is needed going forward as part of the overall data governance effort. Currently, this data capture effort is approximately 20% complete and is anticipated to be fully or nearly fully complete by the end of 2021.

Resource Allocation Methodology

SDG&E's resource allocation process is best described in terms of an enterprise-level methodology and a program-level methodology. Both complement each other and use the same frameworks to evaluate projects. The enterprise-level methodology includes a tool that is being developed by SDG&E's Asset Management department to aid with the allocation of capital resources across SDG&E's electric asset classes, while the program-level methodology developed by SDG&E's Wildfire Mitigation and Vegetation Management department applies a more granular approach to targeting the implementation of programs, such as grid hardening. Accomplishments in risk assessment models go hand in hand with improving SDG&E's resource allocation methodologies; as better risk models are built and more information about risks become available, SDG&E's approach to targeting mitigations can be further refined to address the areas of highest concern. As described above, SDG&E has been using risk models to inform its mitigation efforts and continues to evolve the necessary tools. WRRM is an example of a risk model that has been informing grid hardening priorities for the past several years. In 2020, SDG&E leveraged the WRRM analysis and the work performed in SDG&E's Risk Assessment and Mitigation Phase (RAMP) proceeding to develop the WiNGS model as the future tool that will inform resource allocation for wildfire mitigation initiatives with the objective of reducing both the wildfire risk as well as the PSPS impact. SDG&E will continue to develop WiNGS and collaborate with stakeholders in the coming years to identify improvement opportunities and discuss how to best apply these new tools.

Emergency Planning and Preparedness

SDG&E's Emergency Management department coordinates safe and effective emergency preparedness for the Company, customers, and emergency response personnel. To respond appropriately to any incident while adhering to the COVID-19 conditions, SDG&E's Emergency Operations Center (EOC) developed a new response approach in 2020 consisting of tiered staffing plans, with a largely virtual response.

As a result, recognizing the importance and reliance on information technology (IT) systems for a remote virtual response, SDG&E conducted a gap analysis for virtual responders. Gaps in equipment were closed by procuring, installing, training, and exercising of the tools remotely for effective and timely decision-making purposes.

But even with a largely virtual response, the processes for decision making in all stages of the EOC activation have not changed. The PSPS dashboards, weather sites, coordination with the key staff are available both virtually and in-person.

SDG&E's EOC was activated for 353 days in 2020, for the following events: Pandemic – 303 activation days; Fire-related incidents – 38 days; and Other – 12 days. Each event was followed by a comprehensive After-Action Review (AAR) process, which includes workshops with both internal and external stakeholders to gather lessons learned to inform corrective actions.

Stakeholder Cooperation and Community Engagement

SDG&E recognizes that collaboration, best practice sharing, and the exchange of lessons learned is of the utmost importance to protect public safety. SDG&E regularly solicits feedback from communities it serves in an effort to identify gaps in processes, communications, and partnerships. This feedback is analyzed as part of an iterative improvement process.

To date, SDG&E has established a Community Based Organization (CBO) network comprised of over 400 organizations, serving a critical role in connecting SDG&E with their constituencies. This includes the County of San Diego Office of Emergency Services (County OES) AFN Working Group and Partner Relay Network. In 2020, SDG&E conducted four drive-thru Wildfire Safety Fairs, located in HFTD communities that have been impacted by PSPS events. The success of these events can be measured by the thousands of cars that participated, with 97% of survey respondents considering the event "very successful." In addition to the drive-thru fairs, four informational webinars were conducted for the purpose of educating and informing the public on wildfire safety, all while providing a direct line to SDG&E for questions and feedback.

Lastly, SDG&E is proud to have entered an enhanced partnership with regional 2-1-1 organizations – San Diego and Orange County. These partnerships allow for efficient information flow of SDG&E wildfire preparedness information to those who call into 2-1-1 organizations. 2-1-1 San Diego acts as a resource hub, connecting those in need with information as well as resources during a PSPS event.

SDG&E shares the Wildfire Safety Division's long-term vision of a sustainable California in which its citizens have access to safe, affordable, and reliable energy. A fundamental step in accomplishing that vision is mitigating the risk and preventing catastrophic climate change-driven wildfires ignited by utility facilities. SDG&E remains committed to working with all stakeholders to achieve this vision.

1 Persons Responsible for Executing the WMP

Instructions:[1] *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*

Title, credentials and components of responsible must be released publicly, but other contact information may be provided in a redacted file attached to the WMP submission.

Wildfire mitigation at SDG&E is a Company-wide, inter-departmental effort involving resources and programs across utility functions. Consistent with the instructions, SDG&E provides the names and titles of the program owners specific to each component of the Plan. This information is accurate as of February 5, 2021 and may change due to employee movement and attrition.

Executive-level owner with overall responsibility

- Name and title: John D. Jenkins, Vice President – Electric System Operations
- Email: JJenkins@sdge.com
- Phone number: (858) 654-8627

Program owners specific to each section of the plan

Note: A program owner may own multiple sections, and multiple components across sections, but each section must have a program owner accountable.

Table 1-1 below provides the program owner for each section of SDG&E's 2021 WMP Update. For any questions related to this Plan or the activities described herein, SDG&E's designated single point of contact is Kirstie Raagas, Regulatory Business Manager (kraagas@sdge.com, (619) 699-5003).

[1] Text in green italics are instructions, prompts, and clarifications from Resolution WSD-011, Attachment 2.2 – 2021 Wildfire Mitigation Plan Guidelines Template (November 2020), as modified by the WSD on January 5, 2021, January 22, 2021, and January 25, 2021.

Table 1-1: WMP Section Program Owners

Name	Title	Email	Phone Number	Component
Section 1: Persons responsible for executing the plan				
Jonathan Woldemariam	Director – Wildfire Mitigation and Vegetation Management	JWoldemariam@sdge.com	(858) 650-4084	Entire Section
Section 2: Adherence to statutory requirements				
Jonathan Woldemariam	Director – Wildfire Mitigation and Vegetation Management	JWoldemariam@sdge.com	(858) 650-4084	Entire Section
Section 3: Actuals and planned spending				
Shaun Gahagan	Wildfire Mitigation Program Manager	SGahagan@sdge.com	(858) 503-5124	Entire Section
Section 4: Lessons learned and risk trends				
Sarah Almujahed	Wildfire Mitigation Program Manager	SAlmujahed@sdge.com	(858) 654-6419	Entire Section
Section 5: Inputs to the Plan and Directional Vision for WMP				
Jonathan Woldemariam	Director – Wildfire Mitigation and Vegetation Management	JWoldemariam@sdge.com	(858) 650-4084	Entire Section
Section 6: Performance Metrics and Underlying Data				
Jonathan Woldemariam	Director – Wildfire Mitigation and Vegetation Management	JWoldemariam@sdge.com	(858) 650-4084	Entire Section
Section 7: Mitigation Initiatives				
Jonathan Woldemariam	Director – Wildfire Mitigation and Vegetation Management	JWoldemariam@sdge.com	(858) 650-4084	Section 7.1 Section 7.2 Section 7.3.5 et al. Section 7.3.6 et al. Section 7.3.7 et al. Section 7.3.8 et al.
Shaun Gahagan	Wildfire Mitigation Program Manager	SGahagan@sdge.com	(858) 503-5124	Section 7.3.1 Section 7.3.9 et al.
Sarah Almujahed	Wildfire Mitigation Program Manager	SAlmujahed@sdge.com	(858) 654-6419	Section 7.3.2 Section 7.3.3 et al. Section 7.3.10 et al.
Brian D'Agostino	Director – Fire Science and Climate Adaptation	BDAgostino@sdge.com	(858) 650-4084	Section 7.3.4 et al.
Augie Ghio	Director – Emergency Management	AGhio@sdge.com	(619) 961-5681	Section 7.3.11 et al. Section 7.3.12 et al.
Section 8: Public Safety Power Shutoff, Including Directional Vision				
Jonathan Woldemariam	Director – Wildfire Mitigation and Vegetation Management	JWoldemariam@sdge.com	(858) 650-4084	Entire Section
Section 9: Appendix				
Jonathan Woldemariam	Director – Wildfire Mitigation and Vegetation Management	JWoldemariam@sdge.com	(858) 650-4084	Entire Section

1.1 Verification

I am an officer of the applicant corporation herein, and am authorized to make this verification on its behalf. The statements in the 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 February 5, 2021 at San Diego, California.



John D. Jenkins
Vice President – Electric System Operations
San Diego Gas & Electric Company

2 Adherence to Statutory Requirements

Instructions: *Section 2 comprises a "check list" of the CPUC Code Sec. 8386 (c) requirements and subparts. Each utility shall both affirm that the WMP addresses each requirement AND cite the Section or Page Number where it is more fully described (whether in Executive Summary or other section of the WMP).*

Mark the following table with the location of each requirement. If requirement is located in multiple areas, mention all WMP sections and pages, separated by semi-colon (e.g., Section 5, pg. 30-32; Section 7, pg. 43)[2]

Table 2-1: Adherence to WMP Statutory Requirements

Requirement	Description	WMP Section
1	An accounting of the responsibilities of persons responsible for executing the plan	Section 1
2	The objectives of the plan	Section 5.2
3	A description of the preventive strategies and programs to be adopted by the electrical corporation to minimize the risk of its electrical lines and equipment causing catastrophic wildfires, including consideration of dynamic climate change risks	Section 7.3
4	A description of the metrics the electrical corporation plans to use to evaluate the plan's performance and the assumptions that underlie the use of those metrics	Section 5.3
5	A discussion of how the application of previously identified metrics to previous plan performances has informed the plan	Section 4.1
6	Protocols for disabling reclosers and deenergizing portions of the electrical distribution system that consider the associated impacts on public safety. As part of these protocols, each electrical corporation shall include protocols related to mitigating the public safety impacts of disabling reclosers and deenergizing portions of the electrical distribution system that consider the impacts on all of the aspects listed in PU Code 8386c	Section 7.3.6.1.1 Section 8.2

[2] Per WSD guidance, section references are sufficient.

Requirement	Description	WMP Section
7	Appropriate and feasible procedures for notifying a customer who may be impacted by the deenergizing of electrical lines, including procedures for those customers receiving a medical baseline allowance as described in paragraph (6). The procedures shall direct notification to all public safety offices, critical first responders, health care facilities, and operators of telecommunications infrastructure with premises within the footprint of potential de-energization for a given event	Section 7.3.10.1.1
8	Plans for vegetation management	Section 7.3.5
9	Plans for inspections of the electrical corporation's electrical infrastructure	Section 7.3.4
10	Protocols for the de-energization of the electrical corporation's transmission infrastructure, for instances when the de-energization may impact customers who, or entities that, are dependent upon the infrastructure	Section 8.2
11	A list that identifies, describes, and prioritizes all wildfire risks, and drivers for those risks, throughout the electrical corporation's service territory, including all relevant wildfire risk and risk mitigation information that is part of the Safety Model Assessment Proceeding and the Risk Assessment Mitigation Phase filings	Section 7.3.b
12	A description of how the plan accounts for the wildfire risk identified in the electrical corporation's Risk Assessment Mitigation Phase filing	Section 4.2 Section 7.1
13	A description of the actions the electrical corporation will take to ensure its system will achieve the highest level of safety, reliability, and resiliency, and to ensure that its system is prepared for a major event, including hardening and modernizing its infrastructure with improved engineering, system design, standards, equipment, and facilities, such as undergrounding, insulation of distribution wires, and pole replacement	Section 5.2
14	A description of where and how the electrical corporation considered undergrounding electrical distribution lines within those areas of its service territory identified to have the highest wildfire risk in a commission fire threat map	Section 7.3.3.16
15	A showing that the electrical corporation 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 electrical corporation	Section 7.3.9.1 Section 7.3.9.5

Requirement	Description	WMP Section
16	Identification of any geographic area in the electrical corporation's service territory that is a higher wildfire threat than is currently identified in a commission fire threat map, and where the commission should consider expanding the high fire threat district based on new information or changes in the environment	Section 4.2.1
17	A methodology for identifying and presenting enterprise wide safety risk and wildfire-related risk that is consistent with the methodology used by other electrical corporations unless the commission determines otherwise	Section 4.2A
18	A description of how the plan is consistent with the electrical corporation's disaster and emergency preparedness plan prepared pursuant to Section 768.6, including plans to restore service and community outreach	Section 7.3.9.4
19	A statement of how the electrical corporation will restore service after a wildfire	Section 7.3.9.5 Section 8.2
20	Protocols for compliance with requirements adopted by the commission regarding 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 electrical corporation representatives, and emergency communications	Section 7.3.9.3
21	A description of the processes and procedures the electrical corporation will use to do the following: (A) Monitor and audit the implementation of the plan. (B) Identify any deficiencies in the plan or the plan's implementation and correct those deficiencies. Monitor and audit the effectiveness of electrical line and equipment inspections, including inspections performed by contractors, carried out under the plan and other applicable statutes and commission rules.	Section 7.2.A Section 7.2.B Section 7.3.4.13 Section 7.3.5.13

(22) Cites "Any other information that the Wildfire Safety Division might require. While it is assumed such information will be incorporated into the WMP, substantive additions will be identified for easier reference.

3 Actuals and Planned Spending for Mitigation Plan

3.1 Summary of WMP Initiative Expenditures

Instructions: *In the Table 3-1, summarize the projected costs (in thousands) per year over the three-year WMP cycle, including actual expenditures for years passed. In Table 3-2 break out projected costs per category of mitigations, over the three-year WMP cycle. The financials represented in the summary tables below equal the aggregate spending listed in the mitigations financial tables reported quarterly. Nothing in this document shall be construed as a statement that costs listed are approved or deemed reasonable if the WMP is approved, denied, or otherwise acted upon.*

Table 3-1: Summary of WMP Expenditures – Total

	Spend in thousands $
2020 WMP Planned	$444,544
2020 Actual	$569,237
Difference	$124,693
2021 Planned	$646,466
2022 Planned	$669,869
2020-22 Planned	$1,885,572

Table 3-2: Summary of WMP Expenditures by Category
(in thousands $)

WMP Category	2020 WMP Planned	2020 Actual	Difference	2021 Planned	2022 Planned	2020-22 Planned (w/ 2020 Actual)
Risk and Mapping	$1,400	$1,191	($209)	$1,539	$1,881	$4,611
Situational Awareness	$6,845	$5,890	($955)	$7,914	$12,445	$26,249
Grid Design and System Hardening	$265,972	$343,782	$77,810	$415,358	$459,632	$1,218,772
Asset Management and Inspections	$56,790	$81,591	$24,801	$68,357	$58,745	$208,693
Vegetation Management	$62,322	$79,264	$16,942	$71,639	$71,640	$222,543
Grid Operations	$20,167	$17,110	($3,057)	$20,731	$15,719	$53,559
Data Governance	$315	$7,480	$7,165	$22,693	$16,579	$46,752
Resource Allocation	$11,985	$5,342	($6,643)	$7,387	$5,617	$18,347
Emergency Planning	$13,821	$14,353	$532	$17,626	$15,231	$47,211
Stakeholder Cooperation and Community Engagement	$4,928	$13,234	$8,307	$13,222	$12,379	$38,835
Total	**$444,544**	**$569,237**	**$124,693**	**$646,466**	**$669,869**	**$1,885,572**

3.2 Summary of Ratepayer Impact

Instructions: *Report the projected cost increase to ratepayers due to utility-ignited wildfires and wildfire mitigation activities engaged in each of the years below. Account for all expenditure incurred in that year due to utility-ignited wildfires / mitigation activities and provide methodology behind calculation below Table 3-3.*

SDG&E has not incurred costs due to utility-ignited wildfire during 2016-2020 timeframe. Wildfire mitigation activities started in 2019 and these were funded through the 2019 GRC. The bill impact referenced in the table below are as of the last electric rate implemented for year 2019[3] and for year 2020.[4] The bill impact is an estimate for a residential customer on basic service with a consumption of 500 kWh/month.

Table 3-3: Electricity Cost Increase to Ratepayers

	Annual performance - Actual					
Outcome metric name	2016	2017	2018	2019	2020	Unit(s)
Increase in electric costs to ratepayer due to utility-ignited wildfires (total)	$0	$0	$0	$0	$0	Dollar value of average monthly rate increase attributable to utility-ignited wildfires per year (e.g., $3/month on average across customers for utility-ignited wildfires occurring in 20XX)
Increase in electric costs to ratepayer due to wildfire mitigation activities (total)	$0	$0	$0	$1.32	$2.26	Dollar value of average monthly rate increase attributable to WMPs per year

[3] Filed and approved in SDG&E Advice Letter (AL) 3377-E.

[4] Filed and approved in SDG&E AL 3619-E.

4 Lessons Learned and Risk Trends

4.1 Lessons Learned: How Tracking Metrics on the 2020 Plan Has Informed the 2021 Plan

Instructions: *Describe how the utility's plan has evolved since the 2020 WMP submission. Outline any major themes and lessons learned from the 2020 plan and subsequent implementation of the initiatives. In particular, focus on how utility performance against the metrics used has informed the utility's 2021 WMP.*

SDG&E's wildfire mitigation efforts have continued to develop and evolve since the submission of its 2020 WMP. Areas of focus include the continuous enhancement of data analytics capabilities, as well as piloting new technologies and assessing various strategies for mitigating the risk of wildfires. In addition to building its data governance framework, performing efficacy studies of its wildfire mitigation initiatives, and enhancing its risk assessment and resource allocation methodologies, SDG&E implemented various programs including drone inspections, advanced protection, backup generator grants, and fuels management. Each of these initiatives lead to continuous enhancements to SDG&E's approach to mitigate wildfire risk and have resulted in the key lessons learned outlined below.

Data Governance

In early 2020, SDG&E began centralizing WMP-related measures and metrics in a central repository to gain insights and assess progress on WMP programs and initiatives. During the establishment of the centralized measures and metrics reporting process, SDG&E inventoried required data metrics and identified data owners and data sources. Through subsequent interviews of data owners, SDG&E determined that each specific data metric would need to be clearly defined and a repeatable and verifiable processes established to accumulate and track the data to ensure its integrity and auditability.

Initially, SDG&E almost exclusively collected data metrics and measures manually. In addition, data definitions were inconsistent, some data was untimely, and preliminary and final data metrics could vary. To enhance data quality and improve the efficiency of the data gathering process, SDG&E began developing a WMP Data Governance Framework (DGF) and an automated Central Data Repository (CDR) for wildfire-related data, which can be used by multiple internal and external stakeholders in the future. These changes will improve data collection by moving away from manual collection to a more uniform, electronic format that will provide data metrics in a searchable format, similar to a GIS data structure.

As a result of beginning the DGF compliance documentation efforts and related audits, SDG&E learned:

- Data sources were not consistently governed, defined, documented or controlled;

- Data interfaces to source systems were sometimes prohibited due to regulatory and security requirements; and
- Procedures to support data collection and transformation were not well documented and were sometimes dependent on the inherent knowledge of department subject matter experts.

As the DGF compliance documentation is completed for each subject matter area and audit issues identified, corrective actions are discussed with management for implementation.

SDG&E envisions that the CDR will eventually provide a "single source of truth" for SDG&E's wildfire-related data, for use by multiple internal and external stakeholders in the future. In response to the WSD GIS Data Standards[5] and other related regulatory initiatives, SDG&E is making significant enhancements to the CDR that will make it scalable and sustainable to accommodate future regulatory requirements. SDG&E will pursue technology solutions to automate these data requests where possible.

As a result of the CDR implementation efforts, SDG&E learned:

- Some data represented in two or more systems were not reconciled, which caused inconsistencies in metrics reporting;
- Some data interpretations were made by subject matter experts and did not follow objective criteria; and
- Some data was manually collected and updated but, in some instances, lacked supporting documentation or procedures.

To date, SDG&E has completed approximately 25% of the effort needed to implement the DGF and CDR and anticipates the completion of data related to the all the metrics tables contained in the WMP by the end of 2021. SDG&E expects that the repository along with the supporting documentation will be completed near the end of 2022. The DGF and CDR is discussed in further detail in Section 7.3.7 below.

Efficacy Studies of Wildfire Mitigation Initiatives

In order to better understand how and to what degree SDG&E's wildfire mitigation programs reduce risk events on the electric system, SDG&E performed several studies in 2020. SDG&E studied reliability performance data from its long running programs such as overhead distribution hardening and overhead transmission hardening and was able to measure the

[5] Wildfire Safety Division Draft Geographic Information System Data Reporting Requirements and Schema for California Electrical Corporations (August 21, 2020) (WSD GIS Data Standards).

effectiveness of these mitigations by comparing the reliability performance before and after hardening.

Overhead distribution hardening reduced risk events by approximately 47% and was especially effective at reducing risk events due to weather. Overhead transmission hardening reduced risk events by approximately 83% and was especially effective at reducing risk events due to weather and equipment failure. Measuring the effectiveness of these mitigations informed updates to SDG&E's risk models, which produce more accurate risk reduction models.

These studies and more are discussed in greater detail in Section 4.4.2 below.

Risk Assessment and Resource Allocation

Recognizing the need for enhanced approaches to evaluate risks and determine strategies based on evaluation of more granular risk spend efficiencies (RSEs), in 2020 SDG&E began developing its Wildfire Next Generation System (WiNGS) model. WiNGS is a new tool that enables more granular risk assessments and alternatives analysis to be conducted at the segment (sub-circuit) level with the objective of identifying solutions to reduce the impacts of PSPS and mitigate the risk of wildfires. In its first version of implementation, SDG&E has used WiNGS to inform its longer-term grid hardening strategies. In the future, SDG&E plans to apply the same level of modeling for other wildfire mitigation initiatives, as applicable.

As described further in Section 4.5.1.4 below, WiNGS provides an assessment of wildfire risk and PSPS impacts on a segment-by-segment basis. The assessments establish a baseline understanding of risk that allows for the evaluation of different mitigation scenarios and ultimately the selection of optimal solutions to mitigate both the wildfire risk as well as the PSPS impacts. Key lessons learned from this initial implementation of WiNGS include:

- There is a continuous need to enhance data and analytics used in the model to improve assessments.
- Modeling PSPS consequences is still evolving and SDG&E is continuing to learn from this preliminary work. Key areas under development are the valuation of customer impacts as well as modeling interdependencies across segments to enhance risk-based optimizations. These interdependencies manifest when looking at how solutions impact upstream or downstream segments within a circuit, which requires more sophisticated dynamic modeling to identify the appropriate mix of strategies.
- Outputs of the model provide directional guidance for SDG&E's teams as far as the types of solutions to implement, but factors outside of the model can change implementation approaches. For example, considerations such as permitting and feasibility analysis are not built into the model because they require subject matter expert (SME) input and various iterative stakeholder interactions, which can lead to changes in implemented solutions.

Grid Hardening

As described in its 2020 WMP, SDG&E conducted a substantial amount of work to analyze segments across the HFTD with the objective of reducing PSPS event impacts while continuing to mitigate wildfire risk. Although the overall mix of SDG&E's grid hardening solutions remains consistent (e.g., traditional hardening, covered conductor, and undergrounding), the risk modeling conducted in 2020 continues to inform which types of solutions and how much of each are best suited for the over 500 segments included in the analysis. One of the main lessons learned in grid hardening is the amount of time it takes to pivot grid hardening efforts from traditional hardening to enhanced solutions such as deployment of covered conductor or undergrounding. As SDG&E's grid hardening strategies shift, it takes time to shift design and construction efforts and find the appropriate level of resources to ramp up implementation of new solutions. Lessons learned from piloting specific grid hardening solutions such as covered conductor and strategic undergrounding are further outlined below as well as in SDG&E's prior WMP Quarterly Reports.[6]

Pilot Programs

SDG&E identified 11 pilot programs/demonstrations in its 2020 WMP and reported on the status and results of these pilots in WMP Quarterly Reports. The pilot programs are: Covered Conductor, Distribution Infrared Inspections, Expanded Generator Grant Program, Advanced Protection – Falling Conductor Protection, Strategic Undergrounding, Drone Assessment, Circuit Ownership, Vegetation Management LiDAR, Ignition Management, Fuels Management, and Vehicle Tracking. Lessons learned from implementing each pilot is discussed in turn below.

1. Covered Conductor

The pilot to install the three-layer covered conductor in the HFTD provided a great opportunity for multiple departments to better understand the material, associated hardware, and design parameters associated with covered conductors, as well as identify areas of improvement. Improvements included making minor modifications to the hardware required to attach the covered conductor to the pole, which allowed for an efficient construction by the crews; making modifications to SDG&E's Construction Standards to remove potential uncertainty during construction; and identifying the need for an additional tool (large impact gun), during construction. In addition, SDG&E was successful in developing a mobile trailer to assist with training SDG&E crews on how to install the covered conductor, as well as address safety concerns and any questions regarding how to reduce construction delays.

[6] *See* SDG&E's Quarterly Report on 2020 Wildfire Mitigation Plan for Q3 2020 (September 9, 2020) and SDG&E's Quarterly Report on 2020 Wildfire Mitigation Plan for Q4 2020 (December 9, 2020).

SDG&E completed the installation of 1.9 miles of covered conductor, which recently withstood 2020 Red Flag Warning events, demonstrating successful results. The pilot of SDG&E's covered conductor project has concluded, and SDG&E will pursue this as a full-fledged program going forward. Additional details regarding the program are available in Section 7.3.3.3 below.

2. Distribution Infrared Inspections

In 2020, the pilot program for distribution infrared inspections focused on Tier 3 of the HFTD, utilizing circuits with the highest fault counts in prior years for the initial circuit selection. With this focus, SDG&E completed inspections on approximately 17% of structures. The infrared technology takes the energy radiated from wires and connections and converts this to temperatures, and the thermography team uses these temperatures to analyze any differentials to identify the potential for future failure. While distribution infrared found significantly less issues inspecting the same structures visually, the issues found are high value, as a hot connection left unmitigated would have eventually led to a failure and a risk event.

While SDG&E expected that due to the low findings, the risk reduction benefit was too low to continue in Tier 3 of the HFTD, when SDG&E completed its MAVF on these two programs, due to the significantly lower cost of inspections and repairs, it was Distribution Infrared inspections that had the higher RSE. Even though it mitigates much less risk, it does so at lower cost, making it the more efficient mitigation. As such, in 2021 SDG&E plans to pilot the technology in Tier 2 of the HFTD, where circuits are located in a more urban setting with higher electrical loads, which could put more stress (and heat) on the connections and splices in those areas. SDG&E will continue monitoring and assessing the effectiveness of this pilot program as it moves to the more urban circuits within Tier 2.

3. Expanded Generator Grant Program (now known as Resiliency Assistance Program)

Based on its experience in 2019 and 2020, SDG&E refined its Resiliency Assistance Program and expanded upon the concept of customer resilience with the introduction of a widely leveraged point of sale strategy. In 2020, SDG&E partnered with a third-party vendor to enable point of sale instant rebates on various in-store and online portable backup generators. SDG&E's initial Generator Grant Program offered backup battery units to Medical Baseline customers who resided in Tier 3 of the HFTD. SDG&E established the Resiliency Assistance Program, which recognized that the HFTD spans various customer segments, including those who do not necessarily qualify for the Medical Baseline program. This program also offered an increased rebate amount for customers who were participating in the California Alternate Rates for Energy (CARE) program.

SDG&E solicited and relied on customer feedback to continuously evolve the program, and SDG&E will continue to shape informed enhancements in future years. Specifically, portable generators offer a range of starting technologies such as pull start, push button, and keyed start. Both sales trends and direct customer feedback indicate that customers prefer a range of options and in some cases have difficulty with the amount of force required to utilize the pull

start option. Additional feedback indicated that dual fuel (e.g., gasoline/propane) units were more widely popular compared to single fuel capable units. A common theme echoed throughout sales trends and direct customer feedback was the concept of customer choice. Consequently, SDG&E will incorporate these lessons learned to offer more choices to customers in 2021 and beyond.

The pilot of SDG&E's Expanded Generator Grant Program has concluded, and SDG&E will pursue this as a full-fledged program going forward. Additional details regarding the program are available in Section 7.3.3.11.3 below.

4. Advanced Protection – Falling Conductor Protection

In 2020, Falling Conductor Protection was implemented successfully on numerous circuits throughout Tier 3 of the HFTD and preceding years. SDG&E identified lessons learned, which can be applied to ongoing design, construction, and deployment opportunities and are being integrated into SDG&E's workflow. These opportunities include increased site visits to understand the changing circuit conditions overlapping with other projects and their stage of construction and site selection and access validation between GIS tools and the real world.

Additionally, expanding the availability of coverage through implementing design policies that remove coverage barriers by identifying locations for equipment replacement to provide advanced protection and reclosing instead of fusing. Integrating improved wireless communications infrastructure through the deployment of private LTE (pLTE) networks within the Company's service territory provides promising communications reliability and routability for this program. SDG&E has tested and is deploying this technology to meet the strict requirements of network communication for Advanced Protection.

Lessons learned through this testing and system integration have provided specific system configuration parameters to facilitate meeting the performance requirements of this technology and demonstrate the great promise that this wireless communication infrastructure brings to the utility provider and community. This allows for more economic implementation of the falling conductor technology with greater coverage and advanced protection functions unavailable if left fused. The key barrier identified to implementation of the technology is the availability of specialized relay and SCADA technician resources spread among numerous competing programs of prioritization. SDG&E has started working to mitigate this through training to expand the resource availability.

5. Strategic Undergrounding

As explained in its 2020 WMP, and as further informed by experience in 2020, SDG&E plans to significantly increase the scope of strategic undergrounding over the next 10 years using the lessons learned from the 2020-2022 experience. In recent years, catastrophic wildfires in California have escalated in frequency and scope. According to CAL FIRE's website,[7] California experienced record wildfire impacts in 2020, in which over 4 million acres burned. The one million acre August Complex fire became the largest fire in California history burning more acres than the fires from 1932 through 1999 combined, and five of the six largest fires in California history were burning at the same time. In 2020, although not linked to utility facilities, SDG&E and its customers also experienced a 16,390 acre wildfire (the Valley Fire) in its service territory. The Valley Fire damaged 119 wood poles requiring replacement of the poles and powerline to restore service.

Closely related to increase in wildfire risk is the increase of PSPS events. PSPS events are driven by numerous factors, particularly the frequency of Red Flag Warnings and wildfires themselves. During 2020, SDG&E saw an increase in the number of weather events where PSPS was considered, from approximately 3-5 PSPS-related events per year to 7 weather events. The events also affected a larger number of customers compared to any other year since SDG&E began implementing PSPS in 2013. During the December 2-4 weather event, approximately 74,000 customers were impacted by PSPS. These trends have led SDG&E to shift towards a grid hardening plan that encompasses more undergrounding, which will increase in scope in future years.

Increasing the strategic underground scope will be done in a methodical manner leveraging the WiNGS model to compare alternatives but to also prioritize the segments based on RSE values. SDG&E continues to evaluate ways in which the cost of undergrounding (currently an approximate $2.6 million per mile, direct cost) can be reduced. As SDG&E learns more about the costs and constraints, it will shift towards prioritizing more undergrounding as compared to past years. This will also be accompanied with increased installation of covered conductor (as opposed to bare conductor).

Through this pilot, SDG&E learned and encountered the following challenges:

COVID-19 – The COVID-19 pandemic, among other things, caused: limitations on in-person interaction with customers; restrictions on accessing customer properties; and delays/limitations on travel accommodations for field survey crews, designers, and engineers. It also affected worker health.

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[7] *See* http://fire.ca.gov/stats-events/.

Permitting/Regulatory – There were delays with permitting agencies and governmental agencies. In addition, SDG&E experienced delays due to resources constraints and inefficient process and procedures (e.g., moratoriums and multi-agency projects coordination requirements, permit variation requirements), which can hinder projects.

Land Rights and Easements – SDG&E cannot secure land rights until designs are near final. Furthermore, non-cooperative and challenging customers as well as limited or no alternative routes will delay or cancel projects.

Resource Constraints – The primary constraint consisted of competing with other SDG&E program initiatives for internal key resources, as well as competing with other utilities (Southern California Edison Company (SCE) and Pacific Gas and Electric Company (PG&E)) for key resources (e.g., electric crews, designers). SDG&E also had to balance and manage the workload across internal departments. There was a long-lead time and delays for materials due to worker limitations in factories. Additionally, there was limited availability of local, experienced design/engineering firms with knowledge on undergrounding. Likewise, there was a limited selection of qualified electrical construction firms that could complete the work safely and on time.

Design and Construction – Rock (hard digging) is prevalent in Tier 3 and Tier 2 of the HFTD. SDG&E also had to coordinate with neighboring water districts during design and construction, and construction field reviews are required to minimize re-designs.

Environmental and Weather – SDG&E designed projects to avoid or minimize impacts to sensitive areas. The amount of Red Flag Warnings (RFW) and wet/cold weather conditions suspended construction and significantly impacted progress.

Cost and Savings – Undergrounding can be cost prohibitive in certain locations. Where blue granite rock formation was encountered, SDG&E had to hand dig the route, which delayed construction and contributed to added cost. SDG&E also had to strategically bid projects due to locations, schedules, and flexibility to bundle accordingly. SDG&E had to carefully plan its trench routes and equipment placements to manage costs. Where feasible, SDG&E approved designs for construction and adjusted its trench depth, reducing it from 30 inches to 24 inches, resulting in increased cost savings. SDG&E also reduced impact to the communities such as avoiding any business operation conflicts.

The pilot of SDG&E's Strategic Undergrounding Program has concluded, and SDG&E will pursue this as a full-fledged program going forward. Additional details regarding the program are available in Section 7.3.3.16 below.

6. Drone Distribution Assessment

The drone assessments performed in Tier 3 of the HFTD during 2019 and 2020 provided valuable new information and lessons that will be implemented during future phases of the program as SDG&E expands into assessments of transmission facilities and for distribution facilities in Tier 2 of the HFTD. Lessons learned in 2020 included:

- Customer engagement and access: SDG&E identified that customer awareness and notification was key to obtaining images of facilities with the drone and to the safety of field crews and to cost efficiencies in getting through locked gates and having crews be able to visit a location once to perform the flight. While finding ways to effectively communicate with some customers remains challenging, engaging "scouts" ahead of the crews to identify potential access issues has helped to streamline flights and reduce lost time. SDG&E is also investing in improving its database for managing access protocol data to help minimize the need for "scouts" as the program returns to the same areas in the future.
- Government agencies: As the use of drones expands, many government agencies are still developing protocols and procedures for allowing drone flights to occur on land managed by those agencies, such as state parks and federal department of defense. The ability to perform flights on those lands will require ongoing engagement and the development of standard practices that can be implemented consistently. SDG&E will endeavor to develop those practices in coordination with other government agencies during the next phase of the program.
- Image capture changes: An analysis of the images (e.g., angle, height and distance from facilities, camera used) that best identified certain types of issues will help refine the number of images needed during future phases of the program. The reduction in the number of images that would be required for pilots to obtain in future phases of the program will help to reduce overall costs.
- Field expertise and image capture: In addition, SDG&E analyzed the types of issues found using images captured by the drone versus the types of issues found during regular inspections to determine what types of damages may be best identified from the ground. The next phase of the program will include a modified assessment effort, where drone pilots and qualified electrical workers will be paired up in the field to perform the flights and the assessments contemporaneously. SDG&E will review the results of this modification to the assessments to determine whether cost efficiencies are realized, and whether it enhanced the ability to more quickly identify issues that require immediate repair.

7. Circuit Ownership

SDG&E's circuit ownership pilot has been completed and implemented. As such, this project is no longer considered a pilot. The circuit ownership program provides the opportunity for SDG&E's field employees, and management of field employees, to submit circuit vulnerabilities via a Mobile Data Terminal (MDT) program or mobile application (both iOS and Android). Specifically, this program facilitates supplemental submission of circuit vulnerabilities (in addition to the existing inspection programs) so that they can be repaired in a timely manner to prevent a potential ignition and minimize the risk of wildfire. SDG&E has released the program systemwide and is currently utilizing the software.

To date, SDG&E has had four submittals through the MDT program, with two that identified potential fire concerns. Two were determined to be "descoped" due to no fire potential. Formal trainings on the business process were conducted. The mobile phone application, EPOCH application, and SharePoint site were all successfully deployed. Details are provided in in Section 7.3.4.9.3 below.

8. Vegetation Management LIDAR

SDG&E continues to engage LiDAR (Light Detection and Ranging) vendors to develop an effective and efficient application in the utility sector. LiDAR technology has penetrated most of the industry including utilities and municipalities. LiDAR is a technology that collects exceptionally large data sets needing an important level of analysis and interpretation. For this reason, data analysis requires a dedicated and focused team. LiDAR has evolved over the years to further improve and support industry needs. Over the past year, SDG&E learned the following through this pilot.

In 2019, SDG&E used LiDAR for transmission inspection to help identify trees within strike distance of overhead conductor. SDG&E modeled line sag and sway to ensure no trees encroach the conductors, or in the event of branch or tree failure at base, they would fall into the minimum vegetation clearance distance to the overhead conductors and or impact towers/poles. This has proven to be somewhat beneficial providing inspectors in the field more accurate information pertaining to tree heights, clearance and distance allowing the inspector to work through inputting data collection promptly.

In 2020, SDG&E piloted the use of LiDAR to enhance tree inspection activities for distribution facilities in Tier 3 of the HFTD. The pilot focused on a distribution circuit on Palomar Mountain, which is one of SDG&E's high-risk circuits due to its location on State Forest Lands that is heavily vegetated with tall trees. The circuit is also frequently subject to potential PSPS events. In the initial stages of scoping the pilot requirements, SDG&E found that LiDAR would not be easily applied to the routine inspection program for a variety of reasons: timing to capture LiDAR within the routine inspection schedules; duration to classify and model the data after capture; and making the information readily available and in a useable format for routine inspection.

SDG&E learned that LiDAR is currently incompatible with SDG&E's work management tool, PowerWorkz, which prohibits SDG&E from syncing LiDAR spatial data with inventory records maintained in PowerWorkz. SDG&E is currently working with its IT development team to further enhance its work management system to leverage LiDAR for distribution in the near future.

SDG&E also discovered that LiDAR's penetration was occasionally inaccurate where tree canopies were very dense. SDG&E will continue to work with the LiDAR vendors and field review piloted circuit segments to further refine the modeling, identified gaps, limitations, and other potential applications in the Vegetation Management program. Additional details regarding the program are available in Section 7.3.5.7 below.

9. Ignition Management Program

The Ignition Management Program's process for reducing the frequency and consequence of ignitions is constantly being refined, and the program has established the initial path for analysis to be communicated to mitigation owners. Lessons learned in 2020 include:

- Engaging SDG&E's wildfire mitigation subject matter experts and connecting them with the internal team responsible for gathering the data creates a more efficient process.
- Establishing clear evidence and information gathering processes leads to more valuable data.
- Continually strengthening relationships with first responder agencies helps keep all parties well informed.

10. Fuels Management Program

SDG&E's Fuel Management Program was developed to reduce wildland fuel loading in the high fire risk areas around SDG&E facilities and rights-of way. Wildland fuel reduction entails involves the thinning, pruning, and in some cases, removal of vegetation for the purpose of minimizing source material that could ignite and propagate a wildfire. While the focus has been on funding grants to third parties for fuel management work in the HFTD, in 2020, SDG&E closely aligned its Fuels Management Program with its pole brushing activities, focusing on expanded pole clearing. Expanded pole clearing involves the thinning and trimming of ground vegetation at the base of distribution and some transmission poles for a radius of 50 feet from the pole. SDG&E performed this fuel modification activity on 300 poles in 2020, and completed maintenance on 314 poles that were cleared in 2019.

In 2021, SDG&E will continue to align and integrate its Fuels Management Program with routine pole brushing activities. Pole brushing is required by the state for fire prevention on poles that carry hardware that can spark and cause an ignition and involves the removal of all vegetation down to bare mineral soil for a radius of 10 feet from the pole. Aligning these two activities will create synergy efficiencies related to project scope, customer contact, property visits, and

environmental review. Additional details regarding the program are available in Section 7.3.5.5 below.

11. Vehicle Tracking

In 2020, SDG&E completed the pilot project installation of the Verizon Telematics vehicle tracking solution on 240 vehicles within Gas Operations, Fleet Services, and Electric Regional Operations. SDG&E collected initial baseline data from the pilot project and enacted reporting standards that focus on vehicle speeding metrics and identified a handful of other metrics that will be targeted in the future. SDG&E is actively deploying this technology to the remaining Fleet Assets with 1,337 additional assets complete. At the end of 2020, SDG&E had 6 units remaining to install and anticipates full installation by end of January 2021.

SDG&E prioritized employee safety metrics, namely speeding reduction. Since implementing this pilot, there has been a 90% reduction in speeding after enacting reporting standards on this metric. SDG&E will continue to focus on this metric as it expands the technology to additional vehicles. Additionally, SDG&E will work on improving other areas, including: idle time, distracted driving, and improved maintenance response times. Tracking employee location in Tiers 2 and 3 of the HFTD is critical to ensuring their safety and support. As an example, during the recent Valley Fire, SDG&E was able to utilize the vehicle tracking technology to monitor employees entering evacuation areas in support of fire services. SDG&E was able to validate vehicles entering these areas were purposeful and could track these vehicles movement throughout the evacuation areas to ensure they remained at a safe distance from the fire.

The pilot of SDG&E's Vehicle Tracking Program has concluded, and SDG&E will pursue this as a full-fledged program going forward. Additional details regarding the program are available in Section 7.3.9.7 below.

4.2 Understanding Major Trends Impacting Ignition Probability and Wildfire Consequence

Instructions: *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)[8] and Risk Assessment Mitigation Phase (RAMP), highlighting changes since the 2020 WMP report. 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.*

4.2.a Enterprise Risk Management

4.2.a.1 Risk Framework

SDG&E's risk framework is modeled after an internationally recognized risk management standard, ISO 31000.[9] This framework consists of an enterprise risk management governance structure, which addresses the roles of employees at various levels ranging up to SDG&E's Board of Directors, as well as various risk processes and tools.

One such process is SDG&E's six-step enterprise risk management process. The figure below describes SDG&E's enterprise risk management process, by which SDG&E identifies, manages, and mitigates enterprise risks, and aims to provide consistent, transparent, and repeatable results.

[8] Updates to S-MAP are currently in deliberation under proceeding R.20-07-013 – Order Instituting Rulemaking to Further Develop a Risk-based Decision-making Framework for Electric and Gas Utilities.

[9] ISO 31000 is a family of standards relating to risk management codified by the International Organization for Standardization.

Figure 1: Enterprise Risk Management Process



This six-step process is aligned with the Cycla Corporation's 10-Step Evaluation Method, which was adopted by the Commission "as a common yardstick for evaluating maturity, robustness, and thoroughness of utility Risk Assessment and Mitigation Models and risk management frameworks."[10] While the lexicon used by Cycla differs slightly from that of the Company, the content is largely aligned. SDG&E performs its enterprise risk management process annually, resulting in an enterprise risk registry (ERR). The Commission defines an ERR as "[a]n inventory of enterprise risks at a snapshot in time that summarizes (for a utility's management and/or stakeholders such as the CPUC) risks that a utility may face. The [ERR] must be refreshed on a regular basis and can reflect the changing nature of a risk; for example, risks that were consolidated together may be separated, new risks may be added, and the level of risks may change over time."[11]

Accordingly, SDG&E's identified enterprise-level risks, including safety-related and wildfire-related risks, are presented in its ERR. Each risk has one or more risk owner(s), a member of the senior management team who is ultimately responsible and accountable for the risk, and one or more risk manager(s), who is responsible for ongoing risk assessments and overseeing implementation of risk plans. SDG&E uses input from the risk managers and the risk owners to

[10] D.16-08-018 at 195, Ordering Paragraph 4.
[11] D.18-12-014 at 16-17.

ultimately finalize its ERR. Therefore, SDG&E's enterprise risk management process is both a "bottoms-up" and "top-down" approach.

In addition, each risk in the ERR has an associated set of mitigations (i.e., projects or programs that reduce the likelihood of the risk and/or negative consequences should the risk occur). Notwithstanding these risk management and mitigation efforts, however, adverse events will occur. When that happens, SDG&E's efforts, including implementation of response plans, development of role and responsibility descriptions and checklists, and facilitation of training and exercises, are designed to prepare the Company to respond safely and effectively to those adverse events that occurred despite mitigation efforts.

4.2.a.2 Risk Identification & Evaluation

In SDG&E's enterprise risk management process, as explained in the 2019 Risk Assessment Mitigation Phase (RAMP),[12] risk identification is the process of finding, recognizing, and describing risks. As the first step in the enterprise risk management process, the Enterprise Risk Management organization works with various business units to update existing risk information and identify enterprise-level risks that have emerged or accelerated since the prior assessment. This part of the process also includes the identification of risk events, their causes, and potential consequences, which is summarized in a Risk Bow Tie. The Risk Bow Tie is "a tool that consists of a Risk Event in the center, a listing of drivers on the left side that potentially lead to the Risk Event occurring, and a listing of Consequences on the right side that show the potential outcomes if the Risk Event occurs."[13]

Risk evaluation is also included in SDG&E's enterprise risk management process.[14] It results in a pre-mitigation risk score. The methodology or framework utilized by SDG&E to calculate risk scores, including for the Wildfire risk, was adopted in the S-MAP (D.18-12-014) and presented in SDG&E's 2019 RAMP.

The S-MAP puts forth a consistent framework to be applied in future RAMP and GRC filings for identifying and evaluating risk across all California utilities. Thus, SDG&E's approach generally follows a consistent framework with the other utilities. It is important to note that SDG&E was the first utility to apply the new quantitative risk methodology adopted in the S-MAP and is continuing to review opportunities for improvement and lessons learned from the new approach.

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12 2019 RAMP, Chapter RAMP-B at B-4.

13 D.18-12-014 at 16.

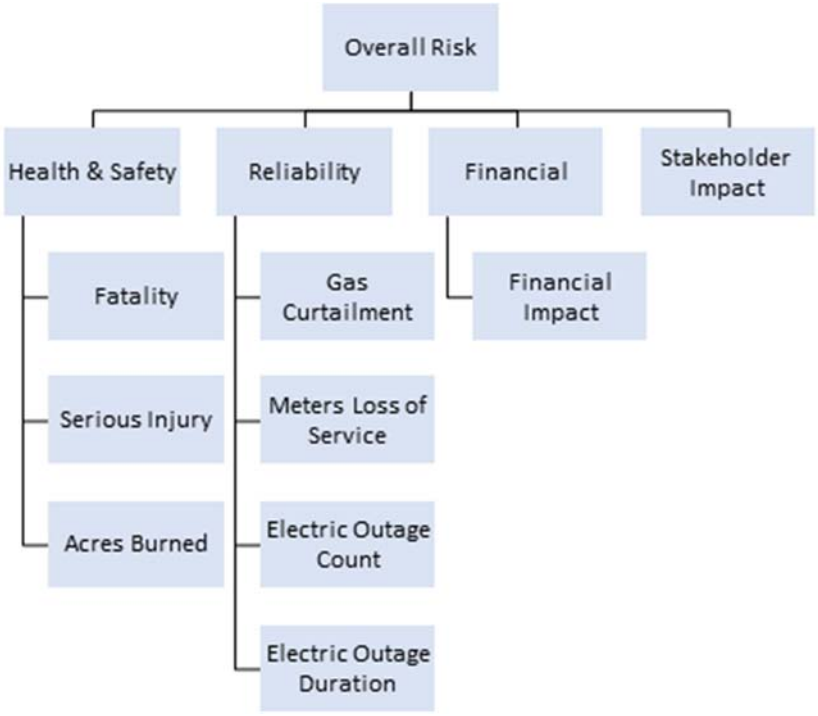
14 *See* 2019 RAMP, Chapter RAMP-B at B-6.

4.2.b Multi-Attribute Value Function

SDG&E refers to its Multi-Attribute Value Function (MAVF) as its Risk Quantification Framework. This is an evolving framework that SDG&E uses as a tool to discuss and inform quantitative risk assessments, and it is subject to change for various reasons. The Risk Quantification Framework depicted and discussed below is being considered for use in SDG&E's 2021 RAMP filing, which will occur by May 15, 2021. This proposed Risk Quantification Framework may undergo changes between now and that date depending on feedback received from the CPUC and others. What is presented in this WMP is the most up to date information at the time of the writing of this document but is subject to change.

SDG&E used an older version of its Risk Quantification Framework for its 2019 RAMP. That framework is similar to the one discussed below, with two notable exceptions – it did not contain the "Acres Burned" sub-attribute, nor did it contain the attribute "Stakeholder Impact." The changes from 2019 are due to the evolving nature of risk frameworks. In particular, the inclusion of Acres Burned was introduced to more fully measure the impact from wildfire. The burning of vegetation and the subsequent pollution created is a serious health concern, and SDG&E has utilized academic and government work to understand and estimate those impacts.

Figure 2: SDG&E's Proposed Risk Quantification Framework



Attribute	*Unit*	*Range*	*Weight*
Health & Safety	Index	0 - 20	60%
Reliability	Index	0 - 1	20%
Financial	$M	$0 - 500M	15%
Stakeholder Impact	Index	0 - 100	5%

- **2021 RAMP Attributes:**
  a. Health & Safety is measured by indexes, has a range of 0 - 20, and a weight of 60%. Below are the sub-attributes:
     - Fatality has a value of 1
     - Serious Injury has a value of 0.25
     - Acres Burned has a value of 0.00005
  b. Reliability is measured by indexes, has a range of 0 - 1, and a weight of 20%. Below are the sub-attributes:
     - Gas Curtailment is measured by the number of million cubic feet (MMcf), has a range of 0 - 250 for SDG&E, and a weight of 25% (SDG&E)
       - Meters Loss of Service is measured by the number of meters, has a range of 0 - 50,000 (SDG&E), and a weight of 25% (SDG&E)
       - Electric Outage Count is measured by the System Average Interruption Frequency Index (SAIFI) outages, has a range of 0 - 1, and a weight of 25%
       - Electric Outage Duration is measured by the System Average Duration Index (SAIDI) minutes, has a range of 0 - 100, and a weight of 25%.
  c. Financial is measured in millions of dollars, has a range of $0 - 500M, and a weight of 15%.
  d. Stakeholder Impact is measured in indexes, has a range of 0 - 100, and a weight of 5%.

4.2.b.1 Approach for determining probability of ignitions and consequences

SDG&E continually evaluates its wildfire risk assessments regarding the probability of ignitions and the consequences of wildfires. This wildfire risk assessment is an on-going effort which is updated as new data is collected and when new studies are undertaken. The general approach to wildfire risk is a hybrid approach of a "top down" approach, coupled with a "bottoms up" approach. The "top down" approach refers to the assessment across the entire risk, namely the total wildfire risk across SDG&E's entire service territory, using global concepts of ignitions, relevant outages, potential damage, and so forth. The "bottoms up" approach is undertaken by analyzing granular aspects of wildfire risk such as the amount of risk (likelihood of ignition and consequence if an ignition occurs) from specific assets or locations. Together these two methods help calibrate each other to provide a more robust risk picture than only reviewing one method (global or granular).

The global "top down" assessment is based on a model that was built using stochastic methods (e.g., Monte Carlo) which allows for uncertainty to be incorporated into the modeling. The inputs related to the likelihood of ignition involve information related to historical large fires, annual ignitions, accommodations to climate change, accommodations to system hardening, and accommodations from operational changes such as system protection settings and PSPS. The inputs related to the consequence of ignitions involve information related to SDG&E's wildfire behavior modeling, accommodations due to climate change, and applying financial treatments to consequences to adjust to the current year's financial considerations (e.g., real estate prices, Consumer Price Index). The output of the model is two probability distributions, one for ignition likelihoods and another financial consequence. Currently, the financial consequence is used as a proxy for human safety, due to the strong connection between safety and homes destroyed, and because large fires are rare giving a small sample size to find correlations between location and safety implications. Future versions of risk modeling will include more refined thinking on how to include safety impacts into modeling, including such notions as density, egress, and specific customer types affected. Together, the financial and safety consequences are used in SDG&E's Risk Quantification Framework.

The granular "bottoms up" approach attempts to find failure and ignition rates for specific scenarios, starting with equipment types and sub-types, but also by location and environmentally-focused conditions such as vegetation and wind. Bear in mind that the sample size of ignitions is relatively small from a statistical standpoint when considering all of the situational characteristics. For example, there are fewer than 10 ignitions recorded for certain equipment types, over the past five years, and those ignitions occurred under various conditions with varying weather, vegetation, and asset-specific characteristics such as age or manufacturer. Although it is a positive situation to have small sampling of ignitions, it leads to the need to generalize much of the information. As an example, there have been a total of four ignitions due to distribution fuses in the past five years. There are thousands of distribution fuses in SDG&E's distribution system, and each of these ignitions occurred under their own unique circumstances, when one considers the weather, vegetation, fuse type, and so forth. Therefore, one should not expect SDG&E to have extremely granular ignition rates for all fuse-related situations, but rather it will be generalized to a few fuse categories and broken out by Tier 2 and Tier 3 of the HFTD.

Finally, an important notion regarding wildfire risk is the connection between ignitions and risk. Over the past 10 years, there have been approximately 300 CPUC reportable ignitions[15] associated with SDG&E equipment. Of those 300, only one of them is associated with the destruction of property – which was a single structure. For the most part, each of these 300 ignitions did not require significant fire suppression activity and burned less than one acre. In other words, preventing any one of those 300 ignitions would not have provided significant risk

[15] As defined by D.14-02-015.

reduction. However, one large fire at the wrong time and place, could have a larger impact than those 300 ignitions combined. Because wildfire risk is very situationally dependent, and many of SDG&E's mitigations involve long term improvements such as equipment change outs, it is very difficult to confidently attribute risk reduction for each equipment change out. Because of this, SDG&E has chosen to largely use ignitions as a rule of thumb indicator of risk reduction, while understanding that the ignition that was prevented was not necessarily going to be a catastrophic wildfire. Put another way, SDG&E's global modeling suggests that approximately one in 500 ignitions will be catastrophic (e.g., damage resulting in over $100M; significant damage and potential safety consequences), and therefore, if a mitigation prevents one ignition, it is preventing 1/500th of a catastrophic fire.

Together, the "top down" and "bottoms up" methods are used to provide an overall view of wildfire risk and assists in determining which mitigations make the most sense to perform. Currently, the "bottoms up" approach essentially helps to allocate the amount of risk that has been identified by the "top down" approach.

4.2.b.2 Incorporation of PSPS Impacts in the Evaluation of Wildfire Risk

SDG&E recognizes that PSPS, while effective at reducing wildfire risk, has impacts to customers that are subject to extended outages. While it could be considered a separate risk, it is directly tied to wildfire mitigation and would not exist otherwise. SDG&E attempts to balance between wildfire risk and the impacts of PSPS.

When evaluating the current level of wildfire risk, SDG&E takes into account the current implementation of PSPS. Without PSPS, the wildfire risk would be significantly higher. In Risk Management, the terms "inherent" and "residual" refer to the levels of risk before and after a risk-reducing activity has been undertaken. In the case of PSPS, the inherent wildfire risk can be thought of as the risk level without a PSPS program, and the residual wildfire risk is the risk level with a PSPS program in place.

In this WMP, SDG&E has updated its overall risk assessment to include the impacts of PSPS in the overall risk evaluation. Therefore, there are two separate risk scores that SDG&E measures: (1) wildfire risk, and (2) PSPS impacts. The overall risk evaluation is the sum of the risk scores for wildfire risk, and PSPS impact. In this section, SDG&E will refer to this sum or risks as the Total Wildfire Risk Score (TWRS). Both the wildfire risk and the PSPS impacts are evaluated using the Risk Quantification Framework described above. All RSE presented in this WMP use the TWRS as their basis. Some mitigations in SDG&E's WMP reduce the wildfire risk, while other mitigations reduce the PSPS impacts, and some mitigations lower the risk for both wildfire risk and PSPS impacts.

Without a PSPS program, the TWRS would be comprised solely from inherent wildfire risk. SDG&E shows that with the application of a PSPS program, the TWRS is reduced, meaning that SDG&E's PSPS program creates a net reduction in total wildfire risk to the community.

The evaluation of PSPS impacts is still in the early stages of development, and SDG&E's framework will continue to evolve in quantifying and understanding the impacts of PSPS to inform strategies for wildfire mitigation.

4.2.b.3 PSPS Customer Impacts Valuation

To estimate PSPS impacts, SDG&E considers the probability and consequences of PSPS events on an annual basis at a segment level. A segment can be thought of as multiple spans and structures between two electrical isolation points that are used for PSPS activities. These segments range from around a mile to several miles and are the basis on which SDG&E implements PSPS. Each segment has a weather station associated to it that acts as a proxy for weather conditions on that segment.

The individual probability of a segment undergoing a PSPS event each year is determined by examining historical weather events and by applying subject matter expert guidelines on how often each segment would experience a PSPS event. Each year, SDG&E reviews its methods for when and where to apply PSPS, and therefore it is not known with certainty the precise actions the utility may take in the future.

Although this analysis is performed at the segment level, there are interdependencies with other segments. As an example, consider a distribution circuit that is comprised of two PSPS segments; the "upstream" segment starts at the substation and goes halfway the length of the circuit; and the "downstream" second segment goes from that halfway point to the end of the circuit. In this example, if the "upstream" segment was to have PSPS, then the "downstream" segment would also experience a PSPS due to the loss of power that emanated from the "upstream" segment. SDG&E has taken care to consider these upstream/downstream effects on PSPS events when analyzing the true impact to the customers.

To calculate the PSPS impact portion of the TWRS, SDG&E used recent data such as the number of PSPS activations, the number of customers affected, and duration of the outages for each customer. SDG&E recognizes that the impact of a PSPS is not the same on all customer types and that there are certain customer groups that may suffer higher consequences than others in a PSPS event. As such, SDG&E uses three categories to represent different types of customers as follows:

- **Critical:** This includes urgent customers whose mission supports regional emergency response (e.g., police, fire department, hospitals) as well as essential customers who are essential to public health, safety, and security as defined by the CPUC (e.g., public utilities, communications providers, water service providers, transportation)
- **Medical Baseline:** Residential and other customers with a qualifying medical condition or medical device usage (e.g., dialysis machine)
- **Non-Critical:** All other customers that do not fall in either the critical or medical baseline categories.

To estimate the heightened impact of the customer categorizations in respect to a non-critical customer, each customer group is evaluated on the risk attribute categories similar to those as defined in the MAVF (i.e., safety, financial, reliability, stakeholder impact). The key difference is that unlike the definition of reliability used in RAMP (e.g., gas meters out, curtailment, SAIDI, SAIFI), reliability is measured as the number of customers losing access to key services (e.g., utilities, healthcare). Since the critical categorization represents a spectrum of different customers types, specific customer types are used as proxies. For example, the impact on "urgent" customers is estimated by using an outage on a communications tower as a proxy.

A combination of industry research and subject matter expertise is used to, by attribute, bucketize the range of impact values and correspond them to an attribute consequence weighting. As shown below, each customer category is evaluated, using reasonable worst-case consequence conditions, and assigned a consequence multiplier for each risk attribute.

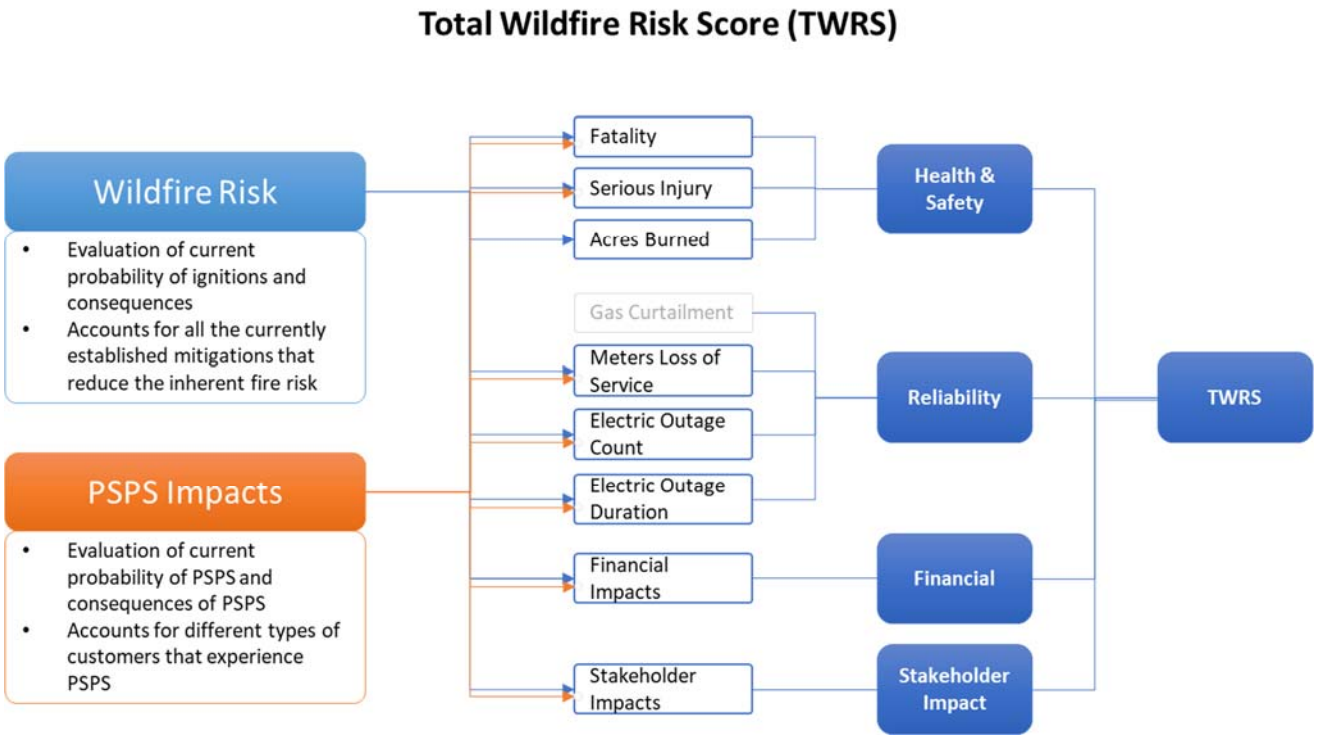
Figure 3: Distinguishing Customer Impacts by Type

Customer Type	Data Assumptions / Proxys	Safety			Financial			Reliability			Stakeholder Impact
		Initial Score	Impact Multiplier	Total Impact	Initial Score	Impact Multiplier	Total Impact	Initial Score	Impact Multiplier	Total Impact	Total Impact
Non-Critical	***Assumption***: 80% Residential, 10% Commercial, 10% Industrial	1	1	1	1	1	1	1	1	1	1
Critical	***Proxy***: Communications Tower	20	1	20	10	1	10	30	1	30	30
Medical Baseline		5	1	5	1	1	1	1	1	1	5

The baseline PSPS impact, per attribute, is calculated using the total number of downstream customers. The per attribute customer value is determined by multiplying the downstream customer count of each customer category by its value and then taking the sum. For each attribute, the baseline risk value is multiplied by the ratio of customer impact to the total number of customers.

The framework of valuing the varying PSPS impacts on different customer types is still in early development and will continue to be iterated and improved upon with input from both internal and external stakeholders. The figure below is a visual representation showing how the wildfire risk and PSPS impact are evaluated using the common Risk Quantification Framework described above.

Figure 4: Evaluation of Wildfire Risk and PSPS impact Using RQF



4.2.c Risk Evaluation and RSE Estimation

4.2.c.1 Risk Scope and Methodology

The section below provides an overview of the scope and methodologies applied for the purpose of risk quantification. The Risk Quantification Framework and approach utilized is based on the Settlement Agreement (SA) that the IOUs and intervenors reached in the S-MAP which was adopted by the CPUC as the guiding framework for conducting risk assessments for RAMP.

The SA Decision sets minimum requirements for risk and mitigation analysis in RAMP, including enhancements to D.16-08-018. SDG&E used the guidelines in the SA Decision as a basis for analyzing and quantifying risks, as shown below.

Pre-Mitigation Analysis Risk Quantification Scores

	Wildfire Risk	**PSPS Impact**	**Total Wildfire Risk Score (TWRS)**
Pre-Mitigation Risk Score	12,623	5,462	18,085
LoRE	22	4	N/A
CoRE	579	1,366	N/A

	Wildfire Risk Score			**PSPS Impact**		
Pre-Mitigation Risk Score	**Non-HFTD**	**Tier 2**	**Tier 3**	**Non-HFTD**	**Tier 2**	**Tier 3**
	323	6,265	11,497	0	1,639	3,824
LoRE	**Non-HFTD**	**Tier 2**	**Tier 3**	**Non-HFTD**	**Tier 2**	**Tier 3**
	9.2	7.2	5.4	0	4	4
CoRE	**Non-HFTD**	**Tier 2**	**Tier 3**	**Non-HFTD**	**Tier 2**	**Tier 3**
	35	643	1,421	N/A	410	956

Risk Quantification Scope

In-Scope for purposes of risk quantification:	The risk of wildfires that meet the CPUC Fire Incident Data Collection requirements for reporting.[16] A wildfire must be reported if all three of the following criteria are met: • A self-propagating fire of material other than electrical and/or communication facilities; • The resulting fire traveled greater than one linear meter from the ignition point; and • The utility has knowledge that the fire occurred. The impacts of PSPS to customers are also included in the scope of the risk quantification.
Out-of-Scope for purposes of risk quantification:	Wildfires that do not meet the CPUC Fire Incident Data Collection requirement for reporting are excluded from this analysis.

4.2.c.2 Sources of Input

SDG&E's safety risk assessment primarily utilized historical data provided by the California Department of Forestry and Fire Protection (CAL FIRE), which has various resources useful for analysis. A notable resource used from CAL FIRE are known as "Redbooks," which are published annually and provide fire names, cause of fire, acres burned, structures burned, and human safety information for each fire. The data from the Redbooks is also summarized by County and Region. CAL FIRE also provides maps and Geographic Information Systems (GIS) data at their Fire and Resource Assessment Program (FRAP) website.[17] GIS files provide the key element of the geographic location of each fire in CAL FIRE's records, and therefore can be used to analyze fires based on location-specific characteristics such as vegetation class or weather patterns. CAL FIRE's incident reports are also valuable because they provide additional facts about events. For example, CAL FIRE's incident page discussing the Sawday Fire, which occurred in San Diego in 2019, has information regarding the ignition location and links to situational updates.[18]

Other data sources used to estimate wildfire risks are web-based news articles that discuss the facts surrounding wildfire events. Although the CAL FIRE Redbooks have fire-related facts, web-

[16] D.14-02-015.
[17] California Department of Forestry and Fire Protection, available at: https://frap.fire.ca.gov/.
[18] California Department of Forestry and Fire Protection, Status Updates, available at: https://www.fire.ca.gov/incidents/2019/10/25/sawday-fire/.

based news articles can help explain the events with more details, such as the type of structures destroyed, the extent of injuries, or the estimated cost of the event. Regarding financial losses, it is difficult to determine the precise cost of wildfire events. Different groups have different points of view on costs and may not always include all considerations. Wildfire events primarily can have costs resulting from the following: a) property damage, b) personal injury or fatality, c) suppression costs, d) environmental damage and remediation, e) lost economic output from various reasons (including work closures and employee unavailability), and f) personal relocation due to evacuations. There is no known single source for all financial impacts from wildfire. SDG&E used available data to approximate financial impacts.

4.2.c.3 Approach for Estimating Likelihoods and Consequences

The following provides an explanation of how likelihoods and consequences from wildfire risk were estimated. Wildfire risk is unique among other enterprise risks, because: a) it has an extremely wide range of impacts (i.e., some fires have no impacts while others cause serious injury and billions of dollars of damage); b) it is situationally dependent on many changing factors (i.e., climate change, weather, vegetation), c) drivers to the risk are frequently outside a utility's control (e.g., man-made debris, animal, human, and plant contacts), and d) significant impacts are rare, which leads to low-confidence estimations regarding future risk.

An outline of how the Wildfire risk was modeled and then used for developing this plan is outlined in the following steps:

- Data Gathering:
  - Wildfire Risk: historical data was used as a starting point for consideration of likelihoods. Data considered was both from reportable ignitions (since 2014) and from large fire history (since 1970) reported, for example, by CAL FIRE, and described in detail above.
  - PSPS impact: historical data was used from SDG&E's reliability database that flags outages by cause. Data from 2017-2019 was considered and based upon the evolving nature of the PSPS program, the data from 2019 was deemed the most relevant to use for on-going analysis.
- Changes from Historic Likelihood:
  - Wildfire Risk: Changes were considered from the historic likelihood of fires. Changes from historic likelihoods are primarily due to: a) system hardening programs, including PSPS, that have been undertaken during the timeframe used (to elaborate, the timeframe used for analysis was between 1970 and 2019, and system hardening programs began in earnest in 2008); b) climate change; c) increased overhead miles relative to previous timeframes; and d) change in vegetation relative to previous timeframes. Because each of these changes are not precisely known, models were used to estimate the actual range of current likelihoods, with 10,000 estimates stored for use in the next step.

- PSPS impact: As mentioned above, data for 2019 is being used for analytical purposes going forward. SDG&E is aware that the number of PSPS events has a large variance from year to year depending on the weather and the presence of wildfires. Additional reasons for changes in likelihood can be due to updated notions of when to perform PSPS, based on analysis of the relationship between wildfire risk and PSPS impacts.

- Modeling of Consequences:
  - Wildfire Risk: Consequences were also modeled by using historical fires to create or "fit" a probability distribution from large fires considering financial loss. The probability distribution is SDG&E's estimation of the types of financial losses that may occur if a large utility associated wildfire occurs. The probability distribution is not a precise statistical forecast, but it is a useful estimation for wildfire risk discussions. The probability distribution that is currently used is not permanent and will be modified as new information becomes available.
  - PSPS impact: Consequences of PSPS activations is discussed in Section 4.2.b.3 above. In short, SDG&E has assigned consequence values for safety, reliability, finance, and stakeholder impact; and those values span three different customer classes. SDG&E is aware that valuing the consequences of PSPS is a very important piece of analysis and will continue to evolve in its approach to more accurately reflect the impacts to customers.

- Monte Carlo Simulation:
  - Wildfire Risk: In Microsoft Excel, Monte Carlo modeling was performed to identify the likelihood and consequence of large fires, using the following approach:
    - 10,000 runs, which simulate individual years, were performed.
    - 10,000 probabilities, one for each run, were created based upon the likelihood information addressed above. During each run, a random number was generated and used to compare between it and the likelihood stored for that run. If the random number is smaller than the likelihood value, the model assumes that a large wildfire occurred during that run. The average of the likelihood values used in this step is approximately 0.069, which indicates that at least one large wildfire will occur in one out of every 15 years. Some of the years that have at least one large wildfire will have multiple large wildfires in that year. The total number of large wildfires that the model produced was 935 over 10,000 runs.
    - If a large wildfire was modeled to occur, a method to determine the number of wildfires that occurred during that run was undertaken. That method created a random value drawn from the Poisson distribution with the parameter of 1 (i.e., $\lambda(1)$). The maximum value between that random draw and the number 1 was then used to represent the number of large wildfires that occurred during that run.

        - Depending on the number of wildfires to run (as determined in the previous step) the consequence probability distribution was then used for sampling. The sum of the sampled values was used for the financial consequence for the run and stored for further analysis.
        - Most runs returned $0 due to the fact that large fires are modeled to occur approximately once every 15 years. In the runs where a large wildfire was modeled to occur, the average financial consequence was approximately $3 billion.
        - The output from the Monte Carlo modeling was then tabulated and put into a format to be analyzed.
    - PSPS impact: There is currently no Monte Carlo simulations performed for PSPS impacts.
- The following steps were undertaken to meet the SA Decision's requirements:
    - Because the scope of the Wildfire risk includes all CPUC-reportable fires, and not solely large destructive fires, an adjustment was made from the other internal modeling. For purposes of the analysis, LoRE is set to the recent history of SDG&E's CPUC reportable fires, which is approximately 22. Because the total number of modeled large fires was 935 out of 10,000 runs, and 22 reportable fires of all sizes occur each year, this data estimates that one out of every approximately 235 reportable wildfires will be a large destructive fire.
    - CoRE was partially calculated from the Monte Carlo modeling by extracting the expected values of the output consequences. This was done differently for each attribute:
        - Financial: The expected value of all Monte Carlo outputs was determined to be $225 million.
        - Reliability: Data was extracted from SDG&E's internal reliability database for fire-related outages to determine reliability impacts.
        - Safety: Due to the large uncertainty around safety during wildfires, a rule of thumb was applied to the financial data. Based on subject matter interpretation of historical data, for each $1 billion loss due to wildfire, it was assumed that 4.25 safety units would occur. This ratio was applied to the Monte Carlo output, producing an expected value of 0.96 safety units per year.
        - Stakeholder Impact: In the Risk Quantification Framework, a significant wildfire has a stakeholder impact score of 100, and all other smaller wildfires have a score of 0. Together, the expected value used is 0.49.
        - CoRE Output: These obtained values were then used as inputs the Risk Quantification Framework to determine the CoRE value of 579.

This analysis sets the foundational starting point for evaluating the effectiveness of mitigations and calculating RSE scores. If an initiative reduces wildfire risk but does not reduce PSPS impact, an estimate of reduction for either LoRE or CoRE for wildfire risk was undertaken, and a post-mitigation wildfire risk score was calculated. If an initiative reduces PSPS impact but does not reduce wildfire risk, an estimate of reduction for LoRE or CoRE for PSPS impact was completed, and a post-mitigation PSPS impact score was calculated. If an initiative reduces both wildfire risk and PSPS impact, an estimate of reduction for LoRE or CoRE for both wildfire and PSPS impacts was completed, and a post-mitigation wildfire and PSPS impact was calculated.

The difference between the pre-mitigation and post-mitigation risk levels is then used to calculate the RSEs by dividing the change in risk level by the total cost of the initiative taking into account the life of the project which determines how long benefits would be realized. For example, grid hardening projects typically have a long duration for benefits because new poles have an estimated age of 40 years so the benefits of new poles can be realized over the lifetime of the new asset. Initiatives such as inspections that occur on a more cyclical basis (e.g., every three years) will have benefits that span the duration of the cycles. These durations do not mean the projects will take that long to implement, they merely reflect the duration of the benefits.

Figure 5: Initiative Assessment



*Note: depending on the initiative and available data, risk reductions will either be calculated based on estimated reduction in likelihood or estimated reduction in consequence.

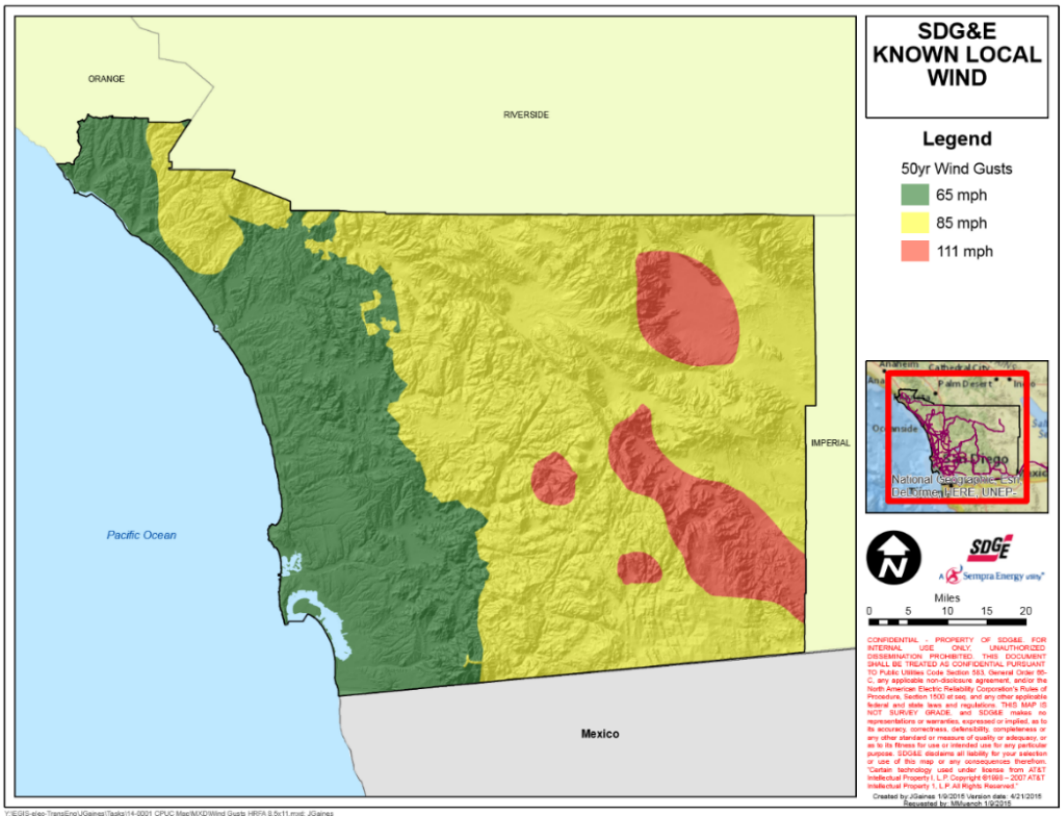
4.2.d Known Local Conditions

SDG&E leverages its weather network to closely monitor winds throughout its service territory and integrates this information into its local known conditions per Commission General Order (GO) 95, Rule 31.1. SDG&E has also conducted a detailed analysis of potential wind gusts across its service territory to support wildfire hardening efforts. The following explains how these known local conditions were created and evaluated.

In an effort to create the most accurate known local wind conditions map possible, SDG&E's Meteorology department uses a Weather Forecasting and Research (WRF) Atmospheric Model to recreate hourly weather conditions on a 3 kilometer (km) grid for the last 30 years. This is possible through using government datasets to initialize WRF to create what is known as a reanalysis dataset. SDG&E created 30 years of data for a few different purposes. First, data quality degrades beyond 30 years and this was also the extent of the computing power that was available. This reanalysis dataset took approximately 1 million compute core hours on SDG&E's meteorology computing cluster. Once the dataset was created, SDG&E was able to take the highest projected wind gusts for each point on the 3 km grid for each year going back to 1984. This provided a preliminary value, but SDG&E also wanted to add a bias correction to these values based upon the real time data received from the SDG&E Weather Network.

To achieve this, two years of data from every station in SDG&E's weather network was compared to the output from the WRF Model over the same two-year period. This enabled SDG&E to determine model biases for every grid cell on the map, which was then applied to the entire 30-year dataset. Once the full 30 years of bias-corrected data was compiled, the 30 years of data was extended to create a 50-year wind. This was achieved by determining the peak wind gusts for each year going back to 1984 and then applying a Generalized Extreme Value Probability Distribution Function (GEV PDF) to the data. This enabled SDG&E's Meteorology team to extend the 30-year wind to a 50-year wind for each grid cell in the map. Once this step was complete, the Meteorology team was then able to conduct analysis on the map to make refinements based upon their subject matter expertise. Having an understanding of the model's tendencies in resolving winds around certain terrain features, the meteorologists were able to refine details of the wind map to bring added value and accuracy to the final version which exists today. The following figure depicts SDG&E's known local wind conditions.

Figure 6: SDG&E Known Local Wind Conditions Map



In addition:

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.).*

SDG&E monitors and accounts for the contribution of weather to ignition probability and estimated wildfire consequence in its decision-making by integrating the weather data and forecast modeling into its fire behavior and fire potential tools. SDG&E's fire behavior modeling tool (WRRM-Ops) was developed using 30 years of historical weather data and the Fire Potential Index leverages weather data into the fire potential that is updated daily, providing forecasters with information on the probability of ignition and the potential for wildfire to grow rapidly.

When specifically looking at the probability of ignition, major contributing factors are atmospheric vapor pressures and the resulting dead fuel moistures of the finer fuels. These factors are incorporated into the Fire Potential Index through the fuel moisture and weather components and contributes to the daily index ranging from Normal to Extreme, which carry increasing levels of work restrictions. Regarding longer term investments, the updated local known weather conditions are incorporated into system hardening projects and construction standards.

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.*

As mentioned in Section 4.2A above, SDG&E monitors and accounts for the contribution of fuel conditions to ignition probability and estimated wildfire consequence in its decision-making by integrating all of the weather data the is collected into the weather data and forecast modeling into its fire behavior and fire potential tools. SDG&E does not project fuel conditions outside of the 7-day forecast period of its Fire Potential Index tool. SDG&E closely monitors all fuel moisture data available from the Remote Automated Weather Stations (RAWS) and fire agencies including the Energy Release Components(BTU/ft^2), Live Fuel Moisture Percentages through the National Fuels Database and the number of grams of water that are measured in the 1, 10, 100 and 1000 hour fuels across the region.

This information is also modeled daily on SDG&E computers for integration into SDG&E fire behavior and fire potential tools. When incorporating dead fuel moistures into the Fire Potential Index, SDG&E integrates 10hr fuel moistures, as that best represents the dead fuel component of the chaparral that drives SDG&E's most extreme wildfires. SDG&E considers that one dead fuel component to be extreme when the measurements fall below 6 gms. Regarding the Live Fuel Moisture, these values are considered extreme when the reading falls below 60%.

4.2.1 Service Territory Fire-Threat Evaluation and Ignition Risk Trends

Instructions: *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). Include a discussion of any fire threat assessment of its service territory performed by the electrical corporation, highlighting any changes since the prior WMP report. 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.*

SDG&E closely examines its entire service territory on a regular basis. SDG&E has identified portions of its service territory where there is an increase in fire potential due to the presence of vegetation outside of the HFTD, though the risk does not elevate to the level of a Tier 2 designation in the HFTD. As circumstances evolve, SDG&E will continue to assess areas of its service territory for potential inclusion in the HFTD.

List and describe any macro trends impacting ignition probability and estimated wildfire consequence within utility service territory, highlighting any changes since the 2020 WMP report:

1. **Change in ignition probability and estimated wildfire consequence due to climate change**

The data collected in 2020 shows that it was the hottest summer on record for SDG&E's service territory, which resulted in lower fuel moistures and a higher ignition potential from all sources across the region. As seen across California in 2020, the hot temperatures led to an increased wildfire consequence, which can be in part attributed to climate change.

2. **Change in ignition probability and estimated wildfire consequence due to relevant invasive species, such as bark beetles**

The most significant invasive pest that continues to impact trees within SDG&E's service territory is the Gold Spotted Oak Borer (GSOB), *Agrilus auroguttatus*. The potential suitable habitat for GSOB is fairly widespread throughout San Diego County, and the pest is estimated to have killed approximately 80,000 trees since its introduction in 2004. The instances of known infestation sites do not occur in all areas of suitable habitat. Most of the suitable habitat is located within the current areas of the designated HFTD.

Rancho Santa Fe (RSF) is an enclave within San Diego County located east of Del Mar that includes a high volume of eucalyptus trees first introduced in the nineteenth century for possible use in the making of railroad ties. The majority of these trees are mature with large canopies. In much of this area, eucalyptus is a monoculture which presents a high risk to

property if a wildland fire were to burn through the crowns of the eucalyptus trees. A few significant pests pose a threat to the eucalyptus, and episodically may cause relatively widespread tree mortality. These pests include the Eucalyptus Longhorned Borer (*Phoracantha recurva*) and the Lerp-Psyllid *(Glycaspis brimblecombei).*

Invasive pests are a natural component of the urban and rural forest ecosystem. Tree mortality can be an expected result of pest activity. Ignition probability would be expected to increase if impacted trees were located within the strike zone of the overhead electrical facilities. However, through its routine inspection activities and enhanced hazard tree inspections within the HFTD, SDG&E has been able to successfully identify and mitigate trees infected by invasive pests that could pose a threat to the power lines by implementing maximum post-trim clearances and pursuing the removal of high risk trees located within the HFTD.

3. Change in ignition probability and estimated wildfire consequence due to other drivers of change in fuel density and moisture

As previously mentioned, the high temperatures in 2020 had an impact on the fuel moistures across SDG&E's service territory, which increased wildfire probability and consequence. SDG&E did not see any major change in its fuel density in 2020.

4. Population changes (including Access and Functional Needs population) that could be impacted by utility ignition

Since the 2020 WMP was submitted, the number of new customer accounts opened in SDG&E's HFTD has increased by approximately 13%. Additionally, the number of customers in the HFTD identified as having Access and Functional Needs (AFN) has increased by approximately 39%. In 2020, SDG&E used its medical baseline program enrollments as a proxy to determine the AFN population in its service territory. For 2021, as explained in Section 4.5.2 below, SDG&E considers customers in the following categories within SDG&E's database(s) to be AFN:

- Customers enrolled in the following programs: CARE, FERA, MBL, Temperature Sensitive;
- Customers who receive their utility bill in an alternate format: Braille, Large Font Bill;
- Customers whose preferred language is a language other than English; and
- Customers who self-identify to receive an in-person visit prior to disconnection for nonpayment or self-identify as having a person with a disability in the household: disabled hearing impaired; disabled vision impaired; disability – not defined.

5. Population changes in HFTD that could be impacted by utility ignition

As stated above, SDG&E has measured a 13% increase in new customer accounts from 2020 through 2021 in the HFTD. For population data, SDG&E references census data. Census data is only collected once every 10 years, so true population increases are measured infrequently, but SDG&E will provide as census information is updated.

6. **Population changes in WUI that could be impacted by utility ignition**

Based on census information, there is no change for this year.

7. **Utility infrastructure location in HFTD vs non-HFTD**

Please see Table 8 in Attachment B.

8. **Utility infrastructure location in urban vs rural vs highly rural areas**

Please see Table 8 in Attachment B.

4.3 Change in Ignition Probability Drivers

Instructions: *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, highlighting any changes since the 2020 WMP report. 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 an ignition or not) 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 risk events, and description of events (including vegetation and equipment condition).*

Over the past year, the climate science has trended towards the continuation of warmer and drier conditions, which leads to a greater number of large fires. This, in turn, leads to an increase in ignitions from all sources. SDG&E's wildfire mitigation initiatives continue to address both the likelihood of an ignition and reduction of the consequences of an ignition should one occur. SDG&E will continue to analyze data gathered through its mitigation initiatives to identify increased areas of risk and inform mitigation activities.

In the study performed in Section 4.4.2.1 below, SDG&E details how it calculated ignition probability from risk events. At a high level, SDG&E used a five-year history of risk event data and ignition data, traunched by HFTD tiers and FPI ratings to demonstrate the impacts location and weather have on ignition probability. The study shows that ignitions are more likely to occur in the HFTD than in the non-HFTD, that ignitions are more likely to occur on extreme days than elevated, and more on elevated as compared to normal.

Tables 7.1 and 7.2 in Attachment B highlight SDG&E's forecasted change in probability drivers. To create these tables, SDG&E developed a methodology for every mitigation in its plan (that directly mitigates wildfire risk) to calculate risk events and ignitions reduced per year. SDG&E then analyzed the mitigation and the list of drivers to determine all drivers that apply. For example, undergrounding impacts all drivers including equipment failures, foreign object in line contacts, and vehicle contacts, where covered conductor mitigates all those with the exception of vehicle contacts. Other mitigations such as enhanced vegetation management only impacts the vegetation contract driver.

Once the mitigations were allocated to the drivers, the risk events (and eventually ignitions) reduced was applied mitigation by mitigation as a proportion of the risk events by driver over total risk events mitigated. For example, SDG&E estimated that the overhead fire hardening work completed in 2020 will result in 8.7 fewer risk events in 2021 and beyond. One driver that applies is animal contacts, another that applies is conductor failure. SDG&E has 78.2 risk events per year for animal contact, 42 risk events per year for conductor failure, and a total of drivers that summed to 1,039 risk events per year overall (based on a five year average of historical risk

events form 2015-2019). The contribution of fire hardening in 2020 to the forecast for animal contacts is 78.2/1039 * 8.7 = .659 fewer animal contact risk events in 2021. Every mitigation that has an impact on animal contacts is added in the same manner to achieve a final result of 77.2 risk events in 2021. SDG&E completed the exercise for forecasted ignitions in a similar manner, converting risk events reduced to ignitions reduced leveraging the study in Section 4.4.2.1, breaking down the ignitions reduced into HFTD tiers as required by Table 7.2 and to provide RSE results by HFTD tier.

4.4 Research Proposals and Findings

Instructions: *Report all utility-sponsored research proposals, findings from ongoing studies and findings from studies completed in 2020 relevant to wildfire and PSPS mitigation.*

4.4.1 Research Proposals

Instructions: *Report proposals for future utility-sponsored studies relevant to wildfire and PSPS mitigation. Organize proposals under the following structure:*

1. ***Purpose of research*** *– brief summary of context and goals of research*
2. ***Relevant terms*** *- Definitions of relevant terms (e.g., defining "enhanced vegetation management" for research on enhanced vegetation management)*
3. ***Data elements*** *- Details of data elements used for analysis, including scope and granularity of data in time and location (i.e., date range, reporting frequency and spatial granularity for each data element, see example table below)*
4. ***Methodology*** *- Methodology for analysis, including list of analyses to perform; section shall include statistical models, equations, etc. behind analyses*
5. ***Timeline*** *- Project timeline and reporting frequency to WSD*

Example table reporting data elements

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Ignitions from contact with vegetation in non-enhanced vegetation areas	2014 – 2020+ (ongoing)	Per ignition	Lat/lon per ignition	Date, hour of ignition (estimated)	-
Ignitions from contact with vegetation in enhanced vegetation areas	2019 – 2020+ (ongoing)	Per ignition	Lat/lon per ignition	Date, hour of ignition (estimated)	-

4.4.1.1 Academic Partnerships for the Purpose of Conducting Further Research

1. Purpose of research

SDG&E, SCE and PG&E have committed to assist in a pioneering effort to establish a partnership involving academia, private industry, and government for the purpose of mitigating the consequences of Wildland Urban Interface (WUI) fires on life, property, infrastructure, economy, and the social fabric of California. The Cal Poly WUI FIRE Institute has the goal of becoming a center of excellence that makes significant contributions to solving the WUI fire problem through research and education that innovates; informs policy; disseminates information; and, educates students, professionals, and stakeholders to reduce WUI fire consequences, costs, and losses.

Cal Poly's WUI FIRE Institute will use a multi-discipline, systems-based approach that focuses on education and research factors influencing WUI fire. The Institute seeks to connect multiple public and private stakeholders to establish Statewide research priorities, collect and disseminate information, convene stakeholder dialogues, guide workforce education and training, and inform policy.

2. Relevant terms

WUI – Wildland Urban Interface

3. Data elements

N/A

4. Methodology

The Institute's approach to WUI fire risk mitigation lies in examining the WUI fire problem from a holistic approach that engages agencies, practitioners, stakeholders, and scientists in the natural, built, and social environments. Cal Poly has much of this expertise on campus and collaborates with other universities, institutions, agencies, and industry to foster and support collaborative applied research, education, and outreach. Cal Poly programs of Electrical Engineering, Forest and Fire Science, City and Regional Planning, Fire Protection Engineering, GIS, Remote Sensing, Architecture, Aerospace, Meteorology, Environmental Engineering, Chemistry, Physics, Landscape Architecture, Economics, Political Science, Journalism, Graphic Communications, and others allow for a holistic examination of WUI fires (past, present and future).

A full-time Director committed to connecting the stakeholders for impactful WUI Fire research, the teaching and learning experience, and interdisciplinary innovation will lead the Institute. Faculty and students from across campus including the College of Agriculture, Food & Environmental Sciences (CAFES), College of Engineering (CENG), College of Science &

Mathematics (COSAM), College of Architecture & Environmental Design (CAED) and College of Liberal Arts (CLA) will work alongside a stakeholder group on real challenges and issues impacting the WUI in the State of California. Ultimately, the mutual goal of Cal Poly and the stakeholders, including SDG&E, SCE and PG&E is to develop a model institute that mitigates the WUI Fire problem in California.

5. Timeline

SDG&E established three new academic partnerships in 2020 for the purpose of advancing wildfire science. Below are additional details regarding these partnerships:

- SDG&E has established a 3-year strategic partnership with leading experts in climate at Scripps Institute of Oceanography to study the onset of wildfire suppressing precipitation in San Diego County, with attention paid to impacts on wildfire and subsequent later autumn and winter season hydrological measures. Scripps will examine the variability from year to year, documenting the types of storms that produce the precipitation, quantifying the current lead time in predicting these events, and identifying potential approaches to display and to predict these important storms. These late season storms and the impact on the wildfire environment could have an impact on PSPS frequency in the future.
- The San Jose State University project will develop new Live Fuel Moisture Content (LFMC) tools to better assess fire danger in the SDG&E service territory using state-of-the-science remote sensing data sets. These tools will be developed using the new high-resolution data from various satellite products eventually leading to a dataset and methodology to incorporate these tools into the Technosylva FireCast fire behavior modeling platform. Additional output from the project will include two peer-reviewed publications and one M.S. thesis which have yet to be finalized.
- SDG&E is also working with the San Diego Supercomputer Center (SDSC) to ingest and store SDG&E datasets for weather forecast, fire potential index and fuels to enable publicly available findability and accessibility of these datasets for various stakeholders and all researchers through web services and visual maps. Application Programming Interfaces (APIs) will enable time range or geolocation and tagged metadata-based querying as well as grouping and sub-setting of datasets for context-driven use. The map services will enable layering of these datasets for use in fire modeling. The project will maintain a server at SDSC for data access along with data storage capabilities stored at SDSC and back up storage on Amazon Cloud.

Cal Poly's WUI Fire Institute objectives for 2021 include:

- Institute Creation: seek formal University-approval to create the WUI FIRE Institute along with mission, bylaws, advisory council, etc. (Process initiated)
- Institute Director: develop job description, conduct search and hire an Institute Director.
- Establish internal steering committee and external advisory council.

- Identify and recruit other institution faculty members with WUI expertise interested in participating in the WUI FIRE Institute.
- Develop web page for WUI FIRE Institute.
- Conduct regular meetings of the external advisory council (Begin by Q2 2021).
- Research Projects – continue existing research projects and identify new projects based on priorities and project ideas aligned with IOUs needs, such as applied research covering fuels management and powerline interaction in High Fire Risk Areas (HRFA). Another possible research topic of interest includes assessing the need for more comprehensive, state-wide fuel surveys and formulating policy recommendations for broader public and private stakeholder participation.
- Convene symposia to engage stakeholders, define research priorities, and identify policy recommendations (minimum of one) (by Q4 2021).

SDG&E will provide annual updates to the WSD on the research findings made through academic partnerships.

4.4.2 Research Findings

Instructions: *Report findings from ongoing and completed studies relevant to wildfire and PSPS mitigation. Organize findings reports under the following structure:*

1. ***Purpose of research*** *– Brief summary of context and goals of research*
2. ***Relevant terms*** *- Definitions of relevant terms (e.g., defining "enhanced vegetation management" for research on enhanced vegetation management)*
3. ***Data elements*** *- Details of data elements used for analysis, including scope and granularity of data in time and location (i.e., date range, reporting frequency and spatial granularity for each data element, see example table above)*
4. ***Methodology*** *- Methodology for analysis, including list of analyses to perform; section shall include statistical models, equations, etc. behind analyses*
5. ***Timeline*** *- Project timeline and reporting frequency to WSD. Include any changes to timeline since last update*
6. ***Results and discussion*** *– Findings and discussion based on findings, highlighting new results and changes to conclusions since last update*
7. ***Follow-up planned*** *– Follow up research or action planned as a result of the research*

4.4.2.1 Research study to determine average distribution ignition percentages by location (Tier 3, Tier 2, non HFTD) and by operating risk condition (FPI normal, elevated, extreme)

1. Purpose of research

SDG&E conducted a study to determine the average distribution ignition percentages by location (e.g., non-HFTD, Tier 2 of HFTD, and Tier 3 of HFTD) and by operating risk condition (e.g., when the FPI is normal, elevated, or extreme). SDG&E and other stakeholders understand the risk of an ignition is greater in the HFTD, and greater in elevated and extreme operating conditions. By comparing the risk events to ignitions tranched by these different locations and operating conditions, the difference in risk in terms of ignition probability can be quantified. This also has an additional benefit of providing ignition percentage values for the purposes of improved RSE calculations and improved risk modeling.

2. Relevant Terms

The following are relevant terms related to this research:

a. Tier 3 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 3 fire-threat areas depict areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 3 represents all of the Tier 3 HFTD area within SDG&E's service territory.

b. Tier 2 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 2 fire-threat areas depict areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 2 represents all of the Tier 2 HFTD area within SDG&E's service territory.

c. Locations outside the High Fire Threat District – All other areas within SDG&E's service territory that are not part of the Tier 2 or Tier 3 HFTD.

d. Normal Fire Potential Index value – An FPI value of 11 or less represents a normal fire potential based upon combined green-up, fuels, and weather measurements.

e. Elevated Fire Potential Index value – An FPI value of 12 to 14 represents an elevated risk of fire potential based upon combined green-up, fuels, and weather measurements.

f. Extreme Fire Potential Index Value – An FPI value of 15 or greater represents an extreme risk of fire potential based upon combined green-up, fuels, and weather measurements.

g. Risk Event – All overhead system faults, meaning any overhead electrical fault caused by foreign object in line, equipment failure, other or of undetermined cause that impacts the primary electric distribution system (12kV and 4kV systems). An electrical fault includes some kind of electrical system short that results in energy created in the form of heat, this is different from outages that can be a result of opens in absence of electrical faults.

h. Ignition – CPUC reportable ignitions (as defined by D.14-02-015).[19]

[19] Per D.14-02-015, a reportable ignition is: a self-propagation fire of material other than electrical and/or communication facilities, the resulting fire traveled greater than one linear meter from the ignition point, and the utility has knowledge that the fire occurred.

3. Data Elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Risk Events	2015 – 2019 Updated Annually as a running 5-year average	Per risk event	Lat/long per risk event – filtered by Tier 3, Tier 2, or non-HFTD	Date of risk event filtered by Extreme, elevated, or normal	-
Ignition	2015 – 2019 Updated Annually as a running 5-year average	Per ignition	Lat/long per risk event – filtered by Tier 3, Tier 2, or non-HFTD	Date of ignition filtered by Extreme, elevated, or normal	-

4. Methodology

To begin, SDG&E converted its five-year reliability dataset, which includes all outages into risk events. Risk events are defined above in detail. SDG&E then created an overhead outage filter. Using the to and from structure fields which represents the outage/fault location, SDG&E filtered to only include structures that represented overhead facilities. A small subset of the data did not use a facility ID in the to or from structure fields but instead utilize an equipment ID. For this subset, SDG&E queried the equipment ID to find the facility ID associated with the equipment, and then applied the overhead filter to those structures. Finally, if the to and from structure fields were blank (which always will be the case for undetermined outages), then SDG&E used the isolation device included with the outage if the isolation device was on an overhead structure. If the isolation device was a circuit breaker and the to and from structure fields were blank, SDG&E checks cause code and includes only outages that are related to overhead.

Once the overhead filter was applied, additional cause code filters were applied to remove any additional underground outages the overhead filter may have missed and to remove any outages that were not faults from the risk event data set. This includes codes like “de-energized for safety” which is an outage to customers but not a fault on the system, and “faulted cables” which are underground only.

To apply the HFTD Tier 3 and Tier 2 filter, the to and from structure fields were used to identify the structure where the risk event occurred by querying the GIS HFTD layer to determine whether the structure was in the Tier 3 HFTD, the Tier 2 HFTD, or the non-HFTD. For the small

set of data that did not have data in the to and from structure fields, the isolating device structure was used as an approximation for the risk event location. If the isolating device was a circuit breaker, SDG&E applied the HFTD location of the associated substation. When SDG&E was unable to identify the HFTD location of a risk event based on the from structure, to structure or isolation device fields, then as a last resort a circuit approximation was used. The circuit approximation assumed that if 50% or more circuit miles were non-HFTD, then the risk event was non-HFTD. If the circuit was 50% or more within the HFTD, then the majority of the circuit mileage would determine if it was classified as Tier 2 or Tier 3.

To apply the normal, elevated, and extreme filter, SDG&E simply applied FPI data per district to district location within the risk event data set to organize the faults into the appropriate categories.

5. Timeline

SDG&E plans to update this study annually and report to WSD during all WMP filings and annual updates. The data will use a rolling five-year average to keep the ignition percentages relevant with current mitigations.

6. Results and Discussion

The following are SDG&E's findings and discussion of this research project:

	Ignition Rate			
Location	**Normal**	**Elevated**	**Extreme**	**ALL**
Non-HFTD	1.17%	2.91%	0.00%	1.46%
Tier 2	2.20%	5.07%	10.34%	3.37%
Tier 3	1.62%	4.31%	10.00%	2.74%
HFTD (Tier 2 + Tier 3)	1.92%	4.69%	10.20%	3.07%
System	1.42%	3.91%	6.10%	2.09%

The results of this study validate certain assumptions about the probability of ignition. Over the last five years, a fault in the HFTD is twice as likely as a fault in the non HFTD to cause to an ignition. A fault in the HFTD on an extreme day is 5 times more likely to cause an ignition than on a normal day. While it was a little surprising to see that ignition probability has historically been higher in Tier 2 than Tier 3, recall that those ratings represent more of the impact side of the risk equation, meaning fires in the Tier 3 are more likely to rapidly spread than in the Tier 2, so even though ignition probability may be higher in Tier 2 due to the data, the risk will be higher in Tier 3 due to the impact side of the risk equation.

7. Follow up planned

SDG&E plans to utilize this 3x3 matrix to be able to estimate ignition reductions in the different HFTD tiers, so that SDG&E can calculate RSEs for its various mitigations per WSD's guidance in WMP Table 12.

4.4.2.2 Research study to understand the effectiveness of recloser protocols

1. Purpose of Research

Prior to 2017, SDG&E had been disabling reclosing on elevated and extreme FPI days in the HFTD. For the last several years and to further reduce the risk of ignitions from risk events, reclosing has been disabled in the HFTD all year and not just during high risk weather. This study reviewed historical risk events that was isolated by reclosers to measure the effectiveness of disabling reclosing at reducing faults and ignitions over the last five years.

2. Relevant Terms

The following are relevant terms related to this research:

a. Tier 3 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 3 fire-threat areas depict areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 3 represents all of the Tier 3 HFTD area within SDG&E's service territory.

b. Tier 2 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 2 fire-threat areas depict areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 2 represents all of the Tier 2 HFTD area within SDG&E's service territory.

c. Locations outside the High Fire Threat District – All other areas within SDG&E's service territory that are not part of the Tier 2 or Tier 3 HFTD.

d. Normal Fire Potential Index value – An FPI value of 11 or less represents a normal fire potential based upon combined green-up, fuels, and weather measurements.

e. Elevated Fire Potential Index value – An FPI value of 12 to 14 represents an elevated risk of fire potential based upon combined green-up, fuels, and weather measurements.

f. Extreme Fire Potential Index Value – An FPI value of 15 or greater represents an extreme risk of fire potential based upon combined green-up, fuels, and weather measurements.

g. Risk Event – All overhead system faults, meaning any overhead electrical fault caused by foreign object in line, equipment failure, other or of undetermined cause that impacts the primary electric distribution system (12kV and 4kV systems). An electrical fault includes some kind of electrical system short that results in energy created in the form of heat, this is different from outages that can be a result of opens in absence of electrical faults.

3. Data Elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Risk Events	2015 – 2019 Updated Annually as a running 5-year average	Per risk event	Lat/lon per risk event – filtered by Tier 3, Tier 2, or non-HFTD	Date of risk event filtered by Extreme, elevated, or normal	-

4. Methodology

For this study, SDG&E began by converting the five-year reliability data set into the five-year risk event data set, and filtering into HFTD tiers as well as FPI days as described in the methodology Section of 4.4.2.1. From there, SDG&E filtered that data set by isolating device, to only identify risk events that were isolated by reclosers. When automatic reclosing is enabled, SDG&E will close into a fault two additional times to see if the fault had cleared itself before the device locks out leaving the sustained outage. It is assumed in this study, that every time a fault occurs when reclosing is disabled, two additional faults are avoided through this policy. SDG&E then utilizes the ignition percentage results from Section 4.4.2.1 to calculate the average annual ignitions avoided through this control.

5. Timeline

SDG&E plans to update this study annually and report to WSD during all WMP filings and annual updates. The data will use a rolling five-year average to keep the ignition percentages relevant with current mitigations.

6. Results

The results of this study show that disabling reclosing reduces an average of 4.56 ignitions per year in Tier 2 of the HFTD and 3.40 ignitions per year in Tier 3 of the HFTD.

Recloser Protocols		Faults by Tier Fire Potential Index								
		Non-HFTD			Tier 2			Tier 3		
Faults isolated by reclosers	year	Normal	Elevated	Extreme	Normal	Elevated	Extreme	Normal	Elevated	Extreme
	2015	153	25	0	47	22	0	37	24	0
	2016	167	13	1	62	14	2	43	25	0
	2017	155	29	3	48	23	4	34	16	2
	2018	86	22	5	29	22	5	34	25	2
	2019	141	24	0	47	35	2	35	31	1
	5 yr avg	**140.4**	**22.6**	**1.8**	**46.6**	**23.2**	**2.6**	**36.6**	**24.2**	**1**

Ignition Rate					
Tier 2			Tier 3		
Normal	Elevated	Extreme	Normal	Elevated	Extreme
2.20%	5.07%	10.34%	1.62%	4.31%	10.00%

		Estimated Faults Avoided								
Adjusted for application of		Tier 2			Tier 3			Ignitions Avoided		
mitigation to calculate faults	year	Normal	Elevated	Extreme	Normal	Elevated	Extreme	Tier 2 IA	Tier 3 IA	**Total IA**
Applied DOP 3017 as written	2015		44	0		48	0	2.23	2.07	4.30
	2016		28	4		50	0	1.83	2.16	3.99
	2017		46	8		32	4	3.16	1.78	4.94
All reclosing left off in the HFTD year-	2018	58	44	10	68	50	4	4.54	3.65	8.19
round, above and beyond policy	2019	94	70	4	70	62	2	6.03	4.00	10.03
requirements	**5 yr avg**	**76**	**46.4**	**5.2**	**69**	**48.4**	**2**	**4.56**	**3.40**	**7.96**

7. Follow Up Planned

The results of this study will be utilized as the probability of ignition component of the RSE calculations for the 2021 WMP update. Going forward, SDG&E plans to enhance this study next year to refine an assumption. In this study, it is assumed that all reclosing operations would be into sustained faults. But not all faults are sustained, some do clear themselves and would result in a re-energization with no fault.

SDG&E intends to research over the same data set period, how many momentary outages occur downstream of reclosers compared to how many results in sustained outages. This will develop a metric called % sustained. The new faults avoided algorithm would be faults downstream of disabled reclosing devices multiplied by two (reclosing operations) multiplied by % sustained. The stated effectiveness of this program would be reduced by the resulting factor but would provide a more accurate result.

4.4.2.3 Research study to understand the effectiveness of overhead distribution hardening at reducing the occurrence of overhead faults

1. Purpose of Research

Prior to approval of a mitigation program, SDG&E utilizes research, case studies, and subject matter expert opinion to develop an assumed effectiveness of the overhead system hardening. The goal of this research is to determine the measured effectiveness of overhead distribution hardening on SDG&E's distribution system and the unique conditions of San Diego County.

2. Relevant Terms

The following are relevant terms related to this research:

a. Project ID – Overhead hardening was broken down into projects that varied in size from one structure to 62 structures. SDG&E utilized the structures in these projects to evaluate the reliability performance of these segments before and after the hardening project was completed.

b. Unhardened Risk Events: Risk events that occurred on the segments before overhead system hardening was completed.

c. Unhardened Years: The number of years the circuit segments associated with the project ID operated before hardening based on a 20-year reliability data set from 2000-2019.

d. Hardened Risk Events: Risk events that occurred on segments after overhead system hardening was completed.

e. Hardened Years: The number of years the circuit segments associated with the project ID operated after hardening based on a 20-year reliability data set from 2000-2019.

f. Miles: Number of circuit miles per project ID

3. Data elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Unhardened Risk Events	2000-2019	Per Risk Event	To/from structure	Date and time	
Hardened Risk Events	2000-2019	Per Risk Event	To/from structure	Date and time	

4. Methodology

SDG&E gathered a list of completed overhead hardening projects from the FIRM program that began hardening work in 2014. This data set included 214 completed projects representing 227 miles of completed overhead hardening. This dataset also included the structure number for every hardened structure and the completion date for each project. The next set of data utilized was the risk event data set. SDG&E pulled reliability data from 2000 through 2019. The risk event data includes the location where the risk event occurred in the to and from structure fields. This does represent one limitation of this study, as risk events of undetermined cause have no specific risk event structure ID to compare to, and are therefore omitted from this study by necessity. For risk events with causes however, SDG&E compared the to and from fields in the risk event data set to the project structure field in the project data set. When the structures match, SDG&E checked the risk event date against the project completion date to determine if the risk event occurred before or after the overhead hardening project was completed. For each project, SDG&E totaled the number of risk events that occurred before and after the hardening project. SDG&E also calculated the operating years before and after the hardening, as well as the project miles for the purposes of normalizing the dataset. SDG&E then calculated averages for the number of unhardened risk events per project, the number of unhardened operating years per project, the number of hardened risk events per project, the number of hardened operating years per project, and the number of miles per project. Utilizing these averages, SDG&E then calculated the average risk event per operating year per 100 miles before hardening and compared it to the average risk event per operating year per 100 miles after hardening.

5. Timeline

This research was completed in 2020. The research will be updated on an annual basis with additional data for further refinement.

6. Results and discussion

On average, the unhardened system saw an average of 9.24 risk events per 100 miles per operating year while the hardened system saw an average of 4.92 risk events per 100 miles per operating year. This represents a 47% reduction in risk. Utilizing the ignition percentages from the study in Section 4.5.1.1, this represents an estimated 0.15 less ignitions per year per 100 circuit miles in Tier 2 of the HFTD, and 0.12 less ignition per year per 100 circuit miles in Tier 3 of the HFTD.

7. Follow-up planned

SDG&E is updating its risk models with the measured effectiveness calculations.

4.4.2.4 Research study to measure the effectiveness of CAL FIRE approved expulsion fuses compared to other expulsion fuses at reducing ignitions due to normal fuse operation

1. Purpose of research

SDG&E's expulsion fuse replacement program's goal is to replace all expulsion fuses within the HFTD with new CAL FIRE approved fuses. The CAL FIRE approved fuses are designed to capture the hot particles and debris that normally exit an expulsion fuse during a normal fuse operation. SDG&E believes that the ignition rate of the new fuse will be reduced from the ignition rate of traditional expulsion fuses. This study was created to test that hypothesis.

2. Relevant terms

The following are relevant terms related to this research:

a. Expulsion Fuse Operation: An expulsion fuse operating to isolate a fault on the electric distribution system.

b. Ignition caused by Expulsion Fuse Operation: CPUC reportable ignition caused by the normal operation of an expulsion fuse operating to isolate a fault.

c. CAL FIRE approved fuse operation: A CAL FIRE approved fuse operating to isolate a fault on the electric distribution system.

d. Ignition caused by CAL FIRE approved fuse operation: CPUC reportable ignition caused by the normal operation of a CAL FIRE approved fuse operating to isolate a fault.

3. Data elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Risk event isolated by overhead expulsion fuse	2015 - 2019	Per Risk Event	Structure / lat long	Date and time	
Risk event isolated by overhead CAL FIRE approved fuse	2015 - 2019	Per Risk Event	Structure / lat long	Date and time	
Ignition caused by expulsion fuse operation	2015 – 2019	Per Ignition	Structure / lat long	Date and time	
Ignition Caused by CAL FIRE approved fuse	2015 – 2019	Per Ignition	Structure / lat long	Date and time	

4. Methodology

SDG&E utilized its GIS database to identify the locations and installation dates of new CAL FIRE approved fuses. SDG&E then reviewed risk event data from 2015 through 2019 to identify all risk events isolated by an overhead fuse. SDG&E then performed a comparison of the risk event isolating device structure and the risk event date to the GIS database to determine if the risk event was isolated by an expulsion fuse or a CAL FIRE approved fuse. Finally, SDG&E compared the fuse operation data to the ignition database data to determine which fuse operations had led to an ignition.

5. Timeline

This study was completed in 2020. SDG&E plans to update this study annually, as more CAL FIRE approved fuses are installed on the system.

6. Results and discussion

# of time normal fuse operated to isolate the fault	3498
Ignition with normal fuse:	4
Ignition rate:	0.11%

# of time cal fire fuse operated to isolate the fault	139
Ignition with cal_fire fuse:	0
Ignition Rate:	0.00%

Normal fuse operation by tier		Ignitions	Ignition Rate
Non-HFTD	2308	1	0.04%
Tier 2	726	2	0.28%
Tier 3	602	1	0.17%

Cal Fire fuse operation by tier		Ignitions	Ignition rate
Non-HFTD	11	0	0.00%
Tier 2	47	0	0.00%
Tier 3	81	0	0.00%

SDG&E saw a reduction in ignition percentage from 0.11% to 0%. While there are not currently enough samples for the data to show a statistically significant reduction, the early results are promising, and SDG&E will continue to update this study as more CAL FIRE approved fuses are installed on the system.

7. Follow-up planned

SDG&E will leverage this data and the future data updates for the purposes of RSE calculations on the expulsion fuse replacement program.

4.4.2.5 Research study to measure the effectiveness of sensitive relay settings at reducing ignitions from risk events

1. Purpose of research

SDG&E has protocols in place so that during extreme FPI or Red Flag Warnings, sensitive relay settings are enabled on reclosers within the HFTD and coastal circuits with fire risk. The sensitive relay settings improve the sensitivity of fault detection, the speed at which faults are cleared, and reduces the energy of the fault as much as possible, which reduces the heat generated by a fault, which should lead to fewer ignitions. This study was created to test that hypothesis.

2. Relevant terms

The following are relevant terms related to this research:

a. Recloser: a switching device designed to detect and interrupt faults

b. Sensitive relay settings: May be referred to as 'Profile 3', is a setting applied to reclosers to improve the sensitivity of fault detection and the speed at which faults are cleared

c. Extreme Fire Potential Index – An FPI value of 15 or greater represents an extreme risk of fire potential based upon combined green-up, fuels, and weather measurements.

d. Red Flag Warning – A Red Flag Warning is issued by the National Weather Service when warm temperatures, very low humidities, and stronger winds are expected to combine to produce an increased risk of fire danger.

e. Risk Event – All overhead system faults, meaning any overhead electrical fault caused by foreign object in line, equipment failure, other or of undetermined cause that impacts the primary electric distribution system (12kV and 4kV systems). An electrical fault includes some kind of electrical system short that results in energy created in the form of heat, this is different from outages that can be a result of opens in absence of electrical faults.

3. Data elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Risk event downstream of a device with sensitive relay settings enabled	2015 - 2019	Per Risk Event	Structure / lat long	Date and time	
Risk event downstream of device operating under normal conditions	2015 - 2019	Per Risk Event	Structure / lat long	Date and time	
Ignition downstream of a device with sensitive relay settings enabled	2015 – 2019	Per Ignition	Structure / lat long	Date and time	
Ignition downstream of device operating under normal conditions	2015 – 2019	Per Ignition	Structure / lat long	Date and time	

4. Methodology

For this analysis, SDG&E filtered its reliability data set to convert it to a risk event dataset that includes the overhead filtering discussed in Section 4.4.2.1. From there, the data was filtered again to only include risk events that occurred downstream of devices with sensitive relay settings enabled. The date, time and location of these risks events were compared to ignition data to identify which ignitions occurred as a result of the filtered risk events. An ignition rate was calculated from faults and ignitions that occurred downstream of reclosers with sensitive settings enabled. This sensitive setting ignition rate was compared to the ignition rate of all other risk events and related ignitions downstream of recloser devices without sensitive settings enabled to determine the effectiveness of sensitive settings at reducing ignitions.

5. Timeline

This study was completed in 2020 and the research will be updated on an annual basis with additional data for further refinement.

6. Results and discussion

Total Risk Events	**62**
Total Ignitions	**0**
% Ignition	**0%**

System Analysis	
Total Risk Events:	**5203**
Total Ignitions:	**109**
% Ignition:	**2.09%**

% Decrease in ignition after SRP enabled:	**100.00%**

SDG&E saw a reduction in ignition percentage from 2.09% to 0%. Based on data from the last five years, SDG&E experienced zero ignitions by primary faults downstream of devices with sensitive relay settings enabled. While there are not currently enough samples for the data to show a statistically significant reduction, the early results are promising, and SDG&E will continue to update this study as more data becomes available.

7. Follow-up planned

The results of this study will be utilized as the probability of ignition component of the RSE calculations for the 2021 WMP update.

4.4.2.6 Research study to measure effectiveness of SDG&E's inspection programs at finding and repairing equipment issues before they fail.

1. Purpose of research

The purpose of this study was to measure the effectiveness of SDG&E's repair timeframes at preventing equipment failures, and to provide baseline data so that SDG&E could estimate the effectiveness of its inspection programs at preventing risk events and ignitions.

2. Relevant terms

The following are relevant terms related to this research:

a. Infraction: General Order 95 issues that were identified through SDG&E inspection programs

b. Risk Event – All overhead system faults, meaning any overhead electrical fault caused by foreign object in line, equipment failure, other or of undetermined cause that impacts the primary electric distribution system (12kV and 4kV systems). An electrical fault includes some kind of electrical system short that results in energy created in the form of heat, this is different from outages that can be a result of opens in absence of electrical faults.

3. Data elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Equipment related Risk Event	2015-2019	Per Risk Event	To/from structure	Date and time	
Equipment related Risk Event with a pending infraction	2015-2019	Per Risk Event	To/from structure	Date and time	
Structures with Pending Infractions	2015-2019	Per Structure	Lat/long	Date and time	

4. Methodology

SDG&E queried 5 years of reliability data and corrective maintenance data. SDG&E filtered the reliability data set into Risk Events as described in the methodology Section of 4.4.2.1. From there, SDG&E further filtered this data set to look at equipment failures only which are the primary target of SDG&E's corrective maintenance programs. SDG&E also queried its corrective maintenance program data to identify all infractions associated with structures, and when those infractions were repaired. Finally, SDG&E utilized the to and from fields of the risk data set to identify structures that had risk events associated with structures that had pending corrective maintenance infractions.

5. Timeline

SDG&E will update this study on an annual basis and report out at the annual updates.

6. Results and discussion

	5 year total	Annual Average
Risk events with pending infractions	60	12
Total equipment risk events	1,619	324
Risk event rate with pending infractions	3.71%	3.71%
Infractions Repaired	19,502	3,900
Risk events with pending infractions over repaired infractions	0.00308	0.00308

These results show that SDG&E's maintenance program and repair times are effective at preventing equipment failures. Just a small percentage of equipment with pending maintenance issues have failed before repairs are made. For the purpose of estimating the effectiveness of inspections, SDG&E will use the .31% of issues that led to failures over issues that were identified and repaired as a forecast of what would fail if issues were not repaired within SDG&E's one year maintenance timelines. This failure rate will be scaled up with severity of inspection findings.

7. Follow-up planned

SDG&E will utilize the results of this study to support its inspection effectiveness model, and plans to update this model annually when new data becomes available.

4.4.2.7 Research study to understand impact of distribution and transmission inspection programs faults avoided due to fire risk infractions found and repaired

1. Purpose of research

The purpose of this study is to measure the effectiveness of each distribution and transmission inspection program by reviewing historical inspection data to determine faults and ignitions avoided.

2. Relevant terms

The following are relevant terms related to this research:

a. Tier 3 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 3 fire-threat areas depict areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 3 represents all of the Tier 3 HFTD area within SDG&E's service territory.

b. Tier 2 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 2 fire-threat areas depict areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 2 represents all of the Tier 2 HFTD area within SDG&E's service territory.

c. Locations outside the High Fire Threat District – All other areas within SDG&E's service territory that are not part of the Tier 2 or Tier 3 HFTD.

d. Risk Event – All overhead system faults, meaning any overhead electrical fault caused by foreign object in line, equipment failure, other or of undetermined cause that impacts the primary electric distribution system (12kV and 4kV systems). An electrical fault includes some kind of electrical system short that results in energy created in the form of heat, this is different from outages that can be a result of opens in absence of electrical faults.

e. Ignition – CPUC reportable ignitions (as defined by D.14-02-015).

f. Fire Risk Infractions – Inspection findings that if left unaddressed could lead to a risk event, and potentially an ignition.

g. Emergency finding – Infraction with the greatest risk of failure. Recommended repair timeframe is 0-3 days.

h. Priority finding – Infraction with less risk of imminent failure than an emergency finding. Recommended repair timeframe is 4-30 days.

i. Non-Critical / Non-priority finding - Infraction with least risk of failure. Recommended repair timeframe is 6-12 months.

j. Failure rate – The assumed rate of failure of an inspection finding over one year if the issue was not found. This rate of failure scales up based on the finding recommend repair timeframe.

3. Data elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Inspection counts	2015 - 2019	Per inspection	Structure / lat long	Date and time	
Inspection findings	2015 - 2019	Per inspection	Structure / lat long	Date and time	

4. Methodology

SDG&E queried five years of inspection counts and fire risk infraction findings separated out by priority of findings. From this dataset, SDG&E calculated the five-year average finding by priority per five-year average inspection count. To estimate the effectiveness of inspections, SDG&E used the results from the research study described in Section 4.4.2.6. Specifically, that 0.31% of non-critical/non-priority findings would fail if issues were not repaired within SDG&E's one-year maintenance timelines. This rate of failure scales up based on the finding severity and recommended repair timeframe. For example, a priority finding is twelve times as likely to fail as a non-critical /non-priority finding. An emergency finding is ten times as likely to fail as a priority finding. These failure rates are then multiplied by the five-year average findings by priority to determine the five-year average faults avoided per inspection program. Depending on the HFTD tier where the inspection is performed the ignition rate from the results of Section 4.4.2.1 is multiplied by the five-year average faults avoided to determine the five-year average

ignitions avoided per inspection program. This methodology was repeated to calculate a five-year average ignition avoided for each SDG&E inspection program.

5. Timeline

SDG&E will update this study on an annual basis and report out at the annual updates.

6. Results and discussion

The results of this study show that SDG&E distribution inspection programs historically avoid approximately 110 faults and 3 ignitions annually. Similarly, SDG&E transmission inspection programs avoid 4.5 faults and 0.4 ignitions annually.

Program	Annual Patrol Inspections	Wood Pole Intrusive Inspections	HFTD Tier 3 Inspections (QA/QC)	Distribution Infrared Inspections	Distribution Drone Assessments	Circuit Ownership	Transmission Visual Inspections (patrol)	Transmission Detailed Inspections (ground)	Transmission Infrared Inspections	Additional Transmission Aerial 69kV Tier 3 Visual Inspections
Historical Annual Faults Avoided	52	17	10	2	29	0.005	0.4	4	0.03	0.1
Historical Annual Ignitions Avoided	1.60	0.51	0.27	0.055	0.804	0.0001	0.040	0.374	0.002	0.005

7. Follow-up planned

This data is being used for RSE calculations for each inspection program. The RSE values will be updated annually as updated risk event data and cost data becomes available.

4.4.2.8 Research study to understand the effectiveness of other special work procedures and infrastructure protection teams at reducing the number of personnel related faults and ignitions during elevated and extreme weather conditions

1. Purpose of research

To determine the effectiveness of SDG&E's special work procedures that cancel all work in the HFTD Tier 3 and Tier 2 on extreme FPI days, and require contracted infrastructure protection teams on days that are elevated or higher.

2. Relevant terms

The following are relevant terms related to this research:

a. Tier 3 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 3 fire-threat areas depict areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 3 represents all of the Tier 3 HFTD area within SDG&E's service territory.

b. Tier 2 High Fire Threat District – Per the CPUC Fire-Threat Map, the "Tier 2 fire-threat areas depict areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For the purposes of this study, Tier 2 represents all of the Tier 2 HFTD area within SDG&E's service territory.

c. Locations outside the High Fire Threat District – All other areas within SDG&E's service territory that are not part of the Tier 2 or Tier 3 HFTD

d. Normal Fire Potential Index value – An FPI value of 11 or less represents a normal fire potential based upon combined green-up, fuels, and weather measurements.

e. Elevated Fire Potential Index value – An FPI value of 12 to 14 represents an elevated risk of fire potential based upon combined green-up, fuels, and weather measurements.

f. Extreme Fire Potential Index Value – An FPI value of 15 or greater represents an extreme risk of fire potential based upon combined green-up, fuels, and weather measurements.

g. Risk Event – All overhead system faults, meaning any overhead electrical fault caused by foreign object in line, equipment failure, other or of undetermined cause that impacts the primary electric distribution system (12kV and 4kV systems). An electrical fault includes some kind of electrical system short that results in energy created in the form of heat, this is different from outages that can be a result of opens in absence of electrical faults

3. Data elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Risk Event	2015-2019	Per Risk Event	Lat/long filtered by HFTD, FPI	Date and time	
FPI Days	2015-2019	Days	Categorized by FPI	Date	

4. Methodology

For this analysis, SDG&E filtered its reliability data set to convert it to a risk event dataset that includes the overhead filtering discussed in Section 4.4.2.1. From there, this data was filtered again to only include risk events caused by SDG&E crews performing work on the system. SDG&E filtered these crew caused contacts by normal, elevated, and extreme FPI, as well as Tier 2 and Tier 3 HFTD.

SDG&E does not perform work in the HFTD on extreme days, so to determine the benefit of this program, SDG&E calculated the risk events per day in the Tier 2 and Tier 3 HFTD that occurred under normal and elevated conditions. SDG&E assumed the same fault per day rate would

apply under extreme conditions, had SDG&E not followed its mitigation procedure to cancel all work in the HFTD under extreme conditions. SDG&E then used the ignition rates calculated from Section 4.4.2.1 to estimate the ignitions reduced.

To calculate the benefit of infrastructure protection teams, the same information is utilized. SDG&E sends infrastructure protection teams with all crews performing work in the HFTD under elevated conditions. They perform preconstruction mitigation measures, like watering down the work area, and should a risk event occur that leads to an ignition, they are there to suppress the ignition before it can grow, limiting the impacts. To calculate the benefits, SDG&E looked at five-year average number of crew caused risk events under elevated conditions in the HFTD and multiplied by the calculated ignition rate from Section 4.4.2.1

5. Timeline

SDG&E intends to update this study annually, using a five-year average.

6. Results and discussion

Personnel Work Procedures and Infrasturcutre Protection		Normal FPI				Elevated FPI			Extreme FPI or RFW		
		Normal Days	Non-HFTD	Tier 2	Tier 3	Elevated Days	Tier 2	Tier 3	Extreme or RFW Days	Tier 2	Tier 3
	2015	253	4	0	2	108	0	1	4	0	0
	2016	206	10	0	3	138	1	3	21	0	0
	2017	173	4	1	1	169	2	0	23	0	0
	2018	169	3	4	3	182	2	3	14	0	0
	2019	216	11	3	6	137	3	4	12	0	0
	5 yr avg	**203.4**	**6.4**	**1.6**	**3**	**146.8**	**1.6**	**2.2**	**14.8**	**0**	**0**
	normalized		11.48	2.87	5.38		3.98	5.47		0.00	0.00

		Days	Tier 2	Tier 3	Faults per day Tier 2	Faults per day Tier 3
Normal + Elevated 5 year average		350.2	3.2	5.2	0.0091	0.0148

Extreme or RFW Procedures		
	Tier 2	Tier 3
Risk events avoided	0.1352	0.2198
ignition rate	10.34%	10.00%
ign avoided	0.0140	0.0220

Infrsturcture Protection Teams		
	Tier 2	Tier 3
Risk Events	1.6	2.2
ignition rate	5.07%	4.31%
ign mitigated	0.0811	0.0948

Based on the historical crew caused risk events, SDG&E's work special work procedures mitigate 0.014 ignitions annually in Tier 2 and 0.022 ignitions annually in Tier 3 of the HFTD. SDG&E's wildfire infrastructure protection teams mitigate 0.0811 ignitions in Tier 2 per year and 0.0948 ignitions in Tier 3 annually.

7. Follow-up planned

This data is being used for RSE calculations for these mitigations. The RSE values will update annually as updated risk event data and cost data becomes available.

4.4.2.9 Research study to measure effectiveness of SDG&E's Enhanced Vegetation Management Program

As required by the WSD's Evaluation of SDG&E's Remedial Compliance Plan, SDG&E provides the following research study that analyzes the effectiveness of extended vegetation clearance data, in compliance with Action SDGE-4. SDG&E, along with SCE and PG&E are also required to submit a "joint, unified plan that reflects collaborative efforts and contains uniform definitions, methodology, timeline, data standards, and assumptions" (Action SDGE-5). As discussed with WSD, the utilities will submit this joint plan on February 26, 2021.

1. Purpose of research

The purpose of this study is to leverage historical vegetation caused risk event data and completed trim data to determine the effectiveness increasing the clearance distance between vegetation and electric supply conductors has on reducing risk events. SDG&E completed a study that was submitted in its first quarterly report that demonstrated as post trim clearance is increased for any vegetation species, in any location in SDG&E's service territory, the rate of risk events decreases. In this updated study, SDG&E filters the data provided in the previous study to only include the five high risk species (Eucalyptus, Oak, Palm, Pine, and Sycamore) and only those located within the HFTD.

2. Relevant terms

The following are relevant terms related to this research:

a. Vegetation Caused Risk Event: A vegetation caused fault on the electric system.

b. Completed Trim – This represents an SDG&E inventory tree that was trimmed in a specific year to a specific post trim clearance level

c. Contact Rate per 1000 tree – This is calculated as the average number of risk events from 2002-2020 at a specific post trim clearance divided by the average number of completed trims from 2002 – 2020 at the same post trim clearance level multiplied by 1000.

d. High Threat Fire District – CPUC layers define this border

e. High Risk Species - For SDG&E this is Eucalyptus, Oak, Palm, Pine, and Sycamore, the species that rank in the top five as far as risk event contribution and account for over 80% of all vegetation related risk events

f. Inventory tree – A tree that has the potential to encroach within the minimum clearance required and/or could otherwise impact the overhead electrical facilities within three years of the inspection date

3. Data elements

The details of data elements used are provided in the following table:

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Vegetation Caused Risk Event	2002-2020	Per Risk Event	Lat/long	Date and time	
Completed Trim	2002-2020	Per Completed Trim	Lat/long	Date and time	

4. Methodology

Approach

SDG&E tracks its tree inventory at the asset level by recording multiple data fields for all activities including pre-inspection, auditing, and tree trimming annually. The information recorded includes among other things: species, clearance, lat/long coordinates, tree health, and date/time stamp of all activities. Trees that do not meet the inventory criteria defined above and are not tracked specifically within the tree database, are still assessed in the field to determine whether they pose a risk to the overhead electrical facilities.

SDG&E's Vegetation Management department performs a field investigation of every tree-related outage to identify root cause and to determine whether follow-on action is required to prevent a recurrence. Outage investigation details are documented with the individual tree record and include species, clearance, outage cause, and tree health. SDG&E does not currently document within its tree records the slope, soil type, soil moisture, and wind speed.

Analysis

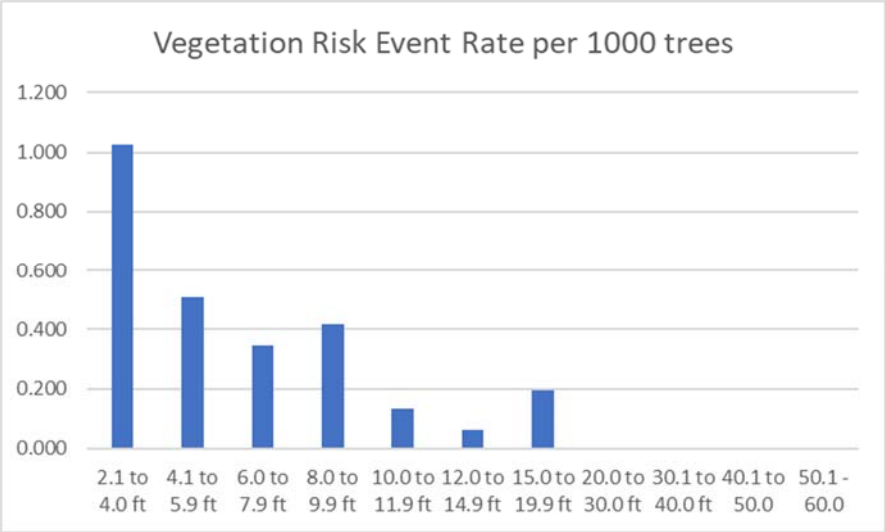
As described in detail in SDG&E's first quarterly report (September 9, 2020), SDG&E starts with a vegetation contact data set and then filters it down to only include risk events (excludes non-faults like de-energized for safety) and to only include risk events associated with trees that have a post trim clearance. This excludes fall-in trees that were not in inventory and provides a more accurate analysis as the effectiveness of post trim clearance cannot be measured on trees that were never trimmed. After the first pass of filtering, in this updated study, SDG&E filters again to obtain the data specific to its enhanced vegetation management program. The vegetation caused risk event data set was filtered by the high-risk species located within the HFTD. The result of the filtered data set is show in the table below.

Risk Events by Post Trim Clearance											
Year	2.1 to 4.0 ft	4.1 to 5.9 ft	6.0 to 7.9 ft	8.0 to 9.9 ft	10.0 to 11.9 ft	12.0 to 14.9 ft	15.0 to 19.9 ft	20.0 to 30.0 ft	30.1 to 40.0 ft	40.1 to 50.0 ft	50.1 - 60.0 ft
2002	1	2	0	4	4						
2003	0	2	2	3	5						
2004	0	0	1	2	3						
2005	0	1	0	1	4						
2006	0	0	0	1	19	0	0	0			
2007	0	0	0	0	11	1	0	0			
2008	1	0	0	1	5	0	0	0			
2009	0	0	0	0	10	0	1	0			
2010	0	0	0	0	11	0	2	0			
2011	0	0	0	0	5	0	0	0			
2012	0	0	0	0	3	1	0	0			
2013	0	0	0	0	1	1	0	0			
2014	0	0	0	0	6	0	0	0	0	0	0
2015	0	0	0	0	3	0	0	0	0	0	0
2016	0	0	0	0	5	0	2	0	0	0	0
2017	0	0	0	0	10	0	1	0	0	0	0
2018	0	0	0	0	5	0	0	0	0	0	0
2019	0	0	0	0	3	1	0	0	0	0	0
2020	0	0	0	0	3	0	0	0	0	0	0
Average c	0.1	0.3	0.2	0.6	6.3	0.3	0.4	0.0	0.0	0.0	0.0

To get context for the risk events, SDG&E examined the number of completed trims to the same clearance levels in the same time frame. The completed trims were used to normalize the risk event averages, representing the exposure or opportunity for risk events. SDG&E applied the same species and HFTD filter to the completed trim data set. The output of completed trims is shown below.

Trees Trimmed to Clearance Levels											
Year	2.1 to 4.0 ft	4.1 to 5.9 ft	6.0 to 7.9 ft	8.0 to 9.9 ft	10.0 to 11.9 ft	12.0 to 14.9 ft	15.0 to 19.9 ft	20.0 to 30.0 ft	30.1 to 40.0 ft	40.1 to 50.0	50.1 - 60.0
2002	88	576	2397	8869	41893						
2003	48	554	1221	4413	38687						
2004	41	889	779	884	67158						
2005	30	407	429	493	34340						
2006	39	471	454	605	40847	2052	556	308			
2007	27	330	230	479	36691	1745	429	671			
2008	21	354	227	213	34836	1110	1250	1993			
2009	21	434	152	234	43627	2089	1819	1999			
2010	16	337	103	203	43578	1808	849	2269			
2011	13	353	113	154	49252	4827	958	1939			
2012	13	340	87	144	51133	3797	1154	1312			
2013	8	278	57	77	44684	2685	1177	1188			
2014	19	352	205	1333	58786	4199	2250	1544	436	13	25
2015	47	279	171	1020	54440	4592	2363	1930	293	29	6
2016	38	348	141	1087	52806	5965	2995	2333	623	81	22
2017	30	300	158	1013	44494	4795	2565	1889	523	101	65
2018	503	1264	408	1895	54725	5951	2828	2912	633	181	25
2019	592	1342	679	2449	44410	8324	4357	5194	829	184	58
2020	464	1183	676	3138	50863	10751	5555	4908	820	215	84
Average	108.3	546.9	457.2	1510.7	46697.4	4312.7	2073.7	2159.3	593.9	114.9	40.7

Finally, SDG&E divided the average number of risk events by the number of completed trims to determine the contact rate per 1,000 trees, specific to the five high risk species in the HFTD. The raw results are shown in the graph below.

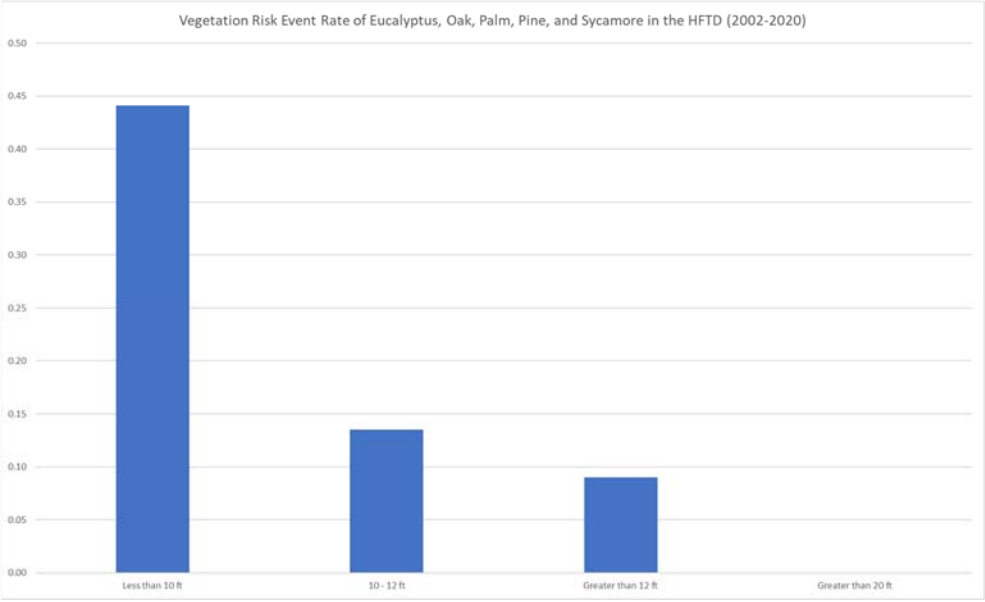


5. Timeline

SDG&E plans to update this study on an annual basis and report its findings in future WMP annual updates.

In 2020, SDG&E participated in multiple joint meetings with SCE and PG&E to discuss a strategy and potential timetable for developing a methodology for deriving the probability of tree-related outages using post-trim clearance data. After receiving additional guidance from the WSD, all three IOUs met weekly beginning on January 6, 2021 for the purpose of developing a unified plan and aligned strategies that include definitions, methodologies, timelines, data standards and assumptions. This joint plan will be provided in a WMP Supplemental Filing on February 26, 2021.

6. Results and discussion



SDG&E's vegetation study in its first quarterly report demonstrated that as clearances from vegetation to electric conductors increase, risk events decrease. This study demonstrates that the results hold true for SDG&E's highest risk species located in the HFTD. In fact, from 2002-2020, SDG&E is unable to identify a single instance of a high-risk species contact in the HFTD when clearances of 20 feet or above have been met. SDG&E's enhanced vegetation management program is trimming trees from its current standard of 10 to 12 feet to its new standard of up to 25 feet where feasible on targeted species within the HFTD. Based on the data, the contact rate of 0.14 per 1,000 trees moves to zero. If SDG&E were to complete its entire scope of enhanced vegetation management work, this would result in 6.3 less vegetation risk events per year in the HFTD and 0.19 less ignitions per year utilizing the five-year average historical ignition rate for the HFTD from the study discussed in Section 4.4.2.1 above.

7. Follow-up planned

SDG&E is using the results of this study for the purposes of RSE calculations. While extending vegetation clearances creates the possibility of diminishing returns, the study shows that the risk reduced by moving from a 10-12 foot clearance to the enhanced clearance levels results in an RSE of 66.9 in Tier 2 of the HFTD and 119.8 in Tier 3 of the HFTD, which is good value returned in both HFTD tiers. While filtering the data down to the HFTD and species limits some of the data set sample sizes, the trend from the system wide analysis completed in SDG&E's initial quarterly report holds true, that as clearances are increased, vegetation-caused risk events decrease. As SDG&E continues to trim more trees to the enhanced levels, it will provide more data to analyze and update results in future submissions.

4.5 Model and Metric Calculation Methodologies

4.5.1 Additional Models for Ignition Probability, Wildfire, and PSPS Risk

Instructions: *Report details on methodology used to calculate or model ignition probability, potential impact of ignitions and / or PSPS, 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.*

For each model, organize details under the following headings:

1. ***Purpose of model*** *– Brief summary of context and goals of model*
2. ***Relevant terms*** *- Definitions of relevant terms (e.g., defining "enhanced vegetation management" for a model on vegetation-related ignitions)*
3. ***Data elements*** *- Details of data elements used for analysis, including scope and granularity of data in time and location (i.e., date range, reporting frequency and spatial granularity for each data element, see example table above)*
4. ***Methodology*** *- Methodology and assumptions for analysis, including Subject Matter Expert (SME) input; equation(s), functions, statistical models, or other algorithms used to obtain output*
5. ***Timeline*** *– Model initiation and development progress over time. If updated in last WMP, provide update to changes since prior report.*
6. ***Application and results*** *– Explain where the model has been applied, how it has informed decisions, and any metrics or information on model accuracy and effectiveness collected in the prior year.*

Per Commission Resolution WSD-002, each electric corporation is required to submit a plan on how the entity intends to apply risk modeling and risk assessment techniques to each initiative in its WMP, with an emphasis on much more targeted use of asset management, vegetation management, grid hardening, and PSPS based on wildfire risk modeling outputs.

SDG&E uses a variety of tools to assess aspects of the risk of wildfires and impacts of PSPS. These models vary in their maturity and granularity depending on the need and timing of when these models were developed as well as their future trajectory. SDG&E's enterprise risk model is described in detail in Section 4.2.b above (MAVF – Risk Quantification Framework). This section covers additional models that are used to inform specific programs or ones that are in development.

These additional models include:

- Wildfire Risk Reduction Model
- Wildfire Risk Reduction Model – Operations
- Wildfire Next Generation System
- Vegetation Risk Index
- PRiME Pole Loading Model
- Circuit Risk Index
- Fire Potential Index
- Santa Ana Wind Threat Index

4.5.1.1 Wildfire Risk Reduction Model

1. Purpose of model

The Wildfire Risk Reduction Model (WRRM), developed by Technosylva and SDG&E subject matter experts, was the first project scoping tool used to prioritize electric distribution fire hardening for SDG&E's Fire Risk Mitigation (FiRM) program. The WRRM combined SDG&E electric distribution asset data and wildfire simulations in a manner to predict the risk of potential equipment related ignitions to surrounding communities. Technosylva aggregated 69 million wildfire computer simulations to build a geospatial layer of wildfire vulnerability over the SDG&E electric distribution overhead assets. This layer combined with the assets expected failure and ignition rates were used to assign a wildfire risk score.

The wildfire risk score, called the expected impact, was also generated for assets considered hardened by SDG&E constructions standards with reduced failure and ignition rates. The difference in risk scores between these different assets and provides a risk reduction score used to prioritize circuits and sections for projects inside the FiRM program.

The further refinement of fire modeling technologies, geospatial data and computer capabilities allowed the WRRM development to evolve into the WRRM for Operations (WRRM Ops) tool for more granular fire weather forecasting instead of a single aggregated simulation model.

2. Relevant terms

The following are relevant terms related to this model:

Asset	Refers to a specific feature on the SDG&E electric utility infrastructure network, such as a pole, conductor, capacitor, transformer, fuse, etc.
Asset Class	A grouping of assets based on their characteristics, such as material type, size, age, that reflects a specific likelihood for equipment failure and wildfire ignition. All SDG&E assets are grouped into different *asset classes* so that different failure and ignition rates can be applied and used in the risk reduction model.
Asset Index	A six digit number used to delineate asset classes.
Burn probability	The probability of a wildfire burning into an area. This is sometimes referred to as a wildfire threat, probability of a fire occurring. As described in the WRRM design Burn Probability is the combination of numerous individual fire growth potential simulations to create an overall fire growth potential map, using only SDG&E Assets as possible ignition sources.
Conditional Impacts	The mean wildfire impact given that an equipment-related wildfire occurs at a specific location (also referred to as conditional risk). Conditional impacts is combined with ignition rate and wind factor characteristics to calculate the Expected Impacts. It is calculated for each asset and can be summed to quantify the conditional impacts for a specific hardening project.
Downfire	The location of a HVRA within the fireplain (fire growth from a specific ignition location)
Expected Impacts	The mean annual equipment-related wildfire impact after incorporating the likelihood of equipment failure and subsequent wildfire (also referred to as expected risk). This is a primary output of the WRRM model. It is calculated for each asset and can be summed to quantify the expected impacts for a specific hardening project.
Exposure	The placement of an HVRA in a hazardous environment – such as building a home within a flammable landscape.
Fireplain	The area where fire can spread to if ignited at a particular location. The fireplain is identified by either a deterministic simulation of fire growth, or through a stochastic simulation of fire growth. A fireplain represents the spread area commonly referred to as Time of Arrival – a raster representation of the fire spread, while Fire Perimeters is the vector format representation of the fire spread.
GIS Assets	The SDG&E GIS database of assets used as the source of potential ignitions for the WRRM.
Hardening Project	A series of field activities that may occur to change, repair, replace or affect asset equipment. The intent of these projects is to "harden" the equipment so that it more durable and less likely to fail. A project is a series of activities that may be combined together under a single work order or field visit for planning, budgeting and/or administrative management.
Ignition Likelihood	The probability of an asset to start a fire ignition based on equipment failure or external weather conditions.
HVRA	Highly valued resources and assets, such as structures/homes, environmentally sensitive areas, etc.

Replacement Asset	The new asset class used to replace an existing asset class. Replacement assets have lower equipment failure rates and ignition rates than existing assets.
Risk Reduction	The expected risk over a 20-year planning horizon for an asset. This is the primary WRRM model output used to quantify risk reduction for an asset replacement. Risk reduction values are summed for assets in a specific hardening projects to provide an overall risk reduction for that project.
Susceptibility	A measure of how easily a HVRA is damaged by wildfire of different types and intensities.
Values-at-risk	A general term that is commonly used to describe the HVRA and the risk assessed to them.
Vulnerability	A combination of Exposure and Susceptibility, vulnerability is the measure of potential (sometimes called conditional) impacts to HVRA from wildfires of different intensities
Wildfire hazard	A physical situation with potential for causing damage to resource or assets. Hazard is measured by two main factors – burn probability and intensity.
Wildfire risk	Overall measure of the possibility for loss or harm caused by wildfire. Risk is the combination of Hazard times the Vulnerability.

3. Data elements

The range of data and resulting risk factors that were incorporated into the model were:

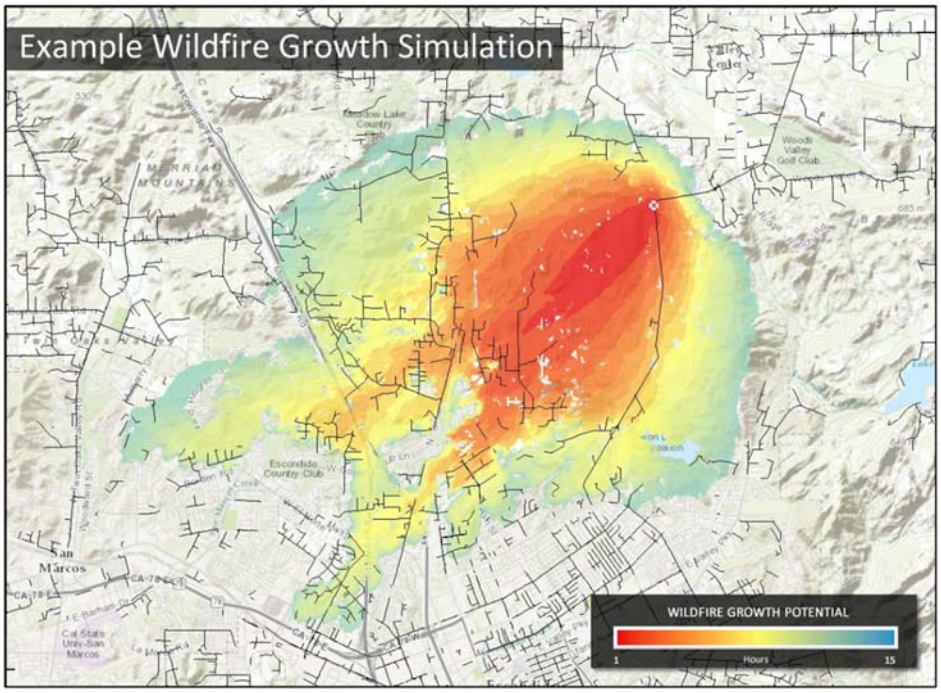
1. Vegetation and fuels data
2. Weather and predictive data
3. Historical fire occurrence
4. Outage history
5. Equipment failures (RIRAT and FiRM data),
6. Fire behavior analysis
7. Fire simulation modeling
8. SDG&E electric distribution network assets
9. Electric system conditions and characteristics
10. Subjective “values at risk” parameters
11. Risk reduction projects

The outcome of the model provides a relative ranking of current risk as well as the expected absolute and percentage of risk reduction following the individual hardening project completion.

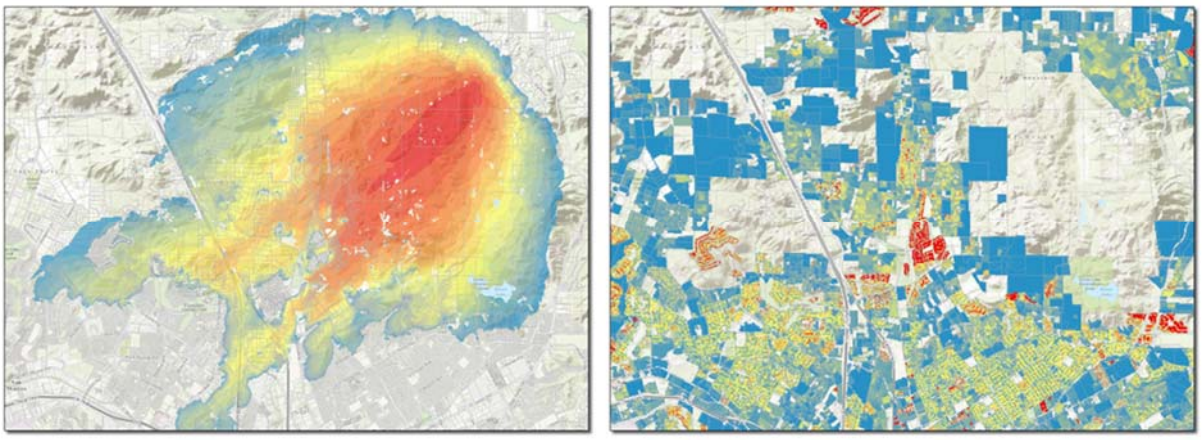
4. Methodology

The framework of WRRM involved a quantitative risk model that associated wildfire hazards with the location of SDG&E electric distribution overhead assets. The WRRM development started with fire growth simulations that would identify the fire growth potential and vulnerability of the impacted structures at each simulated fire location inside SDG&E’s territory.

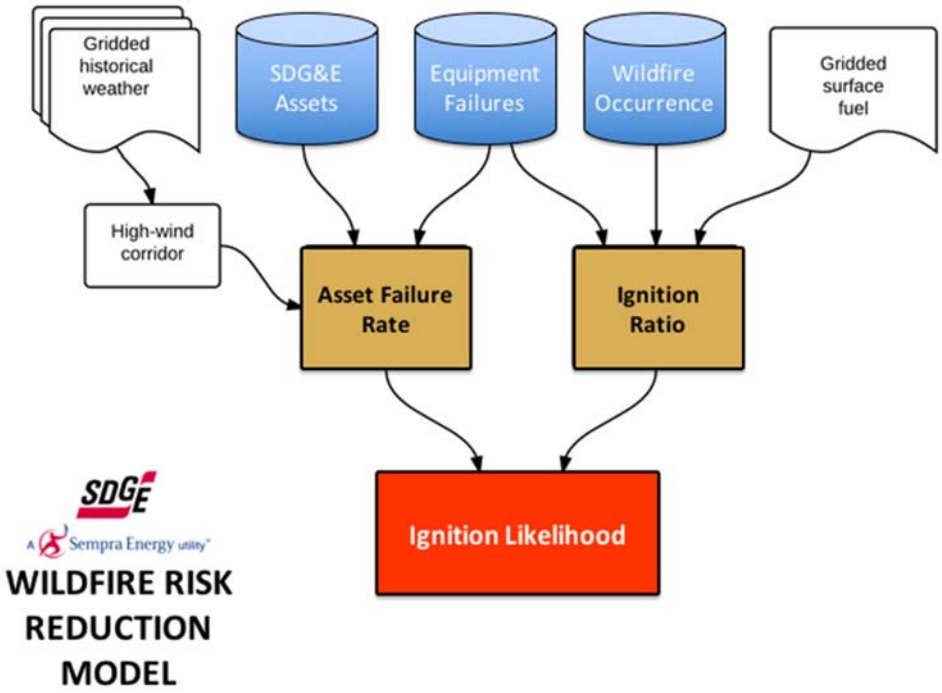
This was accomplished by a landsat digital model of surface and canopy fuels, topography and climate data as inputs into the numerous fire growth potential simulations. Thousands of simulations would be run for each potential ignition location in a Monte Carlo approach to identify the total fire growth potential for that location.



Once the fire growth potential for a location was determined, the geospatial simulation was overlaid with property and parcel information relating to the surrounding community to identify potentially impacted structures. Identifying the susceptibility of each structure type to a wildfire (i.e., residences, commercial spaces, parking lots) would then estimate a value of impacted square footage or an estimate of structure damage if an ignition were to occur. This mean value of impacted structure damage would generate the conditional impact value for that given location.



Once the conditional impact of the SDG&E asset location was determined the assets at that location required the assignment of an ignition likelihood. This ignition likelihood is the combination of each asset failure rate and the ratio for when those failures might result in an ignition.

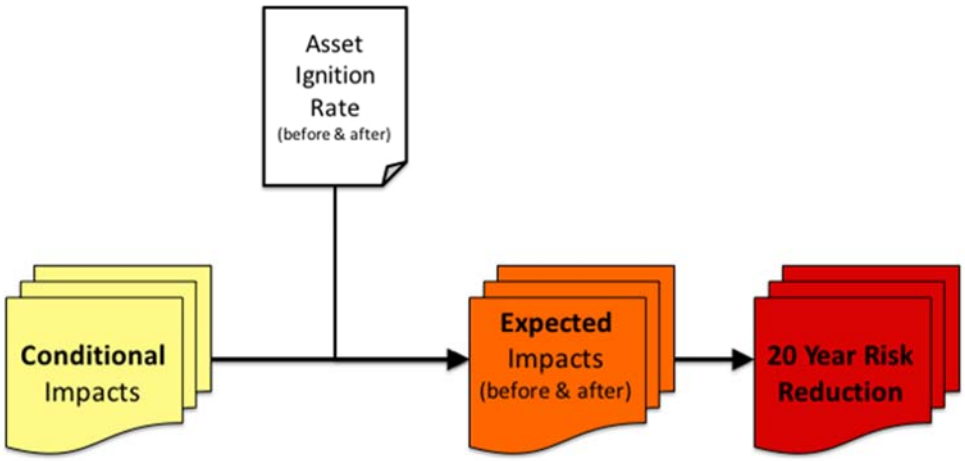


During the development of the model, SDG&E found challenges in providing detailed records granular enough to characterize every class of assets or the individual assets themselves. This challenge was also present in identifying equipment related ignitions, their causes or conditions of failure. In lieu of this data SDG&E subject matter experts categorized and characterized assets into classes to assign equipment failure rates and ignitions ratios in a proportional manner to model the number of historic failures and equipment ignitions to match the records available.

For example, overhead conductor failure records (often called wire downs) were used to assign an equipment failure rate for a generic conductor wire size. Further review from SMEs on attributes that could be used to differentiate the failure rates of overhead spans agreed that overhead wire length is a factor in potential failure. The failure rate would be adjusted to account for spans greater than 1,000 feet to be assigned a higher failure rate than spans less than 500 feet or even 250 feet. It was also agreed upon that areas with higher wind speeds would influence this failure rate and would be further modified by the location of the asset in the models identified wind corridors.

Equipment attributes in the GIS asset information were then categorized into the necessary bins to build the asset classes with each developed equipment failure rate and ignition ratio. When an asset is identified to belong to a specific asset class the associated equipment failure rate and ignition ratio is assigned and combined to generate the ignition likelihood.

Once ignition likelihoods were assigned to all assets across the overhead distribution network a combined number of predicted equipment failures and ignitions could be summarized for comparison with historic records, including the locations of prior fire history. This was used to calibrate the failure rates and ignitions across the model with further SDG&E subject matter experts to achieve a realistic result and relative ranking of where assets of concern exist in the electric distribution network.



With the conditional impact and ignition likelihood determined for each asset at each asset location it is then possible to calculate the overall expected impact of an equipment related ignition. The expected impact accounts for the mean annual equipment-related wildfire impact after incorporating the data and methods discussed so far.

Understanding that different assets have different failure rates, and therefore different ignition likelihoods, a reduction of the expected impact can be estimated by replacing the assets at the location with assets known for being fire hardened. In terms of the FiRM program, this would be accomplished with the replacement of wood poles with steel poles and reconductoring to a stronger overhead conductor type. The difference between the current asset expected impact and the replacement asset expected impact would provide a risk reduction score. Given the longevity of these assets it was decided to expand the risk reduction score over a 20-year benefit period for project comparison.

5. Timeline

- The initial model release for version 1.0 was delivered December 2015
- The second model release for version 2.0 was delivered August 2017
    - Refinements included updated GIS information, more granular asset data and enhanced GIS asset query functions to assist in project creation

6. Application and results

The WRRM and subsequent data tables have been useful in identifying and prioritizing projects for overhead electric distribution fire hardening programs that include FiRM, PRiME and WiSE. This same data also was aggregated to the support the Electric System Hardening team in comparing and prioritizing fire hardening mitigation strategies and was incorporated into the Circuit Risk Index project to further identify wildfire risks with refreshed equipment failure models and updated GIS information.

The original WRRM tool is no longer being updated and focus has shifted on how to store, organize and aggregate the time series forecasts the WRRM Ops produces in a manner to replace the original fire simulations from the WRRM.

4.5.1.2 WRRM-Ops Model

1. Purpose of model

The purpose of the WRRM-Ops model is to leverage the latest fire science available to help anticipate, prepare for, react to, and recover from wildfire activity during emergency operations, including PSPS. The model uses the latest available fuels and weather information and models wildfire consequence, to help anticipate where risk is the highest across the service territory and predict how a wildfire may grow and impact the community once ignited.

2. Relevant terms

The following are relevant terms related to this model:

Asset	Refers to a specific feature on the SDG&E electric utility infrastructure network, such as a pole, conductor, capacitor, transformer, fuse, etc.
Asset Class	A grouping of assets based on their characteristics, such as material type, size, age, that reflects a specific likelihood for equipment failure and wildfire ignition. All SDG&E assets are grouped into different *asset classes* so that different failure and ignition rates can be applied and used in the risk reduction model.
Asset Index	A six digit number used to delineate asset classes.
Burn probability	The probability of a wildfire burning into an area. This is sometimes referred to as a wildfire threat, probability of a fire occurring. As described in the WRRM design Burn Probability is the combination of numerous individual fire growth potential simulations to create an overall fire growth potential map, using only SDG&E Assets as possible ignition sources.

Downfire	The location of a HVRA within the fireplain (fire growth from a specific ignition location)
Exposure	The placement of an HVRA in a hazardous environment – such as building a home within a flammable landscape.
Fireplain	The area where fire can spread to if ignited at a particular location. The fireplain is identified by either a deterministic simulation of fire growth, or through a stochastic simulation of fire growth. A fireplain represents the spread area commonly referred to as Time of Arrival – a raster representation of the fire spread, while Fire Perimeters is the vector format representation of the fire spread.
GIS Assets	The SDG&E GIS database of assets used as the source of potential ignitions.
Wildfire hazard	A physical situation with potential for causing damage to resource or assets. Hazard is measured by two main factors – burn probability and intensity.
Wildfire risk	Overall measure of the possibility for loss or harm caused by wildfire. Risk is the combination of Hazard times the Vulnerability.

3. Data elements

The range of data and resulting risk factors that were incorporated into the model were:

- vegetation and fuel moisture data updated daily,
- weather and predictive data updated daily,
- historical fire occurrence,
- outage history,
- fire behavior analysis,
- fire simulation modeling,
- the SDG&E electric distribution and transmission network assets,
- subjective “values at risk” parameters, and

Fire Behavior Outputs: FireSim has the ability to generate conventional fire behavior outputs based on specific ignition location points. These outputs include Time of Arrival (fire perimeter) for a specific forecasted time period (duration), and fire behavior characteristics including the rate of spread, flame length and fireline intensity. These FB outputs are only shown for the final time slice of the prediction duration, i.e., hour 8 of an eight-hour duration.

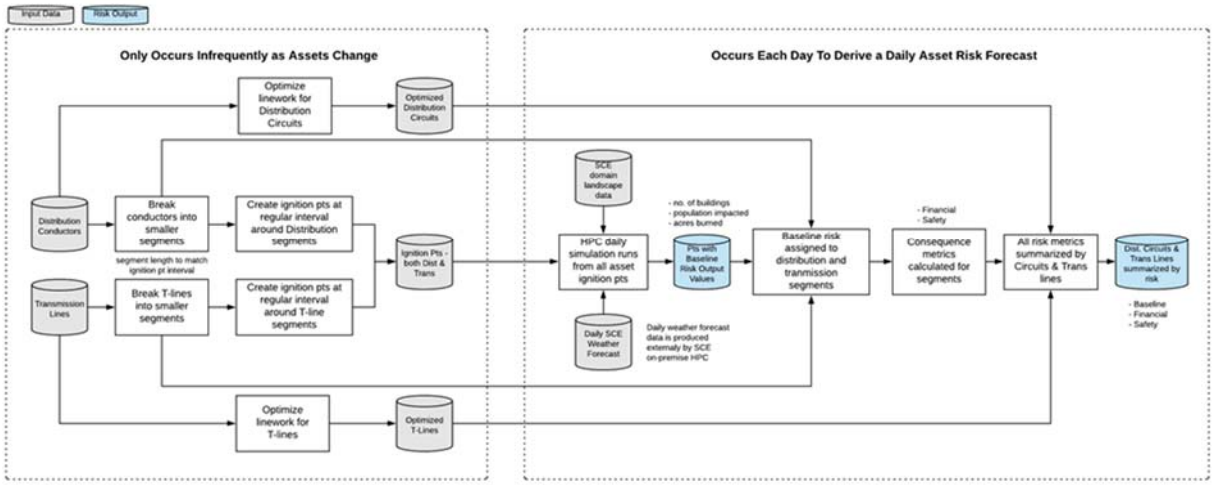
4. Methodology

To calculate risk for each asset, a fire spread prediction is simulated using the asset location as the ignition point(s). Millions of ignition points are defined along the assets to run the simulations for different start times during a daily weather forecast. These simulations are undertaken nightly using the CUSTOMER weather forecast that is updated daily as inputs. This produces a new asset risk forecast each day with a 72-hour horizon.

A number of processing steps are involved to calculate the output risk values for each CUSTOMER asset. The steps are:

1. Pre-processing of electric utility asset GIS data (once)
2. Creation of asset ignition points (once)
3. Running spread predictions from ignition points (daily)
4. Calculating impacts for baseline risk outputs for each ignition point (daily)
5. Assigning baseline risk values to asset segments from ignition points (daily)
6. Calculating consequence model outputs for each segment (daily)
7. Aggregating maximum values for risk metrics for each circuit and T-line (daily)
8. Publishing the daily risk forecast (daily)

The following diagram presents the detailed data flow for calculating risk metrics for the CUSTOMER overhead (OH) assets.



5. Timeline

Development started in 2014 and has continued through today and will continue moving forward. Being a fire-science based model, the better we understand the science the more enhancements we can make to the model's performance. Specific enhancements in 2020 included.

1. Integration of a tree database, with approximately 500,000 trees that are monitored near SDG&E equipment.
2. The ability to adjust weather and fuel related data within the model to improve simulation of real time conditions and assessment of risk.
3. Addition of new layers including historical fire perimeters, Alert SDG&E Cameras, granular weather data, weather station locations, and new view options.
4. The ability to efficiently export information from the program to enhance SDG&E's ability to collaborate pre-incident, during a fire, and post incident.

6. Application and results

The WRRM-Ops model has been applied across the organization to support how we anticipate, prepare for and respond to wildfire. Fire Science and Climate Management uses the results to support operations to anticipate and prepare for wildfire risk.

4.5.1.3 PRiME Pole Loading Model

1. Purpose of model

The purpose of the PRiME model was to identify and target areas where Distribution wood poles could potentially be overloaded and/or potentially have health deterioration while factoring consequences related to fire. The PRiME model was developed to assist in prioritizing areas for remediation based on information and attributes readily available in lieu of performing formal pole loading analysis.

2. Relevant terms

The following are relevant terms related to this model:

a. **PRiME** – Pole Risk Mitigation Engineering
b. **WPI** – Wood Pole Inspections
c. **WRRM** – Wildfire Risk Reduction Model – Prior SDG&E model to evaluate and prioritize proposed fire hardening projects from a standpoint of reducing fire risk potential from overhead electric facilities.
d. **CI score** – Conditional Impact score from the WRRM model is based on geodata from the Fire grid, using historical weather and wind patterns, and value of property.
e. **Multivariate regression** – analysis that examines the relationship between one dependent variable and multiple independent variables in the dataset.

3. Data elements

The PRiME model assessed Distribution wood poles in the SDG&E territory. The model evaluated three areas: pole utilization, pole health, and fire consequence combined with major disruption areas while using data readily available from Geographic Information System mapping (GIS), Wood Pole Inspections reports (WPI), Wildfire Risk Reduction Model (WRRM).

Attributes from GIS used to predict probability of pole over utilization included: pole class, conductor size, number of wires, elevation and wind speed. Data from WPI used to predict the probability of pole health deterioration included: pole age, treatment, manufacturer, reinforcement, capacity and substrate. To determine consequences, the Conditional Impact (CI) score was extracted from the WRMM model to factor fire consequence. This was coupled with determining areas that could affect major disruption associated with major freeway and railroad crossings.

File extractions for large data transfer to refresh the model was intended to be performed on an annual basis.

4. Methodology

The intent of the PRiME model was to assist in prioritization of remediation efforts in lieu of a formal wood pole analysis. Therefore, there were limitations on the data that is readily available for the model input. Initial focus was to start with data available in GIS and WPI. Some drawbacks on relying on data available in GIS and WPI were: the timeliness of GIS reconciliation, data entry errors, and duplicative and/or conflicting information from both sources.

To assist with pole health analysis, the services of Teradata were enlisted to determine correlations of pole replacements from historical WPIs. This effort combined with input from wood pole SMEs from SCE and EDM International, the attributes that were incorporated into the PRiME model to provide a score for pole health are related to: pole age, pole treatment, manufacturer, reinforcement, capacity, and substrate.

SMEs from EDM International were used to develop the PRiME model and assist with analyzing and scrubbing data. The probability of predicting pole over-utilization was limited to attributes available in GIS or WPI. These attributes are pole class, elevation, wind speed, number of conductors and size of conductors. However, to evaluate an accurate pole utilization, more information is needed including line angles, down guy support, and relative wire tensions. Yet, this information is not available to incorporate into the PRiME model.

To evaluate how well the PRiME model predicts over-utilization, we performed an analysis on a random selection of poles. The sample aligns with a 95% confidence level with 3% error for the SDG&E Distribution wood pole population.

Further evaluation involved the use of a statistician to run multivariate regressions. The use of the advanced multivariate regressions have confirmed that the attributes used have an impact on the utilization prediction.

5. Timeline

Initial Alpha introductory model was run on December 11, 2017. The initial model was in need of further development to see if additional attributes should be factored or if existing attributes needed to be adjusted in the evaluation. This led to a PRiME Beta model that was run on August 16, 2018. To gather confidence, the Beta model was compared against the results of pole utilization analysis of a sample selection of poles in the Fall of 2018. As a result, a formal PRiME model was developed and run on January 10, 2019. Since then, the PRiME model was updated on December 10, 2019.

6. Application and results

The initial Alpha model was used to commence PRiME remediation program scope from December 2017 through December 2018. During this time, further development of the PRiME model included additional attributes and was validated by comparing results against a sample size with pole loading analysis to provide a 95% confidence level with a 3% error. The analysis from the sample selection indicated a majority of the pole replacements resulted mostly due to clearance infractions. EDM worked on improving the PRiME model to help identify probable clearance infractions but, have not yet implemented this target approach. In 2019, data results from the January 2019 PRiME model run was used to continue project scope for targeted remediation. Another updated model in December 2019 was used to continue PRiME project scope through 2020.

4.5.1.4 WiNGS Planning Model

1. Purpose of model

The innovative Wildfire Next Generation System model (WiNGS), building upon the Risk Spend Efficiency (RSE) methodology in RAMP, evaluates both wildfire and PSPS impacts at the sub-circuit/segment level to inform its investment decisions by determining which initiatives provide the greatest benefit per dollar spent in reducing both wildfire risk and PSPS impact.

Although SDG&E developed WiNGS in 2020, and the model did not inform the entire scope of grid hardening work in the 2020 WMP, SDG&E is sharing additional details on this model because it represents the future framework that will be used to identify future strategies for mitigating wildfire. The use of WiNGS to inform priorities in the 2020 WMP is limited to some of the covered conductor and undergrounding scope identified for 2022 as well as the Standby Power Program.

2. Relevant terms

The following are relevant terms related to this model:

a. **Critical Health Index:** A unitless index figure representing an asset health estimate
b. **Multi-Attribute Value Function (MAVF):** Framework to quantify risk designed originally for the quantification efforts required in RAMP
c. **RAMP:** Risk Assessment and Mitigation Phase
d. **WRRM**: The Wildfire Risk Reduction Model (WRRM) is a collaboration project between SDG&E and Technosylva Inc., that leverages historical high-resolution weather data to establish the impact of a potential high consequence fire event.

3. Data elements

The WiNGS analysis is conducted at the segment level. That level of data granularity is required to establish the segment parameters. Key segment level data inputs include:

- Segment length (overhead and underground)
- Pole hardening status
- Average conductor age
- Historic PSPS events
- Historic tree strikes

Weather related data and assumptions are gathered from the weather station closest to the segment. Key weather-related data inputs include: Maximum wind speed

Other key data points

- Historic number of ignitions as per the CPUC reportable ignition database (2015 – 2019)

4. Methodology

Baseline Risk

In order to calculate the baseline wildfire and PSPS impact, the respective likelihood and consequence figures must be determined. The initial likelihood of a fire event is determined by pro-rating historical annual ignition rates by the mileage of the segment. This figure is then adjusted to account for wind speed, historical tree strikes, vegetation density, asset hardening, and asset health. Asset health is currently determined by evaluating conductor age and the CRI analysis. The final adjusted figure represents the likelihood of a significant wildfire event on the segment.

The consequence of wildfire events is determined by the maximum WRRM output for the segment. In order to translate the event consequences into risk values, the WRRM values first are converted to natural units. Then natural units and event likelihood are fed into the MAVF developed for RAMP to arrive at a final baseline wildfire risk per segment.

For PSPS events, the individual probability of a segment undergoing a PSPS event is determined by the historical events where the nearest weather station to the segment increased past certain high wind speed thresholds. However, since a PSPS event on a segment affects all customers on and downstream of the segment, the connectivity of segments within a circuit are taken into account. If the maximum upstream probability of the segment being analyzed is greater than or equal to the individual segment probability, the model assumes that the maximum likelihood of a power shutoff event occurring to a customer on or downstream of the segment has been already captured. Thus, there is no additional PSPS impact added onto the circuit by that segment and the likelihood of a PSPS event causing additional risk is 0. If the individual segment probability is greater than the maximum upstream probability, then there is additional PSPS impact to downstream customers that has not been captured by the upstream

segments. Thus, the likelihood of a PSPS event causing additional risk is the difference between the segment and upstream probabilities.

The consequence of PSPS events accounts for the impact of customers on and downstream of the segment. For modeling purposes, the event consequence is assumed over 12 red flag days annually with an assumed PSPS duration of 12 hours per red flag day. The customer and event duration data allow for the calculation of the expected PSPS duration and reliability impact. SME input is used to determine the projected financial and safety impact per event. In order to account for critical customers on lines (e.g., life-support devices, critical infrastructure) as defined by the CPUC and internally, additional scoring multiplier is given to these customer counts. These weights are determined by analyzing the safety, financial, reliability impact of a 12-hour power shutoff event to these customers using industry research.

Similarly, to the baseline wildfire calculation, the natural units and event likelihood are fed into the MAVF to arrive at a final baseline PSPS impact per segment.

Mitigation Analysis

Once the baseline risk per segment has been established, the next step is evaluating the effect and costs of different mitigations. For each mitigation that is in scope (e.g., covered conductor, undergrounding), there are associated percentage decreases in wildfire risk and PSPS impact. For wildfire risk mitigation effectiveness, SME input is used to estimate the impact of a mitigation on various wildfire triggers (e.g., animal contact, vegetation contact). Where possible, additional analyses are conducted using internal data (e.g., historical fault data) to drive more data driven decisions. For PSPS mitigation effectiveness, internal SME input and historical event data is used to estimate the reduction in PSPS likelihood for the individual segment probability. The total cost of the mitigation is determined by the per unit cost.

Since the PSPS likelihood and risk on a segment is influenced by the maximum upstream segment probability, mitigations that occur upstream of segments will influence the PSPS of probability for analysis. Thus, the PSPS impact of a segment cannot be looked at in isolation and must be considered with the other segments on that circuit and their respective mitigations via the use of a dynamic model. The dynamic nature updates the maximum upstream probability of a segment as mitigations upstream are determined.

Portfolio Analysis

The primary goal of the model is to analyze and compare different investment planning portfolios and scenarios. The dynamic requirements of the model require that every possible combination of mitigations be evaluated for many scenarios. In these situations, an optimization solver is required to compare the risk reduction and costs associated with each mitigation combination and identify the ideal set of mitigations that satisfy the requirements and constraints set by the scenario.

5. Timeline

The WiNGS modeling concept was introduced in the 2020 WMP update and a three-year timeline was proposed covering the development and implementation of the model and its findings. The key changes since the prior report have included updated segment data, incorporation of additional analyses, and the shift from a static to a dynamic model.

6. Application and results

The WiNGS Planning model will be used to inform the wildfire risk RSE calculations in the 2021 RAMP. The model has been reviewed by multiple internal subject matter experts to validate any assumptions and model outputs.

4.5.1.5 Vegetation Risk Index

1. Purpose of model

The Vegetation Risk Index (VRI) is used to determine which distribution circuit segments are most at risk of vegetation-related outages during adverse weather conditions based on the number of trees, species of trees, height of the trees, and outage history along that given circuit segment.

2. Relevant terms

The following are relevant terms related to this model:

a. **Inventory Tree:** SDG&E defines an inventory tree as one that could encroach the minimum clearance or otherwise impact the electrical facilities within three -years of the inspection date.

b. **Tree Database**: A database of SDG&E's inventory trees which includes information on height, species, diameter, growth rate, clearance, and other characteristics.

3. Data elements

The details of data elements used:

- Distribution circuit segments within the HFTD
- Vegetation Management's Tree Database
  - Location of trees
  - Tree height
  - Tree species
- Tree-related outages since 2000

4. Methodology

As previously mentioned, the VRI is used to determine which distribution circuit segments are most at risk of vegetation-related outages during adverse weather conditions. To do this, SDG&E's subject matter experts first divided the electric distribution system within the HFTD into circuit segments based primarily on existing SDG&E weather station/sectionalizing device associations and known local wind climatology. SDG&E's Tree Database was then used to catalogue the number of inventory trees along each circuit segment, including the height and species of each tree. Historical tree-related outage data was also collected and included in the VRI calculation. Subject matter experts at SDG&E analyzed the results of the VRI calculations to create breakpoints from the data. Each circuit segment was then assigned a VRI rating of low, medium, or high, based on those breakpoints.

5. Timeline

The VRI was first created in 2019 and is updated annually as conditions on the system change. SDG&E is currently exploring ways to enhance the VRI by incorporating real-time and forecasted weather conditions.

6. Application and results

The VRI has been instrumental for real-time PSPS decision making. Circuit segments that have a "High" VRI rating may experience PSPS at lesser wind speeds as compared to a climatologically similar circuit segment due to the increased risk of tree-related outages. SDG&E has used the VRI to make timely PSPS decisions on certain "High" VRI circuit segments prior to instances of tree-related damages, preventing potential ignitions during critical fire weather conditions.

4.5.1.6 Circuit Risk Index

1. Purpose of model

In addition to the models outlined in detail above, SDG&E is continuing to develop new models to enhance its decision-support tools. Throughout 2020 and up to this point, SDG&E has been developing the Circuit Risk Index (CRI); a relative asset risk assessment model that can help identify circuits and sections (or segments) of the circuits with highest risk based on pole location, age, wire size and material, as well as PRiME and WRRM values.

An early draft of this model was completed in 2020 but has not yet been incorporated in decision-making. Further improvements have been identified that we will continue to work on throughout 2021.

2. Relevant terms

The following are relevant terms related to this model:

a. **Section**: Part of a circuit in between two sectionalizing devices.
b. **Pole CRI**: For every pole in a circuit a CRI score is calculated.
c. **Section CRI**: The sum of CRI values at each SCADA Sectionalizing Device provides the Section CRI.
d. **Circuit CRI**: The sum of CRI values for each circuit provides the Circuit CRI

3. Data elements

- Pole Age calculated as number of years between installation date and today's date.
- PRiME model
- Number of Circuits per pole
- WRRM values

4. Methodology

As previously mentioned, the CRI will be used to determine which distribution circuit segments are most at risk relative to others based on SME input and historical failure rates. To create this relative ranking, SDG&E's subject matter was considered, and relative scoring was assigned at each location (poles).

5. Timeline

The CRI was first created in late 2020 and will be updated annually as conditions on the system change. SDG&E is currently exploring new ways to enhance the CRI.

6. Application and results

The CRI model is still in development and has not been used in any real-time PSPS decision making. SDG&E is currently evaluating the CRI model in asset management activities.

4.5.1.7 Fire Potential Index

1. Purpose of model

The FPI was developed by SDG&E subject matter experts to communicate the wildfire potential on any given day to promote safe and reliable operations. This seven-day forecast product, which is produced daily, classifies the fire potential based on weather and fuels conditions and historical fire occurrences within each of SDG&E's eight operating districts.

2. Relevant terms

The following are relevant terms related to this model:

a. **FPI Green-Up**: The state of native grasses.
b. **FPI Fuels**: The Fuels Component of the FPI measures the overall state of potential fuels which could support a wildfire.
c. **FPI Weather**: The weather component of the FPI represents a combination of sustained wind speeds and dew - point depression.
d. **Normal Fire Potential (1-11)**: It is considered "Normal" when the FPI is green and large wildfire is not likely.
e. **Elevated Fire Potential (12-14)**: It is considered "Elevated" when the FPI is either yellow or orange and large wildfires are possible, should an ignition occur.
f. **Extreme Fire Potential (15-17)**: It is considered "Extreme" when the FPI is red indicating that large, damaging wildfires are likely should an ignition occur.

3. Data elements

The data elements of the Fire Potential Index are the following:

The FPI is comprised of three components (FPI Green-Up, FPI Fuels, FPI Weather), which are computed into a final FPI. These components and the final computation are described below.

FPI Green-Up Component: The state of native grasses, or Green- Up Component, of the FPI is determined using satellite data for various locations. This component is rated on a 0-to-5 scale ranging from very wet (or "lush") to very dry (or "cured"). The scale is tied to the Normalized Difference Vegetation Index (NDVI), which ranges from 0 to 1.

FPI Fuels Component: The Fuels Component of the FPI measures the overall state of potential fuels which could support a wildfire. Values are assigned based on the overall state of available fuels (dead or live) for a fire using the following equation: FC = FD / LFM. Where FC represents Fuels Component in the scale below, FD represents 10-hour Dead Fuel Moisture (using a 1-to-3 scale), and LFM represents Live Fuel Moisture (percentage). The product of this equation represents the fuels component that is reflected in the FPI

FPI Weather Component: The weather component of the FPI represents a combination of sustained wind speeds and dew - point depression.

4. Methodology

Final Computed Fire Potential Index: The individual numeric values representing the three variables reflected in the FPI, shown above, are combined and placed on the following scale:

Normal	Elevated	Extreme
≤ 11	12 to 14	≥ 15

SDG&E continually improves the FPI through verification and product enhancement with its team of subject matter experts.

5. Timeline

SDG&E originally released the FPI to support its operations in 2012 and has continually improved the FPI through verification and product enhancement with its team of subject matter experts ever since. In 2020, SDG&E enhanced the FPI by operationalizing enhanced analytical capabilities by leveraging its high performing computing cluster to update the weather component of the product and also incorporated artificial intelligence into the Live Fuel Moisture component.

6. Application and results

SDG&E ties proactive and reactive operational practices and measures to the FPI values through standard operating procedures, with the further expectation that SDG&E will be able to reduce the likelihood its facilities and operations will be the source of ignition for a fire during times when the risk of fire as measured by the FPI elevated or extreme. Moving forward, SDG&E will continue enhancing the predictors that contribute to the FPI, including live fuel moisture and green-up, to modernize the data inputs and better leverage the high-performance computing environment to generate the product.

Additionally, this is also shared with local fire agencies, emergency responders, and the National Weather Service.

4.5.1.8 Santa Ana Wildfire Threat Index

1. Purpose of Model

The SAWTI calculates the potential for large wildfire activity based on the strength, extent, and duration of the wind, dryness of the air, dryness of the vegetation, and greenness of the grasses. Similar to the hurricane-rating system (category 1-5), the SAWTI compares current environmental data to climatological data and correlates it with historical wildfires to rate the Santa Ana wind event on a scale from "marginal" to "extreme." To help the region prepare for hazardous conditions, information from the SAWTI is issued daily to fire agencies and other first-responders, which has led to specific preparedness and operational decisions based on the likelihood of a catastrophic wildfire fueled by Santa Ana winds. The public also has access to SAWTI to make personal safety decisions.

2. Relevant terms

The SAWTI, which predicts Large Fire Potential (LFP) during Santa Ana wind events, is informed by both weather and fuels information.

We define LFP to be the likelihood of an ignition reaching or exceeding 250 acres or approximately 100 ha.

For SAWTI, the following equation was formulated:

$$LFP = Ws\ 2DdFMC$$

Where Ws is the near surface wind speed, Dd is the near surface dew point depression, FMC is the Fuel Moisture Component expressed by this equation:

$$\mathrm{FMC} = \left\{0.1\left[\left(\frac{\mathrm{DL}}{\mathrm{LFM}} - 1\right) + G_{\mathrm{ag}}\right]\right\}^{1.7}, \qquad (2)$$

Where DL is a Dryness Level index (a function of the Energy Release Component [ERC] and Dead Fuel Moisture [DFM]). LFM is the Live Fuel Moisture of Chamise (Adenostoma fasciculatum), and G is the green-up/curing of the annual grasses using the Normalized Difference Vegetation Index (NDVI).

A more comprehensive overview can be accessed at this link:
https://journals.ametsoc.org/view/journals/wefo/31/6/waf-d-15-0141_1.xml

3. Data elements

For the purposes of the SAWTI, SDG&E has condensed fuel moisture into three parameters: 1) dryness level, 2) live fuel moisture, and 3) the state of green-up of the annual grasses.

Dryness Level (DL) The DL is a function of ERC and/or DFM10hr calibrated to historical fire occurrence across Southern California with unitless values ranging from 1 to 3. ERC is a relative

index of the amount of heat released per unit area in the flaming zone of an initiating fire and is composed of live and dead fuel moisture as well as temperature, humidity, and precipitation.

Live Fuel Moisture (LFM) The observed LFM is the moisture content of live fuels (e.g., grasses, shrubs, and trees) expressed as a ratio of the weight of water in the fuel sample to the oven dry weight of the fuel sample.

Annual Grasses (Gag) Following the onset of significant wetting rains, new grasses will begin to emerge in a process called green-up.

4. Methodology

As part of the development of SDG&E's Fire potential Modeling, including the SAWTI, the moisture variables were combined into one term, which is referred to as the fuel moisture component (FMC). While the variables within the FMC often act in concert with each other, there are times when they are out of phase with one another as a result of the variability in precipitation (frequency and amount) that occurs across Southern California during the winter. Through a comprehensive empirical investigation, the governing equation for FMC can be expressed as, or a comparable variation of:

$$\mathrm{FMC} = \left\{0.1\left[\left(\frac{\mathrm{DL}}{\mathrm{LFM}} - 1\right) + G_{ag}\right]\right\}^{1.7}$$

where DL is the dryness level consisting of the energy release component (ERC) and/or the 10-hour dead fuel moisture time lag DFM10hr. Dead fuel refers to nonliving plant material whose moisture content responds only to ambient moisture. Dead fuel is typically grouped into ''time lag'' classes according to diameter as follows: 0.20cm, DFM1hr; 0.64cm, DFM10hr; 2.00cm, DFM100hr; and 6.40cm, DFM1000hr. Live fuel moisture (LFM) is a sampling of the moisture content of the live fuels indigenous to the local region, and Gag is the degree of green-up of the annual grasses. Currently, SDG&E is assuming that all the terms in the FMC have equal weight, but further study may lead to future modifications.

For a full methodology, SDG&E has included a peer reviewed publication which includes additional details.

5. Timeline

SDG&E, the U. S. Department of Agriculture, the U.S. Forest Service, and the University of California Los Angeles (UCLA), in collaboration with CAL FIRE, the Desert Research Institute, and the National Weather Service unveiled a web-based tool in September 2014 to classify the fire threat potential associated with the Santa Ana winds that are directly linked to the largest and most destructive wildfires in Southern California.

6. Application and results

The SAWTI calculates the potential for large wildfire activity based on the strength, extent, and duration of the wind, dryness of the air, dryness of the vegetation, and greenness of the grasses. Like the hurricane-rating system (category 1-5), the SAWTI compares current environmental data to climatological data and correlates it with historical wildfires to rate the Santa Ana wind event on a scale from “marginal” to “extreme.” To help the region prepare for hazardous conditions, information from the SAWTI is issued daily to fire agencies and other first-responders, which has led to specific preparedness and operational decisions based on the likelihood of a catastrophic wildfire fueled by Santa Ana winds. The public also has access to SAWTI to make personal safety decisions.

4.5.2 Calculation of Key Metrics

Instructions: *Report details on the calculation of the metrics below. For each metric, a standard definition is provided with statute cited where relevant. The utility must follow the definition provided and detail the procedure they used to calculate the metric values aligned with these definitions. Utilities must cite all data sources used in calculating the metrics below.*

1. ***Red Flag Warning overhead circuit mile days*** *– Detail the steps to calculate the annual number of red flag warning (RFW) overhead (OH) circuit mile days. Calculated as the number of circuit miles that were under an RFW multiplied by the number of days those miles were under said RFW. Refer to Red Flag Warnings as issued by the National Weather Service (NWS). For historical NWS data, refer to the Iowa State University Iowa archive of NWS watch / warnings.[20] Detail the steps used to determine if an overhead circuit mile was under a Red Flag Warning, providing an example of how the RFW OH circuit mile days were calculated for a Red Flag Warning that occurred within utility territory over the last five years.*

When the National Weather Service issues a Red Flag Warning, they do so by zones. SDG&E has these zones identified as part of its GIS system. SDG&E can run a spatial query on these zones to identify the total circuit mileage impacted by a Red Flag Warning. SDG&E then determines the number of days (down to the decimal value) by subtracting the Red Flag Warning end date and time from the Red Flag Warning start date and time to determine Red Flag Warning circuit mile days.

2. ***High Wind Warning overhead circuit mile days*** *– Detail the steps used to calculate the annual number of High Wind Warning (HWW) overhead circuit mile days. Calculated as the number of overhead circuit miles that were under an HWW multiplied by the number of days those miles were under said HWW. Refer to High Wind Warnings as issued by the National Weather Service (NWS). For historical NWS data, refer to the Iowa State University Iowa archive of NWS watch / warnings.[21] Detail the steps used to determine if an overhead circuit mile was under a High Wind Warning, providing an example of how the OH HWW circuit mile days were calculated for a High Wind Warning that occurred within utility territory over the last five years.*

Similar to Red Flag Warnings, when the National Weather Service issues high wind warnings, it is done in zones. SDG&E has these zones identified as part of SDG&E's GIS system and can run a spatial query on these zones to determine the total circuit mileage impacted by a high wind warning. SDG&E then determines the number of days (down to the decimal value) by

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20 https://mesonet.agron.iastate.edu/request/gis/watchwarn.phtml

21 https://mesonet.agron.iastate.edu/request/gis/watchwarn.phtml

subtracting the high wind warning end date and time from the high wind warning start date and time to determine high wind warning circuit mile days.

3. ***Access and Functional Needs population*** *– Detail the steps to calculate the annual number of customers that are considered part of the Access and Functional Needs (AFN) population. Defined in Government Code § 8593.3 and D.19-05-042 as individuals who have developmental or intellectual disabilities, physical disabilities, chronic conditions, injuries, limited English proficiency or who are non-English speaking,[22] 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.*

SDG&E considers customers in the following categories within SDG&E's databases to be AFN and queries its databases frequently.

- Customers enrolled in the following programs: CARE, FERA, MBL, Temperature Sensitive;
- Customers who receive their utility bill in an alternate format: Braille, Large Font Bill;
- Customers whose preferred language is a language other than English; and
- Customers who self-identify to receive an in-person visit prior to disconnection for nonpayment or self-identify as having a person with a disability in the household: disabled hearing impaired; disabled vision impaired; disability – not defined.

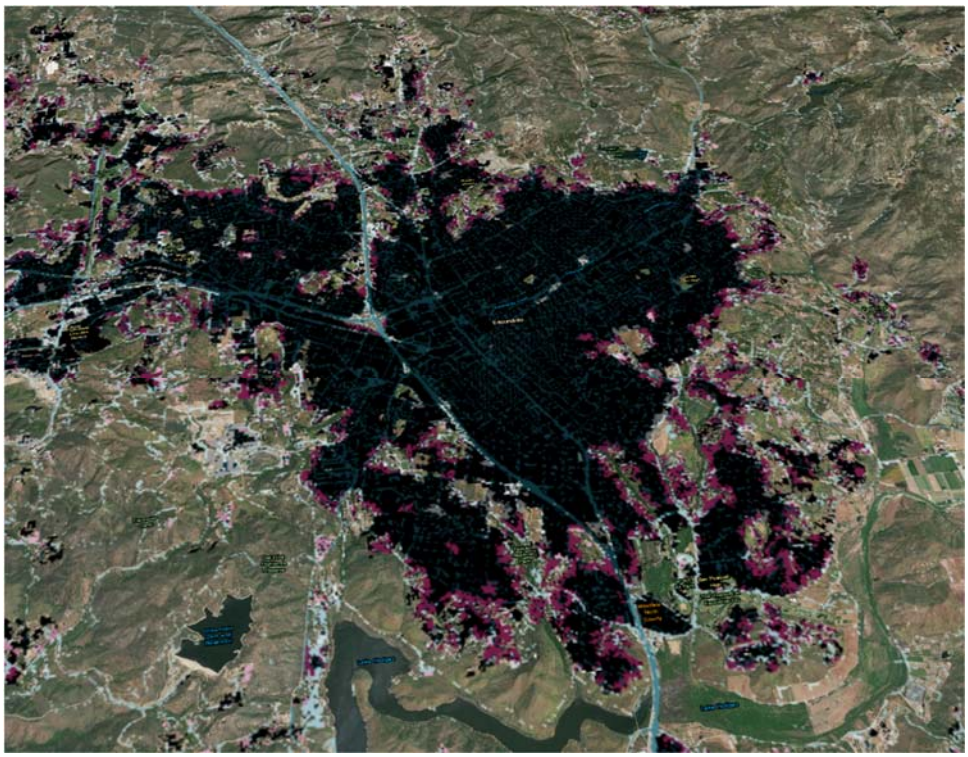
Currently, there are approximately 390,000 SDG&E customer accounts associated with AFN, of which approximately 185,000 are located within the HFTD. While the primary methodology for identifying AFN populations is through SDG&E's databases, SDG&E also reaches AFN customers through local community partners who represent or provide services to these constituencies (e.g., 2-1-1 San Diego). SDG&E does not receive a number of customers from these partners, and as such, they are not included in SDG&E's count.

[22] Guidance on calculating number of households with limited or no English proficiency can be found in D.20-03-004.

4. ***Wildlife Urban Interface*** *– Detail the steps to calculate the annual number of circuit miles and customers in Wildlife Urban Interface (WUI) territory. WUI is defined as the area where houses exist at more than 1 housing unit per 40 acres and (1) wildland vegetation covers more than 50% of the land area (intermix WUI) or (2) wildland vegetation covers less than 50% of the land area, but a large area (over 1,235 acres) covered with more than 75% wildland vegetation is within 1.5 mi (interface WUI) (Radeloff et al, 2005).*[23]

Efforts to calculate and analyze the circuitry and WUI is conducted by internal subject matter experts leveraging in-house GIS capabilities. To illustrate, the map below shows a community that SDG&E serves, Escondido. Using the WUI definition, the WUI areas are mapped in purple, with the black areas indicating urban setting. The greatest threat that is posed to the WUI in this community would be from a wildfire that started in the mountains to the east of this community and was pushed into the WUI by a strong Santa Ana wind.

Figure 7: Example of WUI



In addition to the traditional WUI areas as seen in the map above, SDG&E also closely analyzes areas in its service territory such as coastal canyons, river valleys, and highly vegetated areas outside of the HFTD. These areas are generally closer to the coastline and do

[23] Available here: https://www.fs.fed.us/pnw/pubs/journals/pnw_2005_radeloff001.pdf with the latest WUI map (form 2010) found here - http://silvis.forest.wisc.edu/data/wui-change/.

not have the same magnitude of wildfire risk that is seen across the HFTD, though they do represent areas of WUI in SDG&E's service territory and operational steps are taken to decrease risk in these areas.

5. ***Urban, rural and highly rural*** *– Detail the steps for calculating the number of customers and circuit miles in utility territory that are in highly rural, rural, and urban regions for each year. Use the following definitions for classifying an area highly rural/rural/urban (also referenced in glossary):*

    a. *Highly rural – 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 as determined by the United States Bureau of the Census. For the purposes of the WMP, "area" shall be defined as census tracts.*

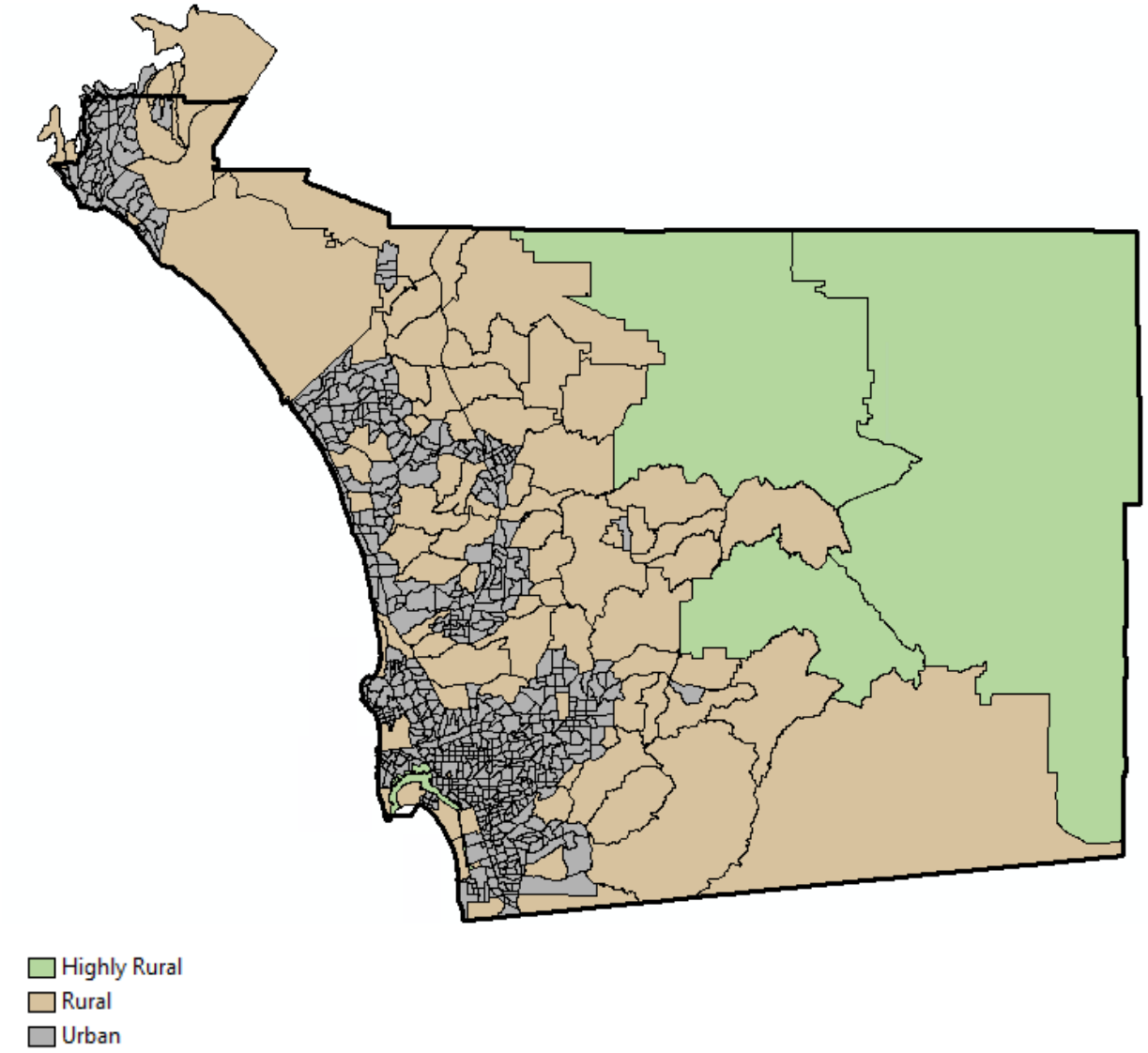
    b. *Rural – In accordance with GO 165, "rural" shall be defined as those areas with a population of less than 1,000 persons per square mile as determined by the United States Bureau of the Census. For the purposes of the WMP, "area" shall be defined as census tracts.*

    c. *Urban – 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. For the purposes of the WMP, "area" shall be defined as census tracts.*

    Population density numbers are calculated using the American Community Survey (ACS) 1-year estimates on population density by census tract for each corresponding year (2016 ACS 1-year estimate for 2016 metrics, 2017 ACS 1-year estimate for 2017 metrics, etc.). For years with no ACS 1-year estimate available, use the 1-year estimate immediately before the missing year (use 2019 estimate if 2020 estimate is not yet published, etc.)

SDG&E's GIS team utilized census tracts for San Diego and Orange county to develop these layers by census tract. The number of customers was provided in the latest census data from 2010 (the latest available at the time, although this should be updated next year). For each tract, SDG&E divided the total number of customers in the tract polygon by the total square miles of the polygon to achieve population density. SDG&E then categorized each tract by Urban, Rural, or very rural according to the GO 165 and Code of Federal Regulations (CFR) Section 17.701 definitions. SDG&E did modify the rural definition to be 7-999 people per square mile to distinguish the layer between very rural, 0-6 people per square mile. An image of these census tract layers is provided below.

Figure 8: Census Tract Layers



To fill out WMP Tables 8, 9, and 10 (Attachment B) using this layer as required, SDG&E GIS team has run spatial queries on the actual and planned improvements in 2020, 2021 and 2022.

4.6 Progress Reporting on Past Deficiencies

Instructions: *Report progress on all deficiencies provided in the 2020 WMP relevant to the utility. This includes deficiencies in Resolution WSD-002.*

Summarize how the utility has responded and addressed the conditions in the table below. Reference documents that serve as part of the utility's response (e.g., submitted in the utility's Remedial Compliance Plan, location in 2021 WMP update, etc.). Note action taken by the WSD for Class A and B deficiencies (e.g., response found sufficient, response found insufficient and further action required, etc.).

In Resolutions WSD-002 and WSD-005, the WSD highlighted several opportunities for SDG&E to enhance its WMP and itemized several items for SDG&E to address. Specifically, the WSD outlined deficiencies and associated conditions to remedy the deficiencies. The deficiencies were categorized into three classes – Class A deficiencies were addressed in a Remedial Compliance Plan (RCP) on July 28, 2020, Class B deficiencies were addressed in Quarterly Reports on September 9, 2020 and December 9, 2020, and Class C deficiencies are addressed in this 2021 WMP Update.

The WSD issued evaluations of SDG&E's RCP on December 30, 2020, and SDG&E's Quarterly Report for Q3 on December 29, 2020 and January 8, 2021.[24] These evaluations required additional action items to address the deficiencies. The table below sets forth the deficiencies the WSD identified for SDG&E; summarizes how and where SDG&E has responded and addressed the conditions; and notes the WSD's action on each item.

Given the short amount of time between the WSD's issuance of its evaluation of the Quarterly Report for Q3 2020 and the submission date of this 2021 WMP Update, the majority of action items related to SDG&E's Class B deficiencies will be addressed in a supplemental filing on February 26, 2021.

[24] Wildfire Safety Division Evaluation of San Diego Gas & Electric Company's Remedial Compliance Plan (December 30, 2020); Wildfire Safety Division Quality Control Report on GIS Data Submitted by San Diego Gas & Electric on September 9, 2020 (December 29, 2020); Wildfire Safety Division Evaluation of San Diego Gas & Electric Company's First Quarterly Report (January 8, 2021).

Table 4-1: List of Utility Deficiencies and Summary of Response, 2020

Deficiency Number	Deficiency Title	Utility Response (brief summary)	Reference Documents	WSD Action
SDG&E-1	Higher number of ignitions related to balloon contact	• Analyzes balloon caused ignitions and describes efforts taking to mitigate occurrence (public awareness campaigns, industry outreach) • Covered conductor, strategic undergrounding and recloser settings will help reduce balloon contact ignitions	SDG&E 2020 WMP Quarterly Report for Q3 2020 SDG&E 2021 WMP Update, Section 7.3.10.5.	Sufficient, with 1 action item
SDG&E-2	Higher number of ignitions related to vehicle contact	• Analyzes vehicle caused ignitions and describes efforts taking to mitigate occurrence (where frequently occur, relocate structures) • Strategic undergrounding and recloser settings will help reduce vehicle contact ignitions	SDG&E 2020 WMP Quarterly Report for Q3 2020	Sufficient, with 2 action items
SDG&E-3	Incorporate lessons learned into updates of its risk models	• Continuously seeks opportunities to improve risk modeling • Incorporated lessons learned in developing new model – WiNGS to quantify both the wildfire risk and the PSPS impact at a more granular level to guide investment decisions as well as operational decisions.	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 3 action items
SDG&E-4	Detail on strategic undergrounding pilots	• Describes findings and challenges of undergrounding pilot (engineering, permitting and easements, environmental) • Explains the data that is being collected and how SDG&E will track/measure effectiveness of the mitigation	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 4 action items
SDG&E-5	Detail on need for regulatory assistance	• Regulatory assistance to initiate this work is no longer needed • SDG&E believes it has the right within its electric tariffs to proceed with these overhead to underground service conversions and to reimburse the reasonable customer costs associated with the conversion, that benefit all customers through reduced risk of wildfire	SDG&E 2020 WMP Quarterly Report for Q3 2020	Sufficient

Deficiency Number	Deficiency Title	Utility Response (brief summary)	Reference Documents	WSD Action
SDG&E-6	Detail on plans for reinforcing transmission lines	• Provides a map showing all Tier 3 substations will have at least one hardened transmission line • Also outlines which transmission lines are planned to be fire hardened from 2020-2022	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 1 action item
SDG&E-7	Potential redundancies in VM activities	• Explains how SDG&E assesses its vegetation management processes to determine effectiveness • Inspection activities do not overlap in timing	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 2 action items
SDG&E-8	Consideration of environmental impacts, local community input	• Vegetation management activities are performed in accordance with state and federal environmental regulations for the protection of species, habitat, and cultural resources	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 3 action items
SDG&E-9	Explain how investments in undergrounding reduce planned VM spend	• Since SDG&E can quantify the number of inventory trees and brushed poles along its lines scheduled to go underground, the cost savings associated with the inspection of these assets and average, historic cost of trimming and brushing can be estimated	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 1 action item
SDG&E-10	Use of outside entities for fuel reduction	• Explains fuel reduction projects via outside entities are completed, and how they tie to overall effectiveness of vegetation management program	2021 WMP Update, Section 7.3.5.5	None to date
SDG&E-11	Details on VM around substations	• Describes fuels reduction work around substations, and how it maintains defensible space around its substations	SDG&E 2020 WMP Quarterly Report for Q3 2020	Sufficient
SDG&E-12	Details of quality assurance, quality control	• Explains how SDG&E uses a third-party contractor to perform QA/QC Audits • Describes all QA/QC Audits performed, timing, and results	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 8 action items

Deficiency Number	Deficiency Title	Utility Response (brief summary)	Reference Documents	WSD Action
SDG&E-13	Supporting data for increased time-of-trim clearances	• Provides further information on its study to measure the impacts of post trim clearance on vegetation contacts and ultimately ignitions	SDG&E 2020 WMP Remedial Compliance Plan; SDG&E 2020 WMP Quarterly Report for Q3 2020; SDG&E 2021 WMP Update, Section 4.4.2.9.	Insufficient, with 2 action items
SDG&E-14	Granularity of "at-risk species"	• Provides tree species of "at risk" trees, as well as criteria considered for "at risk" tree species designation	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 3 action items
SDG&E-15	Details of centralized data repository	• Outlines data to be housed in the central repository (which is being built out) and describes frequency it plans to update all data	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 2 action items
SDG&E-16	Details of cooperative fuel reduction work	• Sets forth plans to collaborate with the USFS on fuel reduction programs, and notes there are no formal agreements with USFS on fuel reduction efforts	SDG&E 2020 WMP Quarterly Report for Q3 2020	Sufficient, with 1 action item
Guidance-1	Lack of RSE Information	• Explains how SDG&E categorizes its initiatives as either foundational support for mitigating fire risk, directly tied to mitigating fire risk, or geared toward mitigating PSPS. • Provides a calculated reduction in ignition risk, as well as in wildfire consequence risk for each initiative in its 2020 WMP. • Describes the risk models used to calculate these reductions.	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 4 action items
Guidance-2	Lack of alternatives analysis for chosen initiatives	• Discusses all alternatives considered for each grid hardening or vegetation management initiative in 2020 WMP • Provides list of all tools, models, and other resources used to compare alternative initiatives • Explains risk quantification method used as well as rationale for implementing the chosen initiative	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 5 action items

Deficiency Number	Deficiency Title	Utility Response (brief summary)	Reference Documents	WSD Action
Guidance-3	Lack of risk modeling to inform decision-making	• Provides a high-level description of its risk-informed decision-making approach used to select the portfolio of mitigation initiatives in 2020 WMP • Provides initiative-level details on the current and future approaches to decision -making in selecting WMP initiatives • Provides a table describing its risk assessment techniques used for each initiative in the format used by SCE	SDG&E 2020 WMP Remedial Compliance Plan See Section 7.3.b below.	Insufficient, with 3 action items
Guidance-4	Lack of discussion on PSPS impacts	• Initiatives either offer direct PSPS mitigation, are foundational support for PSPS mitigation, or are not primarily tied to PSPS mitigation • Identifies which initiatives affect PSPS and how they affect PSPS – Specifically, whether they affect the threshold, reduces frequency/scope/duration, or supports directional vision for necessity of PSPS	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 1 action item
Guidance-5	Aggregation of initiatives into programs	• To the extent possible, SDG&E breaks out its WMP programs into individual initiatives and for each, reports on its spend; describes the effectiveness at reducing ignition probability or wildfire consequence; lists all data and metrics used to evaluate effectiveness	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 2 action items
Guidance-6	Failure to disaggregate WMP initiatives from standard operations	• SDG&E identifies its WMP programs as either “standard operations” or “augmented wildfire operations” • Confirms it is budgeting and accounting for WMP activity of each initiative, and includes a ledger of all subaccounts	SDG&E 2020 WMP Quarterly Report for Q3 2020	Sufficient

Deficiency Number	Deficiency Title	Utility Response (brief summary)	Reference Documents	WSD Action
Guidance-7	Lack of detail on effectiveness of "enhanced" inspection programs	• Explains the incremental benefits of performing the enhanced inspections – HFTD Tier 3, distribution infrared pilot, and distribution drone pilot. • At this time, not feasible to combine enhanced and existing inspection programs but open to considering in the future	SDG&E 2020 WMP Quarterly Report for Q3 2020	Insufficient, with 2 action items
Guidance-8	Prevalence of equivocating language – failure of commitment	• WMP program targets are set forth in Section 5.3 of this 2021 WMP Update • Wildfire mitigation strategy and objectives are outlined in Section 5.2 and Section 7.1 of this 2021 WMP Update	2021 WMP Update	None to date
Guidance-9	Insufficient discussion of pilot programs	• Discusses its 11 pilot programs and provides status, results, how SDG&E is remedying ignitions/faults revealed during pilot, and how SDG&E plans to expand use (if applicable) • The 11 pilots are: Covered Conductor, Distribution Infrared Inspections, Expanded Generator Grant Program, Advanced Protection – Falling Conductor Protection, Strategic Undergrounding, Drone Assessment, Circuit Ownership, Vegetation Management LiDAR, Ignition Management, Fuels Management, and Vehicle Tracking	SDG&E 2020 WMP Quarterly Report for Q3 2020; SDG&E 2020 WMP Quarterly Report for Q4 2020	Insufficient, with 2 action items
Guidance-10	Data issues – general	• Provides a geodatabase file with voluminous project and event data, including geospatial data organized in WSD's specific schema • Note – 230kV, critical facilities, and customer specific information will be designated as confidential • Where SDG&E did not have or was unable to provide information, an explanation and timeline to comply is provided	SDG&E 2020 WMP Quarterly Report for Q3 2020; SDG&E 2020 WMP Quarterly Report for Q4 2020	

Deficiency Number	Deficiency Title	Utility Response (brief summary)	Reference Documents	WSD Action
Guidance-11	Lack of detail on plans to address personnel	• Describes SDG&E's programs for recruitment and training of personnel • Provides strategy for direct and indirect recruiting of contractors – electric and vegetation management	SDG&E 2020 WMP Quarterly Report for Q3 2020	Sufficient, with 1 action item
Guidance-12	Lack of detail of long-term planning	• Robust description of SDG&E's wildfire mitigation in 10 years, including a description of wildfire mitigation capabilities, a year-by-year timeline, and list of activities to achieve this 10 year plan	SDG&E 2020 WMP Quarterly Report for Q3 2020	Sufficient, with 1 action item

5 Inputs to the Plan and Directional Vision for WMP

5.1 Goal of Wildfire Mitigation Plan

Instructions: *The goal of the Wildfire Mitigation Plan is shared across WSD and all utilities: Documented reductions in the number of ignitions caused by utility actions or equipment and minimization of the societal consequences (with specific consideration to the impact on Access and Functional Needs populations and marginalized communities) of both wildfires and the mitigations employed to reduce them, including PSPS.*

In the following sub-sections report utility-specific objectives and program targets towards the WMP goal. No utility response required for section 5.1.

5.2 The Objectives of the Plan

Instructions: *Objectives are unique to each utility and reflect the 1, 3, and 10-Year projections of progress towards the WMP goal. Objectives are determined by the portfolio of mitigation strategies proposed in the WMP. The objectives of the plan shall, at a minimum, be consistent with the requirements of California Public Utilities Code §8386(a) –*

Each electrical corporation shall construct, maintain, and operate its electrical lines and equipment in a manner that will minimize the risk of catastrophic wildfire posed by those electrical lines and equipment.

Describe utility WMP objectives, categorized by each of the following timeframes, highlighting changes since the prior WMP report:

1. *Before the next Annual WMP Update,*
2. *Within the next 3 years, and*
3. *Within the next 10 years – long-term planning beyond the 3-year cycle.*

In accordance with California Public Utilities Code (P.U. Code) § 8386(a), SDG&E constructs, maintains, and operates its electric system in a manner that minimizes the risk of catastrophic wildfire posed by its electric power lines and equipment. SDG&E's overarching WMP objective is to prevent and mitigate the risk of wildfires caused by utility equipment. Building upon over ten years of wildfire prevention and mitigation work, SDG&E's 2020 WMP continues to focus on reducing wildfire risk. Each year, SDG&E identifies ways to enhance its wildfire prevention and mitigation efforts through enhancing or expanding existing programs and developing and implementing new programs. A description of SDG&E's WMP objectives for each of the specified timeframes is provided below. For detailed year by year timeline please refer to Attachment A. This information was also provided in SDG&E's September 9, 2020 WMP Quarterly Report.

Before the next Annual WMP Update

The annual WMP updates allow for new activities to be identified and added or for existing activities to be modified. In 2021, SDG&E will continue to make progress on the initiatives outlined in the 2020 WMP with a key focus on improving risk analytics to enhance decision-making. Building on some of the new enhancements in 2020 such as the development of the WiNGS model, the PSPS mitigation engineering effort and the data governance initiative, 2021 will include additional enhancement to data collection and analysis, more granular risk assessments and further development of PSPS mitigation initiatives.

Within the next three years

SDG&E has an established practice of continuously looking for opportunities to improve its wildfire mitigation efforts. The WSD has developed a Utility Wildfire Mitigation Maturity Model (Maturity Model) as a method to assess utility wildfire risk reduction capabilities and examine the relative maturity of the wildfire mitigation programs. The WSD believes that the maturity assessment can be used to drive continuous improvement in utility wildfire mitigation when leveraged with requirements to increase maturity over time. While SDG&E will refer to the Maturity Model as a guide towards improving each area of mitigation, it is important to note that the Maturity Model does not represent an absolute assessment of a utility's ability to mitigate and prevent wildfire. The Maturity Model should be part of an iterative process to improve utility wildfire mitigation and prevention efforts over time. The Maturity Model generally highlights maturity to progress in the areas of further automation, review from external stakeholders, and granularity of the initiatives. Along with other areas of improvement, these will be major areas of progress for many of SDG&E's wildfire initiatives.

Within the next 10 years

The WMP is an opportunity to demonstrate how SDG&E has advanced wildfire mitigation in each of the ten categories identified in the Maturity Model. SDG&E generally agrees that capability advancements should be a major focus in each category, however, the specific direction the Maturity Model seems to indicate for some capabilities should be examined further. For example, fully automated systems to inform utilities regarding the risk associated with each asset from flying debris, vegetation, and weather patterns may seem desirable but may take away from sound judgment based on human experience and on-the-ground intelligence. In addition, as SDG&E's risk modeling continues to mature, it will inform the optimal mix of wildfire mitigation initiatives. Based on data, experience, and modeling, some of these fully automated systems may not apply as much as they would for an overhead system and SDG&E may need to shift to other mitigations (such as increasing strategic undergrounding). With this in mind, SDG&E sets forth its general plan for each of the ten categories in the table below.

Table 5-1: SDG&E's 10 Year Vision for Wildfire Risk Mitigation

Category	Three Years (2020 – 2022)	Ten Years (2020 – 2029)
Risk Assessment and Mapping	• Expansion of the Ignition Management Program • Wildfire Risk Reduction Model Enhancements • Creation of the SDG&E Fire Science and Innovation Lab • Upgrading High-Performance Computing Infrastructure	• Increased granularity in risk assessments • Incorporation of broader range of inputs in risk assessment • Increased automation of risk modeling • More real-time updates of risk models
Situational Awareness and Forecasting	• Integration of weather data into NMS for more automated and real-time operational decision-making • Integration and increased automation of broader datasets such as the Vegetation Risk Index, Circuit Risk Index and historical wind conditions into the PSPS Situational Awareness Dashboard • Enhanced fault detection via wireless fault indicators • Weather network modernization and expansion • Fire Science and Innovation Lab	• Increased scope of reliable weather data and improved processes for validating readings • Increased resolution of weather data across the grid • Increased accuracy of weather forecasts • Increased use of external weather data for validation • Greater automation in fire detection capabilities
Grid Design and System Hardening	• Continuation of overhead fire-hardening infrastructure programs • Increased scope of strategic undergrounding • Expansion of covered conductor installation across the system • Enhanced Advanced Protection capabilities • Private LTE Communication Network • Public Safety Power Shutoff Sectionalizing Enhancements • Expansion of the Generator Grant Program to mitigate PSPS impacts • Expansion of microgrid solutions in the new Backup Power for Resilience Program	• Higher granularity in prioritizing initiatives across the grid • Strategic grid design and localization that includes microgrid solutions and location of lines away from highest risk areas • More redundant grid topology and greater sectionalizing capabilities • Increased investment in ignition-preventing equipment and advanced technologies • Significant increase in strategic undergrounding and implementation of covered conductor

Category	Three Years (2020 – 2022)	Ten Years (2020 – 2029)
Asset Management and Inspections	• Continuation of infrastructure inspections per regulatory requirements while exceeding requirements in certain high-risk areas (Tier 3 of HFTD) • Expanded deployment of enhanced inspection technologies such as Infrared inspections of OH distribution and drone assessments • Deployment of new mobile application to enable field employees to submit circuit vulnerabilities (Circuit Ownership)	• Enhanced data collection of wildfire-related attributes at more granular asset levels with greater frequency • Optimized inspection cycles based on risk mitigation efficacy • Enhanced inspection capabilities to identify high risk assets • More robust processes, training and technologies to monitor and validate work performed
Vegetation Management Plan	• Continuation of tree-trimming program • Continued development of SDG&E's robust tree database • Continued implementation of the vegetation management work plan with enhanced clearances in high risk areas (going above regulatory requirements) • Continued testing and deployment of LIDAR technology to enhance vegetation management • Continued development of the Vegetation Risk Index (VRI) to further support risk-informed optimization of vegetation management efforts • Continuation of pole-brushing activates • Establishment of new Fuels Management program	• Increased granularity in vegetation database • Enhanced modeling capabilities to better predict vegetation growth patterns and probability of failure • Optimized vegetation inspection cycles based on risk mitigation efficacy • Enhanced vegetation inspection capabilities to identify high risk areas • Enhanced understanding of individual vegetation strike potential • More robust processes, training and technologies to monitor and validate work performed
Grid Operations and Protocols	• Continued use of various inputs for operational decision-making such as the Fire Potential Index and the Santa Ana Wildfire Threat Index • Continued use of enhanced recloser protocols with more sensitive relay settings to minimize safety risks and potential fire ignitions • Continued use of special work procedures during high risk conditions	• Increased automation in adjusting grid operations based on risk • Enhanced protocols for grid operations and better understanding of associated wildfire risk • Significant decrease in use of PSPS • Enhanced prediction, communication and mitigation of PSPS consequences • Use of advanced technologies to increase efficiency in post-PSPS inspections • Enhanced training, tools and policies to prevent and suppress ignitions related to grid activities

Category	Three Years (2020 – 2022)	Ten Years (2020 – 2029)
Data Governance	• Increased collaboration with agency stakeholders to provide data in a timely manner by developing an ESRI Cloud Managed Service infrastructure for controlled sharing of information	• Enhanced data analytics capabilities to process large amounts of data and conduct real-time reporting • Establishment of more comprehensive databases, analyses and algorithms with advanced sharing capabilities • Enhanced tracking of near-misses and increased accuracy in estimating potential ignitions • Increased participation in utility-ignited wildfires research
Resource Allocation Methodology	• Establishment of new organization dedicated to overseeing portfolio of wildfire mitigations • Development of more holistic methodologies to optimize wildfire mitigation investments across the system • More granular assessment of risk across the system to determine most appropriate risk reduction efforts	• Increased granularity in estimating risk reduction potential of wildfire mitigation efforts (risk spend efficiencies) • More real-time updates of risk spend efficiencies • Enhanced methodology and process for portfolio-wide assessment of wildfire mitigations • Established process for evaluating and developing new technologies
Emergency Planning and Preparedness	• Continued maintenance of emergency response plans • Enhanced community outreach • Expansion of Emergency Management Operations to include additional personnel dedicated to enhanced after-action review program, coordination of PSPS events and enhancement of technology solutions to support emergency operations • Continued engagement with local stakeholders to prepare for and respond to fire-related events	• Increased stakeholder engagement and use of simulations to stress-test response plans • Increased granularity and customization of response plans • Enhanced customer communication and ability to reach vulnerable populations during emergencies • Enhanced documentation and use of lessons learned to update plans • More formalized review of procedures, benchmarking and stakeholder engagement
Stakeholder Cooperation and Community Engagement	• Continued community outreach and public awareness efforts with year-round wildfire safety education and communication campaign • Continued deployment of Community Resource Centers (CRCs)	• More formalized processes of learning from peers in and outside the State • More successful engagement with communities • Ability to utilize enhanced partnerships with LEP and AFN populations to reduce impacts of PSPS and wildfire mitigation measures to those populations • Broader engagement and deeper planning with emergency and non-emergency planning agencies

5.3 Plan Program Targets

Instructions: *Program targets are quantifiable measurements of activity identified in WMPs and subsequent updates used to show progress towards reaching the objectives, such as number of trees trimmed or miles of power lines hardened.*

List and describe all program targets the electrical corporation uses to track utility WMP implementation and utility performance over the last five years. For all program targets, list the 2019 and 2020 performance, a numeric target value that is the projected target for end of year 2021 and 2022, units on the metrics reported, the assumptions that underlie the use of those metrics, update frequency, 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 targeted preventive strategy and program.

Table 5-2: List and Description of Program Targets, Last 5 Years

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Install weather stations	13	30	20	20	Weather stations	SDG&E continues to add new weather stations to strategic locations to provide more granular weather data.	Quarterly	No*
Install cameras	NA	4	NA	NA	Cameras		Quarterly	No*
Install wireless fault indicators	594	502	500	500	Wireless fault indicators		Quarterly	No*
Replace SCADA capacitors	NA	30	32	40	SCADA capacitors		Quarterly	No*
Harden the overhead distribution system - covered conductor	0	1.9	20	60	miles		Quarterly	No*

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Replace and reinforce poles	725	598	670	670	poles	SDG&E's pole replacement and reinforcement is conducted in compliance with GO 165. For poles identified for replacement in Tier 3 of the HFTD, SDG&E intends to accelerate the replacement faster than the six-month time frame required by the Commission's general orders.	Quarterly	No*
Replace expulsion fuses	2,490	3,179	3,970	906	expulsion fuses		Quarterly	No*
Install sectionalizing devices	7	23	10	10	sectionalizing device		Quarterly	No*
Install micro grids	0	4	2	1	micro grids		Quarterly	No*
Enable circuits with Advanced Protection	8	6	8	8	circuits		Quarterly	No*
Replace hotline clamps	660	2,061	2,250	1,650	hotline clamps		Quarterly	No*
Provide generators to MBL and AFN customers impacted by PSPS	65	1,420	2,000	2,000	generators		Quarterly	No*

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Provide whole facility generators to customers impacted by PSPS	NA	75	413	412	generators		Quarterly	No*
Provide generator rebates to customers impacted by PSPS within HFTD	NA	1,274	1,250	1,250	generators		Quarterly	No*
Underground electric lines/equipment	2.6	15.8	25	50	miles		Quarterly	No*
Harden the overhead distribution system - bare wire	122.9	99.5	100	35	miles		Quarterly	No*
Harden transmission system - overhead	7	21.6	6.7	38.6	miles		Quarterly	No*
Harden transmission system - underground	3	0	0	5.5	miles		Quarterly	No*

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Harden transmission system - distribution underbuild	10	9.4	2.7	25	miles		Quarterly	No*
Fire harden CNF - transmission overhead	25	29.1	0	0	miles		Quarterly	No*
Fire harden CNF - distribution overhead	26.4	46.8	0	0	miles		Quarterly	No*
Fire harden CNF - distribution underground	8.7	14.4	0	0	miles		Quarterly	No*
Replace lightning arrestors	NA	0	924	1,848	lightning arrestors		Quarterly	No*
Install LTE communication network stations	NA	15	10	25	base stations	The number of total base stations required is expected to be reduced with the purchase of an additional spectrum in 2021.	Quarterly	No*
Perform compliance maintenance program HFTD - 5-year detailed	16,329	17,977	22,269	18,055	inspections	SDG&E's detailed distribution system inspections are conducted in compliance with GO 165.	Quarterly	No*

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Perform transmission system inspections - detailed	37	2,679	2,715	2,715	inspections		Quarterly	No*
Perform distribution infrared inspections	NA	13,077	18,000	18,000	inspections		Quarterly	No*
Perform transmission system inspections - infrared	112	6,481	6,565	6,565	inspections	Updated metric to report structures inspected instead of tie lines inspected (2019 performance is reported in TL's)	Quarterly	No*
Perform compliance maintenance program HFTD - wood pole intrusive	19,729	14,450	9,796	380	inspections		Quarterly	No*
Perform HFTD Tier 3 inspections	15,176	11,864	10,815	12,380	inspections	SDG&E's QA/QC distribution system inspections are performed within the HFTD Tier 3 prior to fire season and exceed the requirements of GO 165.	Quarterly	No*

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Perform drone assessments of distribution infrastructure	10,400	37,310	22,000	22,000	inspections		Quarterly	No*
Perform drone assessments of transmission infrastructure	NA	2679	2715	2715	inspections		Quarterly	No*
Perform transmission system inspections - aerial 69kV Tier 3 visual	22	1,957	1,792	1,792	inspections	Updated metric to report structures inspected instead of tie lines inspected (2019 performance is reported in TL's)	Quarterly	No*
Perform compliance maintenance program HFTD - annual patrols	86,401	86,075	86,000	86,000	inspections		Quarterly	No*
Perform transmission system inspections - visual	116	6,940	7,024	7,024	inspections	Updated metric to report structures inspected instead of tie lines inspected (2019 performance is reported in TL's)	Quarterly	No*
Perform substation system inspections	301	405	330	330	inspections	SDG&E's substation system inspections are conducted in compliance with GO 174.	Quarterly	No*

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Perform tree trimming	45,3330	45,1207	45,5000	45,5000	trees inspected		Quarterly	No*
Perform fuels management	511	324	500	500	poles cleared	SDG&E's fuels management program removes, thins, or treats vegetation along SDG&E rights of way and adjacent fire-prone corridors.	Quarterly	No*
Perform enhanced inspections, patrols and trimming	8,310	17,095	17,000	17,000	trees trimmed/removed	SDG&E performs enhanced 25-foot clearance post-prune between trees and electric facilities within the HFTD.	Quarterly	No*
Perform pole brushing	34,000	36,563	35,500	35,500	poles brushed		Quarterly	No*

**SDG&E intends to hire an independent evaluator and that evaluator will prepare a report by July 1, 2021 per WSD requirements.*

5.4 Planning for Workforce and Other Limited Resources

Instructions: *Report on worker qualifications and training practices regarding wildfire and PSPS mitigation for workers in the following target roles:*

1. *Vegetation inspections*
2. *Vegetation management projects*
3. *Asset inspections*
4. *Grid hardening*
5. *Risk event inspection*

For each of the target roles listed above:

1. *List all worker titles relevant to target role (target roles listed above)*
2. *For each worker title, list and explain minimum qualifications with an emphasis on qualifications relevant to wildfire and PSPS mitigation. Note if the job requirements include the following:*
    a. *Going beyond a basic knowledge of General Order 95 requirements to perform relevant types of inspections or activities in the target role*
    b. *Being a "Qualified Electrical Worker" (QEW) and define what certifications, qualifications, experience, etc. is required to be a QEW for the target role for the utility.*
    c. *Include special certification requirements such as being an International Society of Arboriculture (ISA) Certified Arborist with specialty certification as a Utility Specialist*
3. *Report percentage of Full Time Employees (FTEs) in target role with specific job title*
4. *Provide a summarized report detailing the overall percentage of FTEs with qualifications listed in (2) for each of the target roles.*
5. *Report plans to improve qualifications of workers relevant to wildfire and PSPS mitigation. Utilities will explain how they are developing more robust outreach and onboarding training programs for new electric workers to identify hazards that could ignite wildfires.*

Minimum Worker Qualifications

Vegetation Inspections and Vegetation Management Projects

All job titles listed in the tables below related to Forester, Pre-inspection, Auditor, and Tree Trim require an in-depth knowledge of applicable rules and regulations (e.g., GO 95, Public Resources Code Section 4293, North American Electric Reliability Corporation (NERC) FAC-003-4), industry safety practices, hazard tree assessment, fire prevention, environmental impacts, ANSI pruning standards, and customer conflict resolution. Many individuals within these job titles have the preferred qualification of degree, experience, and/or time-in-service.

Asset inspections, Grid hardening, and Risk event inspection

SDG&E has established and maintained a robust training program for its electrical asset inspectors. The SDG&E Skills Training Center trains qualified electrical workers (QEWs) to conduct Overhead CMP Detailed and Quality Control (QC) inspections through a two-day course that is instructor-led and covers the Overhead (89 condition codes) and QC (50 conditions codes) portion of the CMP program.

The course provides inspectors with the knowledge needed to identify infraction, reliability, and discretionary conditions on overhead poles, attached equipment, and conductors for Overhead Detailed and QC inspections as defined in GO 165, GO 95 and SDG&E's Overhead Construction Standards. Online refresher courses consisting of six modules are provided to SDG&E inspectors and include an assessment in order to pass.

Additionally, patrol training is conducted annually for all QEWs and Electric Troubleshooters performing patrols. Only employees that have completed the Overhead CMP Detailed and QC inspection training may perform inspections. Additionally, system enhancements to SDG&E's workforce management system prevent inspection orders being dispatched to non-qualified QEWs.

Qualification Improvement Plans

Vegetation Inspections and Vegetation Management Projects

All internal SDG&E full time equivalents (FTEs) complete annual safety, fire preparedness, fire PPE, and environmental compliance training. Additionally, FTEs receive specific training related to SDG&E's Electric Standard Practice (ESP) 113.1, which specifically addresses wildland fire prevention and fire safety, and the Cleveland National Forest Operations and Maintenance Fire Prevention Plan. All individuals who are ISA-Certified and Utility Specialist credentialed must complete continuing educational training relative to arboriculture and utility vegetation management to maintain certification status.

Vegetation Management contractors are subject to SDG&E ESP 113.1 and receive internal, annual fire preparedness training. Contractors are also required to develop their own internal-company fire plan and to conduct annual training that also includes hazard tree assessment, environmental awareness, and customer service.

ESP 113.1 is the main fire prevention document used by Vegetation Management for guidance in the service territory, and the Cleveland National Forest Operations and Maintenance Fire Prevention Plan for guidance when working on Cleveland National Forest land. Some capital projects are required to have project specific fire prevention plans that SDG&E's Fire Coordination team develops with SDG&E's Project Management team. When these are required, all employees, contractors and consultants working on the specific project must attend training before entering the right of way (ROW) for the project.

In late 2019, SDG&E participated in an initiative to develop a Utility Line-Clearance Arborist training program in collaboration with academia, utilities, contractors, and industry specialists. The goal of this program was to develop an accreditation program to improve the professionalism and training consistency for line-clearances arborists. The initial program was implemented at Butte Valley College in Northern California. The curriculum is currently being developed for community colleges throughout California.

Building on this program, the invested stakeholders are now developing a Pre-Inspector Training Program to be offered at the college level to promote industry professionalism and standards. This curriculum is scheduled to be implemented in early 2021.

Asset inspections, Grid hardening, and Risk event inspection

SDG&E has established and maintained a robust training program for its electrical asset inspectors. The SDG&E Skills Training Center qualifies QEWs to conduct Overhead CMP detailed and QC inspections through a two-day course that is instructor led and covers the Overhead (89 condition codes), and Quality Control (50 conditions codes) portion of the CMP program. This initial course is conducted at the Skills Training Center in the presence of a qualified CMP instructor. This course provides the inspectors the knowledge needed to identify infraction, reliability, and discretionary conditions on overhead poles, attached equipment, and conductors for OH detailed and QC inspections as defined in General Order 165, General Order 95, or SDG&E's Overhead Construction Standards.

On-line refresher courses consisting of six modules are provided to SDG&E inspectors and include an assessment in order to pass. Additionally, patrol training is conducted annually for all QEWs and Electric Troubleshooters performing patrols. Only employees that have completed the Overhead, CMP detailed, and QC inspection training may perform inspections. Additionally, system enhancements to SDG&E's workforce management system prevent inspection orders being dispatched to non-qualified QEWs.

Training in safety, fire preparedness, fire PPE, environmental compliance, PSPS processes, and WMP processes is incorporated into the apprentice curriculum and into the annual safety training for Electrical Regional Operations. Additionally, FTEs receive specific training related to SDG&E's fire plan in ESP 113.1 and the Cleveland National Forest Operations and Maintenance Fire Prevention Plan.

The SDG&E's Skills Training Center recently made advancements within the Apprentice Program to utilize a structured curriculum obtained from the National Utility Industry Training Fund (NUITF), which is a product of the Electrical Training Alliance and the International Brotherhood of Electrical Workers (IBEW). The program integrates learning systems and online training modules, all of which add consistency and efficiency to the training. These modules are self-guided and can be completed in class and at home.

The Skills Training Center staff worked to tailor these courses to SDG&E's workforce and work practices, aligning with the phases of SDG&E's three-year apprenticeship program. Quizzes and tests are conducted online, grades are always accessible, and the instructors have the capability to connect with their students, and vice versa. This new technology, combined with SDG&E's strong hands-on training program, will ensure that SDG&E's workforce is fully prepared for the next stage of their careers.

Incorporated into the apprentice curriculum and annual safety training for Electrical Regional Operations is training in safety, fire preparedness, fire PPE, and environmental compliance training. Additionally, FTEs receive specific training related to SDG&E's ESP 113.1 and the Cleveland National Forest Operations and Maintenance Fire Prevention Plan.

5.4.1 Target Role: Vegetation Inspections

Worker Titles	Minimum Qualifications	Percent FTE	Special Certification Requirements
Vegetation & Pole Integrity Mgr	• Bachelor's Degree in Forestry, Biology, Horticulture. Business Administration, and or equivalent training/experience, Business Administration, Communications, or Accounting • 7 years' experience Utility Vegetation Management, including 3 years contractor management required	4%	• ISA Certified Arborist • ISA Utility Specialist
VM WMP Manager	• Bachelor's Degree in Forestry, Biology, Horticulture. Business Administration, and or equivalent training/experience Business Administration, Communications, or Accounting • 7 years' experience Utility Vegetation Management, including 3 years contractor management required • 3-5 years' experience resource conservation management preferred	4%	• ISA Certified Arborist • ISA Utility Specialist
Area Forester/Contract Administrator/Supervisor (SDG&E)	• 3 years' utility vegetation management experience • Bachelor's degree in Forestry, Biology, Horticulture, or related field (preferred)	48%	• ISA Certification • ISA Certified Utilities Specialist (preferred)
Fuels Management Lead Forester (SDG&E)	• Bachelor's degree in Forestry, Biology, Horticulture, or related field (preferred) • 3-5 years' experience administering vegetation management programs • Supervisory experience working with external contractors	4%	• ISA Certification • ISA Certified Utilities Specialist (preferred)
Forester Patrol Person (SDG&E)	• 3 years' utility vegetation management experience Bachelor's degree in Forestry, Biology, Environmental Science, Horticulture, or related field (preferred)	18%	• ISA Certification
VM Business Advisor (SDG&E)	• BS/BA in Business Administration, Communications, or Accounting • 3-5 years related experience	4%	N/A
SR Veg Mgmt Data Analyst (SDG&E)	• 5 years - Experience in data analytics and organization, including some experience with Business Intelligence (BI) reporting, data warehousing, financial data and data validation. Required • Familiar with using SQL, Python, AI, SAP, Hana, and other similar analytical and problem solving tools. Intermediate	4%	N/A

Worker Titles	Minimum Qualifications	Percent FTE	Special Certification Requirements
	• Intermediate to advanced MS Excel skills, MS Power Point and Word		
Resource Coordinator (Customer Help Desk) (SDG&E)	• High school diploma required. College courses are desired • Minimum of three years of customer service experience is required. • Utility background or experience preferred. • Microsoft Office proficiency required. • Strong technical writing skills preferred. • Working knowledge of Mainframe, GIS, SAP and DPSS/REAC desirable	13%	N/A
Auditor (Contractor)	• 3 years' utility vegetation management experience • Bachelor's degree in Forestry, Biology, Environmental Science, Horticulture, or related field (preferred)	7%	• ISA Certification
Pre-Inspector (Contractor)	• Bachelor's degree in Forestry, Biology, Environmental Science, Horticulture, or related field (preferred) • 3-5 years' experience in Utility Vegetation Management • Current Class C Driver's License with clean driver safety record • TRAC Qualified preferred • Lift a minimum of 50 pounds	16%	• ISA Certification

5.4.2 Target Role: Vegetation Management Projects

Worker Titles	Minimum Qualifications	Percent FTE	Special Certification Requirements
Tree Trim General Foreman/Supervisor (Contractor)	• 5 years line clearance tree pruning experience in a Foreman role • Line clearance Certification • Certified ISA • Current California Driver License Class B endorsement • General Computer knowledge • Good leadership qualities	5%	• ISA Certification • Line-clearance qualified tree-trimmer certification
Tree Trimmer (Contractor)	• Current California Driver License (Class B permit) • General computer skills • Strong work ethic	61%	• ISA Certification • Line-clearance qualified tree-trimmer certification (or trainee)
Pole Brush General Foreman (Contractor)	• 5 years brush field experience • Current California Driver License • General Computer knowledge • Good leadership qualities	1.5%	• Qualified Applicator Certification
Pole Brusher (Contractor)	• Current California Driver License • General computer skills • Strong work ethic	9%	• N/A

5.4.3 Target Role: Asset Inspections

Worker Titles	Minimum Qualifications	Percent FTE	Special Certification Requirements
Lineman	• Journeyman Lineman having completed an accredited apprenticeship program • IBEW Journeyman Lineman status in good standing • Class A California Driver's License	100%	Overhead and/or Underground Inspection Training
Fault Finding Specialist	• Journeyman Lineman having completed an accredited apprenticeship program • IBEW Journeyman Lineman status in good standing • Complete the 4-week Relief Fault Finder (RFF) class and pass the associated written and practical exams	100%	Overhead and/or Underground Inspection Training
Working Foreman	• Journeyman Lineman having completed an accredited apprenticeship program • IBEW Journeyman Lineman status in good standing • Six months experience in both overhead and underground electric acquired during the past three years • Successfully pass tests on Construction Standards and Practices	100%	Overhead and/or Underground Inspection Training

5.4.4 Target Role: Grid Hardening

Worker Titles	Minimum Qualifications	Percent FTE	Special Certification Requirements
Apprentice Lineman	• 9 months' experience as Line Assistant • Valid California driver's license • Must have held previous position for at least 9 months	12%	N/A
Apprentice Non-QEW	• Complete the apprentice program and passes the Journeyman's test	10.2%	N/A
Apprentice QEW	• Complete the apprentice program and passes the Journeyman's test	2.7%	N/A
Construction Manager-Electric	• Bachelor's Degree or equivalent experience • 8 years' experience	1.6%	N/A
Construction Supervisor-Electric	• H. S. Diploma/GED • 6 years' experience • Complete 2-day program at Skills Training Center or complete outside program	11.8%	N/A
District Manager	• H. S. Diploma/GED • 10 years' experience	0.3%	N/A
Distribution Lineman	• Lift a minimum of 60-75 pounds • Valid California Class A driver's license	39.5%	• Journeyman Lineman with IBEW • Journeyman Lineman
Electric Troubleshooter	• Complete 7-week Relief Trouble Shooter (RETS) class and pass the associated written and practical exams	10.6%	• Journeyman Lineman
Fault Finder	• Complete the 4-week Relief Fault Finder (RFF) class and passed the associated written and practical exams	1.6%	• Journeyman Lineman
Line Assistant (non QEW)	• Successfully pass Company administered aptitude and skills tests • Valid California Class A driver's license • Pass a DMV physical examination and DOT drug screen • Must have held previous position for at least 9 months	8.9%	N/A
Lineman	• Complete the minimum 3-year 6000 hour Lineman Apprentice program at the Skills Training Center and their assigned Districts • Complete a 3-year 480-hour college-level program to be qualified to take the Journeyman Lineman's test • Pass the Journeyman Lineman test	25%	• Journeyman Lineman • Qualified QEW

Worker Titles	Minimum Qualifications	Percent FTE	Special Certification Requirements
Relief Fault Finding Specialist	• Completed underground electrical system school • Must have held previous position for at least 9 months • Valid Class A California driver's license	6.5%	• Journeyman electrical worker • Qualified QEW
Relief Electric Troubleshooter	• Valid California Class A driver's license • Class A Medical Certificate • Must have held previous position for at least 9 months	9.1%	• Journeyman Lineman
Transmission Patroller	• Valid California Class A driver's license • Class A Medical Certificate • 18 months experience in OH & UG transmission construction and maintenance within the past 3 years • Must reside within SDG&E's service territory	.5%	• Journeyman Lineman
Working Foreman-Electric Transmission	• Valid California Class A driver's license • Class A Medical Certificate • 18 months experience in transmission construction and EHV hotline maintenance within the past 5 years • Must have held previous position for at least 9 months	10.6%	• Journeyman electrical worker
Working Foreman-Electric Distribution	• Six months experience in both overhead and underground electric acquired during the past three years • Valid California Class A driver's license • Class A Medical Certificate • Must have held previous position for at least 9 months	9%	• Journeyman electrical worker

5.4.5 Target Role: Risk Event Inspections

Worker Titles	Minimum Qualifications	Percent FTE	Special Certification Requirements
Troubleshooter	• Journeyman Lineman who completed an accredited apprenticeship program • IBEW Journeyman Lineman status in good standing • Complete 7-week Relief Trouble Shooter (RETS) class and pass the associated written and practical exams	100%	N/A

6 Performance Metrics and Underlying Data

Instructions: *Section to be populated from Quarterly Reports. Tables to be populated are listed below for reference.*

NOTE: Report updates to projected metrics that are now actuals (e.g., projected 2020 spend will be replaced with actual unless otherwise noted). If an actual is substantially different from the projected (>10% difference), highlight the corresponding metric in light green.

6.1 Recent Performance on Progress Metrics, Last 5 Years

Instructions for Table 1: *In the attached spreadsheet document, report performance on the following metrics within the utility's service territory over the past five years as needed to correct previously-reported data. 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: Recent Performance on Progress Metrics, last 5 years is provided in Attachment B.

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

Instructions for Table 2: *In the attached spreadsheet document, report performance on the following metrics within the utility's service territory over the past five years as needed to correct previously-reported data. 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.

Table 2: Recent Performance on Outcome Metrics, last 5 years is provided in Attachment B.

6.3 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.*

Table 3: List and Description of Additional Metrics, last 5 years is provided in Attachment B.

6.4 Detailed Information Supporting Outcome Metrics

Instructions for Table 4: *In the attached spreadsheet document, report numbers of fatalities attributed to any utility wildfire mitigation initiatives, as listed in the utility's previous or current WMP filings or otherwise, according to the type of activity in column one, and by the victim's relationship to the utility (i.e., full-time employee, contractor, of member of the general public), for each of the last five years as needed to correct previously-reported data. For fatalities caused by initiatives 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 initiative.*

Table 4: Fatalities Due to Utility Wildfire Mitigation Initiatives, last 5 years is provided in Attachment B.

Instructions for Table 5: *In the attached spreadsheet document, report numbers of OSHA-reportable injuries attributed to any utility wildfire mitigation initiatives, as listed in the utility's previous or current WMP filings or otherwise, according to the type of activity in column one, and by the victim's relationship to the utility (i.e., full-time employee, contractor, of member of the general public), for each of the last five years as needed to correct previously-reported data. 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 initiatives 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.

Table 5: OSHA-Reportable Injuries Due to Utility Wildfire Mitigation Initiatives, last 5 years is provided in Attachment B.

6.5 Mapping Recent, Modelled, and Baseline Conditions

Instructions: *Underlying data for recent conditions (over the last five years) of the utility service territory in a downloadable shapefile GIS format, following the schema provided in the spatial reporting schema attachment. All data is reported quarterly, this is a placeholder for quarterly spatial data.*

Please refer to SDG&E's Quarterly Data Report submitted concurrently herewith.

6.6 Recent Weather Patterns, Last 5 Years

Instructions for Table 6: *In the attached spreadsheet document, report weather measurements based upon the duration and scope of NWS Red Flag Warnings, High wind warnings and upon proprietary Fire Potential Index (or other similar fire risk potential measure if used) for each year. Calculate and report 5-year historical average as needed to correct previously-reported data.*

Table 6: Weather Patterns, last 5 years is provided in Attachment B.

6.7 Recent and Projected Drivers of Ignition Probability

Instructions for Table 7: *In the attached spreadsheet document, report recent drivers of ignition probability according to whether or not risk events 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 as needed to correct previously-reported data.*

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 2020 ignition data compiled by the WMP deadline shall indicate in the 2020 columns that said information is incomplete.

Table 7.1: Key Recent and Projected Drivers of Ignition Probability, last 5 years and projections is provided in Attachment B.

Table 7.2: Key Recent and Projected Drivers of Ignition Probability by HFTD Status, last 5 years and projections is provided in Attachment B.

6.8 Baseline State of Equipment and Wildfire and PSPS Event Risk Reduction Plans

6.8.1 Current Baseline State of Service Territory and Utility Equipment

Instructions for Table 8: *In the attached spreadsheet document, 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, weather stations, 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) as needed to correct previously-reported data.*

The totals of the cells for each category of information (e.g., "circuit miles (including WUI and non-WUI)") would be equal to the overall service territory total (e.g., total circuit miles). For example, 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.

Table 8: State of Service Territory and Utility Equipment is provided in Attachment B.

6.8.2 Additions, Removal, and Upgrade of Utility Equipment by End of Three-Year Plan Term

Instructions for Table 9: *In the attached spreadsheet document, input summary information of plans and actuals for additions or removals of utility equipment as needed to correct previously-reported data. Report net additions using positive numbers and net removals and undergrounding using negative numbers for circuit miles and numbers of substations. Report changes planned or actualized for that year – for example, if 10 net overhead circuit miles were added in 2020, then report "10" for 2020. If 20 net overhead circuit miles are planned for addition by 2022, with 15 being added by 2021 and 5 more added by 2022, then report "15" for 2022 and "5" for 2021. Do not report cumulative change across years. In this case, do not report "20" for 2022, but instead the number planned to be added for just that year, which is "5".*

SDG&E is not planning any new overhead circuits in its 2020 – 2022 WMP. SDG&E did complete overhead removals as part of its CNF project, including 12 miles of distribution underground, and transmission line 626 between Santa Ysabel and Descanso, which was approximately 19 miles of 69kV transmission line. All the removals were located in Tier 3 of the HFTD.

SDG&E's GIS system is a live system and does not maintain historical versions. Although SDG&E has a list of structures that were removed as part of these projects, because the structures no longer exist in GIS, spatial queries cannot be run against these structures. Since the urban, rural, and very rural layers were just developed in GIS as part of this WMP requirement, the

spatial query is SDG&E's only way to understand the classification required in Table 9. As far as future years, while SDG&E has scoped some future underground projects, SDG&E does not have the required structure removal list necessary to complete this exercise. Therefore, Table 9 in Attachment B contains nulls for the aforementioned reasons. Upgrades which represent the majority of SDG&E's hardening activities will be represented as required in Table 10 of Attachment B.

Instructions for Table 10: *Referring to the program targets discussed above, report plans and actuals for hardening upgrades in detail in the attached spreadsheet document. Report in terms of number of circuit miles or stations to be upgraded for each year, assuming complete implementation of wildfire mitigation activities, for HFTD and non-HFTD service territory for circuit miles of overhead transmission lines, circuit miles of overhead distribution lines, circuit miles of overhead transmission lines located in Wildland-Urban Interface (WUI), circuit miles of overhead distribution lines in WUI, number of substations, number of substations in WUI, number of weather stations and number of weather stations in WUI as needed to correct previously-reported data.*

If updating previously-reported data, separately include a list of the hardening initiatives included in the calculations for the table.

Table 10: Location of Actual and Planned Utility Infrastructure Upgrades Year over Year is provided in Attachment B.

7 Mitigation Initiatives

7.1 Wildfire Mitigation Strategy

Describe organization-wide wildfire mitigation strategy and goals for each of the following time periods, highlighting changes since the prior WMP report:

1. *By June 1 of current year,*
2. *By September 1 of current year,*
3. *Before the next Annual WMP Update,*
4. *Within the next 3 years, and*
5. *Within the next 10 years.*

Please refer to Section 5.2 above for a description of SDG&E's overall wildfire mitigation strategy and goals for the 3 year and 10 year timeframes. Short-term goals are described further below in each category.

The description of utility wildfire mitigation strategy shall:

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.*

Determining How to Manage Wildfire Risk

SDG&E has fostered a safety culture where wildfire mitigation activities are a prominent focus. Wildfire is the top risk in SDG&E's Enterprise Risk Management assessment. As such, SDG&E's wildfire prevention and mitigation activities are a key component in keeping customers, employees, and communities safe. Generally, wildfire mitigation activities are focused on electrical assets which have the potential to cause fires as opposed to those causing a safety or reliability issue unrelated to wildfires. Improved reliability is often a collateral benefit of wildfire mitigation work because the system hardening, fire science, and weather technology prevent more forced outages.

In order to reduce the risk of catastrophic wildfires caused by its electric power lines, SDG&E's mitigation activities encompass infrastructure hardening, undergrounding, vegetation management, fuels management, inspections and patrols focused on high risk fire areas, and customer outreach and education, in conjunction with leveraging the fire science and weather technology SDG&E has developed since 2007.

SDG&E's wildfire mitigation activities are focused mostly within the HFTD and WUI and are often complimentary to the activities associated with safety and reliability outside of HFTD. Some of these activities include increased inspections; infrastructure hardening; undergrounding; operational measures such as patrols prior to RFW days; post-PSPS patrols prior to restoration of outages; additional vegetation management inspections as well as increased clearance of tree pruning.

SDG&E's situational awareness related activities are also mostly focused in the HFTD and WUI. These activities include forecasting weather; monitoring the wind, fuel, and relative humidity to understand the wildfire risk; monitoring fire cameras; and collaborating with the National Weather Service and others. SDG&E's public outreach and collaboration with its public service partners are another aspect where the activities in the HFTD and WUI are different. Each year, SDG&E spends much time organizing and conducting community outreach and education events to better prepare customers for PSPS events and raise awareness of wildfire risk. Throughout the year, SDG&E diligently works to strengthen collaboration with its public service partners and to determine additional ways to its support customers. The wildfire mitigation measures mentioned here are designed to reduce the risk of ignition and wildfire consequence.

Wildfire mitigation related activities are quite separate from activities outside this scope. Much of SDG&E's safety and reliability related work outside the HFTD is very important and contributes greatly to the Company's mission, however, it has a different focus. For example, SDG&E's outreach and communication with customers is focused on customer satisfaction and mitigating the impacts of outages. Outside the HFTD and WUI, system upgrades are not driven by wildfire risk but are driven by improving the impacts of outages to customers and reducing risk not related to wildfires. An example of an activity is the underground cable replacement program SDG&E runs every year to improve reliability for customers. Over the years, the situational awareness of weather impacts outside HFTD has increased and is monitored for any potential weather impacts especially when forecasted. There are fewer weather stations outside the HFTD and WUI areas as the weather severity is much reduced in those areas.

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 7.3.*

Summary of Major Investments and Implementation of Wildfire Mitigation Initiatives

Since the 2007 wildfires in Southern California, SDG&E has made significant investments to address its wildfire risk. As discussed throughout this WMP, these investments have resulted in a number of advancements in the categories of mitigation efforts. The following summarizes the major investments and implementation of wildfire mitigation initiatives achieved over the past year and notes priorities for the upcoming Plan term.

Risk Assessment and Mapping

SDG&E's WRRM-Ops model was leveraged heavily in 2019 to inform operational decision-making by providing a better understanding of ignition probability and estimations of wildfire consequences along electric lines and equipment. SDG&E plans to further update and evolve the WRRM-Ops platform into a single visual and configurable live map that can be relied upon to make operational decisions, including with respect to PSPS decision-making. In 2020, there were significant enhancements to WRRM-OPs to include a PSPS Real-Time Analysis Tool for the 2021 fire season, integration of SDG&E's Vegetation Risk Index, significant FireSim Mobile Enhancements, and the implementation of herbaceous live fuel moisture data.

Timeframe	Key Objectives
By June 1, 2021	Complete review of 2020 PSPS events and identify any enhancements required before the 2021 Santa Ana wind season.
By September 1, 2021	Operationalize the WRRM-Ops platform into a single visual and configurable live map that can be relied upon to make operational decisions, including with respect to PSPS.
Before the 2022 WMP Update	Key updates before the 2022 wildfire season will be working towards the incorporation of the risk assessment and mapping technology into a real-time PSPS decision support and situational awareness tool. There will also be ongoing work to improve the inputs into the fire behavior modeling system with a focus on fuel moisture and weather inputs.

Situational Awareness and Forecasting

Utilization of situational awareness tools such as weather stations, cameras, wireless fault indicators, and the Fire Potential Index have proven beneficial to system planning, emergency operations, and the safe implementation of PSPS. Based on these successes, SDG&E's situational awareness networks will be expanded into areas where they can be used to minimize the impacts of PSPS (both scope and duration), and make communities safer. An unprecedented 30 weather stations were added in 2020 providing better coverage in areas known to have diverse wind fields, including the wildland urban interface. SDG&E's weather network comprises of 220 weather stations and 96% of them are capable of 30 second observations, which is critical to data driven, real-time decision-making.

Timeframe	Key Objectives
By June 1, 2021	Finalize location selection for any additional situational awareness tools.
By September 1, 2021	Finalize installations of additional equipment to support 2021 fire season activities.
Before the 2022 WMP Update	There will be an ongoing focus on the development of AI-based forecasting models to support PSPS decisions. There are also plans to expand SDG&E's weather network to include additional equipment in strategic locations, and to use imagery to observe fuel moistures and enhance the understanding of fire potential.

Grid Design and System Hardening

In 2020, SDG&E hardened approximately 155 miles of distribution overhead, 30 miles of distribution underground, 50 miles of transmission overhead, as well as replaced approximately 3,200 fuses and 2,000 hotline clamps, installed 4 temporary microgrid configurations, and added 23 switches to enhance sectionalizing for PSPS operations. In addition, SDG&E's PSPS Mitigation Engineering team performed a segment-by-segment analysis of circuits prone to PSPS to identify the highest risk areas within the circuit to apply specific mitigations to reduce the impacts of PSPS. The effort resulted in the implementation of additional sectionalizing devices, weather stations, undergrounding as well as microgrids that benefited a number of customers during the 2020 fire season. SDG&E continues to analyze its system to develop longer-term strategies that take into account the changing climate and increasing wildfire risk, with a continued focus on mitigating PSPS impacts to customers.

Timeframe	Key Objectives
By June 1, 2021	Implement hardening projects planned for 2021 and scope and design hardening projects for 2022
By September 1, 2021	PSPS Enhancements • 10 Switches/Projects • Installation of the permanent, renewable solutions for 2 microgrids
Before the 2022 WMP Update	System Hardening • Undergrounding – 25 miles • Traditional OH Hardening – 100 miles • Covered Conductor – 20 miles

Timeframe	Key Objectives
	• Installation of the permanent, renewable solutions for 2 microgrids High Volume Programs • Expulsion Fuses – 3449 (Tier 2), 521 (Tier 3) • Hot Line Clamps – 2025 (Tier 2), 225 (Tier 3) • Lighting Arrestors – 924 (Tier 3) • SCADA Capacitors – 17 (Tier 2), 14 (Tier 3)

Asset Management and Inspections

In 2020, SDG&E maintained and inspected its facilities, as mandated by GO 165, GO 95, GO 128, and GO 174; it continued its pilot distribution drone assessment program; and it began a transmission drone assessment program. In addition, SDG&E has continued enhancing existing distribution inspections through continued distribution infrared inspections, which allow for the detection of issues invisible to the human eye. In 2020, SDG&E completed 17,977 distribution overhead detailed inspections, 13,077 electric distribution infrared inspections, 14,450 distribution wood pole intrusive inspections, 86,075 GO 165 distribution patrol inspections, visual inspections on 114 tielines, infrared inspections on 110 tielines, detailed inspections on 42 tielines, and additional 69kV aerial inspections on 21 tielines within the HFTD. In 2021, SDG&E will continue to maintain and inspect its facilities, consistent with Commission mandates, and will also continue its distribution and transmission drone inspection programs within the HFTD to identify potential issues not visible by traditional ground inspections, where terrain or other constraints may limit the ability to perform a detailed ground inspection, or where the high-resolution imagery captured by the drone provides better visibility of a potential fire hazard.

Timeframe	Key Objectives
By June 1, 2021	• Continue maintenance and inspection of facilities consistent with the scope and schedule of CPUC GOs. • Obtain permission to perform drone inspection flights on U.S. Department of Defense managed land. • Complete approximately 1,681 assessments of transmission structures within the HFTD.
By September 1, 2021	• Determine whether the use of drones provides good value and should continue to be used by the Company in its regular inspection efforts.
Before the 2022 WMP Update	• Identify the appropriate cycle, locations, and/or types of structures where drones would be utilized as part of SDG&E's routine inspection programs.

Vegetation Management and Inspections

In 2020, SDG&E's Vegetation Management department inspected over 451,000, trimming over 173,000 trees, and removing over 10,000 trees. SDG&E also redefined its enhanced pruning to include post-trim clearances greater than the recommended 12-foot clearances in GO 95, Rule 35. Appendix E. This was the first complete year SDG&E pursued the enhanced clearance of up to 25 feet for targeted species, leading to over 13,000 trees trimmed and over 3,900 trees removed in the HFTD. SDG&E establishes clearances on site-specific criteria including species, growth rate, tree/line movement, structure, proper pruning practices, and tree health. In 2021, SDG&E will continue to implement its enhanced pruning scope to achieve maximum, safe clearances on approximately 17,000 of the 78,371 trees that meet the targeted criteria within the HFTD. SDG&E will also review its list of targeted species with a focus on specific risk characteristics and relative outage frequency.

SDG&E's Fuels Management Program involves three activities: fuels treatment, vegetation abatement, and fuels reduction grants. The fuels treatment activity aligns with SDG&E's pole clearing work with a focus on removing dead/flammable fuels and thinning vegetation surrounding SDG&E structures (poles), as well as included a 50-foot radial clearance around poles and within rights-of-ways. In 2020, SDG&E treated 300 new sites and conducted maintenance on 314 sites, which were previously treated in 2019 utilizing chemical fuel reduction (e.g., wildfire retardant). SDG&E awarded fuels management grants to community partners to remove fuels, which supported the treatment of 143 poles and areas within right-of ways. In 2020, SDG&E also removed fuels in fee-owned rights-of-ways and roadside shoulders, treating 626 acres.

Timeframe	Key Objectives
By June 1, 2021	Determine success and efficacy of fire-retardant fuels treatment
By September 1, 2021	Align with routine pole brushing activities; Identify expanded scope and applicability of fuels management program
Before the 2022 WMP Update	Fully integrate all fuels modification activities within Vegetation Management department

Grid Operations and Protocols

SDG&E previously completed a large deployment of remote distribution sectionalizing devices, focusing heavily on the HFTD. This equipment allows SDG&E to sectionalize various elements of its distribution system to efficiently manage system operations and reliability, which results in quicker restoration times for customers. In 2020, SDG&E plans to continue to validate the internal operating procedures annually prior to fire season and look for innovation in system protection settings for its automated reclosers and other automated sectionalizing devices.

In 2019, SDG&E started the process of analyzing all 465,000 trees tracked annually to further analyze the approach to safely operate the electric system during PSPS, which resulted in development of the Vegetation Risk Index. In 2020, SDG&E's PSPS Mitigation Engineering team developed mitigation strategies that reduced impacts to customers that have been exposed to PSPS in the past. Based on this team's efforts, in 2020, SDG&E implemented a combination of mitigations such as strategic undergrounding, remote sectionalizing, covered conductor, overhead hardening, and microgrids.[25] SDG&E also provided battery backup generation to mitigate customer impacts.

Regarding its air suppression resources, SDG&E currently has two aerial assets available for the purpose of helping fight fires. For 2021, SDG&E is finalizing negotiations for the purchase of an additional aerial firefighting asset (as discussed in Section 7.3.8.6.1 below).

Timeframe	Key Objectives
By June 1, 2021	Continue to disable reclosing in the HFTD
By September 1, 2021	Continue to enable sensitive/fast protection settings on days with extreme FPI; Take ownership an additional air suppression resource
Before the 2022 WMP Update	Continue to leverage fire suppression resources to accompany crews performing work in the HFTD during elevated FPI

[25] In 2020, due to COVID-19 delays, obtaining land rights, and certain permitting issues, SDG&E deployed its microgrids in a temporary configuration using conventional generators. The permanent, renewable solutions will be placed in service in 2021.

Data Governance

Enterprise Asset Management Platform

In 2019, SDG&E started developing an Enterprise Asset Management Platform (EAMP), a centralized repository for asset data, which will enable SDG&E to predict and assign asset health indexes on its critical electric assets to identify and compare assets based on their likelihood of failure. For 2020, SDG&E implemented consolidated data views pulling asset attributes of different categories including nameplate data, inspection and maintenance data, outage history, and weather data for distribution poles, cables, tees, and wires. Additionally, asset health and risk indices were completed for distribution wood poles, cables, wires, and tees utilizing machine learning, AI, and statistical analysis. The EAMP has the ability to perform granular analysis to understand the quality of asset data in scope. In 2021, SDG&E will work on a strategy to understand the baseline maturity of its asset data with a goal of improving and maturing as the EAMP continues. The next phase of EAMP will focus on integrating more distribution assets and expanding the scope to transmission.

Timeframe	Key Objectives
By June 1, 2021	Incorporate one additional asset into the centralized repository including consolidated data views, asset health and risk indices. Establish data quality methodology and baseline.
By September 1, 2021	Incorporate two additional assets into the centralized repository including consolidated data views, asset health and risk indices.
Before the 2022 WMP Update	Incorporate three additional assets into the centralized repository including consolidated data views, asset health and risk indices.

WMP Data Governance Framework and Central Data Repository

Beginning in early 2020, SDG&E began the centralization of measures and metrics related to the WMP program and initiatives in order to provide weekly, key insights and progress reports for executive leadership. During the establishment of this centralized measures and metrics reporting process, required data metrics were inventoried, and data owners and data sources were identified. Initially, the collection of these metrics and measures was almost exclusively done manually. However, as data owners were interviewed, it was determined that each specific data metric would need to be clearly defined, along with a repeatable and verifiable processes established to accumulate and track the data to ensure its integrity and auditability going forward. In addition, data definitions would also need to be done in a consistent and repeatable manner. Once this was determined, SDG&E moved to enhance the data quality and improve the efficiency of the data gathering process by embarking on the development of a

WMP Data Governance Framework (DGF) and construction of an automated Central Data Repository (CDR) for wildfire-related data. This was envisioned to be useful for multiple internal and external stakeholders in the future. Over time, this will change the manual collection to that of an electronic format that will provide data metrics in a searchable format, similar to that of a GIS data structure.

Once completed, the DGF will define a set of repeatable standards, policies, processes and controls for wildfire- related data. Similar to the WSD GIS Data Standards, the vision of SDG&E's DGF is to make its wildfire-related data actionable, accessible, aligned, and auditable. In addition, the CDR will eventually provide a "single source of truth" for SDG&E's wildfire-related data, for use by multiple internal and external stakeholders in the future. In response to the WSD GIS Data Standards and other related regulatory initiatives, SDG&E is making significant enhancements to the CDR that will make it scalable and sustainable to accommodate future regulatory requirements. SDG&E will pursue technology solutions to automate these data requests where possible.

Currently, SDG&E has completed approximately 25% of the effort needed to implement the DGF and CDR, and anticipates the completion of data related to the all the metrics tables contained in the WMP by the end of 2021. Once completed, SDG&E will then turn to areas that are not specifically called out in the WMP and begin inclusion of these items as they are identified along with the policies, procedures, and definitions that are needed. SDG&E expects that the CDR along with the supporting documentation will be completed near the end of 2022.

Timeframe	Key Objectives
By June 1, 2021	Complete electronic capture of all metrics contained in WMP tables and include in CDR.
By September 1, 2021	Expand CDR to include items not currently contained in WMP.
Before the 2022 WMP Update	Fully functional CDR.

Resource Allocation Methodology

Over the past few years, SDG&E established the Asset Integrity Management program and its centralized group, to develop and implement a holistic and sustainable asset management system (people, process and technology) for electric assets with an integrative approach for governance, strategy, analytics and continuous improvement. In 2020, SDG&E will continue with a phased approach on developing the asset management system with a focus on electric transmission, substation, and distribution business segments. In parallel, the Investment Prioritization workstream commenced to develop business processes and a system for capital

investment optimization using a multi-attribute value framework for evaluating capital investments through a data-driven, quantitative risk- and safety-based lens focusing on transmission and substation to support SDG&E's Federal Energy Regulatory Commission (FERC) filings. The focus for 2021 and 2022 is to continue the implementation of the Investment Prioritization initiative for transmission and substation portfolio and commence with the electric distribution value framework development.

In addition to SDG&E's initiatives in the Asset Integrity Management program that enable enterprise-wide resource allocation across departments and asset classes for various risks, SDG&E developed the WiNGS model described in Section 4.5.1.4 to aid with more granular risk-based resource allocation for primarily the grid hardening projects that are aimed at reducing wildfire risk and PSPS impacts. As SDG&E continues to evolve its analytics and the WiNGS model, it will explore expanded use of the model for other areas of mitigation.

Timeframe	Key Objectives
By June 1, 2021	AIM: • Configure electric transmission and substation FERC value framework into software tool with sample projects • Develop electric distribution value framework WiNGS: • Pilot more granular analytics capabilities • Pilot use of model for other initiatives • Develop technology roadmap needed to operationalize WiNGS
By September 1, 2021	AIM: • Functional tool with FERC value framework to test electric transmission and substation investment portfolio • Configure electric distribution value framework into software tool with sample projects WiNGS: • Implement technological solutions to streamline the use of WiNGS more dynamically
Before the 2022 WMP Update	AIM: • Functional tool with FERC value framework informs 2022 FERC capital plan • Functional tool with electric distribution value framework to test distribution investment portfolio WiNGS: • Incorporate advanced analytics • Leverage model to prioritize initiatives other than grid-hardening

Emergency Planning and Preparedness

SDG&E developed its emergency preparedness plan in collaboration with key internal and external stakeholders and lessons learned from past incidents, trainings, and exercises are incorporated as appropriate. SDG&E updates the emergency plans in a three-year cycle; 2021 is the next scheduled update. SDG&E will update and validate the plan prior to the 2021 wildfire season. Each update of the plan will be developed in collaboration with key internal business units and external public safety partners.

SDG&E also plans to install Distribution Communications Reliability Improvements (DCRI), which include a private long-term evolution (LTE) network that will enhance system protection capability and drive more automation of electric system awareness and reporting of events. This new LTE network will also enhance the push-to-talk radio capabilities in some of the more remote areas in HFTD and enhance the speed and data throughput of SDG&E's fire cameras. More information regarding the DCRI program is covered in Section 7.3.3.18.1 below. The improved communication network and system protection may also allow for more automation of PSPS initiation and PSPS re-energization data gathering and processes.

Additionally, SDG&E has invested in upgrading its PSPS dashboard used by the Utility Incident Commander in the Emergency Operations Center for decision-making during PSPS events. Enhancements to the dashboard also include a grant from the U.S. Department of Energy via a partnership with Pacific Science & Engineering to incorporate human factor engineering into the decision-making process.

SDG&E has also worked on a collaborative project between Emergency Management, Regional Public Affairs, and IT to develop an automated system (K2) to assist with communication with public safety partners during a PSPS event. This automated system assists with identifying the appropriate partners to notify based on jurisdiction and adjacency.

Timeframe	Key Objectives
By June 1, 2021	Conduct review of the emergency preparedness plan with stakeholder departments
By September 1, 2021	Adopt emergency preparedness plan revision
Before the 2022 WMP Update	• Update emergency plans • Further refine the K2 system to identify jurisdictions / adjacencies to support public safety partner notifications

Stakeholder Cooperation and Community Engagement

SDG&E understands the important role all stakeholders play in achieving wildfire prevention and mitigation. For this reason, in 2020, SDG&E increased its collaboration with customers, elected officials, non-profit support organizations, first responders and more, to expand partnerships, increase lines of communication and provide additional resources.

A major component of SDG&E's mission to educate the communities it serves is through Wildfire Safety Fairs and town halls. Given the COVID-19 pandemic, those normally in-person events were transitioned to webinars and drive-thru educational fairs, but remained very successful. There were over 3,000 customers who participated in four webinars and four drive-thru Wildfire Safety Fairs. These customers stated a 97% "very satisfied" survey rate. Social distancing adjustments are expected to continue through 2021 with outreach and education to the HFTD communities, including at CRCs.

CBOs are an integral channel and support network utilized to promote wildfire preparedness and awareness of PSPS events. This network, comprised of over 400 organizations, serves a critical role in connecting SDG&E with their constituencies and includes the County OES AFN Working Group and Partner Relay Network, which translates communications into dozens of languages. Nearly 200 of these organizations are members of SDG&E's Energy Solutions Partner Network. In 2020, SDG&E continued to work with these organizations year-round to help prepare customers, especially those who may be especially vulnerable, for wildfires and PSPS through presentations, direct consultations, and amplification of emergency preparedness information. Prior to COVID-19 and social distancing practices, SDG&E's Outreach team was present at 27 booth events, reaching over 4,500 people. Outreach efforts were shifted to virtual presentations, in which SDG&E completed 88 presentations, conducted 25 meetings and continued general monthly messaging to partners.

In addition, SDG&E identified areas for improvement in this area and established a new Access and Functional Needs department. This department, although nascent, was able to stand up new customer support models – through 2-1-1 Organizations – for vulnerable customers to provide hotel stays, accessible transportation, food, resiliency items, and welfare checks during PSPS events. Additionally, in an effort to increase engagement and establish community feedback loops, SDG&E (together with the other IOUs) established a Statewide AFN Council and regional AFN Working Group to refine PSPS communications, support services, and protocols.

As the wildfire mitigation program evolves in 2020, SDG&E will continue to work and build relationships with emergency response agencies, strategic partner organizations and fire suppression agencies. SDG&E will remain open to fostering new, strategic relationships aimed to improve collaboration and public messaging with the foundational goal of keeping our communities safe.

Timeframe	Key Objectives
By June 1, 2021	• Schedule and finalize webinars and community fairs • Promotion and amplifications of PSPS, wildfire and readiness messaging through CBO partnership activities including: events (virtual with COVID), presentations, monthly social media posts • Look to explore refreshing AFN customer "database" to optimize communications • Expand opportunities to extend and amplify our messaging through CBO's and other support groups
By September 1, 2021	• Complete webinars and community fairs, gathering stakeholder feedback • Promotion and amplifications of PSPS, wildfire and readiness messaging through CBO partnership activities including: events (virtual with COVID), presentations, monthly social media posts • Initiate co-creation of PSPS mitigation and other solutions with AFN community • Enhance communication channels and utilize technology to create more accessibility • Identify marketing opportunities for SDG&E programs, services and tools to AFN customers (e.g., large font bill, braille bill)
Before the 2022 WMP Update	• Survey customers, community organizations and community partners to understand the needs of AFN customers on an ongoing basis • Strengthen and expand AFN CBO partnerships

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

Resource Challenges and Constraints

For vegetation management, given the current and continued high demand for utility tree crews throughout California, SDG&E anticipates the possibility of contractor resource constraints in 2021 and conceivably into 2022. This will also be driven by the expected high workload of tree trimming and removal operations at SDG&E. The enactment of Senate Bill 247 which initiated the requirement for prevailing wages for line clearance tree trimmers brought an expected increase in the candidate hiring pool for these jobs. This, however, has not yet resulted in a marked increase in hiring for SDG&E's tree trimming contractors. In the near term for 2021, the ongoing COVID pandemic may also impact the contractors' ability to maintain a consistent workforce.

Relay technician and SCADA technician resource constraints, along with the COVID-19 challenges made it more difficult to commission the Advanced Protection work on circuits and substations and the sectionalizing devices on circuits. These resource constraints are expected to continue in 2021 and SDG&E will continue its efforts to effectively manage the work.

For strategic undergrounding work, competing priorities across the IOUs for permitting, design, and construction resources were a challenge to accomplish all the WMP goals for 2020. This constraint is expected to continue in 2021. SDG&E plans to mitigate impacts of constraint as much as possible by issuing work as early as possible and securing resources as early in the year as possible.

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. Include utility research listed above in Section 4.4.

Technology and Innovations

SDG&E continues to leverage new technologies and innovations to refine, improve, and advance its wildfire mitigation strategy in the coming years. These technologies are summarized below and discussed in greater detail in Section 4.4 above and Section 7.3 below.

Distribution Communications Reliability Improvements

SDG&E established its Distribution Communications Reliability Improvements (DCRI) program (discussed in Section 7.3.3.18.1 below) and is currently deploying a privately-owned LTE network in its service territory using licensed radio frequency (RF) spectrum. A robust communication network is foundational for the success of SDG&E's advanced protection technologies on the electric distribution system (e.g., Falling Conductor Protection). Use of private LTE technology yields many benefits, such as:

- LTE standards provide for enhanced cybersecurity capabilities;
- Reduction of cybersecurity risk due to broad adoption and use of modern cybersecurity posture;
- Engineered and designed for utility use cases, applying enhanced failover and redundancy capabilities, yielding high availability and reliability;
- Forward looking technology lifecycle with global adoption; and
- Solutions are upgradable over time and adaptable for new utility use cases and requirements.

Advanced Protection

As part of its advance system protection technologies, SDG&E is implementing falling conductor protection, which detects adverse changes to the electric system as a result of broken overhead conductors and can isolate them before they fall to the ground. SDG&E's Falling Conductor Protection (FCP) pilot is still in the stages of strategic deployment within Tier 3 of the HFTD under "test mode" operation.

In this mode, the advanced protection devices utilized for FCP will operate as designed, identify potential broken conductor conditions, and send various tripping signals and alarms to their respective endpoints, without actually operating any devices. This test mode is specifically designed to gauge the performance of this form of broken wire detection platform without incurring any unnecessary negative impacts to reliability.

FCP has been shown to operate correctly and sufficiently in both the lab and field commissioning environments. Currently, SDG&E has approximately 180 circuit miles covered by protection devices running in test mode. SDG&E will continue to expand this technology throughout its service territory with a focus on the wildfire prone areas first. This technology is discussed in more detail in Section 7.3.3.9 below.

Vegetation Risk Index

SDG&E innovatively leveraged its historical meteorological data and tree-caused outage information by incorporating data science into its vegetation management, developing a Vegetation Risk Index (VRI) of the highest risk trees in its service territory. SDG&E's Vegetation Management department continues to integrate the VRI into its work management tool and using it for decision-making for enhanced vegetation management work.

The VRI data is displayed in the GIS layer (shapefile) on the vegetation inspectors' mobile data computers along with circuit segments that are most at risk of tree impacts. The associated wind speeds along the circuit segments will also be recorded in the tree record to aid in current and future operational decisions. Additionally, prior tree caused outage information will be housed in the tree record and available to the inspector drawing awareness to the history of tree failures on the circuit to further decide if tree removal is a more proper application. The VRI is further discussed in Section 4.5.1.5 above and Section 8.2 below.

PSPS App and Other Customer Communication Tools

In 2020, SDG&E launched a redesigned PSPS website for customers to support awareness and direct customers to resources. The website has a new dashboard layout that makes it easier to find information, and includes a new address look-up tool so customers can find out if they are impacted. The page also includes a dynamic list of communities impacted and potential shutoffs, including real-time customer counts and Community Resource Centers.

In 2020, SDG&E also launched a new mobile app – available for iPhone and Android – specifically for PSPS. The app is "unauthenticated," which means that users do not need to log in to use the app. This is helpful for customers who might not be an SDG&E accountholder (e.g., renters whose landlord covers utilities). The app provides users up-to-date, real-time status updates with push notifications for saved locations, and use of an interactive map. Users also receive clear insight into restoration efforts with a status tracker and time of restoration estimate.

Models

Over the past decade, SDG&E has developed various innovative models to, among other things, assess risk, ignition probability and wildfire consequence, and perform wildfire simulations. These models are discussed in detail in Section 4.5.1 above. SDG&E continues to refine these models and based on new learnings and findings, will use the knowledge gained to inform wildfire mitigation strategy in the coming years. Notably in 2020, SDG&E built upon the RSE methodology in RAMP to create an innovative model – WiNGS – that evaluates both wildfire and PSPS impacts at the sub-circuit/segment level to inform its investment decisions by determining which initiatives provide the greatest benefit per dollar spent in reducing both wildfire risk and PSPS impact. SDG&E plans to use this model to scope and prioritize some of its grid hardening work that is planned for 2022.

Weather technologies

SDG&E's weather technologies continue to evolve employing the very latest in situational awareness data fusion and displays. An unprecedented 30 weather stations were added to SDG&E's weather network in 2020, providing better coverage in areas known to have diverse wind fields, such as the wildland urban interface. SDG&E's weather network comprises of 220 weather stations, and 96% of them are capable of 30 second observations. These 30 second observations are critical to enable data driven decision-making and are displayed real-time in a tabular and graphical format. Additionally, SDG&E's Meteorology department completed a PSPS dashboard initiative that displays wind gust observations relative to alert speeds for all 220 stations in a dynamic and easily consumable information environment. Finally, SDG&E modernized electronics on all but 20% of the Weather Stations with the remainder slated for a 2021 rebuild.

In 2020, SDG&E's existing Fire Science and Climate Adaptation mobile application received a complete overhaul of its functionality and data display characteristics, migrating to a geo-located user experience with map-based data visualization. The upgraded functionality will display the weather, Fire Potential Index, Air Quality Index, Outage Potential Index, wildfire cameras, and utility load and forecast load.

7.2 Wildfire Mitigation Plan Implementation

Describe the processes and procedures the electrical corporation will use to do all the following:

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.

Monitoring and Auditing the Implementation of WMP

During 2020, a WMP Data Governance Framework (DGF) was established to define a repeatable set of standards, policies, processes and controls for wildfire-related data associated with WMP initiatives. Once the WMP DGF was established, business units who contribute data to the WMP were required to document their compliance with the DGF. The DGF includes the following policies: Data Definition, Data Collection, Data Processing, Data Storage and Retention, Data Access, and Data Quality.

For the business units that completed their DGF compliance documentation, SDG&E conducted audits to assess if DGF controls were designed appropriately and operating effectively. For the DGF audits completed in 2020, controls issues and business enhancements were noted, along with recommendations for management corrective actions. The development and updates of business unit DGF compliance documentation and related audits will continue in 2021. The DGF compliance documentation and audits have been and will be conducted by a third party, independent auditor.

A significant amount of information is collected during the DGF audits which may include data dictionaries and taxonomies, standard operating procedures, access control matrices, reporting processes and QA/QC procedures for each business unit contributing data and assisting with the implementation of the WMP.

The WMP DGF includes a specific Data Quality policy addressing accuracy, completeness, timeliness, integrity, and authorization of the data through the data life cycle. Each business unit is required to document their compliance with this policy, and provide evidence of the quality assurance and quality controls during the DGF audits completed. The WMP data assurance and quality processes and controls cover a broad scope of procedures completed by employees, as well as independent contractor auditors that complete inspections in the field.

In addition to the DGF audits, the WMP business units and related data are also audited by other external regulatory agencies, such as California Independent System Operator (CAISO), and the Sempra Energy Internal Audit (IA) department. On an annual basis, the Sempra Energy IA department conducts a risk assessment to determine the audit universe, including areas of the WMP. The inherent risk of the area is considered, along with the compensating controls to determine the residual risk. The areas with a high residual risk are included in the annual IA plan. Once the IA is completed, SDG&E management is provided a report of the audit findings,

along with recommended management corrective actions (MCAs). The audit report and related MCAs are tracked by IA for satisfactory completion. The annual audit plan and internal audit reports are provided to the SDG&E Board of Directors.

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

SDG&E submits that its WMP is a comprehensive, robust, and strategic guide to help reduce the potential for infrastructure-caused catastrophic wildfires to protect the safety of SDG&E's customers, workforce, and the communities served. SDG&E continues to innovate and look for further opportunities to enhance and refine its wildfire mitigation initiatives.[26]

One area that SDG&E acknowledges requires further advancement is data governance. Over the past year, SDG&E has made great progress in developing and establishing a centralized database of information and data related to all the its WMP programs and initiatives. Generally, data flows from a variety of areas within the Company on differing levels and quality. Work is not only needed to collect and validate the source of the data, but also to articulate clear definitions of what the data represented as well as development of clear policies and procedures surrounding the data so that a "single source of truth" for all WMP programs and initiatives could be structured. In addition to the development of a WMP centralized database, a dashboard was created to provide a clear view on the progress and issues related to the WMP.

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

Monitoring and Auditing the Effectiveness of Inspections

SDG&E has multiple QA/QC programs to monitor and audit the effectiveness of its inspection programs. For SDG&E's electric asset inspection and maintenance programs, once inspections and repairs are reported as complete in SDG&E's asset management system, SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's Operational and Engineering managers, who are responsible for each of SDG&E's operating districts. They randomly select 1.5% of the combined (overhead and underground) electric inspections and assess their conditions to see if the appropriate improvements have been properly carried out.

For vegetation management, SDG&E utilizes a third-party contractor to perform quality assurance audits of all its vegetation management activities to measure work quality, contractual adherence, compliance, and to determine the effectiveness of each component of

[26] In its evaluation of SDG&E's 2020 WMP, the WSD determined there were deficiencies. These are discussed in Section 4.6 above.

the program. These audits include a statistical analysis of a representative sample of all completed work. Auditing is performed by Certified Arborists. A minimum random sampling of 15% of completed work is audited to determine compliance with scoping requirements.

In addition to these internal audits, in 2020 the WSD Compliance Branch begun auditing both SDG&E's completed electric distribution asset work as well as SDG&E's vegetation management program.

D. *Ensure that across audits, initiatives, monitoring, and identifying deficiencies, the utility will report in a format that matches across WMPs, Quarterly Reports, Quarterly Advice Letters,[27] and annual compliance assessment.*

As the WSD imposed additional WMP-related quarterly reporting requirements in 2020, SDG&E recognized the need for improved automation to query and report consistent and accurate data in response to more frequent and overlapping requests. SDG&E initiated an effort to join relevant data from many unique data sources into a single system for streamlined and consistent reporting across the WMP, quarterly reports, quarterly advice letters, and annual compliance assessment. SDG&E will continue to develop this system and automation process and anticipates phasing in some automation support for WMP-related quarterly report generation throughout 2021. As additional data sources are integrated and validated, SDG&E's ability to automate report generation will continue to improve, which will help ensure consistent data across reporting requirements.

[27] General Rule for filing Advice Letters are available in General Order 96-B: https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M023/K381/23381302.PDF

7.3 Detailed Wildfire Mitigation Programs

Instructions: *In this section, describe how the utility's specific programs and initiatives plan to execute the strategy set out in Section 7.1. 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*

7.3.a Financial Data on Mitigation Initiatives, By Category

Instructions: *In the following section (7.3.2) is a list of potential wildfire and PSPS mitigation activities which fit under the 10 categories listed above. While it is not necessary to have initiatives within all activities, all mitigation initiatives will fit into one or more of the activities listed below. Financial information—including actual / projected spend, spend per line- miles treated, and risk-spend-efficiency for activity by HFTD tier (all regions, non-HFTD, HFTD tier 2, HFTD tier 3) for all HFTD tiers which the activity has been or plans to be applied—is reported in the attached file quarterly. Report any updates to the financial data in the spreadsheet attached in Table 12.*

Please see Attachment B, Table 12. In this table, if an actual is substantially different from the projected (>10% difference), SDG&E has highlighted the corresponding metric in light green.

7.3.b Detailed Information on Mitigation Initiatives By Category and Activity

Instructions: *Report detailed information for each initiative activity in which spending was above $0 over the course of the current WMP cycle (2020-2022). For each activity, organize details under the following headings:*

1. ***Risk to be mitigated*** */ problem to be addressed*
2. ***Initiative selection*** *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*
3. ***Region prioritization*** *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*
4. ***Progress on initiative*** *(amount spent, regions covered) and plans for next year*
5. ***Future improvements to initiative***

List of initiative activities by category – *Detailed definitions for each mitigation activity are provided in the appendix*

In response to the WSD's Evaluation of SDG&E's Remedial Compliance Plan, specifically Action SDGE-1, SDG&E provides the following high-level description of its risk-informed decision-making approach used to select the portfolio of mitigation initiatives presented in its 2020 WMP. Details for selecting each initiative are provided in the specific initiative sections below.

Risk-Informed Decision-Making Approach to Selecting 2020 WMP Portfolio of Mitigations

SDG&E uses various risk models to inform its selection of risk mitigations. These models include the enterprise-level Risk Quantification Framework described in Section 4.2 which applies the MAVF required in RAMP as well as initiative-specific models that help inform the prioritization of major programs such as the hardening programs by evaluating asset-specific risks. The following describes how these two approaches informed the development of the 2020 WMP with additional details provided in each of the initiative sections below.

The basic process SDG&E followed in the development of its 2020 WMP:

- **Evaluate Baseline Risk:** SDG&E evaluated wildfire risk using the Risk Quantification Framework described in Section 4.2 to establish an understanding of the Company's current risk level given its established mitigations as well as potential increases in risk due to factors such as climate change. Applying the Risk Quantification Framework results in a risk score commonly referred to as the baseline risk or the pre-mitigation risk.

- **Identify Mitigation Initiatives:** SDG&E catalogued all of its wildfire mitigation initiatives and identified any additional efforts needed to further reduce the risk. This involved the input of subject matter experts as well as historical data on wildfire risk factors to identify potential mitigations for consideration in the development of the plan.
- **Evaluate Mitigations (enterprise-level):** SDG&E analyzed each initiative identified as a part of its Plan, and based on the ability to quantify the mitigation and interdependencies between mitigations, developed groupings of initiatives to calculate RSEs. The RSE evaluates the cost-effectiveness of mitigations and is developed using the same Risk Quantification Framework that is used to evaluate the baseline risk. To calculate the RSEs, SDG&E estimated a potential risk reduction that could be achieved as a result of implementing each initiative and the total cost of the initiative. To come up with an estimate of the potential risk reduction, SDG&E relied on subject matter expertise supplemented with available historical data to estimate effectiveness of mitigations. This method of measuring effectiveness of mitigations is continuously evolving as more data becomes available to enable measurement of actual impacts of mitigations.
- **Initiative-level Prioritization (asset-level):** Some initiatives involve large scale projects such as grid hardening and require refined methodologies to target and prioritize the necessary asset replacements. For such initiatives, asset risk models are used to inform the scoping and prioritization of the work. The use of these models informs both the specific prioritization of the work within initiative as well as the overall scope of work that is evaluated as a part of the enterprise-level evaluation of the plan. An example of an initiative that uses asset-specific models is the Distribution Overhead System Hardening (Section 7.3.3). For Distribution overhead system hardening, SDG&E used its WRRM model which evaluates the failure rates of assets along with the consequences of those failures based on their locations to identify the scope of overhead system hardening in what was previously referred to as the FiRM program. For Pole loading, SDG&E used a model that predicts out of compliance or the potential of not passing an intrusive inspection to identify scope of work necessary to mitigate poles at-risk in what was previously known as the PRiME program. Both models are further described in Section 4.5.1.

In compliance with Action SDGE-3 of the WSD's Evaluation of SDG&E's Remedial Compliance Plan, the following table provides a summary of all models used to evaluate each initiative.

Table 7-1: Summary of Models Used to Evaluate SDG&E's Initiatives

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.1.1.	A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment [WRRM-Ops]	Insufficient awareness of Wildfire risk	N	N	N/A	N/A	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
7.3.1.2.	Climate-driven risk map and modelling based on various relevant weather scenarios	The scope of this initiative is covered in Section 7.3.1.1					
7.3.1.3.	Ignition probability mapping	The scope of this initiative is covered in Section 7.3.1.1					
7.3.1.4.	Initiative mapping and estimation of wildfire and PSPS risk-reduction impact	The scope of this initiative is covered in Section 7.3.1.1					
7.3.1.5.	Match drop simulations	The scope of this initiative is covered in Section 7.3.1.1					
7.3.1.6.	Weather driven risk map and modelling	The scope of this initiative is covered in Section 7.3.1.1					

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.2.1.	Advanced weather monitoring and weather stations [Advanced weather station integration]	Insufficient awareness of Wildfire risk	N	Y	N/A	N/A	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
7.3.2.2.	Continuous monitoring sensors	SDG&E does not have an applicable program					
7.3.2.3.	Fault indicators for detecting faults on electric lines and equipment [Wireless fault indicators]	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.2.4.1.	Fire science and climate adaptation department	Insufficient awareness of Wildfire risk	N	N	N/A	N/A	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
7.3.2.4.2.	Fire potential index	The scope of this initiative is covered in Section 7.3.2.4.1					
7.3.2.4.3.	Santa Ana wildfire threat index	The scope of this initiative is covered in Section 7.3.2.4.1					

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.2.4.4.	High-performance computing infrastructure	Insufficient tools to process big data	N	N	N/A	N/A	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
7.3.2.5.	Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions [Observers]	The scope of this initiative is covered in Section 7.3.9.7 which is grouped with RSE for PSPS					
7.3.2.6.	Weather forecasting and estimating impacts on electric lines and equipment	The scope of this initiative is covered in Section 7.3.2.4.1					
7.3.3.1.	Capacitor maintenance and replacement program [SCADA capacitors]	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.2.	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault	The scope of this initiative is captured under Advanced Protection. See Section 7.3.4.15					
7.3.3.3.	Covered conductor installation	Ignition risk: contact from object & equipment failure	Y	Y	RAMP RQF Model, WiNGS	RAMP RQF Model, WiNGS	-

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.3.4.	Covered conductor maintenance	The scope of this initiative is captured under Asset Inspection Programs in Section 7.3.4					
7.3.3.5.	Crossarm maintenance, repair, and replacement	The scope of this initiative is captured under Asset Inspection Programs in Section 7.3.4					
7.3.3.6.	Distribution pole replacement and reinforcement, including with composite poles (Pole replacement and reinforcement)	Ignition risk: equipment failure	N	N	N/A	N/A	Grouped with RSE calculations for the various inspection programs. Pole replacement and reinforcement activities can be identified as a part of any of the inspection programs in Section 7.3.6.
7.3.3.7.	Expulsion fuse replacement	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.8.1	PSPS sectionalizing enhancements	Adverse impact of PSPS	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.8.2	Microgrids	Adverse impact of PSPS	Y	Y	RAMP RQF Model	RAMP RQF Model, WiNGS	-
7.3.3.9.	Installation of system automation equipment (Advanced Protection)	Wildfire consequence risk	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.10.	Maintenance, repair, and replacement of connectors, including hotline clamps	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.11.1.	Resiliency Grant Programs	Adverse impact of PSPS	Y	Y	RAMP RQF Model	RAMP RQF Model	-

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.3.11.2.	Standby Power Programs	Adverse impact of PSPS	Y	Y	RAMP RQF Model, WiNGS	RAMP RQF Model, WiNGS	-
7.3.3.11.3.	Resiliency Assistance Programs	Adverse impact of PSPS	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.12.	Other corrective action	Corrective actions are part of Asset Inspection Programs in Section 7.3.5					
7.3.3.13.	Pole loading infrastructure hardening and replacement program	The scope of this initiative is covered in Distribution Overhead System Hardening in Section 7.3.3.17.1					
7.3.3.14.	Transformers maintenance and replacement	The scope of this initiative is captured under Asset Inspection Programs in Section 7.3.4					
7.3.3.15.	Transmission tower maintenance and replacement	The scope of this initiative is captured under Asset Inspection Programs in Section 7.3.4					
7.3.3.16.	Undergrounding of electric lines and/or equipment (Strategic undergrounding)	Ignition risk: contact from object & equipment failure	Y	Y	RAMP RQF Model, WiNGS	RAMP RQF Model, WiNGS	-
7.3.3.17.1.	Distribution overhead system hardening (Bare Conductor Hardening)	Ignition risk: equipment failure	Y	Y	RAMP RQF Model, WRRM, PRiME Pole Loading Model	RAMP RQF Model, WiNGS	-

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.3.17.2.	Overhead transmission fire hardening (Transmission)	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.17.2.	Underground transmission fire hardening (Transmission)	Ignition risk: contact from object & equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.17.2.	Overhead transmission fire hardening (Distribution Underbuilt)	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.17.3.	Cleveland National Forest fire hardening - Transmission OH	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.17.3.	Cleveland National Forest fire hardening - Distribution OH	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.17.3.	Cleveland National Forest fire hardening - Distribution UG	Ignition risk: contact from object & equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.3.18.1.	Distribution communications reliability improvements	Insufficient awareness of Wildfire risk	N	Y	N/A	N/A	Upon further consideration of this initiative, it is now deemed a foundational initiative that is important for supporting various wildfire mitigation initiatives. Enhanced communication systems support the implementation of Advanced Protection as well as other systems such as weather monitoring.

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.3.18.2.	Lightning arrestor removal and replacement	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.1.	Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)	Ignition risk: equipment failure	Y	N	RAMP RQF Model	RAMP RQF Model	-
7.3.4.2.	Detailed inspections of transmission electric lines and equipment (Transmission ground inspections)	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.3.	Improvement of inspections	The scope of this initiative is captured under Discretionary Asset Inspection Programs in Section 7.3.4.9					
7.3.4.4.	Infrared inspections of distribution electric lines and equipment	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.5.	Infrared inspections of transmission electric lines and equipment	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.6.	Intrusive pole inspections	Ignition risk: equipment failure	Y	N	RAMP RQF Model	RAMP RQF Model	-
7.3.4.7.	LiDAR inspections of distribution electric lines and equipment	Insufficient surveys of right of ways for design	N	N	N/A	N/A	LiDAR inspections on distribution and transmission lines are primarily used for grid hardening design efforts rather than for identifying issues like the other inspection programs. As such, quantifying a reduction in ignition risk for these inspections is not applicable.
7.3.4.8.	LiDAR inspections of transmission electric lines and equipment	Insufficient surveys of right of ways for design	N	Y	N/A	N/A	

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.4.9.1.	HFTD Tier 3 Inspections	Ignition risk: equipment failure	Y	N	RAMP RQF Model	RAMP RQF Model	-
7.3.4.9.2.	Drone assessments of distribution infrastructure	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.9.3.	Circuit ownership	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.10.1.	(Drone assessment of transmission)	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.10.2.	Additional Transmission Aerial 69kV Tier 3 Visual Inspection	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.11.	Patrol inspections of distribution electric lines and equipment - CMP	Ignition risk: equipment failure	Y	N	RAMP RQF Model	RAMP RQF Model	-
7.3.4.12.	Patrol inspections of transmission electric lines and equipment	Ignition risk: equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.4.13.	Pole loading assessment program to determine safety factor	The scope of this initiative is covered in Distribution Overhead System Hardening in Section 7.3.3.17.1					
7.3.4.14.	Quality assurance / quality control of inspections (Monitoring and auditing of inspections)	The scope of this initiative is captured under Asset Inspection Programs in Section 7.3.4					

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.4.15.	Substation inspections	Ignition risk: equipment failure	N	Y	N/A	N/A	The way SDG&E designs and constructs its substations, with the steel structures and gravel and concrete base makes it difficult for a fire to spread outside the substation. With very little ignition history, SDG&E performs substation inspection and maintenance more for the importance of substation reliability.
7.3.5.1.	Additional efforts to manage community and environmental impacts	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.2.	Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)	Ignition risk: contact from object	Y	N	RAMP RQF Model	RAMP RQF Model, WiNGS[28]	-
7.3.5.3.	Detailed inspections of vegetation around transmission electric lines and equipment	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.4.	Emergency response vegetation management due to red flag warning or other urgent conditions	The scope of this initiative is covered in Section 7.3.5.2					

[28] The potential use of WiNGS to inform vegetation management priorities will be explored in 2021-2022 and if deemed appropriate, will be implemented in later years.

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.5.5.	Fuel management and reduction of "slash" from vegetation management activities	Wildfire consequence risk	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.5.6.	Improvement of inspections	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.7.	LiDAR inspections of vegetation around distribution electric lines and equipment (vegetation management technology)	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.8.	LiDAR inspections for vegetation around transmission electric lines and equipment	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.9.	Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)	Ignition risk: contact from object	Y	Y	RAMP RQF Model	RAMP RQF Model, VRI	-
7.3.5.10.	Other discretionary inspection of vegetation around transmission electric lines and equipment, beyond inspections mandated by rules and regulations	The scope of this initiative is covered in Section 7.3.5.9					

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.5.11.	Patrol inspections of vegetation around distribution electric lines and equipment	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.12.	Patrol inspections of vegetation around transmission electric lines and equipment	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.13.	Quality assurance / quality control of vegetation inspections	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.14.	Recruiting and training of vegetation management personnel	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.15.	Remediation of at-risk species	The scope of this initiative is covered in Section 7.3.5.2 and Section 7.3.5.9					
7.3.5.16.	Removal and remediation of trees with strike potential to electric lines and equipment (Hazard tree removal and Right Tree-Right Place)	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.17.	Substation inspections	The scope of this initiative is covered in Section 7.3.5.2					
7.3.5.18.	Substation vegetation management	The scope of this initiative is covered in Section 7.3.5.2 and Section 7.3.5.9					
7.3.5.19.	Vegetation inventory system (Tree database)	The scope of this initiative is covered in Section 7.3.5.2 and Section 7.3.5.9					
7.3.5.20.	Vegetation management to achieve clearances around electric lines and equipment (Pole brushing)	Ignition risk: contact from object	Y	N	RAMP RQF Model	RAMP RQF Model	-

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.6.1.1.	Recloser protocols	Ignition risk: contact from object & equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.6.1.2.	Sensitive/Fast Protection settings	Ignition risk: contact from object & equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.6.2.	Crew accompanying ignition prevention and suppression resources and services (Wildfire infrastructure protection teams – Contract fire resources)	Wildfire consequence risk	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.6.3.	Personnel work procedures and training in conditions of elevated fire risk (Other special work procedures)	Ignition risk: equipment failure; Wildfire consequence risk	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.6.4.	Protocols for PSPS re-energization	Wildfire consequence risk; Impact of PSPS on customers	N	Y	N/A	N/A	This is an activity that is foundational to supporting wildfire mitigation efforts and is part of core PSPS operations. Costs for protocols cannot be separated out and evaluating benefits for having protocols cannot be meaningfully measured.

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.6.5.	PSPS events and mitigation of PSPS impacts	Ignition risk: contact from object & equipment failure	Y	Y	RAMP RQF Model	RAMP RQF Model	-
7.3.6.6.1.	Aviation firefighting program	Wildfire consequence risk	Y	N	RAMP RQF Model	RAMP RQF Model	-
7.3.7.1.	Centralized repository for data	Insufficient awareness of Wildfire risk	N	Y	N/A	N/A	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
7.3.7.2.	Collaborative research on utility ignition and/or wildfire (Innovation lab and other collaboration)	The scope of this initiative is covered in Section 7.3.2.4.1					
7.3.7.3.	Documentation and disclosure of wildfire-related data and algorithms	The scope of this initiative is covered in Section 4.5					
7.3.7.4.1.	Ignition management program	The scope of this initiative is covered in Section 7.3.2.4.1					
7.3.7.4.2.	Reliability database	The scope of this initiative is covered in Section 7.3.7.1					

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.8.1.	Allocation methodology development and application (Asset management)	Insufficient approach to resource allocation	N	Y	N/A	N/A	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
7.3.8.2.	Risk reduction scenario development and analysis	The scope of this initiative is covered in Section 7.3.8.1					
7.3.8.3.	Risk spend efficiency analysis - not to include PSPS	The scope of this initiative is covered in Section 7.3.8.1					
7.3.8.4.1.	Wildfire mitigation personnel	Insufficient awareness of Wildfire risk	N	N	N/A	N/A	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
7.3.8.4.2.	PSPS mitigation engineering team	The scope of this initiative is covered in Section 7.3.8.4.1					
7.3.9.1.	Adequate and trained workforce for service restoration	The scope of this initiative is covered in Section 7.3.9.7					

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.9.2.	Community outreach, public awareness, and communications efforts	The scope of this initiative is covered in Section 7.3.9.7					
7.3.9.3.	Customer support in emergencies	The scope of this initiative is covered in Section 7.3.9.7					
7.3.9.4.	Disaster and emergency preparedness plan (CERP)	The scope of this initiative is covered in Section 7.3.9.7					
7.3.9.5.	Preparedness and planning for service restoration (Mutual assistance and contractors)	The scope of this initiative is covered in Section 7.3.9.7					
7.3.9.6.	Protocols in place to learn from wildfire events (After action reports)	The scope of this initiative is covered in Section 7.3.9.7					
7.3.9.7.	Other - Emergency management Operations	Grouped with PSPS (See Section 7.3.6.5)					
7.3.10.1.	Community engagement	Insufficient awareness of Wildfire risk	N	N	N/A	N/A	This initiative is primarily around educating the community about wildfire safety, resiliency and emergency preparedness. Quantifying an RSE for it would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring effectiveness of that reduction.
7.3.10.1.1.	PSPS communication practices	Grouped with PSPS (See Section 7.3.6.5)					
7.3.10.2.	Cooperation and best practice sharing with agencies outside California	The scope of this initiative is covered in Section 7.3.10.1.1					

2021 WMP Initiative #	Initiative activity	Risk to be Mitigated	RSE Calculated	Risk Informed Prioritization	Current Risk Models Used 2020 - 2022	Future Risk-Informed Decision-Making Enhancements 2023 and beyond	Notes
7.3.10.3.	Cooperation with suppression agencies	The scope of this initiative is covered in Section 7.3.10.1.1					
7.3.10.4.	Forest service and fuel reduction cooperation and joint roadmap	The scope of this initiative is covered in Section 7.3.5.2					
7.3.10.5	Mylar Balloon Alternative	Insufficient awareness of Wildfire risk	N	N	N/A	N/A	The current scope of this initiative is focused on outreach efforts to drive adoption of the alternative technology for Mylar balloons. No current deployment of this technology is in place to allow for a calculation of RSEs based on measurable indicators of effectiveness.

7.3.1 Risk Assessment and Mapping

SDG&E has remained committed to the ongoing development and implementation of its WRRM model and continues to refine a primarily automated risk assessment and mapping methodology. SDG&E's engineers and emergency operations personnel continue to analytically evaluate and prioritize proposed grid hardening projects and emergency actions from the standpoint of reducing or eliminating fire risk potential from overhead electric facilities.

SDG&E continues to work with Technosylva and others to implement innovative approaches to enhance and leverage this modeling and efforts are being duplicated across the state. WRRM represents SDG&E's continued commitment to the ongoing development and further refinement of risk related models for the evaluation of hardening projects and the safe operation of the SDG&E system. To date, SDG&E subject matter experts, including fire coordinators and fire scientists analyze the model's performance for all wildfires on the landscape, identifying deviations from the risk and propagation modeling. These findings help drive the future development of the model and refining the model will result in improved and more specific quantifiable outcomes allowing for better decision making in the overall hardening effort. SDG&E stands at the forefront of the development of this important risk related model and leads the industry in the creation of such a model.

In addition to WRRM and using the information it provides, SDG&E built the WiNGS model to aid with the allocation of grid hardening initiatives across HFTD segments based on an assessment of both the wildfire risk as well as the PSPS impacts to customers on those segments. Because WiNGS is a tool that can support resource allocation, it is further described in Section 7.3.8 Resource Allocation Methodology. It is also discussed in Section 4.5.1.4 above.

7.3.1.1 A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment

Risk to be mitigated */ problem to be addressed*

The problem this initiative solves is the lack of awareness of wildfire risk. SDG&E's WRRM prioritizes long-term system hardening efforts to target the areas of greatest wildfire risk. This model was developed in collaboration with fire behavior experts, and leverages 30 years of high-resolution weather data to establish a climate scenario and failure rates of SDG&E's assets, establishing risk maps showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment. SDG&E has further enhanced this model into an operational system (WRRM-Ops) by developing a fully automated process to ingest daily weather and fuel moisture data from its supercomputers, and to re-calculate risk levels to support emergency operations. This information is now leveraged by SDG&E's subject matter experts to gather intelligence and communicate potential impacts and risk for every potential fire of consequence that occurs in SDG&E's service territory.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The reason this initiative was selected was to enhance SDG&E's awareness of wildfire risk by deploying science-based technologies and implementing solutions to inform SDG&E's operations. Lessons learned from this process inform the ongoing development of the modeling system, which supports short, mid, and long term operational and system hardening decisions. Alternatives considered to this initiative included inaction. When SDG&E decided to innovate the development of this operational model in 2014, it was based on operational experience during times of high fire danger and the determination that this model-based intelligence on wildfire risk would be beneficial to planning and operations, which ultimately proved to be true.

This initiative does not have an RSE because it is considered foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E's WRRM and WRRM-Ops models were developed by SDG&E for its service territory. The model is now being deployed by other utilities broadly across the state of California, enhancing the information available when making decisions on whether and how to update the model.

Progress on initiative *(amount spent, regions covered) and plans for next year*

Enhancements and progress that have been made in 2020 include:

- Updates to the software platform to increase ease of use.
- Updates to the Live Fuel Moisture data in the model to improve consequence modeling.
- Updates to the fire growth algorithms to improve the accuracy of consequence modeling.

Enhancements to the tool planned for 2021 include upgrading fuel moisture inputs into the fire behavior modeling, upgrading the forecaster interface, and incorporating the data into a PSPS decision support tool.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E envisions that this modeling platform can be leveraged as a data sharing platform between stakeholders in the wildfire community to assess and manage wildfire risk. This can also serve as an integration point for the latest fire science that is developed through academic partnerships.

7.3.1.2 Climate-driven risk map and modelling based on various relevant weather stations

Please refer to Section 7.3.1.1 above.

7.3.1.3 Ignition probability mapping

Please refer to Section 7.3.1.1 above.

7.3.1.4 Initiative mapping and estimation of wildfire and PSPS risk-reduction impact

Please refer to Section 7.3.1.1 above.

7.3.1.5 Match drop simulations

Please refer to Section 7.3.1.1 above.

7.3.1.6 Weather-driven risk map and modelling

Please refer to Section 7.3.1.1 above.

7.3.2 Situational Awareness and Forecasting

Weather continues to have a significant impact on utility operations. SDG&E is an industry leader in the development and implementation of utility-specific meteorological technology to anticipate, prepare for, respond to, and recover from severe weather and wildfire events. Utilization of situational awareness tools such as weather stations, cameras, wireless fault indicators, and the Fire Potential Index have proven successful historically and continue to be beneficial to system planning, emergency operations, and the safe implementation of PSPS. Based on these successes, SDG&E situational awareness networks will be expanded into areas where they can be used to minimize the impacts of PSPS and make communities safer.

7.3.2.1 Advanced weather monitoring and weather stations

Risk to be mitigated */ problem to be addressed*

The problem that this initiative addresses is the lack of more specific information regarding the location and severity of weather events that may impact SDG&E's system. Weather events have the potential to cause damage to the electric system, which may lead to an ignition. Advanced weather stations provide important information that enables safer and more informed operation of SDG&E's electric system during extreme weather events. SDG&E will continue the strategic rebuild of the weather station network through 2021 as the original equipment is reaching the end of its usable life.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

This is a critical because the information from this weather network provides the foundational data mission critical activities such as the FPI and PSPS activities. Originally when developing weather network, SDG&E considered the alternative of using pre-existing weather station, however, upon further evaluation it determined that the data did not have the granularity needed to support emergency operations during PSPS.

This initiative does not have an RSE because it is considered foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E will focus this activity on regions that have old weather monitoring equipment that have reached end of life. Activity will also be engaged in areas where additional sensors can be installed to acquire data on fuel moisture conditions as an enhancement to the weather station capability. Region prioritization can also be influenced by an assessment of PSPS impacts and identification of areas where additional weather stations can support enhanced isolation strategies during PSPS events. There are multiple methods that are used to prioritize regions. These methods include the integration of high-resolution modeling to determine where unmeasured strong winds may be occurring, SME input from weather and fire experts, and input from community partners sharing local knowledge. This is further described below in describing 2020 progress.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E had the largest expansion to its weather station network since 2011 with the addition of over 30 new stations and a rebuild of about 50 additional weather stations that were at end of their usable lives.

Regarding regions covered, these stations were selected in locations where it was determined by the SDG&E PSPS Mitigation Engineering team that when coupled with additional sectionalizing, this weather information could help mitigate the impact of PSPS by better representing localized neighborhoods and increasingly isolate PSPS when possible. The areas specifically targeted in 2020 for additional weather information was across the northern portions of SDG&E's service territory. Additionally, the stations that were rebuilt are those that were some of the oldest on SDG&E's network originally installed in 2010 and 2011 and cover the highest risk regions across HFTD Tier 3 locations.

In 2021, SDG&E plans to rebuild approximately 30% of the existing network, which is at end-of-life and install new sensor technology to measure fuel moisture where available.

Amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

As technological advancements permit, SDG&E plans to install sensors to better measure and validate fuel moisture conditions across the region to better understand the effects on the wildfire ignition and spread.

7.3.2.2 Continuous monitoring sensors

SDG&E does not have an applicable program.

7.3.2.3 Fault indicators for detecting faults on electric lines and equipment

Risk to be mitigated */ problem to be addressed*

SDG&E initiates operational measures during times of elevated or extreme wildfire risk to improve public safety such as the disabling of automatic reclosing and the use of sensitive and fast protection settings that limit the heat energy produced by a fault reducing the chance of ignition. While the risk reduction benefits of these mitigation measures are significant, these operational practices increase the duration of outages for SDG&E's customers as a lack of circuit coordination caused by these mitigations makes faults and damaged assets more difficult to locate. Wireless fault indicators are a tool that mitigates the reliability impacts of these mitigations.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Wireless fault indicators are a proven technology that helps narrow the search area to determine where a system failure has occurred, so SDG&E can quickly identify a search area and dispatch crews to find system failures. This technology is important to SDG&E's operational mitigation measures that decrease wildfire ignition risk.

During times of heightened wildfire risk, SDG&E patrols all infrastructure for damage prior to restoring power. In instances where large areas are de-energized due to sensitive protective relay settings, wireless fault indicators are used to concentrate focus to a much smaller portion of the electric circuit, which allows for: a faster response to the site if an ignition exists; a greater chance of determining and correcting a fault cause (when damage on the overhead electric system is not immediately obvious); and, potentially, faster customer restoration (which could offset customer reliability impacts caused by wildfire mitigation measures). An alternative SDG&E considered was inaction.

Wireless fault indicators are expected to reduce 1,612 customer outage minutes over the three-year plan period.

Risk Reduction Estimation Methodology

To calculate the benefits of wireless fault indicators, SDG&E considered the 5-year customer minute impacts of risk event data set provided in Table 7 of Attachment B. Using the reliability data, SDG&E calculated the average duration and customer impact by Tier 3 HFTD, Tier 2 HFTD, and non-HFTD. SDG&E then assumes that the installation of wireless fault indicators will reduce the duration of an outage by 10 minutes. SDG&E calculated the customer minutes using the 10-minute reduction per outage. SDG&E converted both numbers to annual SAIDI and calculated the savings per HFTD tier. Finally, SDG&E compared the number of WFI circuit installations to total circuits to see what percentage of benefits would be realized in the 2020-2022 period of the plan. Tier 3 was not considered in the benefits, because Tier 3 is 100% complete. Tier 2 will be 100% complete by 2021. The total SAIDI benefit of WFI's for the WMP timeframe is estimated at 0.311 SAIDI minutes.

A summary of the calculation is shown below.

5-year average SAIDI Non-HFTD	29.9
5-year average SAIDI Tier 2	9.03
5-year average SAIDI Non-HFTD with WFI's	28.3
5-year average SAIDI Tier 2 with WFI's	8.68
SAIDI Minutes saved Non-HFTD	29.9 - 28.3 = 1.63
SAIDI Minutes saved Tier 2	9.03 - 8.68 = .358
Circuits Tier 2	168
Circuits Non HFTD	820
Circuits planned for WFI's (2020-2022) Tier 2	90
Circuits planned for WFI's (2020-2022) Non-HFTD	60
SAIDI minutes saved Tier 2	.358 * 90/168 = .192 minutes
SAIDI minutes saved Non-HFTD	1.63 * 60/820 = .119 minutes
Total SAIDI minutes saved	.192 + .192 = .311

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E routinely reviews results of sensitive relay outages to identify the need and locations for new wireless fault indicator locations. Locations may change based on new information and past findings. Wireless fault indicators are typically placed on bifurcations in SDG&E's system or midway on a section of conductor that does not have SCADA devices to provide real-time notification of loss of current or faults downstream. Examples include a location where a feeder splits but only has a SCADA switch in one direction downstream. Adding a wireless fault indicator to the other direction will provide complete information on the status of all conductors downstream. Other applications of wireless fault indicators are at locations where facilities enter areas of high fuel concentrations, areas that are difficult to patrol, or transitions between HFTD tiers. Overhead to underground and underground to overhead unfused transitions and downstream of non-SCADA substations are also valuable applications.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E installed 502 wireless fault indicators in the HFTD. In 2021, SDG&E plans to install an additional 500 wireless fault indicators finishing the Tier 2 and expanding into the wildland urban interface.

Amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

As technology changes and new innovations are introduced into the industry, SDG&E will continue to evaluate products to enhance its system and potentially incorporate new devices with optimum features. Such new devices may lead to modifications and a request for future installations.

7.3.2.4 Forecast of a fire risk index, fire potential index, or similar

7.3.2.4.1 Fire science and climate adaptation department

Risk to be mitigated */ problem to be addressed*

The problem this initiative solves is the lack of awareness of wildfire risk and impacts of climate change on the risk. In the years prior to 2018 through 2020, there was growing evidence that changing climate conditions were contributing to an increase in wildfire potential throughout California. As a result, SDG&E established a Fire Science and Climate Adaption (FS&CA) department in 2018, which continues to expand and grow to meet the needs of increasing wildfire and climate related risks. The department is comprised of meteorologists, community resiliency experts, fire coordinators, and project management personnel. This department's purpose is responding to and strategizing for SDG&E's fire preparedness activities and programs.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

In addition to providing SDG&E with subject matter expertise in meteorology, wildland fire coordination and response, and community resiliency, this department is building and leading the creation of a Fire Science and Innovation Lab (FSI Lab). The FSI Lab will bring together leading thinkers and problem solvers in academia, government, and the community to create forward-looking solutions to help prevent ignitions, mitigate the impacts of fires, and ultimately help build a more resilient region. With this FSI Lab, SDG&E aims to lead the development of the next generation of fire science and wildfire innovation. An alternative SDG&E considered was inaction.

This initiative does not have an RSE because it is considered foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

In 2020, SDG&E engaged and moved forward many of these academic partnerships in a remote environment. Additionally, numerous community resilience events were targeted to SDG&E's service territory and conducted both online and in socially distant outreach events.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The FS&CA department will continue to focus on collaborations with stakeholders in the community and will continue to evolve the FSI Lab. Specific enhancements and improvements in 2021 will be further enhancing academic partnerships through broader data sharing and sponsoring specific utility focused projects through the FSI Lab.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

The FS&CA Department envisions establishing long-lasting partnerships with academia to create opportunities to educate the next generation of utility wildfire subject matter expertise.

7.3.2.4.2 Fire potential index

Risk to be mitigated */ problem to be addressed*

The problem this initiative solves is the lack of awareness of wildfire risk and ability to forecast fire risk potential based on weather and fuels conditions. The FPI was developed by SDG&E subject matter experts to communicate the wildfire potential on any given day to promote safe and reliable operations. Details about the FPI are further described in Section 4.5.1.7. SDG&E will continue to prioritize the integration of the FPI into its operational decision making to mitigate wildfire potential.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E utilizes the FPI to set its operating conditions (i.e., Normal, Elevated, Extreme, and Red Flag Warning), which inform operation decisions such as: recloser settings, restrictions on the type of work being performed in high risk locations, and the use of contract firefighting resources. It is also used as an input to PSPS decision-making. SDG&E's meteorology team consists of experts in fire science and data science who conduct daily verification of the FPI tool. Through daily verification of the FPI, SDG&E subject matter experts believe that the fire potential may be reporting too high late in the fire season when the days has shortened, and the solar radiation has decreased resulting in lower fuel temperatures. An alternative SDG&E considered was inaction.

This initiative does not have an RSE because it is considered foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E engaged academic partners to further investigate the scientific components that feed into the FPI each day with specific focus on wildfire activity early in the fall months in the absence of Santa Ana Winds.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E's meteorology team updated a new forecasting platform to further analyze output from SDG&E's high-performance computing platform when developing the daily FPI forecast. SDG&E also expanded the availability of the FPI to stakeholders in the wildfire community through a mobile phone application. Lastly, through partnerships with academia, all FPI information has been made available to researchers through an API web portal.

Costs for this program are captured within Section 7.3.2.4.1 – Fire Science and Climate Adaptation department above.

Future improvements to initiative

SDG&E will continue to prioritize the integration of the FPI into its operational decision-making to mitigate wildfire potential. SDG&E's meteorology team consists of experts in fire science and data science who conduct daily verification of the FPI tool. Through the verification process of the FPI, any instance of the index not performing as expected is investigated, leading to improvements by the fire science team.

7.3.2.4.3 Santa Ana wildfire threat index

Risk to be mitigated */ problem to be addressed*

The problem this initiative solves is the lack of awareness of wildfire risk and the impact of wind on the risk. The SAWTI calculates the potential for large wildfire activity based on strength, extent, and duration of the wind, dryness of the air, dryness of vegetation, and greenness of the grasses. Details about the SAWTI are further described in Section 4.5.1.8. SDG&E intends to continue to support the daily operation of the SAWTI and continue to share the information daily with the fire agencies for public dissemination.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The SAWTI enables SDG&E to make informed operational decisions with greater understanding of the risk of a potential ignition growing into a catastrophic wildfire. This is a critical activity because the data that is generated as part of this initiative is shared with fire agencies and the general public through the Predictive Services Unit at the U.S. Forest Service. This tool is also critical because it has the ability to put all Santa Ana winds into historical perspective and provides a good indication of the overall threat associated with each event. An alternative SDG&E considered was inaction.

This initiative does not have an RSE because it is considered foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E will continue to generate this data for all southern California.

Progress on initiative *(amount spent, regions covered) and plans for next year*

Before the 2020 wildfire season, SDG&E conducted verification of the SAWTI in collaboration with fire agencies and stakeholders in the wildfire community. Additionally, SDG&E integrated a new artificial intelligence-based live fuel moisture model, which was integrated into SAWTI to improve model output. SDG&E will continue these activities this year.

Costs for this program are captured within Section 7.3.2.4.1 – Fire Science and Climate Adaptation department above.

Future improvements to initiative

SDG&E will continue to work with academia and the fire agencies to further develop fire science for integration into SAWTI.

7.3.2.4.4 High-performance computing infrastructure

Risk to be mitigated */ problem to be addressed*

The problem this initiative solves is the lack of tools to process big data that is key to understanding the fire risk. Wildfire risk mitigation requires the development of high-quality weather information to support daily decision-making. To that end, SDG&E utilizes three high-performance computing clusters to generate high quality weather data that is incorporated directly into operations. Collectively, nearly 2,000 compute core hours of high-performance computing are used per day to generate operational products, including the SAWTI, FPI, and WRRM-Ops.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Electric utilities worldwide recognize that the weather has a significant impact on operations. As science evolves and new technologies become available, SDG&E will use its computing clusters to integrate the new methodologies in order to maintain forecast reliability and situational awareness.

This initiative does not have an RSE because it is considered foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The forecast data generated by these supercomputers is shared with several partners, including the U.S. Forest Service, which disseminates the data through their public website, and the National Weather Service.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E plans to continue the production and sharing of forecast products as well as prioritize data analytics and modeling for the foreseeable future.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E intends to maintain and update this program to stay aligned with the latest computing technology and intends to share all the data that is generated with the wildfire community. This will include acquiring a new high-performance computing platform. SDG&E intends to

work closely with the San Diego Supercomputing Center to closely monitor data science advancements to ensure that this program remains highly capable of providing the advanced analytics required to operate the utility of today and of the future.

7.3.2.5 Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions

Risk to be mitigated */ problem to be addressed*

To enhance its real-time situational awareness, during elevated fire risk conditions SDG&E deploys electric workers to areas of electric lines and equipment to ensure that the electric system is operating as designed and identify if there are any imminent risks to public safety. Specifically, these field observers are monitoring for debris or vegetation impacting infrastructure, line slapping, conductor movement or system damage.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E engages in this activity because in addition to monitoring weather conditions from the SDG&E weather network, input from the field is an important factor when considering the potential need for PSPS.

Since this activity is part of a high-risk weather event response, the RSE for this mitigation is grouped with PSPS events and mitigation of PSPS impacts (see Section 7.3.6.5).

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

In advance of each high-risk fire weather event, SDG&E subject matter experts provide a list of the areas within SDG&E's service territory where the combination of high winds and vegetation could lead to potential threats to public safety. These areas are prioritized for placing observers. Throughout the duration of a high-risk event, observers are moved and deployed to areas where winds are shown to be increasing according to the SDG&E Weather Network.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E continues to integrate lessons learned within its PSPS program, including the efficient deployment of observers. As SDG&E subject matter experts better understand the impact Santa Ana winds have on the region and the potential risks to infrastructure, they are able to leverage this increased understanding when deploying observers to the highest risk areas to mitigate public safety risk.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12. The cost for this mitigation is captured within the Emergency Management Operations program.

Future improvements to initiative

SDG&E will continue to integrate the latest risk assessments and scientific understanding to the deployment of observers during high-risk events to try to place observers in the best place to mitigate risk.

7.3.2.6 Weather forecasting and estimating impacts on electric lines and equipment

Please see Section 7.3.2.4 above.

7.3.3 Grid Design and System Hardening

SDG&E's grid hardening programs are a set of controls and mitigations that directly address the goals of the wildfire mitigations plans, in the form of reducing wildfires caused by utility equipment and minimizing the societal impacts to customers from mitigations such as PSPS. SDG&E has a number of controls and mitigations including overhead hardening and strategic undergrounding that have demonstrated a measured reduction in risk events on utility equipment, reducing the opportunities for ignitions. SDG&E has a number of protection and equipment programs, such as advanced protection, expulsion fuse replacement program, and the lightning arrestor program. While these programs do not prevent the risk event from occurring, they reduce the chance that a risk event results in an ignition, by utilizing protection settings and/or equipment that addresses a specific failure mode known to lead to the ignition. These result in measured reductions in ignition percentage from risk events. And finally, SDG&E has a number of programs with the purpose of reducing PSPS impacts to customers including the PSPS sectionalizing program, microgrid and generator programs, as well as strategic undergrounding. The impacts of these programs are measured in the number of customers who will no longer be impacted a PSPS event assuming weather conditions similar to previous events.

7.3.3.1 Capacitor maintenance and replacement program

Risk to be mitigated */ problem to be addressed*

This initiative mitigates the risk of a capacitor being an ignition source. The supervisory control and data acquisition (SCADA) capacitors program will replace existing non-SCADA capacitors with a more modern SCADA switchable capacitor. The current capacitors are designed to provide continuous voltage and power factor correction for the distribution system. During a failure of a capacitor from either mechanical, electrical, or environmental overstress, an internal fault is created resulting in internal pressure and the potential to rupture the casing. This rupture of molted metal has the potential to be an ignition source. These capacitor faults are currently protected through fusing, which is not always effective at preventing the high-risk failure mode described.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The supervisory control and data acquisition (SCADA) capacitors program will replace existing non-SCADA capacitors with a more modern SCADA switchable capacitor. The modernization of these capacitors will introduce a monitoring system to check for imbalances and internal faults and open based on the protection settings. In addition, the SCADA capacitor will provide a method for remote isolation and monitoring of the system providing additional situational awareness during extreme weather conditions. The program will first prioritize replacing or removing from service fixed capacitors within the system and then addressing capacitors with switches. Both types of capacitors will be modernized to a SCADA switchable capacitor. While this program will not reduce capacitor faults, the advanced protection equipment is designed to detect and isolate issues on capacitors before the capacitor rupture occurs, reducing or eliminating the failure mode most likely to lead to an ignition, a large improvement over the current protection which utilizes analog fuses.

Risk Reduction Estimation Methodology

Capacitors currently cause an average of 0.2 ignitions annually in the HFTD based on SDG&E's ignition data from 2015-2019. This program is estimated to reduce capacitor caused HFTD ignitions by 0.16 per year once completed in 2022. This estimate is derived by evaluating historical data on faults that could cause ignitions to determine ignition rates and estimating a reduction in ignition rates as a result of capacitor replacements.

A summary of the risk reduction estimation methodology is provided in the table below:

Risk Events (average 2015 – 2019)	9
Pre-mitigation Ignitions (average 2015 – 2019)	0.2
Effectiveness Estimate	80%
Pre-mitigation ignition rate	0.2/9 = 0.022
Post-mitigation ignition rate	0.022 – (0.8*0.022) = 0.004
Post-mitigation ignitions	0.004*9 = 0.04
Ignition Reduction Estimate	0.2 – 0.04 = 0.16
Capacitors in the Tier 3 HFTD	27
Capacitors in the Tier 2 HFTD	75
Ignitions reduced Tier 3 HFTD	.16*(27/102) = .04
Ignitions reduced Tier 2 HFTD	.16*(75/102) = .12

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E plans to replace all capacitors within the HFTD, prioritizing Tier 3, followed by Tier 2.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E is modernizing approximately 100 capacitors in the HFTD. In 2020, SDG&E completed 30 and plans to complete 32 in 2021, and approximately 40 in 2022. SDG&E is removing fixed capacitors which are considered to be the most at-risk capacitors in SDG&E's service territory, followed by switchable capacitors. This program is planned to address 100% of capacitors within the HFTD by the end of 2022.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E plans to monitor the SCADA capacitors to ensure effectiveness of reducing ignition risk and improve equipment as necessary if there are any issues. As more work is done to understand the risk in the wildland urban interface, the program could potentially expand to those areas as well.

7.3.3.2 Circuit breaker maintenance and installation to de-energize lines upon detecting a fault

Please see Section 7.3.4.15 below.

7.3.3.3 Covered conductor installation

Risk to be mitigated */ problem to be addressed*

SDG&E operates and maintains nearly 3,500 miles of overhead distribution circuit miles within the HFTD and has already hardened approximately 850 miles or 25%. This aging infrastructure was originally designed to meet GO 95 requirements of an 8 psf or 55 mile per hour transverse wind load. As SDG&E's weather network and understanding of risk grew, SDG&E learned that winds can reach 85 mph to 111 mph in certain areas throughout the HFTD portion of its service territory during extreme Santa Ana conditions. The aging infrastructure makes these lines more suspectable to equipment failures, and the high winds and outdated design techniques make these lines more vulnerable to foreign object in line contacts, which are both risk events that could lead to ignitions.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

To mitigate the risk described above, SDG&E has three main hardening programs: bare conductor hardening, which has been SDG&E's most historically utilized mitigation; strategic undergrounding, which SDG&E began to utilize in 2019; and covered conductor, the mitigation discussed here. As described in Section 4.4.2.3 above, SDG&E conducted research to understand the effectiveness of overhead distribution hardening at reducing the occurrence of overhead faults. SDG&E found that ignitions were reduced by 47% on the overhead hardened system. SDG&E also measured the effectiveness of undergrounding and found that it is 99% effective in avoiding risk events (less than 1% of SDG&E's historical ignitions have been caused by vehicle contacts with pad mounted equipment on the underground system).

SDG&E has not conducted studies to measure the effectiveness of covered conductor, however, estimates it to be 70% effective, assuming it will be equally effective as bare conductor hardening at preventing equipment failures and better than bare conductor hardening at preventing foreign object in line contacts. In addition to its wildfire mitigation benefits, covered conductor has some PSPS benefits as well, raising the threshold for PSPS to higher wind speeds than bare conductor hardening. The scope of covered conductor work identified in 2022 was informed by the segment-level analysis conducted in WiNGS (for details about the model, refer to Section 4.5.1.4 above).

Risk Reduction Estimation Methodology

Over the three-year period of the SDG&E's 2020 WMP cycle, covered conductor is expected to reduce 0.21 ignitions annually. This estimate is derived by evaluating different causes of ignitions using 5-year ignition data from 2015 – 2019 and estimating a potential reduction in each cause based on estimates of effectiveness of covered conductor (e.g., ignitions caused by animal contact, balloon contact and vegetation contact have an estimated reduction of ~90% while ignitions caused by vehicle contact, have an estimated reduction of ~0%). This results in an overall estimated effectiveness of 70%.

A summary of the risk reduction estimation methodology is provided in the table below:

Pre-mitigation risk events per 100 miles	12.9
Effectiveness Estimate	70%
Post-mitigation risk events per 100 miles	12.9 – (0.7*12.9) = 3.87
Ignition rate in Tier 3	2.74%
Ignition rate in Tier 2	3.37%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Pre-mitigation Tier 2 ignitions per 100 miles	12.9*3.37% = 0.44
Post-mitigation Tier 3 ignitions per 100 miles	3.87*2.74% = 0.11
Post-mitigation Tier 2 ignitions per 100 miles	3.87*3.37% = 0.13
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.11 = 0.24
Ignitions reduced in Tier 2 per 100 miles	0.44 – 0.13 = 0.31
Miles of mitigation in Tier 3	68.8
Miles of mitigation in Tier 2	13
Ignitions reduced in Tier 3	68.8*0.24/100 = 0.17
Ignitions reduced in Tier 2	13*0.31/100 = 0.04
Total Ignition Reduction Estimate	0.17 + 0.04 = 0.21

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E intends to install covered conductor in the HFTD. As discussed above, however, given the significant mileage that exists, risk-based prioritization of the deployment of these hardening initiatives remains very important. SDG&E utilized an early version of WiNGS (described in Section 4.5.1.4) to identify some circuit segments to pivot from bare conductor hardening to covered conductor hardening based on the risk analysis conducted in the model. As it continues to scope specific covered conductor projects, SDG&E plans to utilize its WiNGS model to both evaluate mitigation alternatives and prioritize the deployment of mitigations at the circuit segment level.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E completed its first covered conductor installation, hardening approximately 1.9 miles of line. Given the success of the pilot installation, SDG&E is moving forward with the program and has plans to harden 20 miles of covered conductor in 2021, and 60 miles of covered conductor in 2022.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

As covered conductor becomes a larger part of SDG&E's system, SDG&E will continue to monitor and measure all performance indicators that impact the efficiency of this mitigation, including the measured effectiveness (number of faults per operating year per mile relative to the unhardened system averages) and the cost per mile.

7.3.3.4 Covered conductor maintenance

Please see Section 7.3.4.1 below, which discusses maintenance of distribution overhead equipment.

7.3.3.5 Crossarm maintenance, repair, and replacement

Crossarm maintenance, repair, and replacement is covered by SDG&E's detailed Corrective Maintenance Program inspections discussed in Section 7.3.4.1 below.

7.3.3.6 Distribution pole replacement and reinforcement, including with composite poles

Risk to be mitigated */ problem to be addressed*

SDG&E's Pole Replacement and Reinforcement program replaces deteriorated wood distribution poles, as well as other asset-related components identified through SDG&E's various inspection programs (e.g., CMP and HFTD Tier 3 Inspections) in an effort to reduce the risk of ignitions. With respect to poles, damage is attributed to numerous factors including, the loss of original preservative treatment experienced with Penta-Cellon poles, the presence of fungi decay, and bird or termite damage. In addition to poles, any issues that are identified through various inspections are remediated to timely clear potential infractions and vulnerabilities in SDG&E's system. To do this, jobs are created and sent to SDG&E's various districts, where they are then addressed and cleared. This process mainly consists of internal labor and fixing or replacing various equipment, as needed. Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process.

All SDG&E pole replacements under this program are audited 100% by SDG&E's Civil/Structural Engineering department. This includes field verifying what was constructed and verifying pole load calculations for compliance. For pole reinforcements, SDG&E's Construction Services department performs audits on 10% of those that are reinforced. If there are any issues found, those issues are routed back to the district or contractor who performed the work to be resolved in a timely manner. All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. In addition, SDG&E's QA/QC department performs a 100%

audit on all wildfire mitigation projects that impact structure loads or conductor clearance to ensure quality. Should any component of a project not meet standards, it is identified as a punch list item that must be resolved before construction contracts are completed and final payments are made to contractors. SDG&E's QA/QC department is independent of SDG&E's Construction Services department that manages the project and contractors. This process ensures SDG&E receives a quality construction product.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Pole replacements associated with deteriorated structures found on these intrusive inspections reduce the risk of ignitions by preventing wood pole failures. In addition, replaced poles are constructed to SDG&E's improved site-specific design criteria, (e.g., wood poles will be replaced with steel poles that meet the known local wind conditions of a particular area). For poles identified for replacement in Tier 3 of the HFTD, SDG&E intends to accelerate the replacement (including the design, engineering, and construction of the new structures) faster than the six-month time frame required by the Commission's General Orders.

This initiative does not have its own RSE because it is part of the various asset inspection programs. RSEs for those programs are provided in Attachment B, Table 12.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E monitors reliability and ignition data due to deteriorated structure failures throughout its service territory with a focus on expediting those in the HFTD. The Pole Replacement and Reinforcement program has been successful at mitigating this risk, with only one electrical fault and zero ignitions associated with deteriorated wood poles in the last five years. SDG&E has been executing its GO 165 maintenance program for many years. In 2020, SDG&E is on track to replace approximately 600 structures within the HFTD.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2021 and 2022, the wood pole intrusive inspections are cycling through structures located in the HFTD based on the inspection cycles (e.g., 3 or 5-year cycles). SDG&E plans to continue to expedite pole replacements in the HFTD. In 2020, SDG&E was able to expedite a significant amount of pole replacement jobs well before the six-month timeframe required by the Commission's General Orders. This plan also includes expediting pole replacements in the HFTD Tier 2.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12. Costs for this program have been allocated to the inspection and repair program that required the pole replacement. This is represented by the capital cost category under the

different inspection and maintenance programs under the Asset Management Category of this WMP Update.

Future improvements to initiative

SDG&E plans to continue its mandated and enhanced inspection programs over the next 10 years. Regular inspections and subsequent remediations are a critical piece of preventing potential equipment failures, faults, and ignitions. Expected structure replacement forecasts are adjusted annually based on the latest inspection data results, and the location and number of assets contained in specific inspection cycles.

7.3.3.7 Expulsion fuse replacement

***Risk to be mitigated** / problem to be addressed*

SDG&E's distribution system is dynamic and can experience events that result in a fault, which may serve as an ignition source. When the distribution system experiences a fault or overcurrent, there are fuses connected to the system to protect its integrity and isolate the fault. These expulsion fuses are designed to operate by creating a significant expulsion within the fuse, resulting in the fuse opening and isolating the fault, and in turn limiting further damage to other equipment. Because of this internal expulsion, the fuses are equipped with a venting system that sends a discharge of energy out of the fuse and into the atmosphere. This external discharge has the potential to ignite flammable vegetation.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's fuse replacement program replaces existing expulsion fuses that operate as described above with new more fire safe expulsion fuses that are approved by CAL FIRE and reduce the discharge expelled into the atmosphere, reducing the chance of a fuse operation leading to an ignition. Since the program began in 2019, SDG&E has measured the fuse operations of the new CAL FIRE approved fuses. As described in Section 4.4.2.4 above, SDG&E's research has shown 139 fuse operations with zero ignitions. While there are currently not enough samples relative to historical fuse operations to demonstrate statistical significance, the early effectiveness results are promising and in alignment with SDG&E expectations for this program.

Risk Reduction Estimation Methodology

Over the three-year period of the SDG&E's 2020 WMP cycle, covered conductor is expected to reduce 0.6 ignitions annually. Based on the early results of the study described above, SDG&E is utilizing a 100% effectiveness measure for CAL FIRE approved fuses. Because SDG&E plans to complete this mitigation, replacing all expulsion fuses within the HFTD by 2022, it is calculated that all ignitions from this cause will be mitigated.

A summary of the risk reduction estimation methodology is provided in the table below:

Tier 2 operations of expulsion fuses (2015-2019 average)	145.2
Tier 3 Operations of expulsion fuses (2015 – 2019 average)	120.4
Pre-Mitigation Ignitions Tier 2 (2015 – 2019 average)	0.4
Pre-Mitigation Ignitions Tier 3 (2015 – 2019 average)	0.2
Tier 2 Fuses	6799
Tier 3 Fuses	4342
Post Mitigation Ignitions	0
Ignition reduction	.2+.4 = .6

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

It is SDG&E's intention to replace a total of 11,000 fuse throughout the HFTD. Prioritization started with Tier 3 and moved to Tier 2. Due the high volume of replacements, projects are bundled based on geographic proximity for construction efficiency and to reduce outages when required.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E kicked off this program in 2019 and replaced 2,490 fuses. In 2020, SDG&E replaced 3,179 (with a focus in Tiers 3 and 2 of the HFTD), bringing the total replaced to 5,669 out of the 11,000 total populations of such fuses in the HFTD. The target for 2021 is 4,000 fuses, which will be primarily in Tier 2 of the HFTD with minor work remaining in Tier 3. While Tier 3 remains the priority, the remaining work in Tier 3 are jobs that are more difficult to execute due to access or permitting issues. SDG&E continues to work through these jobs to see them to completion, however, work on the Tier 2 jobs will continue in parallel to maximize productivity and make progress to the final goal of replacing all expulsion fuses within the HFTD.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

As technology changes and new innovative ideas are introduced into the industry, SDG&E will continue to evaluate products to enhance its system and potentially incorporate new devise with optimum features. Such new devices may lead to modifications for future installations.

7.3.3.8 Grid topology improvements to mitigate or reduce PSPS events

7.3.3.8.1 PSPS sectionalizing enhancements

Risk to be mitigated */ problem to be addressed*

As described in Section 8 below, SDG&E utilizes Public Safety Power Shutoffs as a last resort mitigation during extreme weather conditions where the probability of ignition is much higher than normal and the consequences of ignitions due to high winds and dry conditions can and have been catastrophic. While SDG&E believes the last resort utilization of this mitigation is necessary and the right thing to do for the safety of SDG&E's customers and communities, SDG&E also understands that widespread power outages with longer than typical durations can have negative economic and societal impacts and should be limited as much as feasible to the specific areas that are experiencing the extreme risk.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's PSPS sectionalizing enhancement program strategically installs switches in locations that allow for more customers to remain energized during PSPS by improving the ability to isolate high-risk locations. Examples of this include installing switches on circuits that have significant portions of the circuit undergrounded, allowing the customers with the lower risk underground infrastructure to remain energized while the switch isolates the high-risk overhead portion of the circuit. In other cases, certain portion of circuits are more susceptible to experiencing extreme wind than other parts of the circuit, thus combining weather stations with sectionalizing devices enables SDG&E to de-energize only the sections of circuits that are actually experiencing the extreme wind, rather than the entire circuit. The effectiveness of these mitigations is measured in customers who will no longer experience a PSPS event assuming weather conditions similar to prior PSPS events. An alternative to installing the sectionalizing equipment was inaction, however, the PSPS sectionalizing enhancement program allows for SDG&E to strategically target areas of high risk during a PSPS event. By adding in remote sectionalizing devices within the HFTD, SDG&E is able to reduce the number of impacted customers based on past weather events. Distribution equipment replacement process are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 7.3.8 below. Projects within the program were developed and prioritized by the PSPS Mitigation Engineering team described in Section 7.3.8.4.2 below.

Risk Reduction Estimation Methodology

Over the three-year period of the SDG&E's 2020 WMP cycle, the PSPS Sectionalizing Program is expected to reduce PSPS impacts by a total of 15,027 customers. This number includes the 5,773 customers mitigated by 2020 sectionalizing projects during 2020 PSPS events as well as the new sectionalizing projects planned for 2021 and 2022 with estimated customer savings of 5,145 and 4,109 respectively. This is calculated per project by the difference between customers de-energized by the previously used PSPS device and the customers de-energized downstream of the new one. This includes some customers that have never experienced a PSPS, but have a probability of PSPS. Because sectionalizing customer savings vary due to weather-dependency and resulting differences in switch plans, the effectiveness of this mitigation is estimated to be 50%.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E utilizes lessons learned from historical PSPS utilization to identify and prioritize locations for switches. This typically means installing switches in the HFTD, and SDG&E has made significant progress in this area as described in the next section. But as recent weather patterns have become more extreme and widespread as experienced in October 2019 and December 2020, SDG&E is utilizing the lessons learned from those events to place switches with the goal of limiting PSPS exposure in future years, which includes locations in the HFTD and wildland urban interface.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E has installed approximately 303 remote sectionalizing devices combined with over 214 weather stations, which typically allows SDG&E to execute PSPS events at a circuit segment level rather than utilizing whole circuits or substations. In 2019, SDG&E installed seven switches and in 2020, 23 were installed (well exceeding its target of 10). SDG&E was able to exceed its target in 2020 due to the opportunities developed by the PSPS Mitigation Engineering team and aggressively replacing the highest impact switches before the 2020 fire season. The target for 2021 will be 10 PSPS sectionalizing devices.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Through the PSPS events which have occurred in SDG&E's service territory since 2013, SDG&E demonstrated how remote sectionalizing devices combined with a dense weather station network can limit the impacts of PSPS only towards those customers with the highest risk. SDG&E has over 183,000 customers located within its HFTD, but because of SDG&E's hardened transmission system, weather station network, and remote sectionalizing devices, only a small

percentages of those customers are exposed to PSPS events during the highest risk system conditions, and only if they are the customers exposed to the risk on a particular high wildfire threat day. Going forward, SDG&E will continue this program with the goal of reducing PSPS impacts using the most relevant data, including the recent PSPS events of December 2020.

7.3.3.8.2 Microgrids

Risk to be mitigated */ problem to be addressed*

The decision to de-energize a power line is a last resort solution to reduce the risk of utility infrastructure causing a catastrophic wildfire. PSPS events result in impacted customers being without power for anywhere from a few hours to up to multiple days for a single event. Microgrids provide power continuity to customers during both planned and unplanned outages. Specifically, during PSPS events, this results in reduced duration and severity of disruption to customers' electric service. The reduction of PSPS impacts is key to increasing resiliency and reliability to customers. This is especially important for critical facilities, as they provide firefighting resources and life-saving services among other things, and AFN customers some of who require medical devices to be powered 24 hours a day, seven days a week.

Historical analysis of areas impacted by PSPS events highlight specific communities which are compared against the grid hardening strategy. SDG&E evaluates these communities against recent or future grid hardening strategies to determine if additional mitigations should be considered to reduce PSPS impacts to customers. Specific customer information, such as classification as a critical facility, is used to appropriately determine the need to install additional resiliency tools to reduce PSPS impacts to customers.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

As part of SDG&E's wildfire risk modeling assessment described in Section 4.5.1.1 above, microgrids are a tool to reduce the impacts of PSPS events to customers. Microgrids are designed to meet the identified customers' load needs for the duration of a PSPS event. While other solutions may be the preferred approach from a wildfire risk reduction perspective (e.g., undergrounding), those options may not be technically feasible or the most cost-effective solution. For instance, customers who are located far away from a substation or central source of generation would require additional mileage of undergrounding that can be cost-prohibitive.

Additionally, customers may be located in a geographical area that makes digging undergrounding physically not feasible, whether from hard rock or from an environmental or cultural perspective. When these situations arise, SDG&E evaluates other solutions to reducing the PSPS impacts to customers, which can include designing and building a microgrid that can be electrically isolated during a PSPS event and offer reliable electric service to customers and allow SDG&E to use de-energization of power lines as a wildfire risk mitigation solution.

Risk Reduction Estimation Methodology

Over the three-year period of the SDG&E's 2020 WMP cycle, microgrids are expected to reduce PSPS impacts to a total of 662 customers. This number is calculated based on the locations of microgrids and the customers they serve and is used to estimate the reduction in PSPS impact to calculate the RSE in Table 12. Because microgrids are designed to keep those customers energized throughout the duration of a PSPS event, the effectiveness of the mitigation is estimated to be 100%.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E uses a combination of data including, but not limited to, the risk of wildfire from overhead infrastructure, feasibility of alternative solutions such as undergrounding distribution infrastructure, and historical PSPS impact data to guide the targeted customers. This analysis is performed in concert with determining if a traditional overhead hardening or undergrounding solution could mitigate both the wildfire and PSPS impact risks. Additional information such as identification of critical facilities or AFN customers is incorporated into prioritizing targeted locations for a potential microgrid project.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, four microgrids sites were deployed at the following locations: Ramona Air Attack Base, Cameron Corners, Shelter Valley, and Butterfield Ranch. SDG&E has completed the temporary configuration (conventional generators) for these microgrids and plans to have the permanent renewable solution in service prior to the 2022 WMP Update. For 2021, SDG&E has identified two additional locations for further evaluation in coordination with the other grid hardening efforts discussed herein. The community of Sherilton Valley is a low-income community, including medical baseline customers, located in Tier 3 of the HFTD, and was consistently impacted by PSPS events due to overhead distribution line exposure to extreme weather conditions. The second identified location for a potential microgrid is Campo. This community is a low-income community in Tier 3 of the HFTD located in the eastern part of San Diego County. The town of Campo is home to a Feeding America distribution center. Feeding America is the nation's largest domestic hunger-relief organization, and the distribution center located in Campo requires electricity to power the refrigeration to keep perishable food items fresh for delivery to various food banks throughout San Diego County. Dependent upon final engineering and design of the microgrids, these two additional locations would include either a single battery energy storage solution or combination of solar plus battery energy storage to provide power continuity to customers during the PSPS events.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Currently, microgrid benefits include the PSPS impact reduction to the customers located within the microgrid boundary by providing power continuity and wildfire risk reduction if overhead infrastructure is removed as part of the microgrid design. With the continued development of the WiNGS model, SDG&E plans to explore potential use of the segment-level risk analysis to inform identification of additional microgrid sites in the future as a potential alternative to other initiatives such as grid hardening. As the WiNGS model is still in the early stages of development, the implementation of microgrid enhancements will be further refined in the coming years.

7.3.3.9 Installation of system automation equipment

Risk to be mitigated */ problem to be addressed*

SDG&E operates and maintains nearly 3,500 miles of overhead distribution circuit miles within the HFTD, and has already hardened approximately 850 miles or 25%. This aging infrastructure was originally designed to meet GO 95 requirements of an 8 psf or 55 mile per hour transverse wind load. As SDG&E's weather network and understanding of risk grew, SDG&E learned that winds can reach 85 mph to 111 mph in certain areas throughout the HFTD portion of its service territory during extreme Santa Ana conditions. The aging infrastructure makes these lines more suspectable to equipment failures and the high winds and outdated design techniques makes these lines more vulnerable to foreign object in line contacts, which are both risk events that could lead to ignitions.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's Advanced Protection (AP) program develops and implements advanced protection technologies within electric substations and on the electric distribution system. AP aims to prevent and mitigate the risks of fire incidents, create higher visibility and situational awareness in fire-prone areas, and allow for the implementation of new relay standards in locations where protection coordination is difficult due to lower fault currents attributed to high impedance faults.

More advanced technologies, such as microprocessor-based relays with synchrophasor/phasor measurement unit (PMU) capabilities, real-time automation controllers, auto-sectionalizing equipment, line monitors, direct fiber lines, and wireless communication radios comprise the portfolio of devices that SDG&E installs in substations and on distribution circuits to allow for a more comprehensive protection system along with greater situational awareness via SCADA in the fire-prone areas of the HFTD. This portfolio of advanced technology allows SDG&E to implement new protection systems, such as:

- **Falling Conductor Protection (FCP)** designed to trip distribution overhead circuits before broken conductors can reach the ground energized;
- **Sensitive Ground Fault Protection** for detecting high impedance faults resulting from downed overhead conductors that result in very low fault currents;
- **Sensitive Profile Relay Settings** enabled remotely on distribution equipment during red flag events to reduce fault energy and fire risk;
- **High Accuracy Fault Location** for improved response time to any incident on the system;
- **Remote Event Retrieval and Reporting** for real-time and post-event analysis of system disturbances or outages;
- **SCADA Communication** to all field devices being installed for added situational awareness;
- **Increased Sensitivity and Speed of Transmission Protection Systems** to reduce fault energies and provide swifter isolation of transmission system faults; and
- **Protection Integration with Distribution Communications Reliability Improvements (DCRI)** as a means of facilitating the communication infrastructure needs (note: this activity is further described below).

The installation of equipment capable of enabling schemes such as FCP allows for the remaining technologies mentioned in the list above to likewise be enabled. Further, it should be noted that these technologies continue to be researched and developed, and therefore are subject to upgrades to increase functionality. These potential advancements may impact cost forecasts.

SDG&E tracks reliability event data as well as ignition data for both transmission and distribution lines. SDG&E's advanced protection program is designed to reduce the risk of transmission or distribution risk events leading to an ignition. To evaluate the effectiveness of this mitigation, SDG&E would expect to see the ratio of faults leading to ignition to decrease over time.

Risk Reduction Estimation Methodology

Falling conductor protection can sense a break in conductor, and isolate a fault before it occurs. This mitigation is then focused mitigating risk events associated with wire downs. To calculate the benefit of this mitigation, SDG&E utilized the five-year average of wire down activities unmitigated by other mitigations such as hot line clamps, the ignition percentages within the Tier 2 and Tier 3 HFTD, and the percent of circuits that would be enabled with falling conductor protection by the end of the 2022 WMP period. This results in an expected 0.35 ignitions reduced per year based on the current deployment forecast after the three-year period of the plan.

Details of the calculation are provided below.

Tier 2 wire downs (2015-2019 average)	19.1
Tier 3 wire downs (2015 – 2019 average)	16.5
Ignition rate Tier 2 (2015 – 2019 average)	3.37%
Ignition rate Tier 3 (2015 – 2019 average)	2.74%
Ignitions reduced Tier 2	19.1*3.37% = .65
Ignitions reduced Tier 3	16.5*2.74%=.45
Tier 2 circuits enabled (2020-2022)	0
Tier 3 circuits enabled (2020-2022)	22
Total Tier 2 circuits	54
Total Tier 3 circuits	28
Ignitions reduced Tier 2	(0/54)*.65 = 0
Ignitions reduced Tier 3	(22/28)*.45= .35

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

From 2020 to 2022, AP aims to replace aging substation infrastructure such as obsolete 138kV, 69kV, and 12kV substation circuit breakers, electro-mechanical relays, and Remote Terminal Units (RTUs). New circuit breakers incorporating microprocessor-based relays, RTUs, and the latest in communication equipment facilitating the requirements of SDG&E's advanced protection systems will be installed in SDG&E substations within the HFTD. On distribution circuits within the HFTD, AP coordinates with the overhead system hardening programs to strategically install or replace sectionalizing devices, line monitors, direct fiber lines, and communication radios to facilitate the requirements of SDG&E's advanced protection systems.

Progress on *initiative (amount spent, regions covered) and plans for next year*

In 2020, the Advanced Protection program focused on hardening projects in HFTD Tier 3 and 2 areas. Accomplishments in 2020 include design initiation of 7 substations and 6 circuits, with 8 substations and 6 circuits energized. Equipment replaced totaled 13 circuit breakers, 13 electro-mechanical or incompatible relays, and 2 RTUs. 7 new distribution reclosers were installed to increase sectionalizing in support of falling conduction protection and PSPS.

During 2021, the program is forecasted to initiate hardening designs on 10 substations and 8 circuits, with 6 substations and 8 circuits energized. Equipment to be replaced totals 16 circuit breakers, 16 electro-mechanical or incompatible relays, and 3 RTUs. 25 new distribution reclosers are forecasted to be installed.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Improvements to Advanced Protection technology include expanding FCP to include two-phase and single-phase distribution circuits, further extending branch circuit protection. The program will also begin migrating new FCP communication designs to leverage the Company's private LTE communication initiative to improve wireless network coverage, increase path resiliency and optimize deployment cost.

Two new pilot projects in support of the Advanced Protection mission include Early Fault Detection (EFD) and Wire Down Detection (WDD). Early Fault Detection technology has demonstrated the ability to detect and diagnose circuit failure threats remotely before an event occurs. The system shows promise in providing an extremely accurate pre-emptive tool to improve situational awareness and actively monitor circuit risk profiles. Two EFD circuits have been selected, with design and construction currently in progress. Wire Down Detection is an innovative pilot concept which leverages the Company's existing automated metering infrastructure (AMI) network, providing "near time" analysis of circuit events. Both EFD and WDD pilots, once proven, will enhance FCP deployments in support of wildfire mitigation.

7.3.3.10 Maintenance, repair, and replacement of connectors, including hotline clamps

Risk to be mitigated */ problem to be addressed*

Through equipment failure analysis related to wire down outages, SDG&E has identified high risk connectors known as "hotline clamps" that SDG&E intends to replace as part of this program. These hotline clamps have been identified because they have been associated with creating a weak connection resulting in a wire down event. This wire down event can lead to an energized wire on the ground or coming into contact with a foreign object, thus becoming an ignition source.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

As SDG&E explained above, hotline clams have been associated with creating a weak connection that has resulted in wire down events. This initiative replaces these hotline clamp connections with compression connections to eliminate the risk of the wire down failure associated with hotline clamps, which in turn will reduce wire down events and ignitions associated with connection failures. An alternative SDG&E considered was inaction.

Risk Reduction Estimation Methodology

SDG&E estimated the risk reduction from this program by considering the historical wire downs associated with connection failures, the ignition percentages within the HFTD, and the amount of replacement expected completed by the end of 2022. Below is a summary of the calculation that shows .052 ignitions reduced over the three-year WMP period.

Tier 2 wire downs (2015-2019 average for connector failures)	1.27
Tier 3 wire downs (2015-2019 average for connector failures)	1.13
Ignition rate Tier 2 (2015 – 2019 average)	3.37%
Ignition rate Tier 3 (2015 – 2019 average)	2.74%
Ignitions reduced Tier 2	1.27*3.37%= .043
Ignitions reduced Tier 3	1.13*2.74%= .031
% Tier 2 HCL replaced (2020-2022)	88.1%
% Tier 3 HCL replaced (2020-2022)	53.3%
Ignitions reduced Tier 2	.043*88.1% = .036
Ignitions reduced Tier 3	.031*53.3%= 016
Total Ignitions Reduced	.016+.035= .052

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E is focusing this initiative in the HFTD portion of its service territory. Tier 3 of the HFTD is prioritized over Tier 2 areas. Due the high volume of replacements, projects are bundled based on geographic proximity for construction efficiency and to reduce outages when required.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E replaced 694 hotline clamps in 2019 and 2,061 in 2020 (exceeding the target of 1,650). To date, SDG&E has replaced 2,758 hotline clamps of the 8,500 identified in the HFTD, approximately 32%. SDG&E plans to replace 1,650 clamps in 2021. At the current pace, SDG&E will complete this program by the year 2024.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

As technology changes and new innovative ideas are introduced into the industry, SDG&E will continue to evaluate products to enhance its system and potentially incorporate new devise with optimum features. Such new devices may lead to modifications for future installations.

7.3.3.11 Mitigation of impact on customers and other residents affected during PSPS events

As SDG&E has explained, PSPS is a last resort measure used in extreme weather conditions to prevent utility infrastructure from causing ignitions that may lead to catastrophic wildfires. SDG&E understands that implementing a PSPS leaves impacted customers without power, which introduces additional challenges for impacted customers who rely on power to charge devices for communication needs, for pumping water to enable proper hygiene and hydration, run electric space heating, and numerous other potential medical needs. SDG&E strives to not only mitigate wildfire risk, but the customer impacts inherent with PSPS.

To address the impacts associated with the use of PSPS, SDG&E continues to innovate and iterate on customer focused resilience measures and organizes these customer offerings into three categories: Resiliency Grant Programs, Standby Power Programs, and Resiliency Assistance Programs.

These three areas of focus encompass a wide array of resilience focused solutions and through ongoing development, lead to reduced PSPS impacts to customer. Not only do these measures prepare customers for PSPS events, but they help to educate customers on how to properly and safely use backup power solutions.

SDG&E relies on its historical PSPS impact data to guide the targeted regions for these resilience focused solutions. Regarding customer resiliency programs, customers located within Tier 3 of the HFTD are of the highest priority, followed by Tier 2 of the HFTD, and finally extending beyond to other areas of risk. Additional priority is given to regions that are fed by circuits with higher PSPS historical impacts. For example, two customers residing in Tier 3 may be targeted differently due to one customer being fed by a circuit with less than a single PSPS while another customer still within Tier 3 might be given higher priority due to experiencing more than two historical PSPS events. SDG&E takes prioritization of specific regions to the next level through the development of an in-house grid hardening focused model (WiNGS), which is discussed in more detail in Section 4.5.1.4 above. WiNGS is used and will continue to be used to prioritize regions and specific customers based upon risk profile and cost effectiveness of various solutions.

Additionally, please see Section 8.4 for additional customer impact mitigations SDG&E uses during PSPS events. For specific progress on initiatives, see subsequent Sections 7.3.3.11.1 through 7.3.3.11.3 below.

7.3.3.11.1 Resiliency Grant Programs

Risk to be mitigated */ problem to be addressed*

SDG&E's Resiliency Grant Programs focus on enhancing resiliency among the most vulnerable customer segments in the SDG&E territory. The primary program in this category is the Generator Grant Program (GGP), which was launched in 2019 as a customer resiliency program focused on the needs of the Medical Baseline (MBL) customer segment in Tier 3 of the HFTD who previously experiences a PSPS outage. The objective of the GGP is to provide backup power sources that can both mitigate safety and health risks, as well as overall impacts experienced during de-energization incidents.

In 2020, SDG&E expanded this program to empower a greater number of AFN customers with additional tools and resources to mitigate impacts of PSPS. Among vulnerable populations in the SDG&E territory, a key target group of customers with a heightened risk to health and medical needs are those customers enrolled in the Medical Baseline Program (MBL) and reside in the HFTD. MBL households include members who have a certified medical condition that requires a medical device with a need for a constant or sporadic power source to function. Examples of these devices include dialysis machines, electric wheelchairs, apnea monitors, pacemakers, and others.

In both 2019 and 2020, MBL customers were offered a portable battery unit with a solar charging capability, to achieve additional resiliency during PSPS events. The objective of the GGP is to provide backup power sources that can both mitigate safety and health risks, as well as overall impacts experienced during de-energization incidents. Portable battery units delivered to customers through GGP demonstrate SDG&E's desire to leverage cleaner, renewable generator options that enable vulnerable customers to enhance their personal emergency plans with a means to keep small devices and appliances charged and powered during PSPS events.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

To optimize available program resources to vulnerable customers with highest need, in 2019 and 2020 the GGP program was targeted to Medical Baseline customers who have experienced a previous PSPS outage, as it is one of the best indicators of propensity of future outage, thus contributing efficiently to improving overall customer resilience.

In 2020, approximately 1,864 MBL customers with a previous 2019 PSPS outage were invited to participate in the program, and 1,409 portable battery units were delivered to customers between May and October 2020. This high customer response rate of about 76% for the 2020 program was an extremely high success metric that was borne out in post-program surveys for the program that validated the high customer satisfaction with this program.

For customers who opted into the 2020 GGP program, 81% were able to use the battery during a PSPS event, and 96% of customers state that they now feel “very” or “extremely” prepared for a future PSPS event. This population included every customer who experienced a PSPS while being enrolled as an MBL customer in 2019. Of the delivered units, 75 units were provided specifically to master-metered MBL customers who lived in Mobile Home Parks, which were impacted by PSPS in 2019. Additionally, 20 generators were made available for “emergency” delivery during larger PSPS events in November and December 2020, for customers experiencing severe medical challenges due to power outages.

Risk Reduction Estimation Methodology

Over the three-year period of the SDG&E’s 2020 WMP cycle, the Resiliency Grant Program is expected to reduce PSPS impacts to a total of 5,420 customers. This number is calculated based on the count of customers that would receive the generator and is used to estimate the reduction in PSPS impact to calculate the RSE in Table 12. Because the generators provided to customers as a part of this program are not whole-facility solutions but rather smaller units that keep specific equipment energized, the effectiveness of the mitigation is estimated to be 40%.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Of the more than 66,000 currently active participants in SDG&E’s MBL program at this time, over 11,000 of these households are in the HFTD. While the 2020 program was able to target all MBL customers impacted by a 2019 PSPS event, large scale PSPS events occurring late in 2020 have expanded the number of MBL customers with the previous PSPS outage. A majority of this newly identified vulnerable population will still be within the HFTD, however, additional eligibility criteria are likely to come into play for the 2021 season, such as HFTD level, as well as the number and length of outages in specific communities. Additionally, SDG&E will explore offering this program to certain eligible utility-identified AFN customers outside of just the MBL program.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The GGP for 2020 concluded with a total of 1,420 battery deliveries made, including the additional emergency units delivered during the November and December 2020 PSPS events. The GGP program served over 30 communities with eligible customers concentrated mostly in Tier 3 and Tier 2 of the HFTD, but also extending to a small group of MBL customers outside established HFTD impacted by PSPS outages. The three largest communities served (Alpine, Ramona and Valley Center) comprised about 55% of all customers in 2020 benefitting from GGP. Based on the large PSPS events in late 2020, the program is anticipated to target 2,000 customers for battery units in 2021. The 2021 GGP is expected to begin offering eligible customers invitations to participate by May 2021.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

For 2021, SDG&E is looking to expand this program to accommodate both the increased number of MBL customers impacted by 2020 PSPS outages, and to include other customers with AFN who may not be currently enrolled in the MBL program, such as those that have "self-reported" disabilities or vulnerabilities. Another potential expansion for the AFN population is the development of emergency, or "real-time" response programs that can address needs for customers in the short time leading up to and during PSPS events. In late 2020, during PSPS outages, two new enhancements to this program were tested: 1) emergency delivery, and 2) resiliency item delivery. While the core GGP program focuses on proactive empowerment of known vulnerable customers, there is also an opportunity to develop some reactive services that are triggered around actual PSPS events. The newly tested enhancements involved delivery of charged GGP batteries to customers who called into the SDG&E Customer Care Centers or 2-1-1 in need of emergency power backup needs that could not be met through other AFN services such as hotel stays and accessible transportation. In two late 2020 PSPS outages, the SDG&E Emergency Operations Center was able to leverage a real-time delivery of a portable battery backup to eight customers in need. In 2021, there is potential to expand this program through a partnership with 2-1-1 to identify and support severely at-risk customers with these deliveries.

7.3.3.11.2 Standby Power Programs

Risk to be mitigated */ problem to be addressed*

In 2020, SDG&E introduced its Whole House Generator Program. This program has been renamed the Fixed Backup Power (FBP) Program. As SDG&E discussed throughout Section 7.3.3.8, this group of initiatives are focused on mitigating the customer impacts of PSPS events. There are a number of customers who will not directly benefit from SDG&E's grid hardening programs in the near future, and this segment of customers, who reside in the HFTD, are included in the Fixed Backup Power Program's target customers for 2020 and 2021. Specifically, this program assists backcountry residences, businesses, and local communities in the HFTD that may not benefit from a near or long-term traditional hardening initiatives.

Depending on the site requirements, feasibility, and cost, a customer could be targeted for one of the following offerings. The Fixed Backup Power Program is designed to offer a fixed installation backup generator, while community businesses and organizations may receive a critical facility generator on a temporary basis during an active PSPS (previously known as the Critical Facility Generator Program per the 2020 WMP), and clubhouse or central community building at mobile home parks may receive a solar panel and battery backup system.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

As discussed above, SDG&E's Standby Power Programs target customers and communities that will not directly benefit from other current grid hardening programs. Since these customers reside in the backcountry and are so widely distanced from one another, SDG&E's grid hardening initiatives will not reduce the PSPS impacts to this subset of customers. The intention is to help certain customers (who have experienced a PSPS event in the past and reside in the HFTD) in becoming more resilient to PSPS events, while also reducing wildfire risk.

Particularly regarding cost and time that is required for such rural communities, installing fixed standby generators is the most efficient option, as opposed to underground and overhead power-line installations; it would prove to be ineffective (no guarantee that these powerlines would not be shut off during a PSPS event) and costly if SDG&E were to attempt traditional grid hardening measures. Providing standby generators is the most efficient remedy for customers likely to experience PSPS events, as identified by this program.

Risk Reduction Estimation Methodology

Over the three-year period of the SDG&E's 2020 WMP cycle, the Standby Power Program is expected to reduce PSPS impacts to a total of 900 customers. This number is calculated based on the count of customers that would receive the generator and is used to estimate the reduction in PSPS impact to calculate the RSE in Table 12. Because the generators provided to customers as a part of this program are whole-facility solutions that are expected to keep the customers energized throughout a PSPS event, the effectiveness of the mitigation is estimated to be 100%.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

In assessing which communities would benefit most from these programs, SDG&E reviewed areas in the HFTD that have been highly impacted by frequent PSPS events in the past. Based on this review, SDG&E found that Julian, Santa Ysabel, Descanso, Potrero, and Ramona communities were the highest impacted, and therefore, could benefit most from this resiliency program.

The intention is to target customers within these high-risk communities where there is a historical risk of PSPS events. SDG&E intends to move from one community to the next in order to build resilience across the most vulnerable populations and customer segments.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The Standby Power Programs are relatively new initiatives and as such, SDG&E is tracking all aspects of the program to effectively document lessons learned, which will be incorporated in subsequent program years. Currently, 75 residences are confirmed to have installed generators

as of the end of 2020, including one commercial site. The targeted residences, communities, and commercial buildings reside in Julian, Santa Ysabel, Descanso, Potrero, and Ramona.

For 2021, SDG&E plans on increasing the goal of 2020 from 300 generator installations to 413. SDG&E anticipates the 2021 program year to incorporate a portion of the remaining 2020 sites that will not complete construction by end of year 2020 and the full target of approximately 300 additional sites in 2021.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E plans to extend its Standby Power Programs well into 2022. SDG&E has established a streamlined process and plans to maintain and improve it going forward. Specifically, SDG&E has collaborated with the County of San Diego (and the third-party contracting company involved with these programs) to streamline residential permitting—a process that used to take anywhere from four to eight weeks, reducing it down to a two- to three-week process. Also, in discovering the extended permitting and installation processes involved with specific commercial/community buildings (like schools and mobile home parks), SDG&E intends to start these projects earlier in the year in preparation for the timelier site assessments, permitting, and installations. SDG&E will continue to explore enhancements to this category of customer initiatives through evaluation of customer feedback and lessons learned.

7.3.3.11.3 Resiliency Assistance Programs

Risk to be mitigated */ problem to be addressed*

The final area of Customer Resiliency programs is the Generator Assistance Program (GAP), referred to in the 2020 WMP as the "Expanded Generator Grant Program." The objective of this category of customer offerings is to expand the focus to the greater market of SDG&E customers who have recently been impacted or may be impacted by PSPS outages in years to come. While the Resiliency Grant Programs address the needs of the most medically vulnerable and the Standby Power Programs focus on the segment of customers that do not have other SDG&E grid hardening initiatives planned in their area to mitigate impact of PSPS outages, the Generator Assistance Program expands resilience opportunities to the general market in HFTD and beyond.

In July 2020, SDG&E launched its GAP program, which was its first ever program to offer point of sale rebates for portable generators. Using a similar model to Energy Efficiency rebates offered on customer programs promoting products like programmable thermostats, GAP was launched to offer rebates for a wide array of dual-fuel (gas-propane) portable generators that are available in local "big box" stores. To streamline the process for customers during a year

where COVID-19 protection measures were critical, a customer who was invited to the program could download a coupon online, choose a retailer, then choose between the delivery channel of their choice: direct delivery to their home, order with store pickup, or in standard in-store shop and purchase.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

In 2020, SDG&E marketed the Generator Assistance Program to customers in the HFTD who had experienced a 2019 PSPS outage with an offer for a rebate on a portable generator. While SDG&E has years of experience implementing similar Energy Efficiency program measures, the lessons learned in 2020 through direct interactions with customers in implementing multiple brand-new customer resiliency programs has been invaluable. Through a series of email and letter invitations to customers in the summer of 2020, SDG&E has been able to engage, educate and offer customers new options to enhance their own personal emergency preparedness plans for PSPS events.

Risk Reduction Estimation Methodology

Over the three-year period of the SDG&E's 2020 WMP cycle, the Resiliency Assistance Program is expected to reduce PSPS impacts to a total of 3,774 customers. This number is calculated based on the count of customers that are expected to purchase generators through the rebate program and is used to estimate the reduction in PSPS impact to calculate the RSE in Table 12. Because the generators purchased through this program vary depending on the customer's preferences, the effectiveness of the mitigation is estimated to be 75%.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The 2020 GAP program focused on a broad market of residential and small business customers impacted by recent PSPS events across the HFTD. This being SDG&E's first generator rebate program, the objective was to cast a wide net to those with the highest propensity for a future outage, while offering a generous rebate as an incentive for customers to prepare themselves with backup power sources. The program offered a $300 rebate to customers who met the basic eligibility criteria of residing in an HFTD zone and having experienced a recent outage. In addition, for CARE customers meeting these criteria, an enhanced rebate about of $450 was offered. This enhanced rebate allows for a 70-90% discount on the average portable generator models for lower income customers, and the program success was evidenced in finding that CARE customers interested in the program redeemed with a purchase at 33% higher rate than customer eligible for a general market rebate in 2020. The 2021 GAP program will continue to target low income customers with enhanced rebates.

***Progress on initiative** (amount spent, regions covered) and plans for next year*

While final numbers for the 2020 GAP program are still being tallied, the results were very positive for this first-year program. Rebate coupons offered to eligible customers expired December 31, 2020, ending the 2020 program with 2,661 coupons downloaded for an available rebate including 459 CARE customers. Of the coupons downloaded, 1,274 customers redeemed the rebate and purchased a portable generator, including 249 CARE customers (as of late December 2020). These numbers are expected to increase slightly as final 2020 numbers are available from retailers in February 2021. The program was designed to offer a customer resiliency power backup option to the highest PSPS event propensity customers across the HFTD. Customers in 34 communities across the HFTD have participated so far in this program, with about 60% of customers concentrated in larger communities of Valley Center, Ramona, Alpine and Campo. Based on the large PSPS events in late 2020, the program is anticipated to expand eligibility in 2021 well beyond the 28,256 customers targeted in 2020. As PSPS events may occur into early 2021, adding to eligible customer list for GAP 2021, an exact number of eligible customers cannot be determined yet. The 2021 Generator Assistance Program is expected to begin offering eligible customers invitations to participate in the expanded rebate program by May of 2021.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

The Resiliency Assistance Programs in 2021 are expected to be enhanced in several ways. First, based on limited availability of certain generator models in local retailers during 2020 due to nationwide shortages from major weather events, SDG&E will pursue expansion of the type of rebates offered to include additional downstream rebate options to customers. This will allow customers more choice and will also open supply chain options to additional local and national retailers by allowing customers to purchase at their favorite stores and then redeem coupons post purchase. In an effort to provide new cleaner options for customers, SDG&E also plans to add new portable batteries and power stations options to the rebate program, following demonstrated demand for these products at other utilities in California and beyond. Finally, GAP will also include an expanded focus on well pump customers in SDG&E's territory with need for backup power capability during PSPS outages. A partnership with the County of San Diego to identify these customers is underway to target these homes and small businesses. Finally, SDG&E is pursuing new ways to educate and inform customers about smart customer resiliency tips and recommendations. An approach to offering "Resiliency Audits" to customers to self-evaluate PSPS preparedness is also underway and could be offered to both residential and critical facilities customers in 2021. These audit/surveys will inform customers about programs available to solve their unique resiliency gaps, while also gathering critical information from customers on new ways to help prepare them even better in future years.

7.3.3.12 Other corrective action

Please see Section 7.3.4.1 regarding detailed inspections of distribution electric lines and equipment below.

7.3.3.13 Pole loading infrastructure hardening and replacement program

Please see Section 7.3.3.17.1 regarding distribution overhead system hardening below.

7.3.3.14 Transformers maintenance and replacement

Please see Section 7.3.4.1 regarding detailed inspections of distribution electric lines and equipment below.

7.3.3.15 Transmission tower maintenance and replacement

Please see Section 7.3.4.2 regarding detailed inspections of transmission electric lines and equipment below.

7.3.3.16 Undergrounding of electric lines and/or equipment

Risk to be mitigated */ problem to be addressed*

SDG&E operates and maintains nearly 3,500 miles of overhead distribution circuit miles within the HFTD and has already hardened approximately 850 miles or 25%. This aging infrastructure was originally designed to meet GO 95 requirements of an 8 psf or 55 mile per hour transverse wind load. As SDG&E's weather network and understanding of risk grew, SDG&E learned that winds can reach 85 mph to 111 mph in certain areas throughout the HFTD portion of its service territory during extreme Santa Ana conditions. The aging infrastructure makes these lines more susceptible to equipment failures and the high winds and outdated design techniques makes these lines more vulnerable to foreign object in line contacts, which are both risk events that could lead to ignitions.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Strategic undergrounding provides the dual benefits of nearly eliminating wildfire risk for the areas where overhead system is converted to underground and it eliminates the need and impacts of PSPS for customers fed by underground systems. A primary downside of undergrounding is the price, being that it is the most expensive major hardening alternative on a per mile basis, which is why SDG&E recommends a strategic deployment of its underground program. SDG&E seeks to deploy undergrounding in areas where risk is very high as well as in areas where substantial PSPS reductions can be gained through a minimal installation of

underground electric system. The scope of undergrounding work identified in 2022 is informed by the WiNGS model (for details on the model, see Section 4.5.1.4 above).

Risk Reduction Estimation Methodology

To calculate the wildfire risk reduction for strategic undergrounding, SDG&E considered the historical ignitions associated with underground equipment to determine effectiveness, the pre mitigation overhead system risk event rate and ignitions rates, and the underground mileage to be completed within the three-year period. Specifically, the effectiveness of undergrounding was measured by taking total CPUC reportable ignitions associated with underground (of which SDG&E has three, all due to vehicle contacts with pad mounted equipment) and dividing by total ignitions. Based on this analysis, strategic undergrounding is expected to reduce 0.453 ignitions per year and mitigate PSPS impacts to 7,192 customers by the end of 2022.

Below is a summary of the calculation:

Pre-mitigation risk events per 100 miles	12.9
Undergrounding effectiveness	98.1%
Ignition rate in Tier 3	2.74%
Ignition rate in Tier 2	3.37%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Pre-mitigation Tier 2 ignitions per 100 miles	12.9*3.37% = 0.44
Post-mitigation Tier 3 ignitions per 100 miles	.35*(1-98.1%) = .0065
Post-mitigation Tier 2 ignitions per 100 miles	.44*(1-98.1%) = .0081
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.0065 = 0.346
Ignitions reduced in Tier 2 per 100 miles	0.44 – 0.0081=.435
Miles of mitigation in Tier 3	77.5
Miles of mitigation in Tier 2	43
Ignitions reduced in Tier 3	77.5*0.346/100 = 0.269
Ignitions reduced in Tier 2	43*0.435/100 = 0.184
Total Ignition Reduction Estimate	0.269 + 0.184= 0.453

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E plans to utilize its WiNGS model (discussed in Section 4.5.1.4 above) to both evaluate mitigation alternatives and prioritize the deployment of mitigations at the circuit segment level. Underground alternatives will be selected for the highest risk circuit segments and for segments where substance PSPS benefits can be realized.

Progress on initiative *(amount spent, regions covered) and plans for next year*

Including the 13.3 miles from the CNF project, SDG&E installed 29.1 miles of underground cable in 2020 and intends to install 25 miles of underground electric system in 2021. These installations are focused on the HFTD.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Over the next ten years, SDG&E plans to significantly increase its strategic underground scope with a goal to reduce wildfire risk and reduce PSPS event impacts. The strategic underground initiative will continue to evolve as SDG&E gains a better understanding of the costs and constraints involved. Although SDG&E has extensive experience in installation of underground cable, the HFTD areas make this initiative challenging to implement. Some challenges include: difficult terrain, environmental constraints, permitting timelines, and acquisition of easements. Lessons learned from each year's undergrounding accomplishments will help to alleviate some of these constraints through process improvements and stakeholder engagement.

7.3.3.17 Updates to grid topology to minimize the risk of ignition in HFTD

7.3.3.17.1 Distribution overhead system hardening

Risk to be mitigated */ problem to be addressed*

SDG&E operates and maintains nearly 3,500 miles of overhead distribution circuit miles within the HFTD and has already hardened approximately 850 miles or 25%. This aging infrastructure was originally designed to meet GO 95 requirements of an 8 psf or 55 mile per hour transverse wind load. As SDG&E's weather network and understanding of risk grew, SDG&E learned that winds can reach 85 mph to 111 mph in certain areas throughout the HFTD portions of its service territory during extreme Santa Ana conditions. The aging infrastructure makes these lines more suspectable to equipment failures and the high winds and outdated design techniques makes these lines more vulnerable to foreign object in line contacts, which are both risk events that could lead to ignitions.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's Distribution Overhead System Hardening program combines SDG&E's overhead hardening programs formerly known as Fire Risk Mitigation (FiRM), Pole Risk Mitigation Engineering (PRiME), and Wire Safety Enhancement (WiSE) into one program. The one exception to the consolidation of work under this initiative is the distribution hardening component of the CNF project. It will continue to be managed separately from the work

formerly known as FiRM, PRiME and WiSE as all distribution CNF work is expected to be completed in 2021. The consolidation of these hardening programs involves the strategy evolution described in SDG&E's 2020 WMP, and will result in the execution of projects based on a circuit-by-circuit approach that weighs risk inputs alongside the need to reduce PSPS impacts, rather than scoping projects based on specific wire or at-risk poles. Ultimately combining overhead distribution hardening programs into one program will make the engineering, design, construction and management of the projects more efficient and minimize impacts to customers during job walks, construction and post construction close-out activities. The overhead scope will include the replacement of wood to steel poles, replacement of conductor with uncovered (traditional hardening) or covered conductor based on the WiNGS model, and in some case permanent removal of overhead facilities.

As discussed in Section 4.4.2.3 above, SDG&E conducted a research study that measured the effectiveness of bare conductor hardening, and found that it reduced risk events by 47%. Given this is the lowest cost of its major mitigation programs, SDG&E continues to leverage this program as an efficient method to reduce risk for at least one more year. This will allow for one more year of gaining more experience with covered conductor and allowing time to transition from bare conductor scope of work to covered conductor. The decision to harden a section of overhead circuit will be consistent with the risk informed WiNGS model as described in earlier sections that considers wildfire risk reduction and PSPS mitigation impacts to customers and selects the most cost-effective mitigation solutions that maximize the benefit of both goals. Whether the conductor utilized for hardening is bare or covered, it still involves the same rigorous design and engineering process including LiDAR surveys, detailed job walks with key stakeholders, and a rigorous design and engineering process that leverages PLS-CADD engineering software. By using LiDAR survey data and PLS-CADD, SDG&E designs for proper line clearances at all operating temperatures (hot and cold) and ensures that steel poles and other structural components are adequately sized and arranged to withstand the maximum mechanical forces imposed by wind and ice loads (i.e., known local conditions).

SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. In addition, SDG&E's QA/QC department performs an audit on wildfire mitigation projects that impact structure loads or conductor clearance to ensure quality. Should any component of a project not meet standards, it is identified as an item that must be resolved before construction contracts are completed and final payments are made to contractors. SDG&E's QA/QC department is independent of SDG&E's Construction Services department that manages the project and contractors. This process ensures SDG&E receives a quality construction product.

Risk Reduction Estimation Methodology

To determine the estimated ignition reduction for overhead system hardening, SDG&E considered the average historical pre-mitigation risk events, the mitigation effectiveness, the historical ignition rates, and the amount of overhead hardening planned to be completed in the 2020-2022 timeframe. Based on this analysis, this mitigation is estimated to reduce ignitions by 0.365 per year by the end of 2022. Below is a summary of the calculation.

Pre-mitigation risk events per 100 miles	12.9
Effectiveness Estimate	47%
Post-mitigation risk events per 100 miles	12.9 – (0.47*12.9) = 6.91
Ignition rate in Tier 3	2.74%
Ignition rate in Tier 2	3.37%
Ignition rate Non HFTD	1.46%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Pre-mitigation Tier 2 ignitions per 100 miles	12.9*3.37% = 0.44
Pre-mitigation Non HFTD ignitions per 100 miles	12.9*1.46% = .019
Post-mitigation Tier 3 ignitions per 100 miles	6.91*2.74% = 0.189
Post-mitigation Tier 2 ignitions per 100 miles	6.91*3.37% = 0.233
Post-mitigation Non HFTD ignitions per 100 miles	6.91*1.46%=0.101
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.189 = 0.164
Ignitions reduced in Tier 2 per 100 miles	0.44 – 0.233 = 0.202
Ignitions reduced in Non HFTD per 100 miles	0.19 - 0.101 = .087
Miles of mitigation in Tier 3	103.8
Miles of mitigation in Tier 2	92.7
Miles of mitigation in Non HFTD	8
Ignitions reduced in Tier 3	103.8*0.164/100 = 0.170
Ignitions reduced in Tier 2	92.7*0.202/100 = 0.187
Ignitions reduced in Non HFTD	8.0*.087/100 = .007
Total Ignition Reduction Estimate	0.170+ 0.187+ .007 = .365

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The focus of this work will be in fire prone areas including the HFTD Tier 2 and 3, and wildland urban interface as informed by the WiNGS model. In some cases, SDG&E is continuing work previously started and will fully transition to the WiNGS strategy over the course of 2021 and 2022. From the output of the WiNGS model a detailed scope of work is developed with input from SDG&E's operational teams. Once the scope is fully defined the project will be divided

into smaller projects (i.e., sections) so the work can be executed efficiently through the various lifecycle stages. A typical section is composed of approximately 15-45 poles. Each section will have a schedule that outlines the activities (stages) required to complete a project including Stage 1 – Scoping/Project Initiation, Stage 2 – Preliminary Engineering/Design, Stage 3 – Final Engineering/Design, Stage 4 – Pre-Construction, Stage 5 – Construction and Stage 6 – Project Close Out. One of the biggest challenges with SDG&E's projects and execution schedules are the various land and environmental constraints imposed on projects. A single distribution circuit can traverse over multiple landowners including federal, state, and local agencies (i.e., Cleveland National Forest, Camp Pendleton, Bureau of Land Management (BLM)), California State Park, County of San Diego, Caltrans, Indian Tribal Lands, irrigation districts), private properties and conservation easements.

SDG&E often faces environmental constraints that require detailed review and approval processes that can limit the time of year it can operate, dictate the means and methods for construction, or cause re-routing of a section of circuit due to cultural or other environmental concerns. The federal, state, and local agencies often have specific and unique permitting requirements and environmental review and mitigation requirements and often require near final designs before the permitting process can start. In many cases, SDG&E must acquire new land rights or amend existing land rights. These land and environmental activities can impose long durations and uncertainty in our project schedules, but SDG&E leverages previous experience to build accurate schedules and thus forecasts. In some cases, SDG&E must work with its legal counsel to work with a landowner to exercise SDG&E's rights, and in rare cases take them to court. This is also why the execution of projects may not seem logical when looking at the order of work being performed compared to the priority from a risk reduction perspective. Efforts will be made to try to complete the highest risk reduction projects first, but this may not always be possible given the land and environmental constraints noted above.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E completed nearly 100 miles of bare conductor overhead system hardening in 2020, with 42 miles in Tier 3 of the HFTD, 54 miles in Tier 2 of the HFTD, and 4 miles in the wildland urban interface. SDG&E plans an additional 100 miles of bare conductor in 2021, and will ramp down to 35 miles in 2022. While the 2021 forecast represents a change from the overhead hardening plan SDG&E presented in 2020, the reason for the change is due to efficiency. SDG&E had over 100 miles of overhead hardening projects that were in various stages of design in 2020. While SDG&E's updated hardening strategies call for more covered conductor and strategic undergrounding, the added cost of redesigning those in flight bare conductor hardening projects to covered conductor or underground would have lowered the risk spend efficiency of those mitigations (for the inflight projects with additional redesign costs) below overhead hardening. Based on efficiency, more risk per dollar was reduced by completing the inflight traditional hardening programs when faced with redesign. Therefore SDG&E is transitioning to the other alternatives one year later than originally planned.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Future improvements in this initiative will include the continued consolidation of the FiRM, PRiME, and WiSE programs and standardization on processes, procedures, and resources to make the project execution as efficient as possible. As new engineering and design contracts are being awarded, the standardization of processes and procedure are being implemented. SDG&E's dedicated QA/QC teams' roles and responsibilities are also being expanded to include construction review during the preliminary and final design stage and will be present on the job walks. These changes are expected to improve the efficiency, quality and standardization of the project execution.

7.3.3.17.2 Transmission overhead system hardening

- ***Risk to be mitigated*** */ problem to be addressed*

SDG&E has nearly 1,000 circuit miles of overhead transmission that traverses the HFTD. Approximately 800 miles, or 80% of the transmission system within the HFTD, meets SDG&E's hardened design and construction standards. There are still 200 miles of aging transmission infrastructure that were constructed to withstand working loads under stress of 56 miles per hour wind speeds. SDG&E learned from its weather network that wind speeds can reach up to 85 miles per hour throughout the HFTD, and up to 111 miles per hour at some locations. This combination of aging infrastructure and outdated design methodology makes these lines more suspectable to risk events, which may cause an ignition, compared to SDG&E's hardened transmission infrastructure.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's overhead transmission hardening program utilizes enhanced design criteria, enhanced design methods, steel poles over wood poles, high strength conductor, and increased conductor spacing in the HFTD to reduce the chance of risk events and ignitions. As explained in Section 4.4.2.3 above, SDG&E performed a study on 17 transmission lines totaling 190 miles in the HFTD. SDG&E reviewed 20 years of reliability performance from 2000 to 2019. SDG&E compared reliability performance in risk events per operating year per 100 miles before and after overhead transmission hardening and found an 83% reduction in risk events on hardened infrastructure.

Risk Reduction Estimation Methodology

SDG&E utilized the average historical transmission risk event data, average historical transmission ignition rates, the measured effectiveness of hardened transmission lines, and the amount of hardening expected to be completed to estimate the ignitions reduced for the duration of the wildfire mitigation plan period. For the distribution underbuilt components of the calculation, SDG&E utilized the same historical information used for distribution hardening and them applied the miles of distribution underbuilt on transmission. For the underground component of transmission hardening, SDG&E utilized a 100% effectiveness rating, as underground transmission does not have pad mounted equipment that could be struck by vehicles. Utilizing this methodology, SDG&E estimates a reduction of .34 transmission ignitions and .079 distribution ignitions for the associated underbuilt.

A summary of the calculations is provided below:

Overhead Transmission Hardening	
Pre-mitigation risk events per 100 miles	6.27
Effectiveness Estimate	83%
Post-mitigation risk events per 100 miles	6.27*(1-83%)= 1.08
Transmission Ignition Rate HFTD	9.00%
Pre-mitigation HFTD ignitions per 100 miles	6.27*9% = 0.564
Post-mitigation HFTD ignitions per 100 miles	1.08*9% = 0.097
Ignitions reduced HFTD	.564-.097 = .467
Miles of mitigation Tier 3	3.5
Miles of mitigation Tier 2	63.4
Ignitions reduced Tier 3	.467*3.5/100 = .016
Ignitions reduced Tier 2	.467*63.4/100 = .296
Total Ignitions reduced OH	.016+.296 = .312

Underground Transmission Hardening	
Pre-mitigation risk events per 100 miles	6.27
Effectiveness Estimate	100%
Transmission Ignition Rate HFTD	9.00%
Pre-mitigation HFTD ignitions per 100 miles	6.27*9% = 0.564
Post-mitigation HFTD ignitions per 100 miles	0
Ignitions reduced HFTD	0.564
Miles of mitigation Tier 2	5.5
Ignitions reduced Tier 2	.564*5.5/100 = .031

Overhead Transmission - Distribution Underbuilt	
Pre-mitigation risk events per 100 miles	12.9
Effectiveness Estimate	47%
Post-mitigation risk events per 100 miles	12.9 – (0.47*12.9) = 6.91
Ignition rate in Tier 3	2.74%
Ignition rate in Tier 2	3.37%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Pre-mitigation Tier 2 ignitions per 100 miles	12.9*3.37% = 0.44
Post-mitigation Tier 3 ignitions per 100 miles	6.91*2.74% = 0.189
Post-mitigation Tier 2 ignitions per 100 miles	6.91*3.37% = 0.233
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.189 = 0.164
Ignitions reduced in Tier 2 per 100 miles	0.44 – 0.233 = 0.202
Miles of mitigation in Tier 3	3.5
Miles of mitigation in Tier 2	36.2
Ignitions reduced in Tier 3	3.5*0.164/100 = 0.006
Ignitions reduced in Tier 2	36.2*0.202/100 = 0.073
Total Ignition Reduction Estimate	.006+.073 = .079

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E has been hardening its transmission system within the HFTD since the wildfires that impacted Southern California in 2007. SDG&E has generally prioritized this activity based on the area of HFTD the lines have been within, starting with Tier 3 and moving then into Tier 2.

Progress on initiative *(amount spent, regions covered) and plans for next year*

Now that the transmission portion of the Cleveland National Forest project is completed, SDG&E has at least one hardened transmission line into every substation within the HFTD. This not only reduces the risk of ignitions caused by SDG&E's transmission system in the areas of greatest consequence, but it also significantly reduces the risk of transmission-related PSPS events impacting customers at the substation level. SDG&E's hardened transmission system allows SDG&E to take a targeted approach to PSPS decisions utilizing remote sectionalizing on the distribution system, because the substations and transmission lines typically remain energized.

SDG&E completed construction on approximately 21.6 miles of transmission and 9.4 miles of distribution underbuilt on transmission lines (in addition to the transmission hardening on the CNF project) in 2020. These include projects in the communities of Kearny Mesa, Otay Mesa and portions of lines located on Camp Pendleton.

In 2021 and 2022, SDG&E plans to harden an additional 45 miles of its transmission system within the HFTD, including its last remaining miles in Tier 3 of the HFTD.[29] SDG&E notes that the tie lines hardened in accordance with this strategy are driven by Federal Energy Regulatory Commission (FERC)-jurisdictional projects, given that hardening efforts address the 69kV transmission system and the associated 12kV distribution system located in the HFTD. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

SDG&E plans to harden approximately 66 miles of transmission lines and 41 miles of associated distribution underbuilt on transmission lines within the HFTD. By the end of 2022, SDG&E will have 100% of transmission lines traversing the Tier 3 HFTD hardened, and over 85% of the HFTD overall. SDG&E intends to complete this long-term strategy of grid hardening its transmission system within the HFTD by 2026. Projects for the remaining unhardened lines have been identified and have started the process of being scoped and approved.

7.3.3.17.3 Cleveland National Forest distribution and transmission system hardening

Risk to be mitigated */ problem to be addressed*

SDG&E has nearly 1,000 circuit miles of overhead transmission that traverses the HFTD. Approximately 800 miles, or 80% of the transmission system within the HFTD, meets SDG&E's hardened design and construction standards. There are still 200 miles of aging transmission infrastructure that were constructed to withstand working loads under stress of 56 miles per hour wind speeds. SDG&E learned from its weather network that wind speeds can reach up to 85 miles per hour throughout the HFTD, and up to 111 miles per hour at some locations. This combination of aging infrastructure and outdated design methodology makes these lines more suspectable to risk events, which may cause an ignition, compared to SDG&E's hardened transmission infrastructure.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The CNF project design was based on various recommendations addressing fire prevention and the U.S. Forest Service's environmental requests. Using an analytical matrix reflecting elements

[29] There are 5.5 miles of this planned hardening, which is part of a 69kV underground project, however, the undergrounding is not due to wildfire mitigation benefits (although it provides them as discussed strategic undergrounding). Rather, this undergrounding is a necessary part of a specific project solution as this project moves through the GO 131-D permitting process involving a reroute of the transmission line.

of fire risks and environmental concerns, SDG&E and the U.S. Forest Service collaborated to determine which sections of the electric system should be upgraded. Each segment required a custom solution based on many factors, including the location of the customer being served by the distribution system, the topography of the land, and various biological, cultural, and environmental factors. Because of the known higher wind speeds in the area in excess of GO 95, the grid hardening activities are being designed to handle the higher wind speeds of 85 mph and up to 111 mph in some areas. In addition, steel structures are being used, stronger conductor, and increased wire spacing to decrease the likelihood of wire-to-wire contact or arcing as the result of contact by flying debris. As explained in Section 4.4.2.3 above, SDG&E performed a study on 17 transmission lines totaling 190 miles in the HFTD. SDG&E reviewed 20 years of reliability performance from 2000 to 2019. SDG&E compared reliability performance in risk events per operating year per 100 miles before and after overhead transmission hardening and found an 83% reduction in risk events on hardened infrastructure.

Risk Reduction Estimation Methodology

SDG&E utilized the average historical transmission risk event data, average historical transmission ignition rates, the measured effectiveness of hardened transmission lines, and the amount of hardening expected to be completed as part of the CNF project to estimate the ignitions reduced for the duration of the wildfire mitigation plan period. For the distribution components of the calculation, SDG&E utilized the same historical information used for distribution hardening and them applied the miles of distribution that were planned for completion as part of the CNF project. For the distribution underground component of the CNF project, SDG&E utilized the same historical pre-mitigation failure and ignition rates and leveraged the underground effectiveness calculation discussed in strategic undergrounding. Utilizing this methodology, SDG&E estimates a reduction of 0.135 transmission ignitions and .139 distribution ignitions for the associated underbuilt.

A summary of the calculations is provided below:

CNF Overhead Transmission Hardening	
Pre-mitigation risk events per 100 miles	6.27
Effectiveness Estimate	83%
Post-mitigation risk events per 100 miles	6.27*(1-83%)= 1.08
Transmission Ignition Rate HFTD	9.00%
Pre-mitigation HFTD ignitions per 100 miles	6.27*9% = 0.564
Post-mitigation HFTD ignitions per 100 miles	1.08*9% = 0.097
Ignitions reduced HFTD	.564-.097 = .467
Miles of mitigation Tier 3	29
Ignitions reduced Tier 3	.467*29/100 = .135
Total Ignitions reduced	0.135

CNF Overhead Distribution Hardening	
Pre-mitigation risk events per 100 miles	12.9
Effectiveness Estimate	47%
Post-mitigation risk events per 100 miles	12.9 – (0.47*12.9) = 6.91
Ignition rate in Tier 3	2.74%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Post-mitigation Tier 3 ignitions per 100 miles	6.91*2.74% = 0.189
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.189 = 0.164
Miles of mitigation in Tier 3	53.6
Ignitions reduced in Tier 3	56.3*0.164/100 = 0.088
Total Ignition Reduction Estimate	0.088

CNF Distribution Undergrounding	
Pre-mitigation risk events per 100 miles	12.9
Undergrounding effectiveness	98.1%
Ignition rate in Tier 3	2.74%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Post-mitigation Tier 3 ignitions per 100 miles	.35*(1-98.1%) = .0065
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.0065 = 0.346
Miles of mitigation in Tier 3	14.8
Ignitions reduced in Tier 3	14.8*0.346/100 = 0.051
Total Ignition Reduction	0.051

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The CNF projects include the hardening of facilities and select undergrounding of several existing 12kV and 69kV electric facilities spread throughout an approximately 880 square-mile area in the eastern portion of San Diego County located in the HFTD. The existing electric lines located within CNF also extend outside of CNF boundaries. Generally, the CNF program will increase the safety and reliability of SDG&E's system by hardening existing electric infrastructure that currently serves the U.S. Forest Service, emergency service facilities (i.e., fire, communication, and other), campgrounds, homes, businesses, and other customers with the CNF and surrounding areas.

SDG&E studies reliability and ignition data over time to demonstrate whether programs have been effective. For this particular program, SDG&E will study reliability data from the CNF transmission lines and distribution lines before they were hardened and after they were hardened, normalizing the data by fault events per year to ensure apples to apples comparisons. SDG&E would expect reductions in both transmission caused faults and ignitions on hardened lines.

Progress on initiative *(amount spent, regions covered) and plans for next year*

Construction commenced on the CNF program in late 2016 and is planned to continue through 2021. At the end of 2020, SDG&E has hardened a total of 98 miles of transmission, replacing 1,120 structures. The program has also hardened 107 miles of overhead distribution, replacing 1,053 poles, and has installed 16.6 miles of distribution underground. In 2020 specifically, the CNF project converted 12.5 miles of existing overhead distribution to 14.3 miles of underground cable, hardened 29 miles of electric transmission and 45.5 miles of overhead distribution. All of the transmission lines that were identified on this project have been completed and can withstand winds of either 85 mph or 111 mph based upon the known local wind conditions. There is approximately 7.5 miles of distribution remaining to fire harden on CNF that is in active construction and is expected to be completed in Q1 of 2021. SDG&E notes that the tie lines hardened in accordance with this strategy are driven by FERC-jurisdictional projects, given that hardening efforts address the 69kV transmission system and the associated 12kV distribution system located in the HFTD. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

SDG&E is scheduled to complete the CNF project by Q1 of 2021. All construction and close out activities such as QA/QC reviews will occur within 2021.

7.3.3.18 Other

7.3.3.18.1 Distribution Communications Reliability Improvements

Risk to be mitigated */ problem to be addressed*

This initiative enables SDG&E's other mitigation activities such as the Advanced Protection program, which is described in Section 7.3.9 above, and it contributes to addressing the risk of equipment failures or foreign objects in lines that could lead to ignitions. SDG&E's existing communication system within the HFTD does not have the bandwidth to support some of the technologies SDG&E is currently deploying as wildfire mitigations including its Advanced Protection program and specifically the Falling Conductor Protection initiative. In addition, there are gaps in coverage of third-party communication providers in the rural areas of eastern San Diego County that limit SDG&E's ability to communicate with field personnel during Red Flag Crew deployments and Emergency Operations Center activations.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E is deploying a privately-owned LTE network using licensed radio frequency (RF) spectrum by means of the Distribution Communications Reliability Improvements (DCRI) program. This will enhance the overall reliability of SDG&E's communication network, which is critical for enabling fire prevention and public safety programs. SDG&E's communication network is foundational to many initiatives that demand reliable communication. The ability to reliably enable and disable sensitive settings, enable or disable reclosing, or even remotely operating a switch during a high-risk weather event demands reliable communication that the LTE network will provide. SDG&E's Falling Conductor Protection in particular relies on a robust communications network to operate successfully and falling conductor circuits will continue to be enabled as SDG&E's communication network comes online.

This initiative does not have its own RSE because it is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E is prioritizing installations in the HFTD and is working closely with the Advanced Protection team to coordinate the installation of protection and communications equipment.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, the DCRI program completed a large number of accomplishments foundational to advancing communications coverage and reliability in the HFTD. Accomplishments include: acquisition of spectrum licensing; single spectrum RF design for 50% of service territory; site design standards for attachment to distribution assets; integrated LTE/Distribution build process; siting surveys, land rights and environmental analysis; community outreach and communications planning; 15 base stations completed; georedundant production core; QA/test core; use case testing lab environment built; and further use case testing and validation.

The active development of distribution standards and as well as the associated integrated LTE/Distribution build process has delayed the installation of additional base stations this year. The integrated LTE/Distribution build process is a new unique process that integrates numerous departments and various safety and regulatory requirements into new distribution standards that drive design. Site specific designs must be fully completed prior to initiating procurement of the engineered steel poles used in the designs. In 2021, SDG&E plans to complete the installation of 10 base stations.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

The program is continually progressing and there are many facets to define success with a program of this nature. Efforts are being taken to increase efficiency of the buildout such as potential acquisition of a second spectrum type, as well as analyzing initial build sites and adjusting deployment strategies to meet build-out timelines.

7.3.3.18.2 Lightning arrestor removal and replacement

Risk to be mitigated */ problem to be addressed*

Lightning arrestors are a piece of electrical equipment designed to mitigate the impact of transient overvoltage's on the electric system. Over voltage can cause damage to more expensive distribution equipment such as transformers and underground cable, so lightning arrestors are used to as protection devices. Overvoltage can be caused by switching surges, faults, or lightning strikes. When the arrestor senses an overvoltage on the system, the device activates, stabilizing the voltage on the system while passing excess current to ground. If the overvoltage duration is too long, or the overvoltage too high, the arrestor can become thermally overloaded, causing these units to fail in a way where they can become an ignition source. SDG&E had four lighting arrestor-caused ignitions in 2020.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Through SDG&E's effort of continuing to improve and explore alternate solutions and evaluate new technology, a new product was introduced that received CAL FIRE approval. Utilizing this new product, SDG&E plans to replace these arrestors in strategic locations within the HFTD with a CAL FIRE approved lightning arrestor. The CAL FIRE approved device comes with an external device that operates prior to the arrestor overloading, dramatically reducing the potential of becoming an ignition source.

SDG&E will be installing the first of these units in 2021, so no studies have been completed on the effectiveness of this mitigation. SDG&E estimates the mitigation will have an 80% reduction in ignitions, based on the technology and what the product is designed to accomplish. Like all of its equipment mitigations, SDG&E will be installing these new assets in a way where they can be queried for later reporting, so SDG&E can evaluate the effectiveness of these mitigations as new lightning arrestors begin to protect the electric system under overvoltage conditions.

Risk Reduction Estimation Methodology

The ignitions reduced by 2022 was calculated using the 5-year average risk events caused by lightning arrestors, the five-year average ignitions caused by lightning arrestors, the assumed effectiveness of 80% discussed above, and the planned lightning arrestor installations for the WMP timeframe. Based on this data, a reduction of .018 ignitions is expected by the end of 2022. A summary of the calculation is provided below.

Lighting Arrestor risk events HFTD (5-year average)	11
Pre-mitigation ignitions HFTD (5-year average)	0.6
Effectiveness	80%
Post-mitigation ignitions HFTD	0.12
Ignitions reduced HFTD	0.6-0.12 = 0.48
Total Arrestors HFTD	73000
Arrestors Tier 3 (2020-2022)	2772
Ignitions reduced Tier 3	.48*2772/73000 = .018

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

These devices are installed on the distribution system throughout the SDG&E service territory. Some locations have more installations than others based on the increased probability of lightning strikes, in order to protect other major equipment from abnormal surges and failing. Replacement of these lightning arrestors will start in areas of high lightning activity along with in Tier 3 of the HFTD. Due the volume of the work, projects will be bundled together based on geographic location to increase construction efficiency and reduce the number of construction outages for the project.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E's plan for this program was to finalize its construction standards and constructing at test sites to ensure successful installation of these lightning arrestors in 2021. Thus, no major installations occurred in 2020. Construction standards were finalized, and major construction will begin in 2021 with a target of installing 924 lightning arrestors.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Based on information provided from outage and possible ignition events, timelines and prioritization may change to fit the need. SDG&E is contemplating ramping up installation to potentially replace all at-risk locations in 10 years.

7.3.4 Asset management and inspections

The purpose of SDG&E's asset management and inspection programs are to promote safety for the general public, SDG&E personnel, and contractors by providing a safe operating and construction environment, while maintaining system reliability. SDG&E's established inspection and maintenance programs enable SDG&E to identify and repair conditions and components to reduce potentially defective equipment on SDG&E's electric system to minimize hazards and maintain system reliability. To accomplish this, SDG&E meets or exceeds the requirements of the inspections mandated by Public Resource Code Sections 4292 and 4293 as well as GO 95, GO 128, GO 165, and GO 174.

As discussed in the sections below, SDG&E is continually working to find ways to improve the safety of its system through its asset management and inspection programs. This includes development of new programs such as the distribution and transmission drone programs with a continued focus on existing programs such as the routine and detailed inspections performed for substation, distribution and transmission assets. In 2021, SDG&E plans to continue its focus on its existing programs as well the new programs being piloted to enhance its inspections.

7.3.4.1 Detailed inspections of distribution electric lines and equipment

Risk to be mitigated */ problem to be addressed*

Commission GO 165 requires SDG&E to perform a service territory-wide inspection of its electric distribution system, which is referred to as the Corrective Maintenance Program (CMP). This inspection program mitigates the risk of equipment failure by identifying equipment deterioration and making the repair and/or replacement before failures occur. Equipment failure can lead to electrical faults, which can lead to ignitions. GO 165 establishes inspection cycles and record-keeping requirements for utility distribution equipment. In general, utilities must patrol their systems once a year in urban areas and in HFTD Tier 2 and Tier 3. These patrols are discussed in more detail in Section 7.3.4.11 below. In addition to the patrols, utilities must conduct detailed inspections at a minimum every three to five years, depending on the type of equipment. For detailed inspections, the utilities' records must specify the condition of inspected equipment, any problems found, and a scheduled date for corrective action. Utilities are also required to perform intrusive inspections of distribution wood poles depending on the age and condition of the pole and prior inspection history.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The CMP helps to mitigate wildfire risk by providing SDG&E additional information about its electric distribution system, including in the HFTD. With this information, SDG&E's corrective actions address infractions before a potential issue can occur.

Based on findings from this program, SDG&E estimates an additional 0.76 ignitions would occur annually should these inspections and repairs not be performed per program requirements.

Risk Reduction Estimation Methodology

The studies discussed in Sections 4.4.2.6 and 4.4.2.7 above describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average distribution ignition rates broken down by HFTD tier were utilized to calculate ignitions avoided due to the program. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. For 2022, an estimated 0.545 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the five-year detailed distribution inspection program.

A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0.002
5-year average hit rate Priority (4-30 days)	0.001
5-year average hit rate Non - Critical	0.06
2022 Inspection Total Tier 3	6411
2022 Inspection Total Tier 2	11644
Emergency Tier 3	.002*6411 = 13
Emergency Tier 2	.002*11644 = 23
Priority Tier 3	.001*6411 = 5
Priority Tier 2	.001*11644 = 9
Non-Critical Tier 3	.06 * 6411 = 385
Non-Critical Tier 2	.06*11644 = 700
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	13*37% + 5*4% + 385*.31% = 6
Risk events Avoided Tier 2	23*37% + 9*4% + 700*.31% = 11
Distribution Ignition rate Tier 3	2.74%
Distribution Ignition rate Tier 2	3.37%
Ignitions Avoided Tier 3	6*2.74% = .168
Ignitions Avoided Tier 2	11*3.37% = .377
Total Ignitions avoided	.377+.168 = .545

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The five-year detailed inspections are mandated by GO 165. These inspections are performed throughout SDG&E's entire service territory, including the HFTD. SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's operational and engineering managers, who are responsible for certain districts. They typically select about 1.5% of the combined (overhead and underground) territories and assess their conditions to see if the appropriate improvements have been properly carried out. This audit work is also discussed in Section 7.3.4.14 below. SDG&E tracks the issues identified through this inspection method. These records can be evaluated to identify the quantity and types of issues found that demonstrate the effectiveness of the program.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020 and continuing into 2021 as well as future years, SDG&E will continue to comply with GO 165.

The amount spent in 2020 for inspections, O&M repairs, and capital repairs and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E plans to review the results and high definition imagery from its drone inspections (discussed in Section 7.3.4.9.2 below) to provide feedback and enhance its ground GO 165 detailed overhead visual inspections and patrols.

7.3.4.2 Detailed inspections of transmission electric lines and equipment

Risk to be mitigated */ problem to be addressed*

SDG&E utilizes a comprehensive, multi-faceted inspection and patrol program which consists of visual patrols (discussed in Section 7.3.4.12), infrared patrols (discussed in Section 7.3.4.5), detailed patrols (discussed in this section), as well as other various specialty patrols, inspections, and assessments. Inspections and patrols of all structures, attachments, and conductor spans are performed to identify facilities and equipment that may not meet Public Resources Code §§ 4292 and 4293 or GO 95 and GO 128 rules.

When non-conformances are identified through these inspections, secondary assessments are performed based on severity levels assigned. These assessments inform what mitigation measures are needed and the timelines for corrective action. This inspection program mitigates the risk of equipment failure by identifying equipment deterioration and making the repair and/or replacement before failures occur. Equipment failure can lead to electrical faults, which can lead to ignitions.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

For detailed inspections, experienced, internal lineman (patrollers) physically visit every structure scheduled for the year to perform the inspections, looking at all components of the structure and conductor. By physically visiting the structures, patrollers are able to look the structure and also access to the structure for current and future maintenance requirements. As seen in WMP Table 1 in Section the "Grid conditions findings from inspection – Transmission lines" metric (see Attachment B), the detailed inspections result in the largest number of GO 95 findings for corrections showing the benefit of this specific activity.

Risk Reduction Estimation Methodology

The studies discussed in Sections 4.4.2.6 and 4.4.2.7 above describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs.

SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average ignition rate for transmission risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. For 2022, an estimated .182 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the detailed transmission inspection program.

A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0
5-year average hit rate Priority (4-30 days)	0.012
5-year average hit rate Non - Critical	0.077
2022 Inspection Total Tier 3	779
2022 Inspection Total Tier 2	1936
Emergency Tier 3	0*779 = 0
Emergency Tier 2	0*1936 = 0
Priority Tier 3	.012*779 = 9
Priority Tier 2	.012*1936 = 23
Non-Critical Tier 3	.077 * 779 = 60
Non-Critical Tier 2	.077*1936 = 150
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	0 + 9*4% + 60*.31% = .58
Risk events Avoided Tier 2	0 + 23*4% + 150*.31% = 1.4
Transmission Ignition rate HFTD	9.00%
Ignitions Avoided Tier 3	.58*9% = .052
Ignitions Avoided Tier 2	1.4*9% = .13
Total Ignitions avoided	.13+.052 = .182

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Detailed inspections are currently completed on a three-year cycle for all structures in the HFTD. As conditions are identified during these detailed patrols, internal severity codes are established to ensure supervisors properly prioritize corrections. This also ensures that conditions are corrected in timeframes which meet or exceed GO 95 requirements.

In addition, prior to the first event of the current year's wildfire season as conditions allow, SDG&E plans to complete an additional set of transmission visual inspections on tie lines located within Tier 3 of the HFTD which are likely to be impacted by high winds. This additional patrol is looking for potential fire conditions within the high-risk Tier 3 HFTD environment which take immediate prioritization.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E currently completes detailed inspections on all transmission structures on a three-year cycle. This has been a successful historical practice that SDG&E currently plans on continuing in the subsequent years. With the continuation of this program and interval, SDG&E plans to complete 35 detailed tie line inspections in 2021.

SDG&E notes that the transmission line inspection programs are driven by FERC-jurisdictional projects. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

SDG&E does not currently plan on implementing any improvements to this initiative. All structures are physically visited on a three-year cycle with additional patrols (such as visual, infrared, and additional Tier 3 patrols) used to help supplement these inspections.

7.3.4.3 Improvement of inspections

Please see Section 7.3.4.9, which discusses other discretionary inspections of distribution electric lines and equipment.

7.3.4.4 Infrared inspections of distribution electric lines and equipment

Risk to be mitigated */ problem to be addressed*

Infrared distribution inspections mitigate the risk of issues with electrical connections and equipment that cannot be seen during SDG&E's traditional visual inspections. Left undetected, these issues could cause an equipment failure that could lead to an ignition. Connections are difficult to fully assess from the ground or air as it is not possible to visually see the electrical flow. If connections look secure but are not truly tight, the electrical flow may all follow one path resulting in potential premature failure of a connection. Thermographers utilize infrared technology which looks at the radiation emitted by the connections to determine if there are potential issues with a connection prior to failure.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Issues identified through the infrared program are often issues that would not have been identified through current visual or detailed inspections. SDG&E plans to track the infrared inspection findings to evaluate the risk reduction potential. At this time, only a few inspection findings have been discovered utilizing the infrared technology that would not have been seen through traditional visual inspections. The issues identified to date are conditions that could pose a fire or public safety risk.

Risk Reduction Estimation Methodology

Since the distribution infra-red inspection program is new, the pilot results from 2020 were utilized to forecast future years. Due to the technology dependency of this inspection type, it was assumed that any issue found would lead to a risk event, as another inspection cycle or patrol would be unable to identify this issue as they are visual and could not detect hot connections. The results of the 2020 pilot showed an estimated .055 ignitions reduced in the Tier 3 HFTD. A summary of the calculation is provided below:

2020 Inspections completed Tier 3	13077
Emergency Tier 3 Actuals	0
Priority Tier 3 Actuals	2
Non-Critical Tier 3 Actuals	0
Faults Avoided Tier 3	0 + 2 + 0 = 2
Distribution Ignition rate Tier 3	2.74%
Ignitions Reduced Tier 3	2*2.74% = .055

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The initial focus of the pilot program was on distribution circuits located within Tier 3 of the HFTD. Circuits were initially selected within Tier 3 based on the historical fault counts. Based on the results from the initial pilot program and a comparison to visual findings for a similar region, the prioritization of the pilot program has been changed. Due to the low current running through the lines in the more rural areas, it is thought this may have an impact on the effectiveness of the technology in determining potential connection issues. Based on the risk avoided and cost, the program did return value in the Tier 3 HFTD, but SDG&E plans to continue the pilot program on more urban circuits within Tier 2 of the HFTD and assess the effectiveness.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The initial focus of the pilot program was on distribution circuits located within Tier 3 of the HFTD. SDG&E has completed infrared inspections on the structures and adjacent conductors on approximately 13,000 distribution structures within Tier 3 of the HFTD. As noted above, moving into 2021, the scope of this program will change in order to determine the effectiveness of the program within the higher loaded circuits within Tier 2 of the HFTD.

The amount spent in 2020 for inspections and O&M repairs and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E plans to continue the pilot program in 2021 to analyze the effectiveness on higher loaded circuits. As data is collected through these infrared inspections, the results can be

analyzed as they were with the Tier 3 study. Depending on the results, the program with be re-evaluated to analyze potential modification or improvements such as frequency, quantity per year, or new features to increase the effectiveness of the program.

7.3.4.5 Infrared inspections of transmission electric lines and equipment

***Risk to be mitigated** / problem to be addressed*

Infrared transmission inspections mitigate the risk issues on electrical connections and equipment that cannot be seen during SDG&E's traditional visual inspections. Left undetected, these issues could cause an equipment failure that could lead to an ignition. Connections are difficult to fully assess from the ground or air as it is not possible to visually see the electrical flow. If connections look secure but are not truly tight, the electrical flow may all follow one path resulting in potential premature failure. Thermographers utilize infrared technology which looks at the radiation emitted by the connections to determine if there are potential issues with a connection prior to failure.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Historically, the patrols performed on all transmission lines do not provide the same quantity of GO 95 infractions as does the detailed program. However, the conditions reported are often extremely elevated equipment connection temperatures which pose a fire or public safety risk. The conditions noted through the program are typically conditions that would not have been seen through the visual or detailed patrols and are often only able to be seen through infrared showing positive impact of the program.

Risk Reduction Estimation Methodology

The studies discussed in Section 4.4.2.6 and 4.4.2.7 above describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. Due to the technology dependency of this inspection type, it was assumed that any issue found would lead to a risk event, as another inspection cycle or patrol would be unable to identify this issue as they are visual and could not detect hot connections. Finally, the average ignition rate for transmission risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. For 2022, an estimated .083 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the transmission infrared protection program.

A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0
5-year average hit rate Priority (4-30 days)	0.00004
5-year average hit rate Non - Critical	0.0001
2022 Inspection Total Tier 3	2120
2022 Inspection Total Tier 2	4445
Emergency Tier 3	0
Emergency Tier 2	0
Priority Tier 3	.00004 * 2120 = .085
Priority Tier 2	.00004 * 4445 = .178
Non-Critical Tier 3	.0001 * 2120 = .212
Non-Critical Tier 2	.0001 * 4445 = .445
Risk events Avoided Tier 3	.085 + .212 = .297
Risk events Avoided Tier 2	.178+.445 = .623
Transmission Ignition rate HFTD	9.00%
Ignitions Avoided Tier 3	.297*9% = .027
Ignitions Avoided Tier 2	.623*9% = .056
Total Ignitions avoided	.027+.056 = .083

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Infrared patrols on transmission lines are most effective during higher loading conditions and therefore they typically begin in the warmer months prior to fire season. As corrosion, rust, and other structural impacts may cause hotspots on structures and equipment, all energized lines are targeted by this program. Additional patrols performed prior to events are targeted based on meteorological data. SDG&E analyzes wind speed, FPI, and other factors to determine where best to patrol prior to Red Flag Warning or other events.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E completed infrared patrols on all energized transmission lines in its system. In addition, infrared patrols along with visual patrols were completed prior to multiple Red Flag Warning events to verify the integrity of the system in the impacted areas prior to the event. In 2021, SDG&E will perform another set of infrared patrols on all energized transmission lines in the HFTD resulting in 110 infrared patrols as well as additional patrols prior to events as needed.

SDG&E notes that the transmission line inspection programs are driven by FERC-jurisdictional projects. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

SDG&E does not currently plan on implementing any improvements to this initiative. All structures are completed on a yearly basis. Additional infrared patrols completed in conjunction with visual patrols are also performed as needed on potentially impacted transmission lines prior to major events such as Red Flag Warnings.

7.3.4.6 Intrusive pole inspections

***Risk to be mitigated** / problem to be addressed*

SDG&E performs wood pole intrusive inspections on a 10-year (average) cycle. This program mitigates the risk of a pole failing due to internal degradation prior to SDG&E identifying the issue and replacing the pole. A pole failure can lead to a fault on the system and a potential ignition. Each pole is inspected visually and, if conditions warrant, intrusively. GO 165 requires that any pole 15 years of age or older is inspected intrusively. The form of the intrusive inspection is normally an excavation about the pole base and/or a sound and bore of the pole at ground-line. Treatment is applied at this time in the form of ground-line pastes and/or internal pastes. The 10-year cycle fulfills the requirements of GO 165: 1) all wood poles over 15 years of age are intrusively inspected within 10 years, and 2) all poles which previously passed intrusive inspection are to be inspected intrusively again on a 20-year cycle.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Depending on the cavities found, or the amount of rot found, an estimate of the remaining pole strength is determined utilizing industry-wide standards. Depending on the severity of the deterioration, the pole either passes, must be reinforced with a steel truss to provide it another five to ten years of useful life or replaced. This replacement and reinforcement process is described in Section 7.3.3.6 above.

Risk Reduction Estimation Methodology

The studies discussed in Sections 4.4.2.6 and 4.4.2.7 above describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and

utilized to convert issues found into risk events. Finally, the average distribution ignition rates broken down by HFTD tier were utilized to calculate ignitions avoided due to the program. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. The 10-year intrusive program in particular can vary from year to year, as some cycles do not involve many inspections in the HFTD, and some cycles can be over 90% within the HFTD. For 2022, an estimated 0.009 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the 10-year intrusive wood pole inspection program.

A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0.002
5-year average hit rate Priority (4-30 days)	0.001
5-year average hit rate Non - Critical	0.035
2022 Inspection Total Tier 3	0
2022 Inspection Total Tier 2	380
Emergency Tier 3	.002 * 0 = 0
Emergency Tier 2	.002 * 380 = .76
Priority Tier 3	.001 * 0 = 0
Priority Tier 2	.001 * 380 = .38
Non-Critical Tier 3	.035 * 0 = 0
Non-Critical Tier 2	.035 * 380 = 13
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	0
Risk events Avoided Tier 2	.76 * 37% + .38*4% + 13*.31% = .273
Distribution Ignition rate Tier 3	2.74%
Distribution Ignition rate Tier 2	3.37%
Ignitions Avoided Tier 3	0
Ignitions Avoided Tier 2	.273 * 3.37% = .009
Total Ignitions avoided	0.009

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Intrusive wood pole inspections are performed on all wood poles throughout SDG&E's service territory.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E performed approximately 14,000 wood pole intrusive inspections in the HFTD. In 2021, the number of poles in the HFTD will slightly decrease, as the inspection cycle begins to move in other areas of the service territory.

The amount spent in 2020 for inspections, O&M repairs, and capital repairs, and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E does not currently plan on modifying or enhancing this program. Consistent with the Commission's requirements, all wood poles will continue to be intrusively inspected on a 10-year cycle.

7.3.4.7 LiDAR inspections of distribution electric lines and equipment

Risk to be mitigated */ problem to be addressed*

Accurate surveys of the electric distribution right of ways including existing distribution lines, telecommunication lines, structures, crossings, vegetation, and other potential hazards are critical to effective and accurate electric line design. While previous design methods relied upon standard structure heights, span lengths, and sag and tension charts, enhanced design tools and survey methods are required to mitigate the risk of wildfires.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

LiDAR surveys have evolved into a foundational component for SDG&E's overhead transmission and distribution line engineering analysis and design. The transmission department was the early adopter of utilizing LiDAR into their designs. In 2013 with the start of the FiRM program, SDG&E began utilizing LiDAR for the distribution system for clearance and structural adequacy. LiDAR surveys provide the most cost effective, scalable, and accurate solution for overhead power line analysis increasing both system reliability and safety.

Ideally a transmission or distribution line can be modeled with a single deployment of LiDAR and subsequent modeling. In reality, transmission and distribution systems are often changing with joint use additions, customer relocations, compliance, reliability and maintenance modifications, conductor creep and pole settling, and external development. Rural transmission lines, particularly in HFTD, require attentive vegetation analysis. As such, it is important that LiDAR is relatively recent, and field verified. Priority for LiDAR spend follows: post-construction survey, pre-construction design, and vegetation analysis.

This initiative does not have an RSE because it does not directly reduce wildfire risk. As described above, LiDAR inspections on distribution and transmission lines are primarily used for grid hardening design efforts rather than for identifying issues like the other inspection programs. As such, quantifying a reduction in ignition risk for these inspections is not applicable.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

LiDAR is utilized for distribution hardening programs, which are primarily being designed and constructed in the HFTD.

Progress on initiative *(amount spent, regions covered) and plans for next year*

LiDAR is and has been essential for SDG&E's design projects, vegetation analysis and post-construction assessment. In 2020, SDG&E captured LiDAR for approximately 5,700 distribution structures. As SDG&E's system hardening projects continue to roll out, additional pre-LiDAR and post-LiDAR design and analysis will follow.

LiDAR acquisition and inspections will continue to support the transmission and distribution fire hardening efforts. SDG&E plans to assess transmission lines for vegetation and clearance compliance with a targeted completion of all HFTD Tier 3 projects by the end 2021. Section and structural usage analysis based on the same LiDAR set, will follow in 2022 and beyond.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

LiDAR inspections will continue to supplement the grid hardening efforts and post-construction analysis. Vegetation and clearance checks will be fully implemented within the HFTD and potentially expand into non-HFTD projects. Results of these analyses will also be used for emergency operations during red flag and other extreme events.

7.3.4.8 LiDAR inspections of transmission electric lines and equipment

Risk to be mitigated */ problem to be addressed*

LiDAR survey have evolved into a necessary function for SDG&E's overhead transmission and distribution line engineering analysis and design. The NERC FAC-003-4 Transmission Vegetation Management established a standard for utilities to evaluate their transmission system for clearance compliance. This standard, along with the emergence of LiDAR survey and PLS-CADD, allowed utilities to rapidly deploy and model transmission systems for clearance and structural adequacy. LiDAR surveys provide the most cost effective, scalable, and accurate solution for overhead power line analysis increasing both system reliability and safety.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Ideally a transmission or distribution line can be modeled with a single deployment of LiDAR and subsequent modeling. In reality, transmission and distribution systems are often changing with joint use additions, customer relocations, compliance, reliability and maintenance modifications, conductor creep and pole settling, and external development. Rural transmission lines, particularly in the HFTD, require attentive vegetation analysis. As such, it is important that LiDAR is relatively recent, and field verified. Priority for LiDAR spend follows: post-construction survey, pre-construction design, and vegetation analysis.

This initiative does not have an RSE because it does not directly reduce wildfire risk. As described above, LiDAR inspections on distribution and transmission lines are primarily used for grid hardening design efforts rather than for identifying issues like the other inspection programs. As such, quantifying a reduction in ignition risk for these inspections is not applicable.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

As previously stated, LiDAR is a foundational component of all SDG&E's overhead line engineering functions and analysis. LiDAR survey and PLS-CADD design are utilized for all overhead hardening projects, the majority of which are being designed and constructed in the HFTD.

Progress on initiative *(amount spent, regions covered) and plans for next year*

LiDAR is and has been essential for design projects, vegetation analysis and post-construction assessment. In 2020, SDG&E captured LiDAR for approximately 1,000 transmission structures. As SDG&E's grid hardening projects continue to be deployed, additional pre-LiDAR and post-LiDAR design and analysis will follow. Additionally, pilot vegetation analysis of HFTD projects using LiDAR are underway.

LiDAR acquisition and inspections will continue to support the transmission and distribution fire hardening efforts. SDG&E plans to assess transmission lines for vegetation and clearance compliance with a targeted completion of all HFTD Tier 3 projects by the end 2021. Section and structural usage analysis based on the same LiDAR set, will follow in 2022 and beyond.

SDG&E notes that the LiDAR costs associated with transmission programs are driven by FERC-jurisdictional projects. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

LiDAR inspections will continue to supplement SDG&E's grid hardening efforts and post-construction analysis. Vegetation and clearance checks will be fully implemented within the HFTD and potentially expand into non-HFTD projects. Results of these analyses will also be used for emergency operations during red flag and other extreme events.

7.3.4.9 Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations

7.3.4.9.1 HFTD Tier 3 inspections

Risk to be mitigated */ problem to be addressed*

SDG&E has implemented an HFTD Tier 3 Inspection program to perform Quality Assurance/Quality Control (QA/QC) inspections within the HFTD Tier 3 prior to fire season. These additional proactive inspections are scheduled on a three-year cycle, in addition to the GO 165 five-year detailed inspections, exceeding the requirements of GO 165, and are designed to identify potential structural and mechanical problems before they fail. SDG&E has performed HFTD Tier 3 Inspections of its overhead electric distribution poles in high risk fire areas with a focus on identifying areas where maintenance would improve fire safety and reliability, with a goal of mitigating the probability that SDG&E's overhead electric system, facilities, and equipment would be the source of ignition for a fire.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

These inspections were conducted from 2010 through 2016 as a result of a settlement agreement adopted in D.10-04-047. In 2017, SDG&E decided to proactively continue the HFTD Tier 3 Inspections as part of its normal program. In 2018, when the CPUC adopted the current statewide fire threat map, SDG&E began applying the QA/QC three-year cycle to the newly defined HFTD Tier 3. From 2016 to 2018, SDG&E performed HFTD Tier 3 Inspections on an average of 15,000 poles annually (approximately one-third of the distribution poles in the HFTD Tier 3) in its then-existing "extreme" and "very high" fire threat areas. In addition to the inspections, SDG&E performs a system maintenance patrol (as specified by GO 165) for the entire overhead electric distribution system in the HFTD on an annual basis. Safety-related issues identified on those patrols are scheduled for follow-up repair.

Risk Reduction Estimation Methodology

The studies discussed in Sections 4.4.2.6 and 4.4.2.7 above describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years

based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average distribution ignition rates broken down by HFTD tier were utilized to calculate ignitions avoided due to the program. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. For 2022, an estimated 0.259 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the three-year Tier 3 HFTD distribution inspection program. A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0.001
5-year average hit rate Priority (4-30 days)	0.005
5-year average hit rate Non - Critical	0.026
2022 Inspection Total Tier 3	12380
2022 Inspection Total Tier 2	0
Emergency Tier 3	.001*12380 = 16
Emergency Tier 2	0
Priority Tier 3	.005*12380 = 65
Priority Tier 2	0
Non-Critical Tier 3	.026 * 12380 = 327
Non-Critical Tier 2	0
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	16 * 37% + 65 * 4% + 327 * .37% = 9
Risk events Avoided Tier 2	0
Distribution Ignition rate Tier 3	2.74%
Distribution Ignition rate Tier 2	3.37%
Ignitions Avoided Tier 3	9*2.74% = .259
Ignitions Avoided Tier 2	0
Total Ignitions avoided	0.259

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

In addition to these HFTD Tier 3 inspections, SDG&E performs a system maintenance patrol (as specified by GO 165) for the entire overhead electric distribution system in the HFTD on an annual basis. Safety-related issues identified on those patrols are scheduled for follow-up repair.

Progress on initiative *(amount spent, regions covered) and plans for next year*

For HFTD Tier 3 Inspections, the main purpose is to identify fire safety conditions in the HFTD Tier 3. SDG&E performed 11,864 inspections in the HFTD Tier 3 in 2020. All of these inspections were completed by March 2020. In 2021, SDG&E plans to complete 10,815 HFTD Tier 3 inspections.

Amount spent in 2020 for inspections, O&M repairs, and capital repairs and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

In addition, SDG&E intends to accelerate repairs of these types of conditions found in the Tier 2 and 3 of the HFTD (including the design, engineering, and construction of the new structures) faster than the six-month or twelve-month time frame required by the Commission's General Orders. This will reduce the risk of wildfire on an accelerated schedule within the highest risk areas.

7.3.4.9.2 Drone assessments of distribution infrastructure

Risk to be mitigated */ problem to be addressed*

As discussed in SDG&E's 2020 WMP, SDG&E began a pilot program at the end of 2019 to determine whether the use of drone technology could help improve or enhance its existing inspection efforts in the HFTD. Specifically, SDG&E was interested in determining whether drones and the high-resolution imagery captured by the drones, could be used to identify issues that could not be or were difficult to identify from the ground using traditional inspection methods. Improved identification methods for potential fire hazards on distribution facilities would minimize the risk of wildfire ignition and faults that cause outages.

Further, the number of images (over 1 million) being captured during the pilot drone program put a spotlight on how SDG&E could review the data from the drones more efficiently in the future and address a future where SDG&E would be consuming image data from other sources, such as cameras mounted on fleet vehicles or photos submitted by customers. As the amount of data coming into SDG&E's system increases, the ability for humans to review all the data would become impossible, costly and burdensome. Therefore, SDG&E began using intelligent image processing (i.e., machine learning or artificial intelligence) technology to process large amounts of data and focus human resources on potential issues.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

In 2020, SDG&E concluded assessments for 37,301 distribution poles in the Tier 3 HFTD. An analysis of the data collected by the drone program concluded that the program found a higher percentage of total issues than current inspection programs; however, the timing of the

inspections or other efforts such as vegetation management schedules, can influence a straight comparison between programs. Accordingly, SDG&E focused its analysis on the 8,149 poles that were reviewed using ground-based inspectors and the drone teams. For poles with overlapping inspection dates within 0-180 days, the drone program found on average 51% more issues. The top issues that were found significantly more by the drone program included: damaged arrestors, damaged insulators, issues with pole top work, issues with armor rods, crossarm or pole top damage, exposed connections, loose hardware, improper splices, and damaged conductor, damaged transformer and CIP connection issues. With that said, the types of issues identified between the two programs with vegetation issues, grounding problems, and other damage being identified more by the ground-based inspectors.

While further analysis would help determine the exact reasons for the discrepancy in findings between the different types of assessments, it is apparent that the imagery collected by the drones does allow for improved identification of potential fire hazards for certain types of issues or where conditions such as terrain and vegetation density present difficulties in completing full detailed inspections. The drone program also provided SDG&E with an opportunity to leverage the influx of images captured by the drones as well as build intelligent image processing models to identify assets and detect potential damage to its electric facilities. Once the models are developed and tested, SDG&E would potentially be able to process thousands of images in real time or in a fraction of what it would take for a qualified electrical worker to review.

Risk Reduction Estimation Methodology

The distribution drone program is another new inspection program with the first phase of the pilot completed in 2020 that included aerial flights and assessments for all structures within the Tier 3 HFTD. Forecasts for future years will be based off the results from the pilot until a larger history of data is generated allowing the use of historical averages. For the drone program, SDG&E modified its methodology to ensure the effectiveness of drones was not overstated. SDG&E decided to use the measured .31% failure rate for all infractions found, given the unusually high hit rate of issues discovered using this program relative to other inspection programs. Based on the data and assumptions, the drone program will reduce .804 ignitions in the HFTD Tier 3. A summary of the calculation is provided below:

2020 Inspections completed Tier 3	37310
Emergency Tier 3 Actuals	132
Priority Tier 3 Actuals	1823
Non-Critical Tier 3 Actuals	7522
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	132 * .31% + 1823 * .31% + 7522 * .31% = 29
Distribution Ignition rate Tier 3	2.74%
Ignitions Reduced Tier 3	29 * 2.74% = .804

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E targeted its initial efforts in Tier 3 of the HFTD, as this is the area with the highest risk for wildfire. Next, SDG&E plans to expand the program into Tier 2 of the HFTD and complete assessments on its distribution facilities in that area over the next two years. Prioritization will be completed by reviewing circuit risk indexes that are built considering pole age, pole material type, local weather conditions, and vegetation communities. SDG&E will also review its efforts on other programs and remove from the scope of its drone assessments facilities that are being upgraded or otherwise affected by its other WMP initiatives.

SDG&E did encounter constraints in performing drone assessments for all its distribution facilities primarily related to government agency authorizations from California State Parks and U.S. Forest Service, as well as coordination with sensitive customers. Additional effort will be made to gain approvals from these agencies and perform drone inspections on those distribution facilities in 2021 and 2022.

For the intelligent image processing effort, SDG&E prioritized the types of models it developed to focus on the highest risk items and highest frequency issues.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E completed flights and assessments of 37,310 distribution poles in Tier 3 of the HFTD. As SDG&E gained experience through the pilot program, efficiencies in flight planning, customer outreach, and image collection and review were gained over the approximate 15-month schedule for completion of flights. Costs were reduced by 50% from an average of $1,000/pole to $500/pole. With further modifications to the program, SDG&E is working to decrease cost impacts as it expands the program to Tier 2 of the HFTD. There are approximately 44,000 distribution facilities in Tier 2 of the HFTD and SDG&E plans to perform flights and assessments on half of those facilities in 2021 and the remainder in 2022 based on the prioritization discussed above.

SDG&E's intelligent image processing models now in development include 25 models detecting 15 asset variations and 12 damage conditions within a range of 65-97% accuracy. These models are generally associated with the pole, crossarm, insulator, and transformer. SDG&E has invested approximately $2M in development of these models and intends to continue refining the current models and building additional models in 2021 to eventually allow for a full evaluation of the pole, depending on the images provided. For example, a certain number of examples of different types of conditions are necessary in order to build an effective model and if those conditions do not exist then the model's accuracy will be affected.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

To help decrease the costs for flight and assessments, while maintaining quality and effectiveness of the drone program, SDG&E plans on implementing two significant changes in the next phase: (1) reducing the number of images taken by the drone, and (2) deploying a qualified electric worker (QEW) to act as the visual observer with the drone pilot.

Reducing the number of images taken will allow the field teams to complete flights on more poles per day and decrease the time it takes the QEW to review all images and perform the assessment. This will ultimately reduce the cost to perform the flights and assessments on a per pole basis. SDG&E based this change on an analysis of which images were used by the assessment team to identify most issues. The results indicated that more than 65% of the issues were identified using the level 2 image, which is taken from an angle above the pole and at a close distance from the pole. While only approximately 13% of issues were identified using the level 1 image, this photograph was useful in executing the repair and providing context to the assessment team when performing their reviews. Thus, SDG&E will be eliminating the level 3 image capture, which is taken below the crossarm and presents the highest risk of collision when flying the drone and, while is offered additional angles and views of hardware and connections, it represents what can generally be seen from the ground.

Next, the drone teams consisted of a two-man crew with a drone pilot and the visual observer, both of which are not trained and educated about the components of electric facilities. By pairing the drone pilot with a QEW, SDG&E would get the cost savings of reducing manpower and the benefit of having a trained individual to observe the pole in the field. This change will help better determine the advantages and disadvantages between ground-based and drone-based inspections and make a more informed decisions about how to incorporate drone technology into its inspection programs in the future.

Finally, the intelligent image processing models will continue to be enhanced and expanded to reduce future costs associated with inspections and provide the means necessary to address the increasing need to consume and process data.

7.3.4.9.3 Circuit ownership

***Risk to be mitigated** / problem to be addressed*

The Circuit Ownership platform relies upon field personnel expertise to identify potential hazards that could lead to wildfire. This initiative will help reduce the risk of potential fire hazards turning into ignitions by identifying concerns and mitigating them before they fail. This platform gives SDG&E's field personnel another avenue to submit these concerns via a Mobile Data Terminal (MDT) program or mobile application (both iOS and Android). Specifically, this program facilitates supplemental submission of circuit vulnerabilities (in addition to the existing

inspection programs) so that they can be timely repaired, to prevent a potential ignition and minimize the risk of wildfire.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's mobile application enables all employees to submit supplemental inspections if they see an issue with SDG&E assets that needs to be addressed. When issues are identified through the mobile application, they are categorized within two days (unless identified as an imminent danger or hazard) as either a priority, emergency, or non-emergency. This prioritizes the prompt follow up of those priority and emergency submissions. For example, a submission through this program identified a long stretch of overhead wire (sized #6 bare stranded copper) that runs through a dry brush canyon near an urban development. This branch line feeds a small transformer that is used for monitoring. Once the issue was identified, the Circuit Ownership program developed a plan to isolate the transformer "off grid" with solar and batteries, and then remove the 22-span section of overhead small conductor that has a higher risk of failure.

Risk Reduction Estimation Methodology

The circuit ownership program is different from other inspection programs, as the employees using the tool are not performing inspections, but other tasks such as troubleshooting an electric issue for a customer or performing construction work. There is no required amount of inspections performed, as the issues are submitted by the workforce proactively through a mobile application if they see an issue. SDG&E is still measuring the risk reduced by this program the same way it measures inspections effectiveness, by quantifying the amount of issues found, the severity of the issue, the failure rate, and the ignition rate to calculate an estimated ignitions reduced from the program. Being that only two issues were turned in, only 0.0002 ignitions are expected to be reduced from this program in 2020. And even though those are modest numbers, the application has no maintenance fee, with only future cost forecasts being the repair cost of the items identified. Below is a summary of the calculation:

Emergency Tier 3 Actuals	0
Priority Tier 3 Actuals	0
Non-Critical Tier 3 Actuals	0
Emergency Tier 2 Actuals	0
Priority Tier 2 Actuals	0
Non-Critical Tier 2 Actuals	2
Fail Rate Non-Critical	0.31%
Risk events reduced Tier 2	2*.31% = .0062
Distribution Ignition rate Tier 2	3.37%
Ignitions avoided Tier 2	.0062 * 3.37% = .0002

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

This program focuses on regions where there could potentially be a wildfire concern. This includes Tier 2 and Tier 3 of the HFTD and coastal canyons where simulations have indicated a wildfire risk exists.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E deployed this program in 2020 and there are have been four submissions to date. Plans for 2021 include providing refresher training to field personnel that could use this tool to identify potential hazards.

The amount spent in 2020 and forecasted costs through 2022 are provided in, Table 12.

Future improvements to initiative

This initiative has the potential to expand to all users in SDG&E's Electric Regional Operations or even outside departments to submit concerns. Other discretionary inspection of transmission electric lines and equipment, beyond inspections mandated by rules and regulations

7.3.4.9.4 Drone assessment of transmission

Risk to be mitigated */ problem to be addressed*

Similar to the drone assessments on SDG&E's distribution facilities discussed in Section 7.3.4.9.2 above, SDG&E started a pilot drone program to assess approximately 1,442 transmission structures in the HFTD and determine whether drone images could improve or enhance our existing inspection efforts. The primary difference between SDG&E's current distribution and transmission inspections is that transmission already performs aerial patrols of its lines on a routine basis; therefore, the value associated with the use of drones to provide a top-down look and high-resolution images at the structures was unknown.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The risk of wildfire remains the primary driver associated with the use of drones to enhance SDG&E's existing transmission inspection programs.

Risk Reduction Estimation Methodology

The transmission drone program is another new inspection program with the first phase of the pilot completed in 2020 that included aerial flights and assessments for 1,442 structures within the Tier 3 HFTD. Forecasts for future years will be based off the results from the pilot until a larger history of data is generated allowing the use of historical averages. SDG&E leveraged the issues found and the failure rate calculations discussed in the 4.4.2.7 to determine the

estimated ignitions reduced by this program on the transmission system within the Tier 3 HFTD. Based on the results from the transmission drone inspection and repair program in 2020, SDG&E estimates that .007 ignitions would be reduced annually. A summary of the calculation is below:

2020 Inspections completed Tier 3	1442
Emergency Tier 3 Actuals	0
Priority Tier 3 Actuals	2
Non-Critical Tier 3 Actuals	50
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	0 * 37% + 2 * 4% + 50 * .37% = .241
Transmission Ignition rate HFTD	9.00%
Ignitions Reduced Tier 3	.241 * 9% = .007

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E selected the approximately 1,450 structures included in the 2020 pilot program by reviewing transmission lines by age and fire risk, located in the Tier 3 HFTD.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E completed flights and assessments on approximately 1,450 transmission structures in 2020 and will complete the remaining approximately 250 structures in 2021 following authorizations from the U.S. Department of Defense to perform drone flights on Camp Pendleton. As of December 2020, only 3% of the structures assessed were identified as having potential fire hazards. However, the program has demonstrated that the high-resolution images do provide improved visibility of certain attachments and hardware connections. SDG&E will perform an evaluation of the pilot program once the remaining flights are completed and determine next steps. It is anticipated that additional transmission flights and assessment may be performed in 2021 and 2022 on select facilities as a supplement to current inspection efforts.

In addition, SDG&E is planning to expand its intelligent image processing to build models for transmission facilities asset identification and damage detection in 2021 using the images collected.

SDG&E notes that the transmission line inspection programs are driven by FERC-jurisdictional projects. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

Following completion of the pilot program, SDG&E will evaluate the types of images captured and work to refine the number of images that provide the most value in order to improve the cost and efficiency of the program. SDG&E will also look to couple a drone pilot with an inspector during regular inspections planned in 2021 to provide further cost efficiencies.

7.3.4.9.5 Additional Transmission Aerial 69kV Tier 3 Visual Inspection

***Risk to be mitigated** / problem to be addressed*

Fire season is one of the most important times to ensure that tie lines and equipment do not have any major issues which may pose a fire concern. Visual patrols are performed on all tie lines starting in the first quarter of the year to check for major issues. As several months typically elapse prior to fire season, additional patrols are completed on tie lines within the backcountry in Tier 3 of the HFTD to check for potential fire conditions which may exist on these structures. Prior to September 1 of each year, flights are performed to check for these conditions and work is prioritized to ensure any conditions found are corrected before any extreme wind, Red Flag Warning, or Santa Ana event occurs. This reduces the risk for potential wildfires by ensuring these potential conditions are checked and corrected.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Flights are performed by qualified electrical workers who are responsible for performing inspections and patrols throughout the year. As these flights are performed just prior to the start of the typical fire season, the timeliness of these patrols is critical to mitigating potential risk. The issues the patrollers are looking for during the flights are potential fire conditions that if not corrected, may lead to the possibility of ignition. Due to the scope of these patrols and their timing before fire season, all conditions found are critical to repair to mitigate risks.

Risk Reduction Estimation Methodology

The studies discussed in Sections 4.4.2.6 and 4.4.2.7 describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average ignition rate for transmission risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis. For 2022, an estimated 0.005 ignitions would occur should SDG&E stop completing inspections and

repairs in the prescribed timeframes as part of the additional transmission aerial patrol program. A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0
5-year average hit rate Priority (4-30 days)	0.001
5-year average hit rate Non - Critical	0
2022 Inspection Total Tier 3	1792
Emergency Tier 3	0*1792 = 0
Priority Tier 3	.001*1792 = 1.5
Non-Critical Tier 3	0* 1792 = 0
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	1.5 * 4% = .056
Transmission Ignition rate HFTD	9.00%
Ignitions Avoided Tier 3	.056 *9% = .005

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The greatest risk of ignition is typically found in the HFTD where the potential for ignition and spread are greater. Tier 3 of the HFTD is one of the most critical locations and for this reason, the flights are specifically performed to mitigate risk for these locations. Typically, 69kV tie lines have less spacing and ground clearance than higher voltages so the focus of the program is the 69kV tie lines located in Tier 3 of the HFTD. To ensure risk is further mitigated, patrollers utilize these flights to also get another visual on the components and equipment of the 230kV and 500kV structures to further mitigate these risks.

Progress on initiative *(amount spent, regions covered) and plans for next year*

By August 2020, five flights were completed by qualified electrical workers to look at all 69kV tie lines within Tier 3 of the HFTD. The goal was to complete all 69kV lines prior to September 1, 2020 which is typically around the beginning of fire season and this was accomplished. In addition, these flights looked at SDG&E's key 230kV and 500kV tie lines within Tier 3 of the HFTD. SDG&E plans to complete these same flights prior to September 1, 2021.

SDG&E notes that the transmission line inspection programs are driven by FERC-jurisdictional projects. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

In addition to the aerial patrols on the 69kV tie lines in Tier 3 of the HFTD, SDG&E plans to continue to complete patrols on the 230kV and 500kV tie lines in the same area. This is planned moving forward and no additional improvements are currently planned.

7.3.4.10 Patrol inspections of distribution electric lines and equipment

Risk to be mitigated */ problem to be addressed*

In general, utilities must patrol their systems once a year in urban areas and in Tier 2 and Tier 3 of the HFTD. Patrols in rural areas outside of the HFTD are required to be performed once every two years. As a long-standing practice, however, SDG&E performs patrols in all areas on an annual basis. In addition to the patrols, utilities must conduct detailed inspections at a minimum every three to five years, depending on the type of equipment.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The patrol inspections are mandated by GO 165. Upon completion of prescribed actions necessitated by the detailed CMP inspections, SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's operational and engineering managers, who are responsible for certain districts. The managers typically select about 1.5% of the combined (overhead and underground) territories and assess their conditions to see if the appropriate improvements have been properly carried out.

Risk Reduction Estimation Methodology

The studies discussed in Sections 4.4.2.6 and 4.4.2.7 describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average distribution ignition rates broken down by HFTD tier were utilized to calculate ignitions avoided due to the program. The ignitions avoided is calculated on an annual basis. For 2022, an estimated 0.641 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the annual patrol distribution inspection program.

A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0.0005
5-year average hit rate Priority (4-30 days)	0.0005
5-year average hit rate Non - Critical	0.0038
2022 Inspection Total Tier 3	39371
2022 Inspection Total Tier 2	46751
Emergency Tier 3	.0005*39371 = 21
Emergency Tier 2	.0005*46751 = 25
Priority Tier 3	.0005*39371 = 20
Priority Tier 2	.0005*46751 = 23
Non-Critical Tier 3	.0038 * 39371 = 150
Non-Critical Tier 2	.0038*46751 = 179
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	21*37% + 20*4% + 150*.31% = 9
Risk events Avoided Tier 2	25*37% + 23*4% + 179*.31% = 11
Distribution Ignition rate Tier 3	2.74%
Distribution Ignition rate Tier 2	3.37%
Ignitions Avoided Tier 3	9*2.74% = .249
Ignitions Avoided Tier 2	11*3.37% = .365
Total Ignitions avoided	.365+.249 = .641

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E performs inspections throughout its service territory. SDG&E tracks the issues identified through this inspection method. These records can be evaluated to identify the quantity and types of issues found that demonstrate the effectiveness of the program.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, all patrols on the electric distribution system have been completed in SDG&E's service territory. In 2021 and future years, SDG&E will continue to comply with GO 165 and conduct the required inspections.

The amount spent in 2020 for inspections, O&M repairs, and capital repairs and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E tracks the issues identified through this inspection method. These records can be evaluated to identify the quantity and types of issues found that demonstrate the effectiveness of the program.

7.3.4.11 Patrol inspections of transmission electric lines and equipment

Risk to be mitigated */ problem to be addressed*

The transmission visual patrols are conducted once per year on all overhead tie lines within the HFTD. These inspections, conducted by helicopter, allow for an aerial perspective of overhead structures, conductor spans and right-of-way encroachments. These inspections are designed to identify obvious structural problems and hazards. Prior to September 1st of each year, SDG&E performs an additional visual patrol of tie lines located within Tier 3 of the HFTD.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

One of the main reasons for the visual patrols is to look at structures, conductors, and rights-of-way from the air to see a different perspective on the various components. Without these flights, patrollers would be unable to see the tops of structures and components to identify issues, such as cracked pole tops or rust/corrosion in different areas. In addition, these flights are looking for larger issues which pose a fire risk or risk to public safety. As additional visual patrols are performed prior to events and fire season, conditions found often require quicker repairs to ensure safety prior to events.

Based on findings from this program, SDG&E estimates an additional 0.01 ignitions would occur annually should these inspections and repairs not be performed per program requirements.

Risk Reduction Estimation Methodology

The studies discussed in Sections 4.4.2.6 and 4.4.2.7 above describe how SDG&E developed a methodology to estimate the risk reduced by inspection and maintenance programs. To review, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average ignition rate for transmission risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis. For 2022, an estimated 0.018 ignitions would occur should SDG&E stop completing inspections and

repairs in the prescribed timeframes as part of the detailed transmission inspection program. A summary of the calculation is provided below:

5-year average hit rate Emergency (0-3 days)	0
5-year average hit rate Priority (4-30 days)	0.0007
5-year average hit rate Non - Critical	0.0008
2022 Inspection Total Tier 3	2377
2022 Inspection Total Tier 2	4647
Emergency Tier 3	0*2377 = 0
Emergency Tier 2	0*4647 = 0
Priority Tier 3	.0007*2377 = 2
Priority Tier 2	.0007*4647 = 3
Non-Critical Tier 3	.0008 * 2377 = 2
Non-Critical Tier 2	.0008*4647 = 4
Fail Rate Emergency	37%
Fail Rate Priority	4%
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	0 + 2*4% + 2*.31% = .07
Risk events Avoided Tier 2	0 + 3*4% + 4*.31% = .136
Transmission Ignition rate HFTD	9.00%
Ignitions Avoided Tier 3	.07*9% = .006
Ignitions Avoided Tier 2	.136*9% = .012
Total Ignitions avoided	.006+.012 = .018

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Currently, all energized and de-energized transmission lines are patrolled on a yearly basis. These flights both heavily support fire and public safety as they are often looking for major conditions as opposed to a fully detailed inspection performed by land every three years. Additional flights prior to September 1 of each year in Tier 3 of the HFTD are specifically targeted to ensure fire safety prior to the fire season. The location for additional patrols performed prior to events are targeted based on meteorological data. SDG&E looks at wind speed, FPI, and other factors to determine where best to patrol prior to Red Flag Warning or other events.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E completed visual patrols on all transmission lines in the system. At the end of August, an additional set of visual patrols was completed on transmission lines in Tier 3 of the HFTD. In addition, visual patrols along with infrared patrols were completed prior to multiple

Red Flag Warnings to verify the integrity of the system in the potential impact areas prior of the event. In 2021, SDG&E will perform another set of visual patrols on all transmission lines resulting in 113 patrols in the HFTD, an additional set of visual patrols on tie lines within Tier 3 of the HFTD prior to September 1, as well as additional visual patrols prior to events as needed.

SDG&E notes that the transmission line inspection programs are driven by FERC-jurisdictional projects. This WMP provides only the CPUC-jurisdictional elements related to this strategy. These can be found in Attachment B, Table 12.

Future improvements to initiative

SDG&E does not currently plan on implementing any improvements to this initiative. All structures are completed on a yearly basis with additional visual patrols completed in conjunction with additional infrared patrols as needed on potentially impacted tie lines prior to major events such as Red Flag Warnings.

7.3.4.12 Pole loading assessment program to determine safety factor

Please see Section 7.3.3.17.1 above.

7.3.4.13 Quality assurance/quality control of inspections

Risk to be mitigated */ problem to be addressed*

SDG&E utilizes various reports to monitor its CMP progress, for both inspections and repairs. In addition, regular monthly meetings are held with various internal construction and operations centers to discuss detailed CMP progress and compliance. Audits of inspections mitigate the risk of inconsistent application of inspection protocols and the potential to miss an infraction that could become a fire hazard.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Upon completion of prescribed actions necessitated by the CMP inspections, SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's Operational and Engineering managers, who are the ones responsible in each of the districts. This process also allows field supervisors to evaluate the inspectors and ensure they are all aligned with the Company's protocols and procedures.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The 1.5% audit is performed on all inspection programs, with the region determined by the scope of the inspection program. Many of SDG&E's programs like the Tier 3 HFTD inspections focus on the high fire risk areas, those audits will only occur in the HFTD. System wide

programs like the detailed five-year ground inspections require each district to perform the audit in their territory, which ensures all locations systemwide including the HFTD are audited for quality.

Progress on initiative *(amount spent, regions covered) and plans for next year*

All audits on SDG&E's detailed inspections and repairs have been completed for 2020. Audits for 2021 and 2022 will occur as inspections and repairs are completed throughout those years. The cost for these audits are charged to the different inspection and repair programs being audited, the cost for the different programs are provided in Table 12 of Attachment B.

Future improvements to initiative

SDG&E does not currently plan on implementing any improvements to this initiative. SDG&E will continue its current process of auditing our inspection and maintenance results on a quarterly basis.

7.3.4.14 Substation inspections

Risk to be mitigated */ problem to be addressed*

SDG&E's Substation Inspection and Maintenance Program is mandated by the CPUC through GO 174 and promotes safety for SDG&E personnel and contractors by providing a safe operating and construction environment. This is accomplished through routine inspections at reoccurring cycles. A security check is planned once per week, and a more detailed inspection is planned monthly or bimonthly, which takes a visual look at equipment and attempts to identify any problems, like oil leaks.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Substation inspections, while conducted primarily for reliability, also provide incidental wildfire mitigation benefits. Specifically, this inspection program mitigates the risk of equipment failure, which has the potential to cause ignitions,[30] by identifying equipment deterioration to make the repair or replacement before failures occur. In this instance, equipment failure can lead to fires in oil-filled substation equipment; however, those fires would be contained within the substation footprint. Thus, SDG&E's inspection and maintenance programs have incidental wildfire mitigation benefits when performed within the HFTD and wildland urban interface.

This initiative does not have an RSE for the reasons described above. The way SDG&E designs and constructs its substations, with the steel structures and gravel and concrete base makes it

[30] While substation equipment failure can cause ignition of equipment inside a substation, it is rare for it to travel outside of the substation.

difficult for a fire to spread outside the substation. With very little ignition history, SDG&E performs substation inspection and maintenance more for the importance of substation reliability.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E applies the same prioritization criteria to substations inside and outside of the HFTD. Priority 1 substations have an operating voltage above 200kV or have a total of 4 or more transmission lines at or above 69kV. All other substations are categorized as Priority 2. All substations have a Security Check planned once per week.

Inspection	Planned Frequency	Acceptable Frequency
Substation Security Check	Once Per Week	9 per 12 weeks
Substation Inspection	Once per month (Priority 1); Once per two months (Priority 2)	10 per every 12 months (Priority 1); 5 per every 12 months (Priority 2)
Substation Infrared Inspection	12-month Trigger	Due in 15 months

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E's substation inspection program applies to the entire SDG&E service territory, HFTD and non-HFTD. The inspection program targets for 2020 were met. No new substations were energized in 2020, so the inspection targets for 2021 will remain the same as 2020.

Top 5 Corrective Substation Maintenance Orders for 2020

Corrective Maintenance Order*	Qty
Switchyard Vegetation Removal	149
N2 Cylinder Maintenance	34
Transformer Monitor Repair	14
LTC Pass Through Neutral CBM Alarm	12
Petro Pipe Replacement	6

*Note: Corrective maintenance orders are opened for any item requiring follow-up. SDG&E does not identify the source of the corrective maintenance order (Scheduled Substation Inspection or some other method). Not all of the items in the table above were captured by the substation inspection program alone.

Future improvements to initiative

Substation Inspections, which provide incidental wildfire mitigation benefits, are conducted primarily for reliability. The substation inspection program has been refined over the years, and there are no current plans to change the program in the foreseeable future.

7.3.5 Vegetation management and inspections

As part of its efforts to make its electric system more resistant to wildfires, and to comply with relevant Commission rules and state law, SDG&E's vegetation management program was designed with the goal of keeping trees and brush clear of electric infrastructure. SDG&E's vegetation management program involves several components including but not limited to: tracking and maintaining a database of inventory trees and poles, routine and enhanced patrolling, pruning and removing hazardous trees, replacing unsafe trees with more situationally compatible species, pole brushing, and training first responders in electrical and fire awareness. These program components are discussed in detail in the Sections below.

SDG&E's strategy for conducting its vegetation management program focuses on annual routine and enhanced inspections. Routine operations are driven by regulatory requirements by following an annual, master schedule that includes pre-inspection activities, trimming, auditing, and pole brushing. During routine and off-cycle inspections in the HFTD SDG&E pursues enhanced clearances on its targeted species. The off-cycle inspections provide a second assessment of all trees within the HFTD during the annual cycle. The criteria for determining target species include factors such as growth rate and characteristics, failure potential, outage frequency history, and other environmental factors. Targeted species include eucalyptus, palm, oak, pine, and sycamore. Species alone does not necessarily trigger the need for enhanced trimming but must consider the risk based on multiple site-specific conditions. Many of these trees, such as eucalyptus and sycamore, are fast-growing and have the propensity to shed branches during wind conditions.

SDG&E maintains an electronic tree database that tracks the inspection, trimming, and auditing activity of its nearly 457,000 inventory trees. SDG&E defines an inventory tree as one that could encroach the minimum required clearance or otherwise impact the electrical facilities within three -years of the inspection date. The database includes tree information including species, height, diameter, growth rate, clearance, and other characteristics. This history provides tree inspectors with relevant information to determine which trees require work for the annual cycle. The tree inventory database is updated daily reflecting trees that are added to or removed from the system. SDG&E employs a contracted workforce of ISA-Certified Arborists trained in species identification, characteristics, and hazard assessment.

Within the HFTD, SDG&E schedules its enhanced tree inspections to coincide with the post-trim QA/QC activity. The enhanced inspection activity occurs approximately six months after the routine inspection activity. This inspection frequency enables a second look at trees within the annual cycle to ensure conditions have not changed that may result in a tree/line conflict. In areas of the HFTD where the annual, routine pre-inspection activity occurs in the Fall (September-December), SDG&E performs the enhanced tree inspection activity in the Spring and Summer months in advance of seasonal Santa Ana wind conditions. The protocol and scope for both routine and enhanced inspections within the HFTD includes a visual inspection of all trees that have the potential to strike the electrical facilities if the tree were to fail at ground level. The visual inspection includes a 360-degree hazard assessment of trees from ground level to canopy height to determine tree health, structural integrity, and environmental conditions. Where appropriate, sounding techniques or root examination may also be conducted.

The criteria for determining post-trim clearances includes factors such as species, height, growth rate, health, location of defect, site conditions, proper cuts. SDG&E's post-trim clearances are tree-specific applying each applicable factor. The strategy is to ensure a tree cannot encroach the power lines or make contact either by wind sway, branch breakout or tree/root failure. SDG&E follows the industry standard of directional pruning to achieve this goal. If a tree cannot be mitigated by pruning, SDG&E may determine that complete removal is necessary. This course may be followed in situations where continued pruning is detrimental to the tree, the remaining tree poses a threat, or its growth potential cannot be managed for the duration of the annual cycle.

In 2021, SDG&E has created four new internal SDG&E Forester Patroller positions to perform the off-cycle, enhanced tree inspections within the HFTD. These patrollers are ISA-Certified Arborists and highly qualified to perform hazard tree risk assessments. This team will also be engaged to perform customer refusal resolution within the HFTD. In the first quarter of 2021, SDG&E also anticipates implementing its next generation database and work management system. This new system will include upgraded computer field hardware and software which will improve worker performance and quality, and create improvements in data entry, accuracy, and reporting.

7.3.5.1 Additional efforts to manage community and environmental impacts

***Risk to be mitigated** / problem to be addressed*

Vegetation management is an important component of SDG&E's wildfire mitigation strategy. But it also requires attention to mitigate the environmental impacts of tree trimming and removals, as well as the impacts vegetation management practices have within the community.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

In an effort to continue to inform and engage customers on its routine tree activities and wildfire mitigation activities, SDG&E's Vegetation Management department participated in multiple community outreach events in 2020, including virtual online webinars and drive-through fire-preparedness events. SDG&E also educated its customers on the concept of "Right Tree-Right Place," proper planting near power lines, maintaining safe clearances, and fire safety. Customer outreach efforts were coordinated and scheduled through the SDG&E Public Affairs department and the WMP Outreach teams. These efforts were modified to conform with COVID-19-related mandates of social distancing.

Outreach and education help provide customers and stakeholders a thorough understanding of the value and necessity of vegetation management activities. These engagement activities promote buy-in, collaboration, and investment from customers in the safety and fire prevention benefits of SDG&E vegetation management practices.

SDG&E's vegetation management operations are also conducted in consideration of the impact to the environment and in accordance with all applicable rules and regulations. When necessary, tree replacement activities are conducted in accordance with "Right Tree Right Place" concepts. The Vegetation Management department follows the protocols of SDG&E's wildlife agency-approved Natural Communities Conservation Plan (NCCP). The Plan includes internal Company review of scheduled activities in advance to ensure environmental protection.

SDG&E works with land agencies such as the U.S. Forest Service and California State Parks to identify and implement best practices to protect habitat and species. SDG&E follows State Forest Practice Rules in the dispersal and removal of green waste associated with tree pruning and removal operations. Wood debris associated with pruning operations are chipped and removed from the site. All debris is removed from watercourses to prevent flow restriction or channeling and prevent flooding or erosion.

In 2020, as part of its sustainability initiative, and in the effort to reduce greenhouse carbon emissions and decrease landfill space, SDG&E sought alternative options for diverting green waste associated with its vegetation management activities. Green waste resulting from

vegetation management activities are delivered to recyclable and landfill facilities. In 2020, vegetation management generated over 12,000 total tons of green waste associated with its tree trimming and removal activities. In 2020, SDG&E diverted 4,450 tons of that total to its recyclable vendor to be converted to a variety of environmentally-beneficial uses.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E's vegetation management activities impact customers across the service territory, with enhanced activities targeted to the HFTD. To reach a broad segment of customers, the online webinars were publicly available and were attended by approximately 700 people. The drive-through fairs were held in several communities in the backcountry throughout the summer where customers were provided literature and giveaways pertaining to wildfire preparedness. Approximately 2,400 customers in total attended these events.

To further promote outreach efforts, SDG&E created a 30-minute documentary about its wildfire safety efforts and advancements. Part of the documentary covered SDG&E's vegetation management practices and provided education on the need for these efforts. The documentary aired in late 2019 through 2020 and continues broadcasting on local TV stations, with trailers being shown in strategically located movie theaters within SDG&E's service territory. Part of the documentary covered SDG&E's vegetation management practices and provided education on the need for these efforts. Collateral materials have also been developed to further educate customers about the need and value of vegetation management. These materials provide tips and recommendations to help customers manage vegetation and defensible space around their homes and businesses. SDG&E's tree safety website is shared with numerous stakeholders and agencies to post on their respective website allowing for greater opportunities to engage and educate the public. SDG&E also utilizes its contract workforce of professional arborists and tree trimmers to directly engage customers on the positive benefits of safe and proper utility line clearance operations.

Progress on initiative *(amount spent, regions covered) and plans for next year*

All vegetation management contractors are trained in positive customer communications, which affords multiple opportunities to interface with customers regarding vegetation management operations. SDG&E also continues to lead and participate in Arbor Day events in several of its communities and utilizes a non-profit vendor to educate the public and school-age children on electrical awareness, and safe and proper management of trees near power lines.

SDG&E also continues its development of customer engagement activities via a centralized team of associated departments to improve customer outreach and awareness of the various wildfire mitigation efforts. This includes maintaining the appropriate customer baseline and various forums to engage customers. SDG&E will continue to conduct pre- and post- event customer research to obtain feedback on the quality of the messaging and communication

tactics that are employed. Surveys and focus groups will be used to engage customers and solicit reactions to the public education campaign materials created. Surveys will continue to be employed during the community outreach events. Attendees are asked to provide feedback about the event and content suggestion for future events. This type of feedback helped SDG&E establish its Community Resource Centers.

In December 2020, SDG&E entered into a contract with a second certified DBE vendor that processes 100% material received into recyclable streams. The addition of this second recyclable vendor is expected to result in an increase in the amount of material diverted from landfills, and further reduction of the carbon footprint related to tree trimming efforts.

Future improvements to initiative

SDG&E will continue to work with multiple internal departments toward the goal of providing comprehensive outreach and education regarding its vegetation management activities including web content, specific literature, and public events.

7.3.5.2 Detailed inspections of vegetation around distribution electric lines and equipment

Risk to be mitigated */ problem to be addressed*

Vegetation around electric distribution lines and equipment poses potential risks for safety, compliance, and reliability. To address these risks and mitigate the risk of potential ignitions, SDG&E Vegetation Management developed and executes a robust and detailed schedule and scope for its vegetation inspection activities.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

To comply with Commission rules as well as state and federal laws, SDG&E developed and maintains a vegetation management work plan, which is a schedule-based approach to its operations to ensure applicable lines within its service territory are inspected each year.

Risk Reduction Estimation Methodology

To determine the effectiveness of SDG&E's current vegetation management program, SDG&E reviewed historical vegetation contact data going back to 1995 before the formal vegetation management program was established in 1998. During this period, SDG&E increased its post trim clearance standards to 10-12 feet of clearance and saw dramatic reductions in vegetation contacts. SDG&E then utilized the tree inventory location as a method to approximate the location of the risk events, and then utilized the five-year average ignition rates to estimate the ignitions avoided. Based on the calculations, 7.41 ignitions are avoided by completing vegetation management activities according to SDG&E's current process.

Below is a summary of the calculation:

Average vegetation risk events pre-mitigation (1995-1998)	402
Average vegetation risk events post mitigation (1999-2010)	82
Risk events reduced	320
Tier 3 Trees	109732
Tier 2 Trees	132300
Non-HFTD Trees	216806
Total Trees	458838
Risk events avoided Tier 3	320 * 109732/458838 = 76.5
Risk events avoided Tier 2	320* 132300/458838 = 92.2
Risk events avoided Non-HFTD	320* 216806/458838 = 151.2
Ignition rate Tier 3	2.74%
Ignition rate Tier 2	3.37%
Ignition rate Non-HFTD	1.46%
Ignitions avoided Tier 3	76.5 * 2.74% = 2.09
Ignitions avoided Tier 2	92.2 * 3.37% = 3.11
Ignitions avoided Non-HFTD	151.2 * 1.46% = 2.21
Total Ignitions avoided	2.09 + 3.11 + 2.21 = 7.41

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E divides its service territory into 133 distinct zones known as Vegetation Management Areas (VMA). SDG&E's activities in each VMA are driven by a master schedule that identifies specific activities that are calendared to take place in each VMA every year. The activities include: pre- inspection, audit of pre-inspection work, tree pruning and removal, pole brushing, post-trim, and brushing audits. Patrol activities are generally termed to include routine inspections and off-cycle, incremental/enhanced inspections throughout the service territory. During the pre-inspection activity, trees in proximity to SDG&E's power lines are inspected and evaluated and the tree condition in the database is updated accordingly. Each tree is visited and inspected annually. The annual inspections include routine maintenance and hazard tree assessments to verify that trees will remain compliant for the duration of the cycle and/or pruned according to standards and clearances. Trees that will not maintain compliance, or that have the potential to impact power lines within the annual pruning cycle, are identified and assigned to the tree contractor to work. If a tree requires urgent work, the inspector has the discretion to issue the job to the tree contractor for priority completion. Emergency pruning may occur where a tree requires immediate attention to clear an infraction, or if it poses an imminent threat to the electrical facilities.

Within the HFTD, SDG&E performs separately scheduled routine and non-routine hazard tree inspections annually. These inspections are performed by International Society of Arboriculture (ISA) Certified Arborists and include a 360-degree assessment of every tree within the "strike zone" of the conductors. The strike zone includes the area adjacent to power lines both inside and outside the rights-of-way for trees that are tall enough to potentially strike the overhead facilities. SDG&E completes work identified during the non-routine inspections prior to the start of the peak fire season (September 1).

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E tree contractors follow American National Standards Institute (ANSI) A300 industry tree standards and "directional pruning" techniques which foster the health of a tree while maximizing clearance and extending the pruning cycle. Tree branches that overhang electrical conductors may be considered a risk. SDG&E removes all overhanging branches on its distribution and transmission lines. Once the work is completed, the tree crew updates the tree information and records the work performed in a mobile data terminal (MDT), then uploads this information into the Vegetation Work Management System. Where achievable, SDG&E prunes trees to a clearance of 12 feet (or greater) from power lines. The post-pruning clearances obtained by the tree contractor are determined by factors such as species, tree growth, wind sway, and proper pruning practices. On average, SDG&E prunes approximately 175,000 trees each year and removes approximately 8,500 non-compatible trees. In 2020 SDG&E pruned 221,500 trees and removed 12,985 trees. By comparison, in 2019, SDG&E pruned 167,588 trees and 9,936 removed trees.

Tree removal includes the chipping of all material and removal of debris. The only material left on site is the larger wood (> 6-8-inch diameter). Large wood generated from tree removal work is left onsite with the property owner's acknowledgment on the signed tree removal authorization document. Any large debris left on slopes is positioned to prevent movement of the material by gravity. All debris associated with pruning and removal operations is removed from watercourses to prevent flooding or degradation of water quality. Tree removal operations that may occur in sensitive environmental areas are reviewed to determine protocols that must be followed to protect species and habitat.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Inspection activities are currently managed within a work management system currently called PowerWorkz. An enhancement to this system called EPOCH is scheduled to roll out in early 2021. The new EPOCH system is expected to provide enhancements including improved computer performance, ability to add documents and photos, and improvements to the mapping software.

SDG&E plans to explore the use of WiNGS to evaluate vegetation management prioritization in 2021 – 2022. This will determine future refinements for risk models to support future prioritization and implementation of tree trimming.

7.3.5.3 Detailed inspections of vegetation around transmission electric lines and equipment

Please see Section 7.3.5.2 above.

7.3.5.4 Emergency response vegetation management due to red flag warning or other urgent conditions

Please see Section 7.3.5.1 and 7.3.5.9.

7.3.5.5 Fuels management and reduction of "slash" from vegetation management activities

Risk to be mitigated */ problem to be addressed*

In addition to managing vegetation clearances around overhead electrical infrastructure, SDG&E has undertaken multiple ground vegetation management activities to mitigate the risk and threat of ignition and catastrophic wildfire.

SDG&E's Fuel Management Program consists of three activities: fuels treatment, vegetation abatement, and fuels reduction grants. The program was developed to reduce wildland fuel loading in the high fire risk areas around SDG&E facilities and rights-of way. Wildland fuel reduction involves the thinning, pruning, and in some cases, removal of vegetation for the purpose of minimizing source material that could ignite and propagate a wildfire.

The Fuel Management Program was expanded in 2019 and has been administered under separate departments within SDG&E. The program consists of three activities:

- **Fuels Treatment activity**- Increased clearances around select structures (poles). The Fuels Treatment activity was developed in 2019 to reduce the risk of ignition that could occur from equipment or pole failure, or a wire-down event and propagate fire. This activity is also intended to protect Company infrastructure in the event of a wildfire that originates beyond SDG&E facilities.
- **Vegetation Abatement activity** - Vegetation clearing within transmission rights-of-way. Vegetation abatement activity – This activity primarily consists of the removal of ground level, non-native flashy fuels, and the thinning of tree branches (to 6-8 feet) above ground. The Vegetation Abatement Program has been performed for several years and has been administered within SDG&E's Land Services Department.

- **Fuels Reduction Grant activity** - SDG&E-sponsored funding grants to third-parties for the creation of fuel breaks. The Fuels Reduction Grant Activity was implemented to provide funds to third parties (e.g., community organizations) targeted at reducing the risk of a fire of consequence igniting in a project area and to strengthen the resiliency of the project areas.

The Fuel Management Program aims to mitigate the following risks:

- Accumulation of wildland fuels in proximity to electrical infrastructure (wires, poles, equipment) pose a risk of damage to these facilities during wildland fires.
- Firefighting activities, firefighter safety and faults resulting from smoke columns in proximity to electric facilities can cause power interruption.
- Wildland fuels pose a risk of ignition resulting from electric equipment failure if left unabated.

Vegetation debris (i.e., slash) generated from the Fuels Management and Vegetation Management activities are typically completely removed from the project site unless it is determined that a portion of the debris can be used on site for soil cover or other purposes. This determination is made upon review by the SDG&E Environmental Services Department. Property owners may also request that debris be left on sight as chipped material for ground cover or landscaping.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E is performing these Fuels Management activities to further reduce the chance of an ignition caused by its electrical equipment and to minimize the potential for fire propagation if an ignition occurs. Such activities can also help protect electrical infrastructure and reduce costs associated with equipment repair and replacement.

SDG&E developed the Fuels Treatment activity as a proactive program intended to reduce wildfire fuel loads in high fire risk areas outside the areas already addressed by traditional pole brushing and other Company wildfire mitigation-related activities. The goal is to implement and assess new fire reduction practices so the Company can minimize the chances of an ignition event in high fire threat areas. SDG&E is gathering data on this program to determine the best methods to reduce fire threat.

The Vegetation Abatement activity was implemented to maintain Company-owned parcels in a fire-safe manner as required by various municipal compliance ordinances, Fire Marshal directives and community safety expectations. This activity is intended to reduce the fuel loading from overgrown vegetation that may propagate a fire if an ignition were to occur.

Fuels Reduction - Fire departments and academia are in agreement that strategic fuel reduction treatments can reduce ignitions, slow fire spread, and assist in firefighting. The Fuels Reduction

Grant activity provides needed funds to allow community organizations to reduce the risk of catastrophic fire in their respective communities. The fuel reduction treatments will be based on previous analysis by CAL FIRE of wildland fuels in the SDG&E service territory known as HFTD Tier 2 and 3.

Risk Reduction Estimation Methodology

Because SDG&E is relatively new to attempting to quantify the benefits of a Fuels Treatment activity, the risk reduction methodology used is based on subject matter expertise. With more experience with Fuels Treatment, it will be possible to be more certain with future risk analysis.

The overall risk approach was to estimate the reduction of likelihood in ignitions and the decrease in consequence. The likelihood of a wildfire is estimated to be decreased by 20% where Fuels Treatment is applied; and the consequences is estimated to be decreased by 50% where Fuels Treatment is applied. These likelihood and consequence decreases were applied in allocated basis depending on the scope of the program, which is about 5% of Tier 3.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Fuels Treatment Activity

The Fuels Treatment activity has been implemented primarily within the Tier III High Fire Threat District on select poles which carry hardware that could possibly spark and ignite a fire. The scope of this activity entailed the removal of dead or dying fine fuels at ground level within a 50-foot radius of the poles. Some of these poles are those that are already subject to clearing requirements of Public Resources Code Section 4292. However, that requirement only requires a radius clearing of 10 feet.

For this activity, SDG&E also included the use of a chemical fire retardant as an alternative to mechanical brush clearing. The fire retardant was applied around poles, and in some areas, in a linear application between structures within an easement. Landowner approval was secured for all work associated with the Fuels Modification activities.

Vegetation Abatement Activity

This activity is managed within SDG&E's Land Services Department. The activity includes the abatement of ground level, non-native flashy fuels on SDG&E-owned properties and ROW corridors. Typically, the same properties are abated annually, or on a frequency based on vegetation growth. Due to the diversity of ecosystems within the SDG&E service territory, plant species, and rainfall frequency, inspection activities may occur monthly or weekly depending on the season. Brush abatement activities are planned and scheduled in late February/early March each year near the end of the normal rain season and before the flush spring growth occurs so that activities are efficiently managed in the appropriate regions.

Fuels Reduction Grant Activity
Fire Coordination fuels treatment projects will be identified using GIS analysis of Tier 2 and 3 areas of the service territory that meet certain criteria. The analysis will focus on areas impacted by significant wind events (PSPS). The analysis will then overlay areas where electric facilities, fuels, and topography have a direct association to fire ignition potential and growth and community protection.

***Progress on initiative** (amount spent, regions covered) and plans for next year*

Fuels Treatment Activity
In 2019 and 2020, SDG&E implemented the Fuels Treatment activity for pole brushing and fire retardant activities. This included the treatment of 314 structures (poles) in 2019, and 614 total poles in 2020 (of which 314 of the 614 was maintenance of poles cleared in 2019). Total treatment of pole brushing in 2020 was 304 acres. Total treatment using fire retardant was 25 acres including 38 poles and roadside application. There were no fires in the area that was covered by this program, however, we will continue to monitor these areas to determine their efficacy. SDG&E will continue this activity for at least one more year to see if we are able to determine impacts.

Vegetation Abatement Activity
In 2020 a total of 1,352 acres were abated on fee-owned power line corridors, and 300 acres of fee-owned properties were abated. SDG&E will continue these abatement activities following the same scheduled frequency.

Fuels Reduction Grant Activity
2019-2020: SDG&E granted $424k to eight (8) fuels treatment projects within the service territory including five (5) Native American reservations, two (2) community fire safe councils, and one (1) roadside fuel treatment test project. All projects had direct benefit to electric infrastructure and public safety. SDG&E monitored progress and performed final review of the project work areas to ensure the work was completed in a timely manner and to the level described in the project proposals.

2020-2021: A $500K fuels treatment grant was awarded to Fire Safe Council of San Diego County. This grant will be used to treat wildland fuels in proximity to electric facilities with potential to impact communities during a wildland fire.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Fuels Treatment Activity
SDG&E continues to assess the cost/benefit of this fire prevention activity. In 2021, SDG&E will continue this activity for maintenance on poles previously cleared and, where budget may allow, the clearing of additional structures.

Vegetation Abatement Activity
Anticipated improvements to this initiative in 2021 include enhanced reporting methods, pictorial documentation of brushing activities and successional training opportunities. Such efforts will aid in supporting Company sustainability goals. Future innovations may include the inclusion of efficient/improved sustainable brush abatement machinery technology (lower emissions & finely ground deck mulching spoils), and the possible utilization of prescribed grazing using goats.

Fuels Reduction Grant Activity
Fire Coordination will continue to monitor the success of the fuels treatment program and adjust funding and treatment locations. Fire Coordination will continue to engage fire agencies, local/state/federal governments, and community groups to coordinate and maximize all stakeholder efforts.

7.3.5.6 Improvement of inspections

Please see Section 7.3.7.10.

7.3.5.7 LiDAR inspections of vegetation around distribution electric lines and equipment

Risk to be mitigated */ problem to be addressed*

SDG&E seeks to engage new and existing technology to help improve its ability to empirically determine vegetation clearances to meet safety and compliance requirements, and to reduce the risk of vegetation related ignitions or wildfire.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E has successfully utilized and integrated LiDAR technology across multiple activities for several years. LiDAR technology can potentially augment and enhance vegetation inspection and auditing activities by providing highly accurate clearances between trees and power lines, thus providing another tool aimed at preventing an outage or a non-compliant condition.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E is expecting to initiate and prioritize LiDAR into its vegetation inspection and auditing activities within the HFTD and transmission corridors.

***Progress on initiative** (amount spent, regions covered) and plans for next year*

In 2020, SDG&E Vegetation Management performed a pilot project to test the benefits and potential use of the technology in its vegetation management operations. The pilot was conducted on Palomar Mountain along a distribution circuit within an area of high tree density and diversity of tree species. A fresh LiDAR flight was used to provide the most current and accurate data. A vendor was selected with the capability of acquiring and analyzing the flight data with a quick turnaround time. After the results were provided Vegetation Management visited the field to compare the analysis with actual conditions. For the most part the data proved to validate what was observed in the field. However, there were minor discrepancies found with some of the clearances, most of which was related to tree canopy density and the ability to discern different types of equipment and line configurations. SDG&E will continue with the pilot to refine its use and determine next steps for greater application.

In 2020, SDG&E fully integrated the use of a mobile phone app which utilizes LiDAR data and PLS-CADD modeling for field verification of tree clearances, line movement, and position relative to electric infrastructure. This app has been used exclusively for the NERC transmission line inspections where clearance accuracy and is highly critical. Thus far, data modeling and acquisition has been somewhat inconsistent, but SDG&E continues to collaborate with the vendor on the use of the app within its routine tree inspection activities.

SDG&E also continued the use of Tree Growth Regulators (TGR) in 2020 as an integrated activity within its inspection activity. TGR is a chemical application injected into the soil along the tree root zone that dramatically reduces the new shoot growth of trees. Results have shown that the use of TGR can reduce the frequency of pruning on some species of up to three years. TGR is a positive tool that can help utilities maintain compliance during the annual cycle, reduce the number of customer visits, limit injurious pruning, retard disease and insect infestation, and promote tree vigor and health. In 2020, SDG&E treated approximately 3,400 fast-growing trees with TGR.

Future improvements to initiative

SDG&E is additionally researching LiDAR as a tool for post-trim auditing and change detection in trees and equipment, though the latter appears still in the early stages of advancement. SDG&E expects to use LiDAR technology to some degree across multiple Company initiatives and throughout a larger portion of the HFTD in 2021. As the frequency of flights increase, and data acquisition becomes more efficient, Vegetation Management will continue to pilot LiDAR as a more integrated component of its operations.

In late 2020 SDG&E Vegetation Management began another pilot to determine the use of satellite imagery for conditional awareness, clearances, outage investigation, and change detection. The benefit of satellite imagery over LiDAR is the high frequency of data. Imagery can be delivered much more frequently as satellite flights are nearly continual, therefore, data

can be near real-time. Satellite imagery, however, does not provide the high level of detail and clearance accuracy of LiDAR point clouds and three-dimensional modeling.

In 2020, SDG&E began a collaboration with the University of California San Diego supercomputing lab department to model its tree data. The project's goal is to use Vegetation Management's highly rich inventory tree data and outage history to develop a predictive risk analysis tool. Results thus far are still preliminary.

7.3.5.8 LiDAR inspections for vegetation around transmission electric lines and equipment

Please see Section 7.3.5.7 above.

7.3.5.9 Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations

Risk to be mitigated */ problem to be addressed*

SDG&E's Vegetation Management Program strives to be best-in-class through innovative approaches to further reduce risks associated with vegetation and power lines. In the HFTD, these risks include the potential for vegetation contacts, vegetation-related ignitions, and catastrophic wildfire. Increased activity frequency and enhanced post-trim clearances are two elements of SDG&E's effort to mitigate these risks.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Trees are dynamic, living organisms. As such, the vegetation/powerline environment is in continual flux as clearances change due tree growth, tree health, and external forces. Additional and discretionary inspections and trimming beyond currently mandated requirements reduce the risk of non-compliant or high-risk conditions that may lead to wildfire. To that end, in 2020, SDG&E continued broader application of its vegetation management activities in the HFTD related to routine inspection, enhanced patrols, and trimming. SDG&E also continued its enhanced vegetation management activities, including trimming identified high-risk species in the HFTD to a clearance of approximately 25 feet from electrical facilities, where achievable. As described in Section 4.4.2.9 and below, SDG&E's analysis demonstrates the risk reduction benefits of this program.

Risk Reduction Estimation Methodology

The effectiveness of the enhanced vegetation management program was measured using historical data and the methodology and results are described in detail in Section 4.4.2.9. Utilizing that information as a baseline, SDG&E combined the risk events reduced information from the study with the estimated number of enhanced trims to be completed through the

WMP timeframe, the number of targeted species located within Tier 2 and Tier 3 to approximate where the risk reduction would occur, and finally the average ignition rates to calculate ignitions reduced. Based on these results, the enhanced vegetation management program is estimated to reduce 0.126 ignitions by the end of 2022. A summary of the calculation is shown below:

Risk events reduced total from study	6.3
Trees Trimmed to enhanced levels (2020-2022)	51095
Targeted species Tier 3	36090
Targeted species Tier 2	42716
Total Targeted species	78806
% Tier 3	45.8%
% Tier 2	54.2%
Risk events reduced Tier 3	6.3 * (51095/78806)*45.8% = 1.9
Risk events reduced Tier 2	6.3 * (51095/78806)*54.2% = 2.2
Ignition rate Tier 3	2.74%
Ignition rate Tier 2	3.37%
Ignitions reduced Tier 3	1.9 * 2.74% = .051
Ignitions reduced Tier 2	2.2 * 3.37% = .075
Total ignitions reduced (2020-2022)	.051 + .075 = .126

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Enhanced vegetation management activities are targeted in the HFTD. During the annually scheduled routine inspection and enhanced patrol activities, all trees within the strike zone of the transmission and distribution lines receive a “level 2” hazard evaluation. These inspections are performed by ISA-Certified Arborists. Trees tall enough to strike overhead electric lines are assessed for trimming or removal. These efforts would include identification of dead, dying and diseased trees, live trees with a structural defect, and conditions such as wind sway and line sag. Where required, trees are trimmed or removed to prevent line strike from either whole tree failure or limb break out. The enhanced patrols are timed to occur mid-cycle with the routine scheduled inspection resulting in inspections occurring within the HFTD twice annually. Approximately 240,000 of SDG&E’s 455,000 inventory trees are located within the HFTD.

SDG&E’s tree trimming operations follow the concept of directional pruning, where all branches growing towards the lines are rolled back to direct the growth away from the lines and to increase the post-trim clearance. This practice decreases the risk of tree branches contacting electric facilities, whether by growth encroachment, limb failure, or complete tree failure.

SDG&E's enhanced vegetation management program is consistent with the approach presented in the 2020 WMP. SDG&E continues to focus on applying expanded post-trim clearances on targeted species identified as a higher risk due to growth potential, failure characteristics and relative outage frequency. These species include eucalyptus, sycamore, oak, pine, and palm.

During elevated or extreme weather events, SDG&E's vegetation management contractors are kept informed of conditions in advance, allowing them time to relocate crews into safe work areas or to cease operations if required. In instances of emergency tree trimming during elevated fire conditions, additional fire equipment or support from contracted, professional fire resources may be utilized. In advance of a forecasted Red Flag Warning or Santa Ana conditions, SDG&E will determine if vegetation management patrols are warranted to assess tree conditions. SDG&Es Meteorology confers with Fire Coordination and Vegetation Management to determine where this activity should occur.

SDG&E provides electrical equipment training to CAL FIRE representatives in conjunction with joint utility inspections. This training is intended to provide CAL FIRE awareness of electrical equipment, and to build a collaborative and positive working relationship between utility and regulator. CAL FIRE can then use this training to perform regularly scheduled inspections. CAL FIRE was unavailable to participate in joint inspections with SDG&E in 2020 due to fire response throughout the state. However, they have committed to resuming these activities in 2021 and future years.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E continued to apply its enhanced vegetation management program, including achieving an approximate 25 foot clearance, where feasible, between trees and electric distribution facilities within the HFTD. This is a significant increase over the average 12 foot post-trim clearance SDG&E typically achieves, and goes beyond the legal and regulatory requirements that apply throughout SDG&E's service territory. In 2020, SDG&E trimmed approximately 13,000 targeted trees to the expanded 20-30 foot clearance range.

As SDG&E has implemented enhanced inspections, patrols, and trimming, it has identified that additional tools, fleet, and crews are needed to support this program. As such the costs were expanded as compared to what was estimated in the 2020 WMP. SDG&E also hired four internal SDG&E inspectors to augment its contractor workforce to perform the off-cycle HFTD and additional patrol activities for target species, such as Century plant and bamboo. Tree contractors are adding to their work force to meet the demand of the increased workload associated with enhanced scoping.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Over the next 3 years, SDG&E will continue to refine and expand the use of its Vegetation Risk Index over the next three years to identify where to target additional trimming and removal activities. SDG&E will work with CAL FIRE to schedule annual training and joint inspection activities. SDG&E will continue to partner and collaborate with fire agencies and stakeholders on fire avoidance and fuel reduction initiatives.

7.3.5.10 Other discretionary inspection of vegetation around transmission electric lines and equipment, beyond inspections mandated by rules and regulations

Please see Section 7.3.5.9 above.

7.3.5.11 Patrol inspections of vegetation around distribution electric lines and equipment

Please see Section 7.3.5.2 above.

7.3.5.12 Patrol inspections of vegetation around transmission electric lines and equipment

Please see Section 7.3.5.2 above.

7.3.5.13 Quality assurance/quality control of inspections

Risk to be mitigated */ problem to be addressed*

Poor work quality and a lack of contractor oversight can lead to increased risk of non-compliant conditions as well as potential vegetation contacts.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Documented QA/QC activities are a critical component of a utility's vegetation management program as a means to measure contractor performance and to further safety, compliance and reliability.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E utilizes a third-party contractor to perform quality assurance audits of all its vegetation management activities to measure work quality, contractual adherence, compliance, and to determine the effectiveness of each component of the program. These audits include a statistical analysis of a representative sample of all completed work. Auditing is performed by

Certified Arborists. A minimum random sampling of 15% of completed work is audited to determine compliance with scoping requirements. Safety, regulatory requirements, and service reliability dictate the vegetation management methodology of spend and resource allocation. SDG&E works with the audit contractor to determine the scope, frequency, and number of resources needed to complete all audit activities. During the post-trim audit, the Certified Arborist also performs an inspection of all the power lines within the VMA for any trees that will not remain compliant with applicable regulatory requirements for the duration of the annual cycle. SDG&E and the contractor review the results to determine if any additional work is required. Sempra Energy, SDG&E's parent company, performs an annual, internal audit of the vegetation management program through its Internal Audit Services Department.

Before the upcoming 2021 wildfire season, SDG&E's audit contractor will hire additional personnel to perform an anticipated increase in audit scope and activities. Before an annual update, SDG&E anticipates completion of 100% audit on all its enhanced HFTD trim and removal activities.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020 SDG&E expanded its audit program by integrating "level 2" hazard tree assessments during the post-trim audit. These assessments are performed by the same Certified Arborists performing the audit. In 2020, SDG&E also began auditing 100% of all completed reliability trimming and removals performed within the HFTD. Lastly, Vegetation Management increased the audit sampling for all other activities from 10-15%. Within the next two years SDG&E hopes to expand and integrate the use of LiDAR as an additional tool for QA/QC.

Future improvements to initiative

Over the next 5 years, SDG&E will work to develop a comprehensive audit program to continue to assess and quantify the state of compliance of the Vegetation Management program with regulatory requirements. These audits will inform on overall success of the program, state of compliance, and procedural integrity.

7.3.5.14 Recruiting and training of vegetation management personnel

Risk to be mitigated */ problem to be addressed*

A trained, qualified, and professional workforce is imperative for a successful vegetation management program designed to mitigate wildfire and other risks. SDG&E measures the success of contractor training and performance through metrics such as the reduction of customer complaints, outages, claims, notice of violations, ignitions, and safety incidents.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

A highly qualified workforce positions a utility to efficiently and effectively manage operations to ensure safety, compliance, and reliability, and fosters confidence in those who regulate these activities. Vegetation management activities involve routine interactions with customers and vested external stakeholders, sometimes regarding challenging issues. A professional, competent workforce instils trust and credibility that aids SDG&E in achieving vegetation management compliance and risk reduction.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E Vegetation Management contractors are responsible for developing and conducting training of their personnel. SDG&E requires all contractors to perform annual training to address issues such as hazard trees, customer engagement, fire preparedness and environmental concerns. SDG&E personnel attend and participate in contractor-led training modules. Through its service agreements, SDG&E requires professional certifications of many of the contract personnel based on activity type or employee level (i.e., Pre-inspectors, Auditors, General Foremen, Supervisors). The certifications include ISA-Certified Arborist and ISA-Utility Specialist. SDG&E provides training to contractors when scoping activities are changed or modified. SDG&E documents procedural changes.

All contractors are required to adhere to the SDG&E's ESP113.1 Wildfire Mitigation Plan. Contractors are also required to develop their own internal company fire plan and to train personnel annually. Contractors are required to carry personal protective equipment (PPE), including all applicable fire PPE on their vehicles at all times and be trained in the safe and proper use. SDG&E also requires tree contractors to have fire PPE staged at each job site and at the ready for use. SDG&E contractors must be enrolled in the ISNetworld safety clearinghouse that scores and tracks contractor safety performance. Contractors must also meet minimum safety thresholds to remain a viable vendor and work for SDG&E. SDG&E requires its contractors to document employee training and to provide it to SDG&E upon request. SDG&E requires the tree trim contractors have a dedicated safety representative on property to conduct ongoing field observations and workforce training and to perform incident investigations.

SDG&E's Safety Department supports Vegetation Management by utilizing a third-party vendor to perform field safety observations. These observations are documented and reviewed by internal SDG&E personnel for safety adherence. SDG&E tracks the success and effectiveness of the contractors' safety program. The Safety Department utilizes predictive analytics software to record and anticipate contractor safety performance.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E began working collaboratively with the IOUs, Utility Arborist Association, industry professionals and academia to develop and implement a "Utility Arborist Trainee" curriculum for community colleges throughout California. Upon completion of the 5-week curriculum and hands-on field training, the trainee will become a Line Clearance Qualified worker. This approach would reduce the current on-the-job training by the contractor over the course of 18 months (about 1 and a half years). This would significantly reduce the training time, provide consistency in training, and provide a qualified employee upon completion of the curriculum. In 2020, Butte College and the stakeholders successfully completed the development of the training modules, piloted the program and were successful graduating the first cohort of students on July 17.

Future improvements to initiative

SDG&E is currently working with the stakeholders to expand the Utility Arborist Trainee program to colleges in Southern California by early 2021. SDG&E is also collaborating to develop and implement a "Pre-Inspection" curriculum in 2021 with a goal of developing a career path for local students into the utility workforce.

7.3.5.15 Remediation of at-risk species

Please see Section 7.3.5.2 and Section 7.3.5.9 above.

7.3.5.16 Removal and remediation of trees with strike potential to electric lines and equipment (Hazard tree removal and Right Tree-Right Place)

Risk to be mitigated */ problem to be addressed*

Hazard trees pose a risk to powerlines from branch contact, partial tree, or whole tree failure. The risks to be mitigated include electrical outage, property damage, personal injury, ignition and catastrophic fire.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Successful hazard tree evaluation prevents the risks associated with tree/power line conflicts. Inspections must be performed by qualified individuals skilled in tree species identification, diseases, tree biology and mechanics, hazard characteristics, and risk assessment. Hazard tree evaluation is a critical component of SDG&E's vegetation management program operations to reduce tree-related outages and fire ignitions. SDG&E has a robust tree removal program that targets problematic species such as eucalyptus, palms, Century Plant, Bamboo, certain species of Pine, Oak and Sycamore. These patrols help target and remove problematic species before

they become a danger. Because of the potential threat to the power lines from detached fronds, SDG&E also proactively pursues the removal of palms located outside its right-of-way.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E Vegetation Management performs hazard tree inspections and abatement in all areas of its service territory where trees pose a potential threat to the power lines. SDG&E inspects all trees under and adjacent to the lines to determine risk potential. Within the HFTD, SDG&E performs a hazard assessment twice annually of all trees located within the utility strike zone. This zone is defined as the area where a tree is tall enough to hit the power lines if it were to fail at ground level. Trees are visually inspected from the ground to the upper canopy 360 degrees around. HFTD hazard tree inspections are performed by ISA Certified Arborists. Hazard tree trimming or removal is prioritized where necessary if failure is determined to be imminent.

SDG&E's Vegetation Management also uses its historical tree removal data to forecast the number of removals it may perform in a given year, including an analysis of known targeted species that are fast-growing and that have a propensity for branch or trunk failure. Environmental factors such as drought and insect infestation continue to impact the urban and rural forest environment. All hazard trees are assessed for risk and prioritized based on severity of condition and activity schedule. SDG&E's hazard tree removal program is integrated within the routine inspection cycle and its enhanced patrols. Certified Arborists trained in hazard tree evaluation perform these inspections. The scope of these inspections includes a critical look at any tree that could strike the power lines. In addition, the tree trim contractors receive hazard tree training and perform a safety assessment before working on any tree to identify potential defects. Contractors conduct annual hazard tree training for all field personnel. A third-party contractor performs an audit on 100% of all trees removed to ensure work was completed per scope and contract including an assessment of the efficacy of stump treatment application and facility protection.

Progress on initiative *(amount spent, regions covered) and plans for next year*

A measure of effectiveness of the hazard tree removal program is the reduction in the frequency of tree-outages and ignitions. SDG&E's Vegetation Management activities have significantly reduced tree-caused outages over the years. In the early 1990s, prior to industry regulation, SDG&E encountered approximately 400-500 tree-caused outages on an average annual basis. After the establishment of its vegetation program, SDG&E experienced a dramatic reduction in tree-related outages. SDG&E experienced only 43 tree-related outages in 2020. SDG&E conducts a thorough investigation of all tree-related outages and maintains an investigation database to track and record the events. The information helps identify the mechanics of outages and how to prevent future occurrences.

Future improvements to initiative

In 2021 SDG&E will continue its robust hazard tree inspection and trimming operations. SDG&E will begin implementing an internal workforce of internal SDG&E inspectors to perform its off-cycle, enhanced inspections and hazard tree assessments within the HFTD. SDG&E requires contractors to perform annual hazard tree training for their field personnel as a refresher and to learn the latest evaluation techniques.

SDG&E follows the industry-established "Right Tree-Right Place" program to assist customers in the selection of compatible tree species with the goal of minimizing interference with electrical infrastructure and maximizing energy savings and environmental benefits. SDG&E also offers free tree replacements if an existing tree cannot be maintained safely near power lines. SDG&E will continue its outreach and collaboration with cities and other stakeholders to increase the number of tree plantings as a sustainability initiative. SDG&E performs additional off-cycle patrols of select species (such as bamboo and Century plants) that have fast and unpredictable growth rates and are difficult to manage near power lines. SDG&E continues to develop its customer survey initiative to assess the overall success of its tree replacement program.

SDG&E plans to further evolve this program over the next 10 years by leveraging enhanced VRI and WRRM data to develop a more strategic approach to identify areas of high risk and prioritization of mitigation efforts. Utilize LiDAR more effectively to improvement its assessment of hazard trees. SDG&E will research collaborative opportunities with external organizations to develop a means of tracking the sustainability of its tree replacement program including assessing the health of its tree replacements and measuring the ancillary environmental benefits.

7.3.5.17 Substation inspections

Please see Section 7.3.5.2 and Section 7.3.5.9 above.

7.3.5.18 Substation vegetation management

Please see Section 7.3.5.2 and Section 7.3.5.9 above.

7.3.5.19 Vegetation inventory system

Risk to be mitigated */ problem to be addressed*

A robust inventory tree database is an effective and critical tool for tracking and scheduling vegetation management activities. A detailed database that records tree and location attributes allows for optimal management of tree inspection, trimming, and auditing activities to better track compliance and reliability.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The lack of a tree inventory and work management system makes it difficult to track, schedule, and assign work activities. The inability to record tree growth, trimming dates, etc., makes it difficult to perform work efficiently and can lead to non-compliances or tree outages. SDG&E sees tremendous value in a robust work management system

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E Vegetation Management utilizes its tree inventory and work management system throughout the service territory and for scheduling all routine and off-cycle activities. Beginning in 1998, SDG&E developed and implemented an internal vegetation work management system to track and manage trees that are in proximity to its electric infrastructure. SDG&E's database contains records for approximately 457,000 known, specific trees located near its electric power lines. SDG&E's inventory database and work management systems are collectively referred to as PowerWorkz. PowerWorkz includes an ESRI-based electronic mapping mobile application and server-based workflow tool. SDG&E's inventory trees comprise trees with the potential of impacting the power lines by encroachment and/or tree failure within three years of the inspection date.

SDG&E monitors all trees in its inventory using known species growth rates, with additional consideration given to the amount of rainfall occurring during periods affecting overall tree growth, and past pruning practices. Each inventory tree is assigned a unique alpha-numeric identification number within the electronic database, which allows the activity history of each tree to be tracked. Accordingly, this database allows SDG&E to monitor and identify which trees to address in efforts to reduce vegetation-related ignitions. The tree inventory database enables a systematic and efficient approach to managing assets, scheduling, activity history, and resource allocation. The database and work management system provide a current view and status of all inventory trees and prioritizes work. All contractors work within the electronic system to provide real-time updates and scheduling as well as robust reporting functionality. SDG&E has a team of IT analysts, business control, and personnel to support the PowerWorkz management system. Contractors also have access to these personnel to provide software and hardware functionality.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E is currently in the process of implementing its next generation software application for its multi-faceted work management system. This system will improve work performance and efficiency, and better mapping functionality. The new system will also allow the integration of additional work activities and document attachments.

Future improvements to initiative

SDG&E will investigate the integration of its new work management system with other inter-departmental systems to streamline workflows. SDG&E will research opportunities to share its inventory data with external stakeholders for cross-activity initiatives. Over the next three years, SDG&E plans to research and initiate future generation hardware for contract field personnel to interface with the electronic work management system. SDG&E will continue to research industry best practices and work management software applications to further streamline and enhance its operations within the next 10 years.

7.3.5.20 Vegetation management to achieve clearances around electric lines and equipment

***Risk to be mitigated** / problem to be addressed*

Pole brushing is a fire prevention measure involving the removal of vegetation at the base of poles that carry specific types of electrical hardware that could cause sparking or molten material to fall to the ground The clearance requirements in Public Resources Code § 4292 require the removal of all vegetation down to bare mineral soil within a 10foot radius from the outer circumference of subject poles located within the boundary of the State Responsibility Area (SRA). The requirement also includes the removal of live vegetation up to eight (8) vertical feet, and the removal of dead vegetation up to conductor level within the clearance cylinder.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Pole brushing follows a specific multi-activity, annual schedule in order to remain compliant year-round. The number of subject-poles fluctuates minimally year-to-year so scheduling, spend, and resource allocation remain fairly constant. SDG&E performs an environmental review in advance of all new pole brushing activities to assess impacts to protected species and habitat. Like all other vegetation management activities, a QA/QC audit is performed on a random, representative sample of all completed pole-brush work. Additionally, SDG&E conducts internal compliance audits for vegetation management on an annual basis.

In 2020, SDG&E replaced approximately 3,176 fuses and 1,857 hot line clamps attached to poles within the HFTD. This will reduce the risk of equipment-related ignitions and will potentially reduce the number of poles that are subject to pole brushing requirements in Public Resources Code Section 4292. In 2021 SDG&E plans to continue the effort of replacing fuses and hot line clamps attached to poles within the HFTD. This will continue to reduce the risk of equipment-related ignitions and will potentially reduce the number of poles that are subject to pole brushing requirements in Public Resources Code Section.

Pole brush inspection occurs in conjunction with the tree inspection activity. There are opportunities for redundancy and data discrepancy between this and the pole brushing activity

which is performed on a different schedule. Within the next two years, SDG&E is planning to revise its procedure to integrate pole brush inspection within the pole brush activity. This will help reduce property visits and customer contacts and improve contractor work efficiency and data integrity. Over the next 10 years, SDG&E will develop the use of LiDAR to help with equipment change detection and auditing of pole brushing. SDG&E is also investigating inter-departmental processes that could automate notification when equipment is changed out that makes a pole subject to brushing.

Risk Reduction Estimation Methodology

To calculate the effectiveness of pole brushing in terms of ignitions prevented, SDG&E began by analyzing the five-year historical risk event history focused on equipment failures within the HFTD that require pole brushing. Pole brushing does not prevent equipment failures, but if the energy/heat generated by a risk event occurs within the brushed area (no fuel) it is assumed an ignition is prevented. SDG&E is aware that pole brushing is not 100% effective as nearly 80 ignitions since 2014 have been occurred on poles that have been brushed. But SDG&E questioned how many more ignitions would have occurred had SDG&E not brushed the poles? If distance from pole to ignition origin was captured as a data point, SDG&E would have a lot more insight into the effectiveness of pole brushing, however, that data is not currently available and not always clear from ignition investigations. SDG&E instead utilized subject matter expertise to estimate that pole brushing is 40% effective at reducing the ignition rate of equipment failures associated with brushed poles. This assumption leads to an estimated 1.25 ignitions avoided from pole brushing annually. A summary of the calculation is provided below:

Tier 2 equipment failures (average 2015-2019)	33.4
Tier 3 equipment failures (average 2015 -2019)	28
Ignition rate Tier 2	3.37%
Ignition rate Tier 3	2.74%
Post-mitigation Ignitions Tier 2	33.4*3.37% = 1.13
Post-mitigation Ignitions Tier 3	28 * 2.74% = .755
Assumed effectiveness	40%
Ignition rate without mitigation Tier 2	3.37% / (1-40%) = 5.62%
Ignition rate without mitigation Tier 3	2.74% / (1-40%) = 4.56%
Pre-mitigation Ignitions Tier 2	33.4 * 5.62% = 1.88
Pre-mitigation ignitions Tier 3	28 * 4.56% = 1.26
Ignitions avoided Tier 2	1.88 - 1.12 = .75
Ignitions avoided Tier 3	1.26 - .755 = .50
Ignitions avoided	.75 + .50 = 1.25

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E performs required pole brushing activities on subject poles located within the State Responsibility Area (SRA) per Public Resources Code Section 4292. SDG&E utilizes the same work management system to manage and track the inventory of all subject poles that require clearing. SDG&E brushes approximately 34,000 distribution poles that have non-exempt subject hardware attached. Inspectors determine which poles required work and update the records in the database. SDG&E performs three separately scheduled pole brush activities annually including mechanical brushing, chemical application, and re-clearing.

Mechanical pole brushing - clearing all vegetation around the base of the pole down to bare mineral soil for a radius of ten (10) feet from the outer circumference of the pole; removing all live vegetation within the cylinder up to a height of eight (8) feet above ground; removing all dead vegetation up to the height of the conductors. Mechanical brushing is typically performed in the spring months.

On poles where environmentally safe and with customer consent, contractors will apply an Environmental Protection Agency (EPA) approved herbicide, the chemical application. SDG&E treats approximately 10,000 poles with the pre-emergent herbicide to minimize vegetative re-growth and reduce overall maintenance costs. The chemical application is typically done just before the rain season (during the fall and winter months) so the chemical is activated and effective. Not all subject poles can be treated with herbicide due to environmental constraints which include species/habitat protection, site slope, proximity to water, proximity to trees, etc.

Reclearing – A second mechanical activity performed on poles that do not allow chemical application to remove vegetation which has grown into, or blown into, the required clearance area since the last maintenance activity. The need to revisit a subject pole multiple times is not uncommon due to leaf litter cast or blown into the cleared area and vegetation regrowth that cannot controlled by mechanical or herbicide treatments.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E has made significant progress replacing fuses and hot line clamps within the HFTD and will continue these efforts with the fire hardening projects scheduled in 2021. The relatively few instances of ignitions due to equipment on poles demonstrate the effectiveness of the pole brushing program. SDG&E plans to evolve the program with independent and joint inspections by regulatory authorities such as CAL FIRE.

The State Responsibility Area where Public Resources Code Section 4292 applies does not align completely with the HFTD boundary. As an extra pre-cautionary measure, SDG&E brushes about 2,000 additional poles located outside SRA where Public Resources Code Section 4292

does not apply. These poles exist in areas of potentially flammable vegetation, on steep slopes, and/or adjacent to areas where a fire may propagate.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Vegetation Management will work with Meteorology and Fire Coordination to determine where it may be prudent to expand vegetation clearances around subject poles within high fire areas to mitigate the risk of ignitions that could occur outside the required clearances of Public Resources Code Section 4293.

7.3.6 Grid operations and protocols

SDG&E's grid operations and protocols consist of mitigations that reduce risk through changing the way SDG&E operates during periods of elevated and extreme wildfire risk. This includes the disabling of reclosing in the HFTD, the enabling of fast recloser settings, restricting work in the HFTD during extreme fire potential and Red Flag Warnings, and sending contract fire resources with crews during elevated days in the HFTD. These operational decisions have led to reduced ignitions on the electric system, and just as importantly reduced ignitions during operational periods where an ignition is more likely to lead to a catastrophic fire.

7.3.6.1 Automatic recloser operations

7.3.6.1.1 Recloser protocols

Risk to be mitigated */ problem to be addressed*

Distribution reclosing capability on either circuit breakers or mid-circuit sectionalizing devices benefits customers by reclosing into faults a few times to see if the disturbance to electric system was temporary or sustained. For example, a small branch could fall across the electric lines causing the protection device to trip the line (a risk event and an outage), but that branch could fall to the ground, clearing the fault. With reclosing enabled, the device would automatically reclose the switch with the fault now cleared, restoring service to all customers, and limiting the reliability impact from a sustained to a momentary outage. However, it is also possible that the risk event is more severe, like a downed power line. In this case, reclosing would close the switch two additional times, creating two more risk events with the potential to cause an ignition. This is especially dangerous in times of extreme FPI and in the HFTD, where the probability of ignition is high, and the impact of an ignition could be catastrophic.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

To mitigate this risk, SDG&E engaged in the practice of disabling reclosing within the HFTD. Since 2008, SDG&E would only disable reclosing in the HFTD on days when the FPI was elevated or higher. After the devastating fires across the state in 2018, SDG&E updated its protocols to disable reclosing in the HFTD at all times.

Risk Reduction Estimation Methodology

To measure the effectiveness of this mitigation, SDG&E investigated the five-year risk event data for all events isolated by reclosing devices, filtered by HFTD locations and FPI. SDG&E's research study outlined in Section 4.4.2.2 above provides additional detail on how SDG&E measured the benefits as well as the detailed results of the mitigation. Based on the results of the study, SDG&E prevents nearly eight ignitions per year through the use of this mitigation.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

As stated above, SDG&E disables reclosing within the HFTD.

Progress on initiative *(amount spent, regions covered) and plans for next year*

This control has been in place since 2008, and is one of the most effective and efficient mitigations in SDG&E's mitigation portfolio. SDG&E's internal operating procedure for reclosing protocols is validated annually prior to fire season. SCADA-controlled sectionalizing devices with specific anemometer locations are validated yearly to ensure all newly installed devices are updated on the procedure. This occurred in 2020 and SDG&E plans to do the same for 2021.

Future improvements to initiative

SDG&E's reclosing operations continue to represent a standard best practice for California utilities. As discussed in Section 7.3.6.1.2 below, SDG&E looks for innovative system protection settings for its automated reclosers and other automated sectionalizing devices, such as the fast trip settings to reduce fault energy.

7.3.6.1.2 Sensitive/Fast Protection settings

Risk to be mitigated */ problem to be addressed*

In the research study detailed in Section 4.4.2.1 above, SDG&E shows that the chance of an ignition is highest during extreme FPI days for circuits located within the HFTD. A risk event occurring during those weather conditions within the HFTD is more likely to lead to an ignition than normal and elevated FPI days. Sensitive and fast protection settings help reduce fault energy from causing an ignition.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

To mitigate the high ignition percentages of risk events that occur on extreme FPI days within the HFTD, SDG&E has developed a protective relay setting focused on detecting and isolating faults as quickly as possible. This protection settings profile is designed to operate as fast as possible, ignoring traditional protective coordination. SDG&E enables this setting profile on dynamic protective devices such as reclosers and circuit breakers when the FPI indicates an extreme risk. By reducing the resultant energy of a fault, the probability of causing significant damage to the surrounding area is reduced by limiting additional sparks resulting from less sensitive relay settings. These sensitive relay settings improve both the sensitivity of fault detection and the speed at which faults are cleared.

Risk Reduction Estimation Methodology

As discussed in Section 4.4.2.5 above, SDG&E has performed a research study to measure the benefits of this program, and while the data set is too limited to be statistically significant, there were 62 fault events downstream of devices that were enabled with these fast protective relay settings on days with extreme FPI from 2015 through 2019, and zero of these risk events led to ignitions. Under SDG&E's circuits without sensitive protection, SDG&E's historical performance would have expected around six ignitions, thus these results are promising.

There are reliability downsides associated with this program, however, as the sensitive and fast settings have led to unintended operations where the device incorrectly interprets load imbalance as a risk event and operates causing an outage. Further, the lack of protection coordination with devices such as fuses makes it more difficult to locate faults on the system, leading to longer outages. SDG&E mitigates these impacts through the use of wireless fault indicators (discussed in Section 7.3.2.3 above) and only deploys this mitigation during extreme FPI days, which have averaged around 15 days per year. Overall, SDG&E believes the wildfire risk reduction benefits of this program outweigh the reliability downsides, and SDG&E will continue to utilize this program to mitigate ignitions from risk events on days with extreme fire potential.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

This program is only enabled within the HFTD on days where the FPI is extreme.

Progress on initiative *(amount spent, regions covered) and plans for next year*

Sensitive and fast protection settings is part of SDG&E's operating standards to enable these setting on remote sectionalizing devices located within the HFTD on days where the fire potential is extreme. SDG&E developed the settings and the operating standard around these settings in 2015 and have been utilizing them since. Specifically, SDG&E operated these settings in 2020 and will use them again in 2021.

Future improvements to initiative

This program has synergies with SDG&E's PSPS sectionalizing enhancement program and the Advanced Protection program. As more remote sectionalizing devices are deployed and upgraded system protection equipment is installed on the distribution system, then these fast protection settings can be enabled on more devices within the HFTD.

7.3.6.2 Crew accompanying ignition prevention and suppression resources and services

Risk to be mitigated */ problem to be addressed*

Contract Fire Resources (CFR) are utilized to mitigate the fire risks associated with at-risk work activities performed in areas that are adjacent to wildland fuels. The primary objective is preventing ignitions from utility activities. In addition, the CFRs are trained and equipped to notify the agency having jurisdiction of an ignition, and are able to safely mitigate the impact of an ignition through suppressive action until first responders arrive.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's service territory has a large percentage of its infrastructure in the HFTD. While all SDG&E field personnel attend annual fire prevention training, the use of CFRs during times of increased fire risk (e.g., during Extreme or Red Flag Warning FPI days) enables SDG&E to perform necessary activities while reducing the risk of an ignition or of a fire growing into a fire of consequence.

Risk Reduction Estimation Methodology

The effectiveness of this mitigation is calculated in the study above in Section 4.4.2.8. The concept of the study was that because contract fire suppression resources accompany crews during elevated or higher conditions within the HFTD, all crew caused risk events that met that criteria would not lead to a meaningful ignition, as the crews would be on scene to suppress an ignition that did occur. SDG&E utilized historical risk event data caused by employee/contractors and historical ignition rates to estimate the effectiveness in ignitions prevented per year.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Contract Fire Resources are utilized in areas where at-risk work is being performed adjacent to wildland fuels during periods of time that have elevated fire risk.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E utilized these CFRs to prevent fires and reduce the consequence of ignitions associated with utility activities during Extreme or higher FPI days. SDG&E will continue to use them in 2021. The utilization of CFRs may increase/decrease with the severity of the fire conditions in the region. Factors such as fuel moisture, weather, work activities, and fire activities in the region all play a role in determining the need for these prevention resources.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

This program is regularly refined with the training qualifications of personnel serving on CFRs and utility activities are being reviewed annually.

7.3.6.3 Personnel work procedures and training in conditions of elevated fire risk

Risk to be mitigated */ problem to be addressed*

SDG&E has designated the type of work activities that may be performed in its service territory under certain Operating Conditions (e.g., Normal condition, Elevated condition, Extreme or Red Flag Warning condition). As conditions increase in severity, activities that present an increased risk of ignition have additional mitigation requirements. Where risk cannot be mitigated, work activity might cease. Personnel work procedures and training mitigate the risk an ignition while performing at risk activities that are necessary to maintain and operate SDG&E electric system. The following summarizes the work activity guidelines for each of SDG&E's Operating Conditions:

- Normal Condition: normal operating procedures are followed with baseline tools and equipment;
- Elevated Condition: certain at-risk work activities may require additional mitigation measures in order to proceed with work. The additional mitigation measures will be documents; and
- Extreme or Red Flag Warning Condition: most overhead work activities will cease, except where not performing the work would create a greater risk than doing so. In those cases where at risk work needs to be performed, an SDG&E Fire Coordinator is consulted, and additional mitigation steps are implemented. Status of work, ceased or continued, will be documented.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The safety of SDG&E's customers, personnel, and cooperating agencies are all considered during the development and subsequent refinements of SDG&E's personnel work procedures and training. Fire presents the largest risk to all these groups and these procedures ensure SDG&E's activities do not cause ignitions and that SDG&E personnel are prepared in the event of a fire in an area they are working.

Risk Reduction Estimation Methodology

The effectiveness of this mitigation is calculated in the study above in Section 4.4.2.8 above. Because SDG&E does not allow work on extreme FPI days in the HFTD, SDG&E has not employee/contractor caused ignitions in the five-year risk event data on extreme FPI days. To estimate the effectiveness, SDG&E calculated a daily annual rate of employee/crew caused risk events and extrapolated that value using the number of extreme FPI days. SDG&E then utilizes historical ignition rates to convert the risk events into ignitions avoided.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E's Operations and Maintenance Wildland Fire Prevention Plan (ESP 113.1) requires that all employees, contractors, and consultants that conduct activities in the wildland areas of the service territory receive this training on an annual basis. The training includes definitions of at-risk work, wildland areas, FPI, and a matrix that can be used to determine the minimum fire prevention requirements for at risk activities. Information is also provided related to working on or adjacent to wildland fires, reporting wildland fires, and guidance for taking fire suppression action.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E plans to continue to conducting training on fire prevention and refining procedures designed to prevent ignitions from SDG&E equipment or activities.

Future improvements to initiative

Procedures and training are reviewed annually with feedback from attendees are incorporated into future training.

7.3.6.4 Protocols for PSPS re-energization

***Risk to be mitigated** / problem to be addressed*

As described in Section 8 below, SDG&E utilizes PSPS as a last resort mitigation during extreme weather conditions where the probability of ignition is much higher than normal and the consequences of ignitions due to high winds and dry conditions can and have been catastrophic. While power lines are de-energized, they are still exposed to extreme winds and weather, and to the potential for damage. Once the wind has passed, the conditions are typically still extremely dry and dangerous. Before re-energizing a line at the conclusion of a weather event, to ensure no damage has occurred to the line, post-event patrols must be completed to ensure ignitions will not occur upon re-energization.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E utilizes both ground and aerial resources to patrol its de-energized lines once a weather event concludes. While aerial resources are much faster at completing patrols, they cannot fly in elevated wind conditions, which often still exist when extreme wind events are determined to be over. SDG&E strives to complete post-event patrols and restoring service within 24 hours from when the Utility Incident Commander gives the okay to patrol, which signals the end of the weather event for that circuit. While SDG&E has been generally successful in restoring service within 24 hours, challenges such as damage found on lines, a lack of daylight hours, or high winds impacting deployment of aerial resources may cause delays.

This initiative does not have an RSE because it is an activity that is foundational to supporting wildfire mitigation efforts and is part of core PSPS operations. Costs for protocols cannot be separated out and evaluating benefits for having protocols cannot be meaningfully measured.

***Region prioritization** ("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E patrols 100% of lines that were proactively de-energized as part of a PSPS event. These events typically occur in the HFTD. However, depending on how widespread the weather event is throughout the service territory and the extent of the real-time risk, some areas in the wildland urban interface could also be de-energized and patrolled.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E invested in software to improve both the speed and documentation of post-event patrols. While SDG&E had previously provided its field personnel with paper map books, these were replaced with software on their existing MDTs. This software supports forms to document damage found on post-event patrols and to provide photos of damage per CAL FIRE's recommendations.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E will continue to look for ways to reduce post-event patrol times in an effort to reduce the impacts of PSPS events on its customers. Some of these ideas include leveraging drone pilots to perform patrols on areas that can only be accessed by helicopter, when wind conditions delay the use of helicopter-only patrols.

7.3.6.5 PSPS events and mitigation of PSPS impacts

Risk to be mitigated */ problem to be addressed*

As described in Section 8 below, SDG&E utilizes PSPS as a last resort mitigation during extreme weather conditions where the probability of ignition is much higher than normal and the consequences of ignitions due to high winds and dry conditions can and have been catastrophic. While SDG&E believes the last resort utilization of this mitigation is necessary and the right thing to do for the safety of SDG&E's customers and communities, widespread power outages with longer than typical durations can have negative economic and societal impacts and should be limited as much as feasible to the specific areas that are experiencing the extreme risk.

Re-energization after PSPS events takes place after the SDG&E weather network shows that wind speeds have decreased, and the forecast does not indicate that the wind speeds will re-accelerate above certain thresholds. SDG&E requires 4–8 hours of daylight for SDG&E field crews to inspect lines to determine whether there is any damage and deem it safe to restore power. When the crews are inspecting, they are looking for safety hazards such as debris, downed lines, broken hardware, tree branches caught on the line, or issues related to communication wires. If there is any damage to the power lines or poles, repairs must be made first before power can be restored.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

PSPS events are a last resort mitigation and these events with longer than typical durations can negatively impact SDG&E's customers and communities. As discussed in more detail in Section

8 below and Section 7.3.3 above, SDG&E utilizes multiple activities to reduce the impacts of PSPS events including generators, weather stations, microgrids, and the FPI.

Risk Reduction Estimation Methodology

The effectiveness of the PSPS program is based on several factors and assumption regarding wildfire and PSPS. PSPS reduces wildfire risk by lowering the likelihood of a significant fire but introduces PSPS Impacts. The amount of wildfire risk reduced due to PSPS is estimated at 40% of overall wildfire risk. This value was estimated based on many factors, with special consideration of not double-counting risk reductions from various other programs. In other words, the Wildfire Risk score would be higher it wasn't for the PSPS activities bringing it down 40% to its current level.

The amount of risk introduced by PSPS is measured by historical PSPS events. For risk calculations, SDG&E defines a PSPS event as a "PSPS Activation" which is a contiguous span of time where at least one customer is experiencing PSPS. In 2019 there were 4 PSPS activations that fit that definition. SDG&E also knows the number of customers who were affected by each activation, the duration of their time affected, and certain customer characteristics such as medical baseline.

As discussed in Section 4.2.b.3, there are assumptions regarding PSPS impacts for each of the attributes of safety, reliability, financial, and stakeholder impact across three distinct customer types. To calculate the PSPS impact under the current PSPS operational methods, the year 2019 was utilized.

The resulting formula for risk reduction due to PSPS is the following: (WF Reduced - PSPS Impact); and the Risk Spend Efficiency for PSPS is: (WF Reduced - PSPS Impact) / (cost of PSPS program). WF reduced is estimated to be 8,192 point, and the PSPS impact is estimated to be 5,462. Therefore, the risk reduction from PSPS is the difference of 8,192 and 5,462, which is 2,730. Another way of saying is that the PSPS program lowers the Total Wildfire Risk Score by 2,730 points.

SDG&E is currently improving its ability to estimate Wildfire risk and PSPS impacts and will demonstrate those improvements as they become available. WiNGS modeling will allow SDG&E to have consider segment-based estimates around both the wildfire risk and the PSPS impacts. One important future enhancement is to understand more fully the relationship between the amount of PSPS and the amount of wildfire risk reduced.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E utilizes lessons learned from previous PSPS events across the service territory, but prioritizes mitigations in the areas most prone to PSPS events. The various activities used to

mitigate PSPS impacts are focused on reducing the number of customers impacted by PSPS and the duration of PSPS events.

Progress on initiative *(amount spent, regions covered) and plans for next year*

Over the past year, significant progress has been made in completing activities designed to reduce PSPS impacts. Compared to the 2019 PSPS impacted customers, the number of customers impacted was reduced by over 7,000 customers for the December 2-5, 2020 PSPS events – the largest PSPS event in SDG&E history. The PSPS impacts were successfully reduced through the various mitigation programs described throughout this Plan Update, such as microgrid installations, customer generator programs, strategic undergrounding, installing additional sectionalizing switches, additional weather stations, and operational changes such as transferring sections of circuits to other circuits with less impacts from winds. In 2021, SDG&E plans to complete additional hardening, installation of PSPS sectionalizing devices, microgrids as well as providing generators to customers as outlined in Table 12 of Attachment B. The estimated benefit of these projects is described in Section 8.3 below.

Future improvements to initiative

SDG&E will continue refining the activities associated with reducing PSPS impacts as described in Section 8 and throughout this document.

7.3.6.6 Stationed and on-call ignition prevention and suppression resources and services

7.3.6.6.1 Aviation firefighting program

Risk to be mitigated */ problem to be addressed*

Under certain conditions, a wildfire that is not suppressed may grow rapidly and uncontrollably, and endanger public safety. SDG&E's aviation firefighting program mitigates this risk by serving as a wildfire suppression resource. If fire agencies divert aerial resources to fight wildfires outside of SDG&E's service territory, this program ensures aerial firefighting resources remain available in the region.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E has two firefighting helicopters available. SDG&E leases an Erickson S-64 helitanker (Air Crane) and a Sikorsky UH-60 Blackhawk helitanker (Blackhawk). Both firefighting assets are Type 1 firefighting helicopters, which are defined as carrying over 700 gallons of water to fight fires. The Air Crane has the capability of dropping up to 2,650 gallons of water, and the Blackhawk has the capability of dropping up to 850 gallons of water. Additionally, the

Blackhawk hardware is configured for night vision device flight and is capable of night firefighting with the appropriate crew and training.

SDG&E based its decision for these two resources on two missions. First, both resources provide very good fire suppression capability to SDG&E's service territory: they have been successfully utilized in many instances, preventing fires from burning out of control in San Diego County. Second, SDG&E performs capital work in the more rural areas with access issues. In areas of difficult access, aerial resources are a necessary construction tool to be able to set structures. Both assets currently under lease fit the requirement for SDG&E.

Risk Reduction Estimation Methodology

SDG&E's Aviation Program provides risk reduction not only to fires associated with SDG&E equipment but also to the entire community for all causes of wildfire. However, the risk reduction discussed here, and the RSE for the program, only focuses on wildfire risk associated to the utility. Similar to other risk-reducing programs, quantifying aviation risk reduction is complex. The goal is to understand how the aviation program reduces wildfire likelihoods and consequences.

From a likelihood standpoint, the Aviation Program is not focused on preventing CPUC reportable ignitions. As defined by D.14-02-015, a reportable ignition is one that starts at utility equipment and travels a meter in vegetation. The helicopters are not dispatched to an ignition site before the fire spreads one meter. As such, the ignition count will not be decrease.

The Aviation Program focuses on reducing the consequences of wildfires through suppression of fire spread and protection of assets. Thus, the risk reduction can be found in the CoRE portion of the risk score assessment.

The risk assessment asks the question of how much less impact do wildfires have with its aviation program versus without one. This is a complex question to solve. Each fire is different, and there is no known general rule to apply to SDG&E specific program. Fire behavior modeling is not accurate enough to suggest what would have happened without suppression activities compared to with. There is, however, anecdotal evidence that recent non-utility wildfires benefitted from aviation resources. Strong evidence of the benefit is reflected in the regularity that local fire agencies use the resource.

What follows is a brief discussion on how the Aviation Program is effective against wildfires in different types of weather. It is known that on low wind days, aviation resources are excellent tools to prevent prolonged spread; and SDG&E's aviation resources are regularly dispatched in these situations. The effectiveness of aviation resources to assist general fire suppression activities is significant in these situations. However, most wildfire risk that exists to the community is not due to these calmer weather days. On the other end of the weather perspective, in high wind, the benefit of aviation resources is likely to have more constraints. On extremely windy days, wildfires can grow in size even in the first 10 minutes, and although

aerial firefighting resources can arrive very quickly, the spread can become too great to overcome. Additionally, on extremely windy days, there are situations and locations when helicopters are not safe to operate. Generally, helicopters that drop water need to be relatively close to their target, and the stronger the wind the more dangerous it becomes to fly close to the ground. Importantly, strong winds can help dissipate the water from the aircraft and lead to ineffective water drops.

SDG&E will continue to analyze the most effective way to run its Aviation Program, and to determine the effectiveness of that program; using internal and external data to assist in the analysis. For the time being, subject matter experts believe that the program reduces overall wildfire consequence, and therefore wildfire risk, by approximately 4%; based solely on the knowledge of the equipment and operations, coupled with anecdotal evidence of recent history. Importantly, this 4% is only the measure of utility associated wildfires, and the overall benefit of the program is much larger than what that 4% represents.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E has agreements with the County of San Diego, CAL FIRE, and the Orange County Fire Authority for aerial firefighting within SDG&E's service territory. Dispatch of SDG&E's aviation firefighting assets is performed through CAL FIRE and these assets support their initial attack strategy to contain wildfires to less than 10 acres. SDG&E employs flight operations staff to assist in dispatching SDG&E aerial assets 365 days per year. This allows the assets to be launched rapidly once dispatched by CAL FIRE.

When wildfires occur outside of SDG&E's service territory, CAL FIRE may divert aerial firefighting resources to those emerging wildfires, which reduces the aerial firefighting capability in the San Diego region. Accordingly, SDG&E has developed and implemented an effective, year-round aerial firefighting program to support the fire agencies in its service territory.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The Air Crane and Blackhawk have been successfully utilized in SDG&E's service territory for preventing fires from burning out of control in the San Diego region. In addition, SDG&E has leveraged these air resources as a construction tool to set structures in rural areas with access issues. SDG&E is pursuing a partnership with CAL FIRE for night firefighting. While the demands of this mission and requirements are determined by CAL FIRE, SDG&E has started night currency and proficiency flights for pilots to gain confidence and familiarity with night operations. SDG&E is also increasing the hangar space for maintenance and security of these aerial firefighting assets. Expanding the current hangar space will allow robust maintenance of the helicopters to be performed indoors, as well as provide secure indoor storage for when the helicopters are not in use.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

SDG&E will maintain its leases for the Air Crane and the Blackhawk. In 2021, SDG&E will take ownership of a Sikorsky S-70M (Firehawk), which will serve as one of SDG&E's lead aerial firefighting resources once it is outfitting with firefighting capability. Once the Firehawk is in service, which is expected to be in 2022, the Blackhawk will be available as a backup if needed. Operations with the S-70M (Firehawk) will be a more capable and safer for firefighting compared to the current Blackhawk due to the platforms advanced safety systems and enhanced performance characteristics. The Firehawk will be maintained and operated by Helistream. Over the next three to 10 years, SDG&E will continue to assess the effectiveness of its Aviation Firefighting program and will work with CAL FIRE on any changes for improved firefighting effectiveness.

7.3.7 Data governance

In 2020, SDG&E began centralizing its WMP-related measures and metrics in a central repository to gain insights and assess progress on WMP programs and initiatives.

During the establishment of the centralized measures and metrics reporting process, SDG&E inventoried required data metrics and identified data owners and data sources. Through subsequent interviews of data owners, SDG&E determined that each specific data metric would need to be clearly defined and a repeatable and verifiable processes established to accumulate and track the data to ensure its integrity and auditability.

Initially, SDG&E almost exclusively collected data metrics and measures manually. In addition, data definitions were inconsistent, some data was untimely, and preliminary and final data metrics could vary. To enhance data quality and improve the efficiency of the data gathering process, SDG&E began developing a WMP Data Governance Framework (DGF) and an automated Central Data Repository (CDR) for wildfire-related data, which can be used by multiple internal and external stakeholders in the future. These changes will improve data collection by moving away from manual collection to a more uniform, electronic format that will provide data metrics in a searchable format, similar to a GIS data structure.

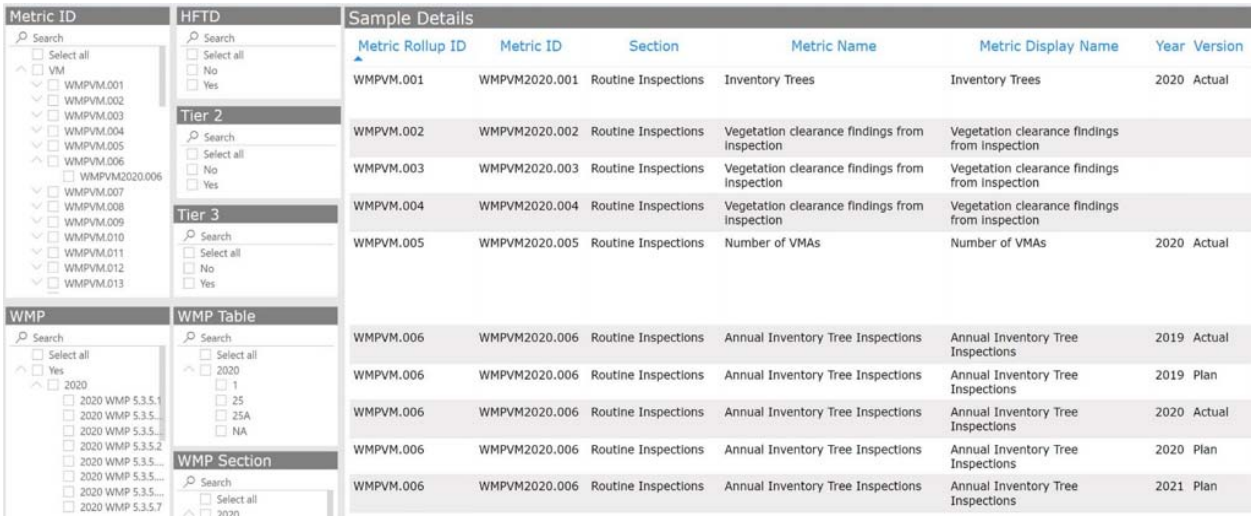
The DGF will define a set of repeatable standards, policies, processes and controls for wildfire-related data. Similar to the WSD's GIS Data Standards, the vision of SDG&E's DGF is to make its wildfire-related data actionable, accessible, aligned, and auditable. A sample of SDG&E's Vegetation Management area compliance documentation for the Data Processing Policy under the DGF is provided below.

Table 7-2: Example DGF Data Processing Policy

Data Processing Policy Table: Inspections				
Process	**Key Participants**	**Activities**	**Decisions**	**Reference Document**
Reporting	• WMVM Director • VM WMP Manager • VM System Forester • WMP Lead Forester • VM IT Support	Identify all pertinent data sources for reports; document all situational dashboard metric requirements. Standard system reports are used as needed for operations.	Confirm all reports meet business and regulatory needs; validate accuracy of data in reports and dashboards; determine if SOR can provide required metrics; adapt SOR as necessary	• WMP Metrics
Transformation	• VM WMP Manager • VM System Forester • WMP Lead Forester • VM IT Support	Upload daily MDT input into server via automated, nightly processing; perform daily MDT health checks to confirm successful upload; perform monthly MDT GIS mapping system updates, Windows updates, and health checks	Determine if nightly upload was successful; if unsuccessful, emails are sent to user to take corrective actions to ensure upload is successful	• Overnight Docking steps in Tree Trim Crews Procedures • High Level GIS Replication
Validation	• VM WMP Manager • VM System Forester • WMP Lead Forester • VM IT Support	Design and develop reports and dashboard in a testing environment; confirm accuracy of data metrics via User Acceptance Testing; design automated validation reports to confirm user upload and report accuracy; design report to confirm MDT health checks, comparative reports, and field observations	Determine if reports and dashboards are accurate and meet Executive/ regulatory requirements	• MDT Send and Receive Compliance Report • For standard reports, no specific documentation noted
Publishing	• VM IT Support • Contract Business Support Vendors	Perform User Acceptance Testing before report distribution and use; limit daily refreshes, subscription reporting, and reports to specific user roles based on internal vs. contractor; make reports available in production server environment based on specific roles	Determine frequency of data dashboards and reports based on Executive needs and regulatory requirements; determine which dashboards and reports are available and to whom (internal vs. Contractor)	• No specific documentation noted

SDG&E envisions that the CDR will eventually provide a “single source of truth” for SDG&E’s wildfire-related data, for use by multiple internal and external stakeholders in the future. In response to the WSD GIS Data Standards and other related regulatory initiatives, SDG&E is making significant enhancements to the CDR that will make it scalable and sustainable to accommodate future regulatory requirements. SDG&E will pursue technology solutions to automate these data requests where possible. An example of the proposed structure of the CDR is shown below.

Figure 9: Example of CDR Proposed Structure



Metric Rollup ID	Metric ID	Section	Metric Name	Metric Display Name	Year	Version
WMPVM.001	WMPVM2020.001	Routine Inspections	Inventory Trees	Inventory Trees	2020	Actual
WMPVM.002	WMPVM2020.002	Routine Inspections	Vegetation clearance findings from inspection	Vegetation clearance findings from inspection		
WMPVM.003	WMPVM2020.003	Routine Inspections	Vegetation clearance findings from inspection	Vegetation clearance findings from inspection		
WMPVM.004	WMPVM2020.004	Routine Inspections	Vegetation clearance findings from inspection	Vegetation clearance findings from inspection		
WMPVM.005	WMPVM2020.005	Routine Inspections	Number of VMAs	Number of VMAs	2020	Actual
WMPVM.006	WMPVM2020.006	Routine Inspections	Annual Inventory Tree Inspections	Annual Inventory Tree Inspections	2019	Actual
WMPVM.006	WMPVM2020.006	Routine Inspections	Annual Inventory Tree Inspections	Annual Inventory Tree Inspections	2019	Plan
WMPVM.006	WMPVM2020.006	Routine Inspections	Annual Inventory Tree Inspections	Annual Inventory Tree Inspections	2020	Actual
WMPVM.006	WMPVM2020.006	Routine Inspections	Annual Inventory Tree Inspections	Annual Inventory Tree Inspections	2020	Plan
WMPVM.006	WMPVM2020.006	Routine Inspections	Annual Inventory Tree Inspections	Annual Inventory Tree Inspections	2021	Plan

To date, SDG&E has completed approximately 25% of the effort needed to implement the DGF and CDR and anticipates the completion of data related to the all the metrics tables contained in the WMP by the end of 2021. SDG&E expects that the repository along with the supporting documentation will be completed near the end of 2022.

7.3.7.1 Centralized repository for data

***Risk to be mitigated** / problem to be addressed*

SDG&E has categorized this workgroup and activity as foundational, in which this activity alone does not mitigate the risk of wildfire but is critical in understanding the wildfire risk in general in relation to SDG&E equipment assets. This activity, in conjunction with the other foundational activities, allows for mitigation prioritization; the calculation of RSEs; and aids to effectively select and implement the right mitigations and controls to reduce the risk of wildfires.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Development of an Enterprise Asset Management Platform (EAMP) will build a central data repository to house all required metrics specific to SDG&E's wildfire mitigation efforts and establish an asset data foundation integrating key asset-related attributes to enable predictive asset health analyses and risk modeling and improve inspection/assessment strategies and prioritization. Integrating this asset risk information with other inputs, such as Circuit Risk Index for situational awareness, will inform the appropriate asset-related operational decision-making and strategy for enhanced reliability and safe operation of assets. SDG&E believes this

will provide a means to optimize the risk, performance, and investments, while meeting or exceeding safety and regulatory objectives.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

EAMP asset data foundation focuses to integrate key asset-related attributes of SDG&E's electric transmission and distribution assets within the SDG&E service territory.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2021 and beyond, the EAMP program will continue to integrate disparate asset data across SDG&E's Electric Distribution, Transmission, and Substation into the centralized repository. Further asset health indexes, asset risk calculations, and advanced analytics will be developed as well. Assets to be integrated as part of EAMP will be prioritized through analysis of ignition and reliability data.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

Moving forward, the EAMP program will continue to maintain and improve currently integrated assets, while expanding to integrate other asset attributes from other asset types as the data quality and availability improves.

7.3.7.2 Collaborative research on utility ignition and/or wildfire

Risk to be mitigated */ problem to be addressed*

To effectively mitigate wildfire risk, SDG&E and the overall community of wildfire stakeholders need to continue to increase and enhance their understanding of weather science, fire science and climate science. The integration of this increased understanding will help inform all aspects of wildfire mitigation from actions taken to anticipate and prepare for an event to recovering after a wildfire has impacted the region. Additionally, the State of California and the western United States lack the scientific expertise to support the private sector through climate change and the increase in wildfire activity. SDG&E is establishing an innovation lab to foster an environment that supports collaborative research with academia to help future scientists focus on issues specific to the utility industry, preparing them for future employment in wildfire mitigation related work.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E is engaging in this activity because the scientific reports released by the State of California in its Fourth Climate Assessment clearly indicate that the risk of wildfire will increase over time as a result of the changing climate. SDG&E has experienced firsthand the benefits of collaborative research through partnerships with academia and government agencies through the development of tools that are now being leveraged to increase situational awareness across the state. Based upon this experience, SDG&E plans to continue the ongoing development and enhancements of its science-based programs to support its operations.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E is focusing its collaborative research locally across the SDG&E service territory, however, SDG&E does collaborate with stakeholders throughout California and around the world.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E established a three-year strategic partnership with leading experts in climate science at Scripps Institute of Oceanography (Scripps) to develop a tool to better predict and understand the onset of wildfire suppressing precipitation in San Diego County, with attention paid to impacts on wildfire and subsequent later autumn and winter season hydrological measures. Scripps will examine the variability from year to year, documenting the types of storms that produce the precipitation, quantifying the current lead time in predicting these events, and identifying potential approaches to display and to predict these important storms.

The San Jose State University project will develop new Live Fuel Moisture Content (LFMC) tools to better assess fire danger in the SDG&E service territory using state-of-the-science remote sensing data sets. These tools will be developed using the new high-resolution data from various satellite products eventually leading to a dataset and methodology to incorporate these tools into the Technosylva FireCast fire behavior modeling platform. Additional output from the project will include two peer-reviewed publications and one M.S. thesis.

The San Diego Supercomputer Center (SDSC) will ingest and store SDG&E datasets for weather forecast, FPI and fuels to enable findability and accessibility of these datasets for various stakeholders through web services and visual maps. Application Programming Interfaces (APIs) will enable time range or geolocation and tagged metadata-based querying as well as grouping and sub-setting of datasets for context-driven use by authorized users. The map services will enable layering of these datasets for use in fire modeling. The project will maintain a server at SDSC for data access along with data storage capabilities stored at SDSC and back up storage on Amazon Cloud. Additionally, students focused on data science will be closely analyzing the relationship between weather, vegetation management, power outages, and ignitions to

leverage leading edge AI methodologies to better understand the relationships between these data sets.

Future improvements to initiative

SDG&E made very good progress in 2020 on this initiative despite the restriction in place due to our social distancing. Moving forward, SDG&E sees an opportunity to establish even stronger partnerships and relationships with the academic community to sponsor ongoing wildfire mitigation-related collaborative research through internships programs where SDG&E further exposes graduate-level academic students to wildfire mitigation within utility companies. This will serve as a mechanism to begin training the next generation of scientists to support this growing problem.

7.3.7.3 Documentation and disclosure of wildfire-related data and algorithms

Please see Section 4.5.1.

7.3.7.4 Tracking and analysis of risk event data

7.3.7.4.1 Ignition management program

Risk to be mitigated */ problem to be addressed*

SDG&E has categorized this program as foundational, in which this activity alone does not mitigate the risk of wildfire but is critical in understanding the wildfire risk in general in relation to SDG&E equipment assets. This activity, in conjunction with the other foundational activities, allows for mitigation prioritization; the calculation of RSEs; and aids to effectively select and implement the right mitigations and controls to reduce the risk of wildfires.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The purpose of this program is to track ignitions and potential ignitions to perform root cause analysis on each ignition or potential ignition to detect patterns or correlations. Such ignition or potential ignition events are documented and analyzed. When patterns or correlations are identified, the outcomes are communicated and assigned to mitigation owners from the business unit most logically positioned to eliminate or reduce future events of a similar nature. The value of this program is in understanding and preventing ignitions. The ignition management program has enabled SDG&E to gather focused data on near ignition events and analysis of this data has helped educate fire prevention decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

This program tracks all ignitions and near ignitions related to SDG&E equipment across SDG&E's service territory.

Progress on initiative *(amount spent, regions covered) and plans for next year*

This program continues to solidify processes for informing mitigation owners and gathering data. This includes automating processing and working to centralize data. The program continues to progress toward broader adoption and is based on the data gathering process that has been put in place and continues to be refined. Data, along with the events initiating the data, are being documented then filtered through the program and the program manager. In 2020, the program has documented and followed up on 210 reports with findings being communicated to the appropriate SME.

When ignitions or near ignitions have been identified through the IMP processes, SDG&E's Electric Engineering SME failure analysis team is notified, and a systematic analysis is conducted to determine the cause of the failure. When the cause of the failure is determined, the mode of failure is tracked for trends and reported to the mitigation owner to remedy the failure. The IMP is building a process to analyze failures that will include a Failure Mode Effect Criticality Analysis to further analyze data collected in the IMP process.

Future improvements to initiative

Moving forward this program aims to further refine process documents and connect mitigation owners with data repositories.

7.3.7.4.2 Reliability database

Risk to be mitigated */ problem to be addressed*

SDG&E has categorized this program as foundational, in which this activity alone does not mitigate the risk of wildfire but is critical in understanding the wildfire risk in general in relation to SDG&E equipment assets. This activity, in conjunction with the other foundational activities, allows for mitigation prioritization; the calculation of RSEs; and aids to effectively select and implement the right mitigations and controls to reduce the risk of wildfires.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E tracks and maintains customer outage impact data for CPUC annual reporting, other internal and external reporting, and to analyze causes of electric system outages to use that information to optimize electric system reliability investments. The data tracked includes any outages in the primary voltage (i.e., 4kV, 12kV, 69kV, 138kV, 230kV, 500kV) electric systems

that leads to customer impact. Planned outages and secondary voltage related outages are not tracked within this database. The database tabulates results in terms of industry measurements such as Customers Impacted (CI), Customer Minutes interrupted (CMI), System Average Interruption Duration Index (SAIDI), and System Average Interruption Frequency Index (SAIFI).

Additionally, reliability data is useful for identifying risk events, or faults on SDG&E's distribution and transmission systems, that could lead to ignitions. Further analysis of reliability and ignition data enables SDG&E to better understand the drivers of faults and resulting ignitions on our system. The value of tracking this data is in gaining a deeper understanding of risk events that could lead to ignitions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

This program tracks and maintains outage data for SDG&E's entire electric system.

Progress on initiative *(amount spent, regions covered) and plans for next year*

This initiative is complete and functional and covers all circuits within SDG&E's service territory.

Future improvements to initiative

The current database is in the process of being migrated to an Oracle IT supported OUA application which allows for easier viewing of data by a broader internal audience.

7.3.8 Resource allocation methodology

SDG&E's enterprise risk management process, discussed in Section 4.2 above, includes a step focused on risk-informed investment decision-making. As addressed in SDG&E's 2019 RAMP, the capital planning process is the Company's current annual process for prioritizing funding based on risk informed priorities and input from operations. The capital allocation planning sessions begin with input from functional capital committees that comprise subject matter experts who perform high level assessments of the capital requirements based on achieving the highest risk mitigation at the lowest attainable costs. These requirements are presented to a cross-functional team representing each functional area with capital requests.

This committee reviews the resource requirement submissions from all functional areas, and projects are evaluated against priority by assessing a variety of metrics including safety, cost effectiveness, reliability, security, environmental, strategic, and customer experience. Recommendations for capital spending are then presented to an executive committee for approval. Once the capital allocations are approved, each individual operating organization is chartered to manage their respective capital needs within the capital allotted by the plan. This includes re-prioritizations as necessary to address imminent safety concerns as they arise. As with the Company's risk evaluation processes, the capital planning process is continuing to

evolve as the Company endeavors to achieve the goal of determining more quantitatively the risk reduction per dollar invested, also referred to as risk spend efficiency or RSE.

7.3.8.1 Allocation methodology development and application

Risk to be mitigated */ problem to be addressed*

The problem that this initiative solves is the lack of sufficient methods to allocate resources based on risk analysis. SDG&E has categorized this workgroup and activity as foundational, in which this activity alone does not mitigate the risk of wildfire but is critical in understanding the wildfire risk in general in relation to SDG&E equipment assets. This activity, in conjunction with the other foundational activities, allows for mitigation prioritization; the calculation of RSEs; and aids to effectively select and implement the right mitigations and controls to reduce the risk of wildfires. Initiatives included in this category cover both an enterprise-wide initiative (Investment Prioritization) lead by the Asset Management organization as well as a more focused initiative (WiNGS) lead by the wildfire mitigation team to apply more granular analytics to grid hardening projects.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

This initiative was selected because of a need for a consistent framework that is based on risk to evaluate various projects and allocate resources to different areas. SDG&E's Asset Management organization, under the Investment Prioritization workstream, has been working on building the governance process, resource allocation methodology and enabling tool to support the creation of long-term and short-term plans for capital investment, operation & maintenance and asset retirement.

The strategic goal of Investment Prioritization is to incorporate an enterprise-wide, multi-attribute value framework methodology to demonstrate appraisal of capital investments in a consistent, transparent, repeatable and standardized manner through data-driven, quantitative risk- and safety-based lens with the appropriate review and approval committees. This value framework will utilize the Company's strategic values and determine standardized value-based metrics to quantitatively compare projects, and thereby enhance the Company's ability to cross-prioritize across portfolio and optimize investment decisions, including wildfire mitigation investments, while ensuring effective spend of ratepayer funds. A software solution from Copperleaf, called C55, is being implemented at SDG&E to improve investment prioritization capabilities. The purpose of the C55 implementation project is to develop business processes and a system for capital investment optimization using an objective, risk-informed value framework. The initial development of this value framework will be applied to electric transmission, substation and system protection assets and employ a phased approach to implement to distribution and other assets supporting the electric system infrastructure.

While the initiative described above focuses on enterprise-wide resource allocation, there was a need to develop a more granular application of the same type of modeling to tackle specific wildfire-related issues such as targeted grid hardening to reduce PSPS. To do that, SDG&E's wildfire mitigation team developed the WiNGS model to specifically tackle the issue of quantifying the impacts of PSPS and identifying more optimal solutions to target both wildfire risk reduction as well as PSPS reduction. The WiNGS model was developed internally with the support of third-party consultants to validate the methodology and provide external proxies to improve data used in the model.

Alternatives to these initiatives would be to not pursue these activities, which does not provide all the necessary enhancements to support risk-informed decision-making or meet the evolving regulatory requirements and expectations.

This initiative does not have an RSE because it is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The goal for Investment Prioritization is to implement across SDG&E's electric capital investment portfolio and utilize as part of holistic risk-informed investment prioritization and decision-making.

The current scope of WiNGS covers preliminary prioritization concepts for grid hardening. However, future versions of the model will be expanded to include other wildfire mitigation programs as applicable.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The Asset Management organization has commenced the Investment Prioritization workstream in 2019 by identifying opportunities to streamline the end-to-end process on investment prioritization and allocation. In 2020, the initial value framework development with the electric transmission and substation capital investments has been completed. This will serve as a foundation to build upon for other asset-intensive capital investments and eventually evolve to enterprise-wide value framework. The focus for 2021 to 2022 is to continue adoption for transmission and substation portfolio and commence with the electric distribution value framework development. Further development will employ a phased approach with other assets supporting the electric system infrastructure. Throughout the next couple of years, the goal is to extend Investment Prioritization and C55 implementation across the SDG&E enterprise including Gas, IT and Fleet assets starting with a gap assessment of existing plans and processes.

In its preliminary implementation of WiNGS, SDG&E's wildfire mitigation team developed an initial version of the model to test grid hardening optimization on a subset of SDG&E's system (HFTD only) and looking at a few alternatives such as traditional hardening, covered conductor and undergrounding. In the coming year, SDG&E's team will explore the expanded application of the tool to evaluate other mitigations such as vegetation management, microgrids and other solutions as applicable.

In addition, in 2020 SDG&E updated the Construction, Planning and Design (CPD) system to include coding to track WMP-related O&M costs directly to the correct memorandum account. This allows for more automated and accurate tracking of costs by removing inefficiencies and human error involved in manually identifying and moving these costs into the regulatory account through journal entries. The new functionality enables timely and accurate monthly financial reporting of WMP-related O&M costs.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

As the Investment Prioritization matures, performance evaluation and continuous improvement capabilities will be developed. The performance evaluation capability will create business processes around identifying objectives and key performance indicators and determining action plans to monitor the effectiveness of the Investment Prioritization. The continuous improvement capability will produce business processes on developing the approach and collaboration to address the recommended corrective or improvement actions.

As far as the WiNGS model, SDG&E's team will continue to improve the data that is used to evaluate the risks at the segment level and will work on assessing the need and approach for expanding the use of the model to other areas across the system and other initiatives that could benefit a more granular approach to prioritization.

7.3.8.2 Risk reduction scenario development and analysis

Please see Section 4.2. *See also* SDG&E's 2019 RAMP.

7.3.8.3 Risk spend efficiency analysis – not to include PSPS

Please see Section 7.3.8.1.

7.3.8.4 Other resource allocation methodology initiatives

7.3.8.4.1 Wildfire mitigation personnel

Risk to be mitigated */ problem to be addressed*

Wildfire mitigation involves many groups within SDG&E. To effectively mitigate the risk of wildfire, a dedicated department is needed to, among other things, develop and oversee SDG&E's comprehensive wildfire mitigation strategy; organize and coordinate wildfire mitigation programs with program managers; track and monitor the execution of the WMP; and communicate with internal and external stakeholders.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

A centralized wildfire mitigation team was developed with the responsibility of developing, executing, and overseeing SDG&E's wildfire mitigation plan across the organization. The team focus on three key areas: wildfire mitigation strategy, wildfire mitigation program management, and wildfire mitigation metrics and measures. This team reviews and tracks all current wildfire mitigation operational targets on a weekly basis, and reviews proposals for new pilot programs or wildfire mitigation technologies. This team also leverages data across the Company to measure and report the effectiveness of mitigations, which feeds into SDG&E's risk models that are critical for prioritization and resource allocation.

This initiative does not have an RSE because it is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

This team supports wildfire mitigation activities throughout the service territory including Tier 3 of the HFTD, Tier 2 of the HFTD, and the wildland urban interface.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

The team continues to review feedback from external stakeholders including WSD and intervenors so that SDG&E's WMP, WMP Updates, and WMP Quarterly Reports meet or exceed expectations.

7.3.9 Emergency planning and preparedness

The mission of the SDG&E's Emergency Management department is to coordinate safe and effective emergency preparedness for the Company, SDG&E's customers, and emergency response personnel. That mission extends to safely and efficiently preparing for, responding to, and recovering from all threats and hazards through strategic planning, training, and exercising, and a sustained Quality Assurance and Improvement process.

7.3.9.1 Adequate and trained workforce for service restoration

Risk to be mitigated */ problem to be addressed*

Employee and public safety is paramount and for this reason SDG&E's Qualified Electrical Workers, apprentices and line assistants are provided the necessary tools and training to support outage restoration, patrols, inspections and maintenance as part of SDG&E's CMP and QC program to reduce system impacts, ensure public safety, and reduce the risk of wildfire. Company lineman are provided extensive training in order to inspect and maintain the SDG&E system. In order to better coordinate outage, storm (e.g., fire, rain, lightning, wind), and PSPS response, SDG&E's workforce must communicate and operate in sync with other first responders in the field (i.e., fire, police). SDG&E has built an Incident Command System (ICS) program through training and tabletop exercises for its line side employees.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E recognized the need to implement an ICS for first responders, such as Electric Troubleshooters (ETS), Fault Finders, and Line Crews. These individuals respond to trouble on SDG&E's system and work side by side with other first responders (i.e., fire, police) and need the tools to more effectively and safely coordinate response and communicate back to Company district utility incident commanders. Having an ICS structure ensures first and foremost the safety of SDG&E's employees and the public, timely communication and adequate resources for the event. The goal is to utilize ICS not just when there is trouble on the system, or during PSPS, but to begin to ingrain ICS during "blue-sky" routine business. In instances where SDG&E is faced with a system issue, PSPS, or storm event, there is a seamless transition for the workforce.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E's Electric Regional Operations group recognizes that in 2021, ICS training in support of the storm response and PSPS needs to be integrated into all aspects of the line assistant training, lineman apprentice program, ETS and Fault Finder training.

Progress on initiative *(amount spent, regions covered) and plans for next year*

The Electric Regional Operations Skills Training Center (STC) support critical enhancements of SDG&E's ETS training. Specifically, relevant scenarios related to storm response and PSPS will be built in virtual reality, integrating the ICS processes and procedures into the training. Additionally, STC has committed to integrating ICS into all other elements of the curriculum for line assistants, apprentices and lineman. SDG&E has hired an ICS subject matter expert to support this effort that will report up through SDG&E's Electric Safety Center and help assist in this integration.

SDG&E has a well-established, State-approved Lineman Apprentice program, where students learn construction standards and methods related to GO 95 and GO 128. Proper clearances, separation of circuits, and more is presented and discussed so the correct assembly of infrastructure is understood. The training forms the foundation for understanding and recognizing infractions and system anomalies. Infraction codes and specific training related to CMP inspections, as defined in ESP 601 is a post Journeyman program. Journeyman must take an initial CMP training for overhead (OH) and underground (UG), as well as patrols and subsequent refresher training in order to conduct inspections or patrols.

Apprentice Lineman Program

- SDG&E/IBEW, and State of California Joint Apprenticeship
- IBEW/NUITF/SDG&E Training Program
- 6,000 hours (3 years)
    - Climbing School/Basic Secondary
    - Advanced Secondary
    - 12kV Hotstick/Rubber Glove
    - Phase III Underground
- Formal classroom and field training at SDG&E Skills Training Center – 29 weeks
- 3 years (6 semesters/480 hours) of college level night school classes in partnership with San Diego City College (2 nights a week, Tuesday and Thursday)
- On the Job Training
- Journeyman test administered by IBEW Local 465

Skills Training Center

- 3 weeks of Climbing School, 5 weeks of Basic Secondary School – 40 days (320 hours)
- 4 weeks of Advanced Secondary School – 2 days (160 hours)
- 12 weeks of Hot Stick/Rubber Glove School – 60 days (480 hours)
- 5 weeks of Phase 3 U.G. School – 25 days (200 hours)

OTJ Training in District Operating Centers

- 4,840 hours

Line Assistant Program

- Pre-apprentice position and feeder pool into apprentice lineman program
- Initial 5-week orientation
- 3 weeks of OH/UG familiarization – 15 days (120 hours)
- 1 week of CDL/vehicle safety training – 5 days (40 hours)
- 1 week of compliance courses – 5 days (40 hours)

Line assistants report to home operating centers performing groundwork functions for OH and UG field crews and rotate through STC to assist apprentice classes with groundwork support. They can remain in Line Assistant classification up to a maximum of 3 years and then must be moved into apprenticeship.

Future improvements to initiative

Future improvements in this area include exercises and tabletops in partnership with various SDG&E departments such as: Emergency Services, Electric Distribution Operations, Substation, Transmission Construction and Maintenance, and Grid Operations, which are planned for later in 2021. In addition to the AR/VR and 2.5 D inspection testing programs, in December 2020, SDG&E began construction on a physical infractions test yard with a target of 25-30 infractions that will be changed regularly for Journeyman to identify and properly code.

7.3.9.2 Community outreach, public awareness, and communication efforts

Risk to be mitigated */ problem to be addressed*

In California, one of the greatest challenges SDG&E faces is the nearly year-long presence of potential wildfires. Climate change and shifting environmental conditions have fundamentally altered how the Company addresses catastrophic wildfire risk and engages with the communities it serves. As a result, SDG&E is working year-round to educate customers and the general public about wildfire safety and emergency preparedness. A comprehensive wildfire

safety communications and outreach plan has been developed with the intent of increasing community resiliency to wildfires.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's comprehensive wildfire safety communications and outreach initiative is divided into three phases: prior to, during and following a wildfire event. Communication efforts before a wildfire focus on educating customers and the public about the measures and programs being implemented by the Company to reduce the threat of catastrophic wildfires, and tactics they can employ to remain resilient and safe. During a wildfire-related event, the Company focuses on providing real-time awareness and updates about the event and how to remain safe and vigilant through the end of the occurrence. After a wildfire, SDG&E examines communications and solicits customer feedback with the intent of refining and improving communication efforts for the following year.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Public education and communication efforts target customers throughout the entire service territory due to the regional threat of potential wildfire. Outreach efforts, in particular, focus on the areas that are most at risk of wildfire (High Fire Threat District).

Progress on initiative *(amount spent, regions covered) and plans for next year*

Wildfire Safety Communications

SDG&E's wildfire safety communications and public education initiative consists of direct and in-direct engagement through community outreach materials and a marketing campaign. Materials produced over the course of the year, are tailored to match SDG&E's respective audience and phase, and is translated into twenty-one prevalent languages. Additionally, communications and outreach efforts will be enhanced and adjusted, where appropriate, to reflect effectiveness feedback received and research conducted throughout the year. Recommendations associated with SDG&E's Compliance Report Regarding Surveys and Metrics to Determine Effectiveness of 2020 Outreach[31] will be integrated into the planning for this year's efforts.

[31] Rulemaking (R.) 18-10-007, San Diego Gas & Electric Company Compliance Report Regarding In-Language Communications and Effectiveness of 2020 Outreach (December 31, 2020) (Compliance Report on Effectiveness of 2020 Outreach).

Prior to a potential wildfire event

SDG&E maintains a robust Wildfire Safety Community Awareness campaign to educate customers and the general public throughout its service territory. This campaign helps the community prepare for the risk of wildfires and encourages customers and the public to take preparatory measures such as updating contact information and signing up for SDG&E notifications. Fundamental to the campaign's success is its collaborative framework – local public safety and community partnerships such as 2-1-1 San Diego, 2-1-1 Orange County, Jewish Family Services, the San Diego County AFN Working Group and American Red Cross help disseminate important information to potentially impacted and vulnerable communities.

Communication efforts also focus on AFN populations and other hard-to-reach communities. A dedicated AFN public-education campaign was produced in 2020 and will be expanded in coming years. The campaign informs customers and the public about SDG&E's collaboration with local community-based organizations (CBOs) through the 2-1-1 San Diego, 2-1-1 Orange County, and Jewish Family Services networks. Wildfire safety materials are also available in the prevalent languages spoken in the service territory (see Section 8.4.2 to learn more). SDG&E plans to continue to leverage its use of localized CBOs, ethnic festivals, events and publications to ensure important communications reach these AFN and micro-language segments (as stated in SDG&E's Compliance Report on Effectiveness of 2020 Outreach).

SDG&E proactively and regularly communicates with its residents and businesses within its service territory. Aside from English and Spanish, communication materials are produced in prevalent languages spoken in the region. These fire-safety and emergency preparedness communications include, but are not limited to:

- Promotion of community engagement events, emergency preparedness workshops for businesses, public participation meetings, and backup generator safety workshops;
- General Market TV (English and Spanish)
- Streaming TV (English and Spanish)
- General Market Radio (English and Spanish)
- Streaming Radio (English and Spanish)
- Live On-Air Radio DJ Reads (English and Spanish)
- Radio Sponsorships (Traffic, News, Weather) in English and Spanish
- Out-Of-Home (Bulletins/Posters/Transit) in English and Spanish
- Digital (Banner Ads, Mobile Phone Ads, Online Video, Paid Search, Paid Social) in English and Spanish
- Print Advertising (Back Country, Spanish, Asian, African-American, General Market)

- Sports Sponsorships (Padres); Community newspapers in the HFTD and the service territory (Back Country, Spanish, Asian, African-American, General Market); Educational information disseminated through a bill newsletter or special insert included in customer bills;
- A series of wildfire safety and preparedness videos including the SDG&E Fire Safety documentary and new vignettes to help customers and the public prepare for wildfire and PSPS;
- Distribution of an annual Wildfire Safety newsletter that is mailed to customers in the HFTD;
- Promotion of weather information and system-outage status on SDGE.com;
- Paid and organic social media messaging that includes platforms like Twitter, Facebook and Nextdoor; and Partnership with a network of over 400 nonprofit community-based organizations who share fire-safety and emergency communications with their networks via their established communication protocols.

SDG&E will utilize the customer feedback solicited to inform its Compliance Report on Effectiveness of 2020 Outreach to refine and improved public education messaging and tactics listed above.

Online Webinars and Drive-Thru Wildfire Safety Fairs

The safety of SDG&E's customers, employees and the communities it serves is its highest priority, and the conditions surrounding COVID-19 only strengthened that focus. The 2020 communications and outreach offerings considered the difficulties associated with the COVID-19 pandemic. In lieu of the Company's annual in-person open houses and Wildfire Safety Fair events, online webinars and drive-thru Wildfire Safety Fairs were held during the summer and early fall. Event objectives included informing customers and the public about safety measures related to PSPS, while adhering to federal and state health and safety protocols. These events were held in locations that have historically experienced extreme weather conditions, providing customers and communities members an opportunity interact directly with SDG&E's subject-matter experts regarding important safety and operational information.

External partners also participated, providing much needed resource information to potentially impacted communities. The external partners included CAL FIRE, American Red Cross, 2-1-1 San Diego and San Diego County Animal Services. These events resulted in record attendance and positive feedback from customers. Participants were surveyed as they completed each drive-thru event, survey results showed 97% were very satisfied. The drive-thru Wildfire Safety Fairs attracted over 2,400 HFTD residents – a record attendance. Promotions for the events included the Company website, organic social media (including NextDoor, Twitter, Facebook, Instagram and LinkedIn), radio and television interviews, promotional coordination with 2-1-1 San Diego, and emails sent to all customers who reside in the (HFTD) (about 200,000

customers). Emails were sent to these customers prior to each event through the fall and each email contained reminder dates for upcoming events.

Participants were provided with a variety of materials and resources to help them remain resilient should a PSPS be instituted. Collateral materials included but were not limited to The High Fire Threat District Newsletters, PSPS Mobile App information (Alerts by SDG&E), local agencies and non-profit organization resources and comprehensive preparedness and safety information. The main call-to-action across most public-education materials was to update contact information and/or signup to receive PSPS notifications.

During a wildfire event

Emergency communications protocols are agnostic of the triggering event. SDG&E follows its long-established emergency communication framework. During a wildfire, if SDG&E infrastructure is impacted, communications are immediately distributed to customers tied to the impacted infrastructure by utilizing SDG&E's customer notification system, the Enterprise Notification System (ENS). SDG&E provides situation updates to communities via broadcast media outlets (radio and TV), social media, the new SDG&E PSPS app, and web-based pages including the outage map, SDG&E NewsCenter and sdge.com. The emergency broadcasting system, TV and radio is also engaged to provide SDG&E-relevant messaging.

In partnership with local media, SDG&E provides 24/7 real-time situation updates through the SDG&E NewsCenter and SDG&E personnel are available 24/7 for media interviews when requested during the event. The media is driven to the SDG&E NewsCenter landing page for real-time updates as well. The SDG&E NewsCenter and sdge.com provide event-specific information about impacted areas. Social media is also utilized to broadcast updates and safety information across the region. SDG&E establishes communications with local water districts, telecommunications infrastructure providers, the San Diego County Office of Education, the San Diego County Office of Emergency Services, and the American Red Cross. Communication protocols are ongoing through the event duration and customer restoration.

In-Community communications are also leveraged through community flyers posted throughout affected communities, school and casino marquees and extensive use of portable roadside signage strategically placed at major thoroughfares and principal egress and regress points in affected communities.

After a wildfire event

After the wildfire event, SDG&E reviews and evaluates communications to customers and the general public. Part of this process includes reaching out to affected customers to solicit feedback on communications related to the event. This feedback is then used to improve customer and public communications and outreach efforts for the following year.

The amount spent in 2020 and forecasted costs through 2022 are provided in Attachment B, Table 12.

Future improvements to initiative

In 2021, SDG&E will expand its AFN campaigns to reach and communicate with a greater number of hard-to-reach vulnerable populations. Since agreements with the 2-1-1 and the Jewish Family Services organizations were finalized in late summer 2020, the AFN campaign started in September 2020. In future years, the AFN public education campaign will start earlier in the year and will work to expand the reach of communications within the service territory. The formal CBO contract established in 2020 will continue and the lessons learned during the 2020 wildfire season will be applied to the 2021 campaign.

Webinars in 2021 will continue to educate the communities through collaboration with both CAL FIRE and 2-1-1. Wildfire Safety Fairs will continue to serve the communities with information, education, resiliency and opportunities to help before, during and after a PSPS activation and/or any other emergency situation. The Company will also review and assess the prevalent languages identified. The expanded CBO collaboration will help with this effort. Many of these organizations target in-language communities and can help refine communications and further identify non-English speaking populations within the territory. SDG&E will continue to utilize these important partnerships and will look to expand efforts in the coming years.

Additionally, the Company is considering and evaluating additional efforts including, but not limited to, working with local school districts to enhance public education efforts. Considerations include school newsletters, communications to parents, as well as leveraging established school communication platforms (emails, text messages and collateral materials).

The Company is also examining new opportunities within its established partnerships with local Tribal Councils. In addition to casino-marquee signage that was leveraged during 2020 PSPS events, direct communications through Indian Health Councils and tribal newsletters are being considered for 2021 efforts.

7.3.9.3 Customer support in emergencies

Risk to be mitigated */ problem to be addressed*

Emergencies and wildfires often leave customers looking for support in many areas. SDG&E provides assistance to those who are directly impacted. Customers eligible for the wildfire residential and non-residential customer protections described below are those directly impacted by the wildfires and identified as such by SDG&E or who have self-reported as being impacted. Directly impacted customers would include those without electric service or those needing to re-locate (either temporarily or permanently) due to wildfire damage.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E provides emergency residential and non-residential customer protections for wildfire victims, as ordered by the CPUC.[32] Examples of protections include billing adjustments, deposit waivers, extended payment plans, suspension of disconnection and nonpayment fees, and specific support for low income and medical baseline customers.

Description of Adopted Customer Protections

In D.19-05-039 and D.19-07-015, the Commission confirmed that SDG&E should continue to provide certain residential and non-residential customer protections for wildfires and other emergencies. Customer support in emergencies, including protocols for compliance with requirements adopted by the CPUC regarding activities to support customers during and after a wildfire, include:

a. Outage reporting
b. Support for low income and medical baseline 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

These customer protections are described in the following sections and unless otherwise noted, apply to both residential and non-residential customers.

Outage Reporting

Throughout the lifecycle of an adverse weather event, it is important that the customer is adequately informed and prepared at all times. SDG&E's multi-channel approach utilizes the broadcast media (radio and TV), the SDG&E NewsCenter, dedicated PSPS landing page (sdge.com/ready), the SDG&E outage map (on sdge.com and the SDG&E app), and social media for real-time situational awareness. SDG&E's ENS also provides notifications and updates directly to impacted customers and community members who have signed up to receive PSPS alerts.

After adverse weather conditions are forecasted and the National Weather Service issues a Red Flag Warning, SDG&E begins to coordinate with local government agencies, community-based

[32] SDG&E filed Advice Letter 3177-E on January 26, 2018 in compliance with Resolution M-4835 dated January 11, 2018, which was made effective December 7, 2018. *See also* Commission Decisions D.19-05-039 and D.19-07-015.

organizations, and emergency responders approximately 72 hours prior to the event. Communications are then initiated with customers via SDG&E's ENS, broadcast media and social media channels. These communications drive traffic to SDG&E's NewsCenter and/or dedicated PSPS landing page for more information and real-time situation updates.

The ENS system provides information in eight languages (English, Spanish, Korean, Vietnamese, Mandarin, Cantonese, Tagalog and Russian), with additional translation options, for prevalent languages, available on SDGE.com. As the event progresses, these notifications become more specific and targeted to customers as the situation warrants. Along with outage updates the channels listed above provide information related to wildfire safety, emergency preparedness, PSPS, and Community Resource Centers.

Support for Low Income Customers/Medical Baseline

In support of customer protections, SDG&E takes the following actions for all low-income customers in the wildfire-impacted areas within SDG&E's service territory to align with the California Alternate Rate for Energy (CARE) and Energy Savings Assistance (ESA) programs as follows:

- Freeze all standard and high-usage reviews for CARE program eligibility standards and high-usage post enrollment verification (PEV) requests for all customers in the impacted areas within SDG&E's service territory.
- Partner with the United Way, the administrator of its Neighbor-to-Neighbor program that provides emergency bill assistance, to increase the bill assistance cap amount for impacted customers from $200 to $400.
- Modify the ESA program by allowing impacted customers to self-certify if: 1) the customer states they lost documentation necessary for income verification of a wildfire, or 2) if the customer states that individuals displaced by the wildfires reside in the household.

Immediately following a wildfire, SDG&E deploys outreach representatives to the field to support American Red Cross and County of San Diego assistance centers. These outreach representatives help customers download the mobile outage map to stay up to date on estimated restoration times, promote and enroll them in programs like CARE and ESA and connect them to the vast array of services provided by San Diego emergency services.

SDG&E also works with local CBOs to help connect customers with emergency related information, outage information, and program information. These CBOs also help to refer customers in need to San Diego emergency services for further information and assistance. SDG&E will continue to work with the local CBOs to place an emphasis on the additional measures available to low-income customers.

In addition to the protections for the low-income customers discussed above, SDG&E will freeze all recertification for medical baseline customers in the impacted areas within SDG&E's service territory.

Billing Adjustments

SDG&E will provide billing assistance for residential customers. Where the customer's residential structure has been destroyed by a wildfire, SDG&E will waive closing bills that include charges from the previous regular read date up until the dates the wildfire occurred, along with charges from the prior month of billing. For non-residential customers, where the structure has been destroyed, closing bill amounts from the previous regular read date up to the dates on which the wildfire occurred will be waived. However, non-residential customers will be held responsible for charges billed for any months prior to the wildfire. SDG&E will stop estimated energy usage for billing purposes when a home/unit was unoccupied due to a wildfire.

Deposit Waivers

SDG&E will waive deposit requirements for customers who are seeking to re-establish service at either the same location or a new location.

Extended Payment Plans

SDG&E will extend payment arrangements with a 0% down payment and offer a repayment period of 12 months to all impacted customers, including customers whose employment was impacted by wildfires.

Suspension of Disconnection and Nonpayment Fees

For customers impacted by wildfires, including customers whose employment was impacted by wildfires, SDG&E will suspend disconnection for non-payment and associated fees, waive the deposit and late fee requirements for affected customers who pay their utility bills late, and not report late payments by customers who are eligible for these protections to credit reporting agencies or to other such services.

SDG&E identifies the premises of customers impacted by wildfires that are not capable of receiving utility services and discontinues billing these premises. SDG&E does not currently charge a disconnect charge. Customers impacted by wildfires will not be charged a reconnection charge.

Repair Processing and Timing (Move In – Move Out)

SDG&E initiates best efforts to expedite move-ins and move-outs to support customers impacted by wildfires returning to their homes. If a customer advises SDG&E that they are relocating to another location as a result of damage to their home due to a wildfire, SDG&E will make every attempt to have service available to the customer on the requested day.

Additionally, SDG&E will track the time from when the service is requested to the time it is completed.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

These customer protections are available to customers throughout SDG&E's service territory. SDG&E will provide descriptions of the customer protections offered to affected customers on a special landing page on its website, SDGE.com (with a contact telephone number for more details of eligibility and protections available) and promote the page with social media campaigns. In addition, SDG&E will make every effort possible to contact impacted customers to bring awareness regarding these protections. An Energy Service Specialist (ESS) or an account executive will make these calls.

Access to Utility Representatives
Customers and stakeholders have a variety of SDG&E representatives available to them to receive information and communicate concerns. These include representatives in SDG&E's Call Centers, Regional Public Affairs, Business Services, and Fire Coordination.

- **Call Centers:** Any customer, or concerned person, can contact SDG&E's call center to obtain information before, during, or after a wildfire event. SDG&E's call center adjusts resource levels accordingly to support wildfire events.
- **Regional Public Affairs:** SDG&E has assigned specific personnel to develop and maintain relationships with local elected officials. As a wildfire event approaches, the SDG&E representative will establish and maintain contact with their key stakeholder. The SDG&E representative provides answers to questions and addresses concerns.
- **Business Services:** SDG&E has identified key and critical accounts for which it assigns a specific resource to establish and maintain contact during a wildfire event. The SDG&E representative reaches out to the customer as the wildfire event develops and maintains contact until the wildfire event is over.
- **Fire Coordination**: The Fire Coordinators are experienced in fire behavior, fire prevention, and firefighting techniques. The Fire Coordinators serve as the direct link between SDG&E and emergency-response agencies. They also serve as the single point of contact for the fire agency Incident Command System, provide periodic updates to fire emergency personnel and SDG&E personnel, establish radio and communications assignments, assist in the coordination of activities related to de-energizing and reenergizing power lines, and update on-scene personnel, control centers, service dispatch, and the SDG&E regional operations centers as to the status of each incident.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E focused on outreach to its most vulnerable customers. This included outreach to Medical Baseline customers, such as efforts to update contact records for wildfire event

communications. Additionally, SDG&E finalized agreements with 2-1-1 San Diego and 2-1-1 Orange County to provide support for AFN customers impacted by PSPS events.

Future improvements to initiative

SDG&E will evaluate new partnerships, programs and service offerings both directly provided by the Company, as well as provided through community partnerships. Central to SDG&E's planning will be collaboration with 2-1-1 San Diego and 2-1-1 Orange County on continued ways to support AFN customers in 2021.

7.3.9.4 Disaster and emergency preparedness plan

Risk to be mitigated */ problem to be addressed*

SDG&E is guided by its mission to improve lives and communities by building the cleanest, safest, and most reliable energy company in America. In support of this mission, SDG&E engages in proactive planning and preparedness efforts to respond effectively to any hazard the Company may encounter.

SDG&E's Emergency Management department ensures all responders are prepared to respond safely and successfully to likely threats and hazards through the application of leading emergency management practices, maintaining 24/7 situational awareness utilizing state-of-the art technology, and strengthening readiness through training and exercising "real-life" scenarios.

The objectives of the Company Emergency Response Plan (CERP) are to ensure that:

- SDG&E has implemented and adopted all-hazards response processes that are applicable regardless of incident type
- SDG&E uses an Incident Command System-utility compatible emergency response structure and processes
- Response team members understand their roles, responsibilities, and key response processes
- SDG&E's response practices will reflect lessons learned from activations, exercises and industry leading practices

The CERP, along with related standards and other Company-published documentation, governs SDG&E's emergency response efforts. This plan supports and is part of the Company's overall emergency response plan framework.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The CERP supports an all-hazards approach to incident response. All-hazards emergency management considers all hazards and incidents that the entity may encounter. Emergency

management must be able to respond to natural and manmade hazards, homeland security-related incidents, and other emergencies that may threaten the safety and well-being of citizens and communities. An all-hazards approach to emergency preparedness encourages effective and consistent response to any disaster or emergency, regardless of the cause.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E's CERP applies throughout its service territory.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E began updating its CERP in 2020, however, the process was delayed due to the COVID-19 pandemic and a number of unprecedented EOC activations (as discussed in Section 7.3.9.7). SDG&E will complete is schedule for an update in 2021 . To increase the capacity and bandwidth of its resources, SDG&E's Emergency Management department has hired a contract Emergency Planner to assist in meeting the September 2021 deadline for the CERP update. Emergency Management is in the process of meeting with the appropriate internal and external stakeholders on the updates.

Future improvements to initiative

SDG&E updates its CERP based on lessons learned. Processes and standards are enhanced, and training exercises are designed to stress test lessons learned and improvements to support a continuously improved response.

7.3.9.5 Preparedness and planning for service restoration

Risk to be mitigated */ problem to be addressed*

The energy industry has a strong track record of maintaining high levels of service and reliability. At times, however, events such as earthquakes, firestorms, hurricanes, and other natural disasters occur that cause significant and widespread damage to the electric grid and/or natural gas infrastructure creates widespread power outages to the end user. Restoring power after a major incident is a complex and difficult task. A speedy restoration requires significant logistical expertise, skilled line workers and assessors and specialized equipment on a large scale. During such events, utilities turn to mutual assistance and the mutual assistance network for the added resources to help speed restoration.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Mutual assistance is an essential part of the energy industry's contingency planning and restoration process. Utility companies impacted by a major outage event are able, under mutual assistance, to increase the size of their workforce by borrowing restoration workers

from other companies. When called up, a company will send skilled restoration workers along with specialized equipment, oversight management, and support personnel to assist the restoration efforts of a fellow electric/gas service company.

While the primary goal of the mutual assistance program is to restore service in a safe, effective, and efficient manner. The program also serves additional objectives that benefit the entire energy industry. These include:

- Promotes the safety of employees and customers
- Strengthens relationships among utility companies
- Provides a means for utility companies to receive competent, trained employees and contractors from other experienced companies
- Provides a predefined mechanism to share industry resources expeditiously
- Mitigates the risks and costs of member companies related to major incidents
- Proactively improves resource-sharing during emergency conditions
- Shares best practices and technologies that help the utility industry improve its ability to prepare for, and respond to, emergencies
- Promotes and strengthens communication among Regional Mutual Assistance Groups (RMAGs)
- Enables a consistent, unified response to emergency events

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Mutual assistance is both incoming and outgoing. There are situations where SDG&E is in a position where its resources are taxed and require the assistance of other subject matter experts from visiting utilities. There are other situations where the SDG&E service territory is not affected, and other utilities require outside assistance. SDG&E's planning efforts cover both scenarios. SDG&E is a member of multiple emergency associations to facilitate mutual assistance and maintains active mutual assistance agreements with the following organizations: California Utilities Emergency Association (CUEA); Western Regional Mutual Assistance Group; Western Energy Institute; Edison Electric Institute; and the American Gas Association. The decision to deploy a response team or request mutual assistance is facilitated by SDG&E's Emergency Management department and determined by the Utility Incident Commander in consultation with key operations directors and executives.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E reviews its Mutual Assistance Plan annually, in accordance with GO 166.[33] In 2020, SDG&E's Mutual Assistance Plan was updated to include COVID-19 considerations. The plan was reviewed by internal and external stakeholders and incorporated all of the Electricity

[33] General Order 166, Standard 2.

Subsector Coordinating Council guidelines for COVID-19. The plan was further reviewed by the SDG&E Safety Department, Logistics Department, Employee Care Services, Human Resources, and Finance Department to ensure proper implementation of the additional protocols. In 2021, SDG&E plans to maintain the Mutual Assistance Plan and update it as needed. SDG&E maintains three mutual assistance agreements (one in California, one in the region, and the other nationwide).

Future improvements to initiative

Future improvements to the Mutual Assistance program will include transitioning from cash advances to a debit card system for per diem disbursements. Debit card systems are safer for COVID-19 purposes as handling cash is discouraged by the Centers for Disease Control.

7.3.9.6 Protocols in place to learn from wildfire events

Risk to be mitigated */ problem to be addressed*

The critical and complex nature of SDG&E's emergency response has significantly grown in scope over the last year. To meet these challenges, an effective emergency preparedness and response department includes a systematic, inclusive, and transparent process to review incidents with continuous quality assurance and improvement as a core value. By providing strategic, data driven direction, the After-Action Review (AAR) program facilitates solutions and vital conversations between stakeholders to effectively mitigate those risks identified during incidents and events.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

As an essential part of the AAR program, SDG&E's Emergency Management department conducts a facilitated de-brief of all major fire and PSPS-related incidents and activations where an opportunity for improved safety, scene management, communications, and/or training have been identified. Feedback is solicited from all responding and supporting departments, including external agencies such as San Diego Fire and Rescue, CAL FIRE, and additional public safety partners. The initial stages of the AAR process call for a thorough evaluation of emergency response related core capabilities and competencies from all key stakeholders. Following this stage, corrective actions and emergency readiness capabilities are then integrated into SDG&E's annual Training and Exercise calendar to ensure operational and organizational effectiveness.

SDG&E has further expanded its Emergency Management Operations to include an Operational Field & Emergency Readiness program to manage SDG&E's comprehensive AAR program to continue building and improving its capabilities in operational planning and response to wildfire, PSPS incidents, and emergencies. Following all EOC activations and major exercises, the AAR program initiates a series of workshops to solicit feedback from the appropriate

stakeholders to ensure best practices are further developed and areas of improvement are documented on an improvement plan to be tracked to completion.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The region prioritization for the AAR process is not based on a physical location. AAR activities and the resulting documentation of the event and related lessons learned are engaged based on the impacted and responding stakeholder groups.

Progress on initiative *(amount spent, regions covered) and plans for next year*

AAR reports and summaries are a key component in the quality assurance and quality improvement process. Following extreme weather and/or fire-related events resulting in the activation of the EOC in 2020, a total of six AAR reports were drafted and disseminated. The key objective being to serve as a reference tool to inform future emergency response planning, training, and exercise activities.

Future improvements to initiative

One key maturation initiative of the AAR program is to align and integrate the processes with SDG&E's Safety Management System (SMS). SMS will provide a systematic, cohesive framework which builds upon SDG&E's strong safety culture and integrates new and existing processes; it will promote improved communication, better documentation, enhanced coordination, and continuous improvement. Where the AAR focuses on emergency incidents and events involving SDG&E's EOC, the SMS will provide an enterprise-wide approach to risk and safety and allow for cross-functional learning and information sharing on all events.

7.3.9.7 Other – Emergency management operations

Risk to be mitigated */ problem to be addressed*

SDG&E manages emergencies in alignment with the state Standardized Emergency Management System (SEMS) and federal National Incident Management System (NIMS), to coordinate across all levels of utility, government, and agency activity. The Company utilizes a utility-compatible Incident Command System (ICS) structure as an all-hazards framework to manage emergency incidents and events. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure and serves as the mechanism to direct those functions during an emergency response.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The SDG&E Emergency Management department is responsible for coordinating emergency management activities and activation of the EOC. The department's mission is to support effective, efficient, and collaborative planning, preparedness, response, and recovery processes for all hazards and risks, including those associated with wildfire risk and Red Flag Warning incidents, enterprise wide. Collectively, this department leads efforts and strategies to prepare for, respond to, and recover from all risks, hazards, and incidents that may impact SDG&E operations.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E's EOC serves as the location from which centralized emergency management is coordinated. To respond and recover effectively from all hazards and threats, like wildfires, SDG&E established an EOC with cross-functional teams representing every major business line within the Company and functioning within a utility-compatible ICS. The activation of the EOC assembles the internal subject matter experts to assess and provide situational awareness to internal and external stakeholders, overarching incident objectives, planning, anticipation, response, communications, and coordination. External Emergency Management partners, such as the County OES and CalOES are provided with situational awareness up to 24-72 hours in advance or as soon as operationally feasible; additionally, those partners are embedded within SDG&E's EOC during emergency conditions.

Progress on initiative *(amount spent, regions covered) and plans for next year*

In 2020, SDG&E embedded four Information Technology Specialists in Emergency Management to help support, develop, and drive technology solutions to the everchanging preparedness and response requirements necessary to ensure timely and appropriate decision making. This collaboration between Emergency Management and IT has proven to be successful in addressing lessons learned from the 2020 fire season responses and provides the ability to quickly pivot as needed during active responses.

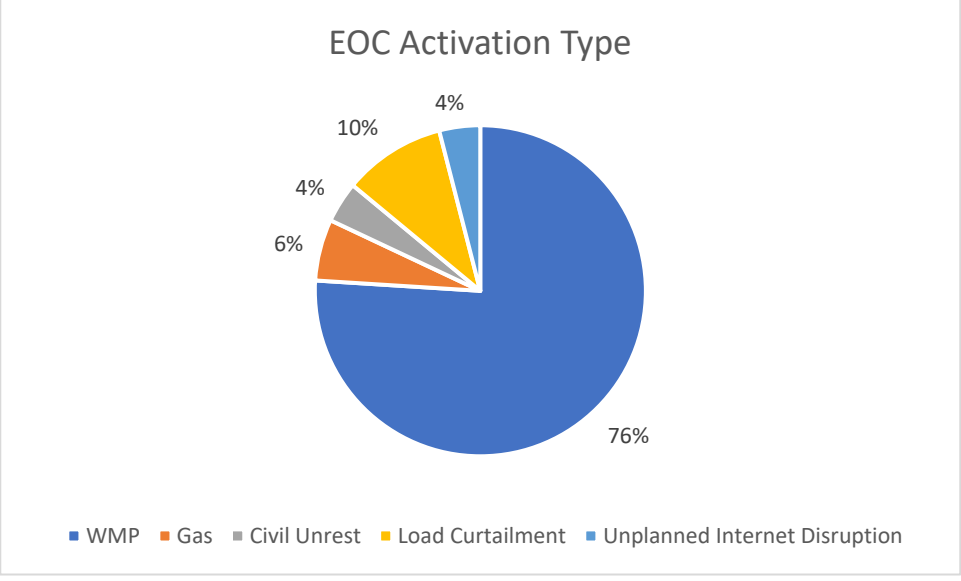
SDG&E's EOC was very active in 2020. The following table summarizes SDG&E's 2020 EOC activations with numbers of days activated.

Table 7- 3: Summary of 2020 EOC Activations

Event / Incident Name	# of Days Activated	Start Date
COVID-19 Pandemic	299	March 7, 2020
Civil Unrest	2	May 30, 2020
Orange Ave Gas Incident	3	July 16, 2020
Electric Load Curtailment	5	August 14, 2020
Extreme Weather (Load Curtailment, Valley Fire, PSPS)	6	September 3, 2020
PSPS	5	September 25, 2020
PSPS	6	October 23, 2020
Unplanned Internet Disruption	2	November 16, 2020
PSPS	16	November 24, 2020
PSPS, Creek Fire	5	December 20, 2020
2020 Total	**353**	

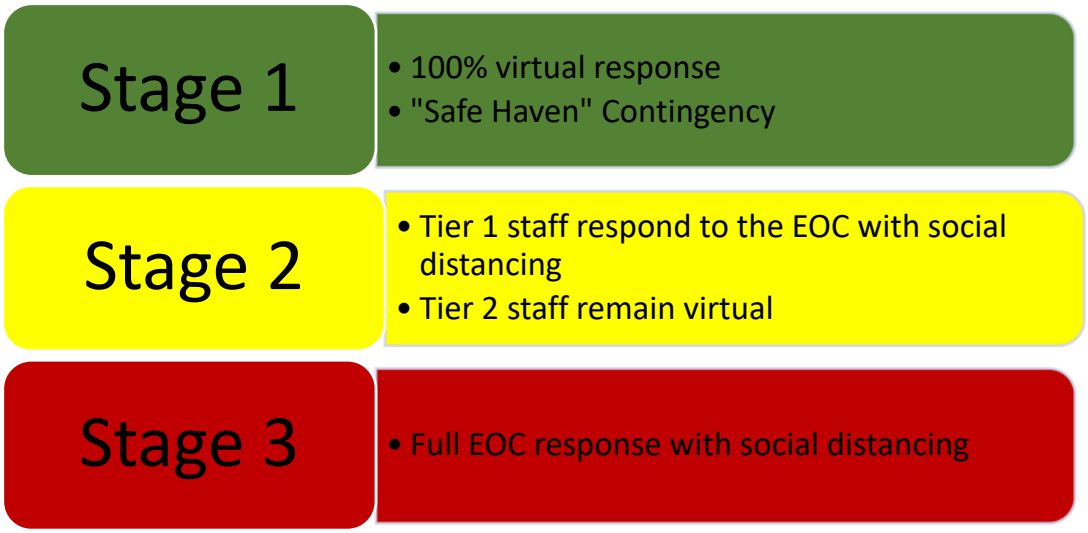
Not including the activation for the COVID-19 pandemic, 76% of SDG&E's EOC activations were WMP related (as shown in the figure below).

Figure 10: 2020 EOC Activation Types



In 2020, to respond appropriately to any incident while adhering to the COVID-19 conditions, the EOC is implemented a tiered response approach to ensure employee safety. The following figure depicts SDG&E's tiered response stages.

Figure 11: SDG&E Tiered Response Approach



While all three stages have similar overall protocols, processes, and procedures, each stage has different planning considerations.

For the safety of our employees, contractors, and vendors, in 2020 SDG&E developed a virtual EOC to coordinate response activities companywide. The Emergency Management and Information Technology departments collaborated on facilitating an online platform for EOC coordination. A virtual platform was built leveraging a Microsoft Teams environment to mimic the physical EOC in the virtual environment. Specialized Teams channels and rooms were created for all 65 EOC positions to provide a commonplace to coordinate with the group at large as well as more private collaboration spaces for their functional groups. Over 450 EOC responders were trained in 9 sessions on the use and functionality of the virtual EOC environment as well as 4 disaster exercises were conducted prior to fire season to ensure the team were competent and confident in their response roles. In 2020, all EOC activations were successfully conducted via a fully virtual environment to adhere to COVID-19 protocols with the exception of the two-day Unplanned Internet Disruption response, which was conducted in person observing all COVID-19 protocols.

SDG&E's current EOC is an approximately 6,500 square-foot facility constructed over 20 years ago to serve as SDG&E's central command post in the event of a natural disaster or other significant incident impacting the region's electric and natural gas systems. Over time, the EOC has evolved to serve as the central hub to support the growing demands of SDG&E's wildfire mitigation, situational awareness, and outreach and collaboration initiatives. It also houses SDG&E's meteorology center. As discussed in its 2020 WMP, SDG&E's existing EOC will be rebuilt to facilitate and support SDG&E's ongoing wildfire mitigation, situational awareness,

outreach and collaboration, and emergency response efforts. SDG&E completed the design phase of this remodel in 2020, and construction will begin in 2021.

SDG&E, through its Emergency Management and Fleet Services departments, implemented a pilot program with Verizon Connect to track vehicles assigned to the HFTD. As discussed in Section 4.1 above, this pilot concluded after the testing and selection of a device meeting SDG&E's needs to provide additional protection for those employees working in areas that do not have adequate radio or cell phone coverage, or both. Management and control of the Sole Worker Safety Program has transitioned to SDG&E's Information Technology department, where 185 TracPlus devices have been purchased and delivered. Training and distribution of the devices will be completed by the end of January 2021.

SDG&E is also implementing an Aerial Mesh Network, which allows live high definition video, infrared video, and shape files to be live-streamed from equipped helicopters to several receive sites located throughout the service territory, and onto SDG&E's intranet for consumption by the EOC, aviation services, and external cooperators such as CAL FIRE. This video is used for real-time situational awareness in times of emergency (fires, earthquakes, large outages). The project will be fully implemented in 2021. Currently, SDG&E has applied for, and are waiting for the Federal Communications Commission licensing on the frequencies to be used by the network. Once the approved frequencies are provided, SDG&E will be able to install the remaining receive sites and finalize the network streaming capabilities.

Future improvements to initiative

To address a continued focus on wildfire, including PSPS events, two new resources were added to the Emergency Management department to create a new Training and Exercise division, which will help in developing and implementing internal and external training and exercises, and all risk response plans (e.g., cybersecurity, earthquake, natural gas, tsunami, terrorism, active shooter, and other man-made and natural disasters). This new division will work with the AAR team to ensure lesson learned are incorporated into all trainings and exercises for continual improvement. This division will also bridge the gap between the EOC and field responders to ensure a comprehensive and cohesive response.

Based on feedback from past lessons learned, in 2021 SDG&E will implement a 24/7 Watch Desk program. This program is the natural evolution of developing a world class emergency management program. This capability will increase the capacity of Emergency Management for situational awareness. There is an increasing demand to maintain around the clock situational awareness to rapidly respond to any risk posed to SDG&E's service territory. It is quickly becoming an industry best practice to have a 24/7 Watch Command Desk; PG&E and SCE currently have this capability. Historically, the responsibility for maintaining situational awareness for emerging risks has been a combination of the Emergency Management On-Duty, Fire Coordinator On-Duty, and Meteorologist On-Duty. This model is inefficient as it has the potential for either redundancy with multiple people gathering information, or issues being

missed. This system relies on department staff rotating monitoring responsibilities while also conducting regular daily work duties and reduced overnight monitoring during sleeping hours. This also leads to an inconsistent executive notification process. The implementation of a 24/7 Watch Command Desk group will increase all risk monitoring, ensure consistent information gathering, and executive notifications. The Watch Desk would monitor for situations including, but not limited to:

- Monitor radios, camera system and Regional Computer-Aided Dispatch Interoperability Project (RCIP) for potential fires
- Information gathering for electric system issues
- Information gathering for gas system issues
- Monitor earthquake and tsunami potential
- Monitor relevant news feeds and social media trends
- Information gathering for rapidly escalating incidents in our service territory
- Collaborate with IT and Sempra Corporate Security to monitor cyber incidents
- Provide daily situation updates and situation analysis
- Monitor lone worker program/tracking
- Increase capacity of the Emergency Management department by assisting in technical writing during administrative shifts
- Make all PSPS notifications to CalOES and Public Safety Partners

7.3.10 Stakeholder cooperation and community engagement

A first-class level of engagement and cooperation amongst all wildfire stakeholders is extremely important to SDG&E, as it endeavors to fulfill its commitment to mitigate the risk of wildfires and adverse impacts of PSPS events. SDG&E remains dedicated to partnering with utility customers, elected officials, nonprofit support organizations, first responders and all other public safety and community partners, understanding they all play a unique and important role in achieving wildfire prevention and mitigation in SDG&E's service territory. SDG&E provides an essential service, and it takes its role within the communities it serves very seriously. This is especially true during times of PSPS events, when communities – neighborhoods in which SDG&E's employees, families and friends live – depend on complete, accurate, and timely information for their well-being.

SDG&E will continue to strive to provide all stakeholders up front awareness and information, doing everything in its power to educate the public on wildfire preparedness, including PSPS events. It is SDG&E's goal to equip those it serves with information and resources to navigate the adversity of an emergency, wildfire or PSPS event. Through thoughtful education campaigns and strategic partnerships, SDG&E has implemented a robust, external communication strategy, which is continuously analyzed to identify areas of improvement. SDG&E also leverages its broadened and increased relationships with CBOs and stakeholders to amplify and disseminate critical, sometimes life-saving information.

One of the pillars of SDG&E's wildfire and PSPS awareness lies within its Energy Solutions Partner network, which consists of nearly 200 CBOs. These year-round efforts and partnerships are further explained below. In addition, key to SDG&E's stakeholder engagement is its relationships with emergency response agencies, locally and at the state-level. SDG&E is widely recognized as a world-class innovator with its Fire Science and Climate Adaptation department. This team is routinely asked – and happily provides – best practices to other national utilities, as well as internationally. This cooperation, in addition to communication practices lay the foundation for SDG&E success in stakeholder cooperation and community engagement.

SDG&E remains committed to fostering productive collaboration and engaging the communities it serves. Endeavoring to collaboratively identify fresh ways to better serve our communities will remain a top priority in 2021 and beyond. As outlined below, SDG&E will continue to leverage its partner network, agency relationships and strive for clear, concise education and messaging.

7.3.10.1 Community engagement – Community outreach and public awareness

Risk to be mitigated */ problem to be addressed*

As discussed above in Section 7.3.9.2, the threat of wildfires in California is becoming a near year-long risk. SDG&E experienced unprecedented wind events in late December 2020 which coincided with weather and environmental conditions conducive to catastrophic wildfires. These events – and their timing – illustrate the need for SDG&E to continually educate customers and the general public about wildfire safety, resiliency and emergency preparedness. Thus, a comprehensive wildfire safety communications and outreach plan has been developed with the intent of increasing community resiliency to wildfires.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E's comprehensive wildfire safety outreach initiative is discussed at length in Section 7.3.9.2 above. The importance of providing accurate, timely information to increase public awareness cannot be understated. By educating communities before an emergency, wildfire or PSPS event occurs, customers can take the necessary steps to prepare for and navigate the inherent difficulties these events bring. Additionally, SDG&E leverages channels outside of its internal outreach campaigns, in the form of partnerships and external events. These provide additional avenues for SDG&E to interact with the public. Providing myriad outreach and engagement channels increases public touchpoints and leads to increased awareness.

This initiative does not have an RSE because it is primarily around educating the community about wildfire safety, resiliency and emergency preparedness. Quantifying an RSE for it would

be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring effectiveness of that reduction.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Public education and communication efforts target SDG&E's entire service territory with a particular focus on the areas that are most at risk of PSPS or wildfire (High Fire Threat District).

Progress on initiative *(amount spent, regions covered) and plans for next year*

In addition to the online webinars and Drive-Thru Wildfire Safety Fairs described in Section 7.3.9.2 above, SDG&E's team of outreach advisors work with community organizations to provide education, programs and services beneficial to customers, with a key focus on wildfire preparedness, PSPS notifications and support services.

A key channel and support network utilized by outreach advisors to promote wildfire preparedness information, PSPS notifications and available support services during PSPS events (see Section 8.4 below) is SDG&E's Energy Solutions Partner network. This network is comprised of nearly 200 CBOs who serve a critical role in connecting SDG&E with their constituencies. Through this Partner Network, SDG&E is able to reach diverse, multicultural, multilingual, senior, special needs, disadvantaged and AFN communities. In many cases they are considered trusted partners and experts by the communities they serve, and are able to provide valuable feedback to SDG&E on the needs of their constituents, as well as amplify SDG&E's wildfire preparedness and notification messaging to hard-to-reach customers.

SDG&E works with these organizations year-round to help prepare customers for wildfires, especially those who may be vulnerable, through presentations, meetings and amplification of emergency preparedness information. Additionally, when a possible PSPS event is identified, SDG&E provides notifications and updates to these organizations who then serve as a critical channel to amplify that messaging and communicate it to customers who may not utilize traditional channels. Through this Partner Network, SDG&E is able to reach diverse, multicultural, multilingual, senior, special needs, disadvantaged and access and functional needs communities.

SDG&E Wildfire Safety Community Advisory Council

As part of its ongoing efforts to support wildfire mitigation and community fire safety, the SDG&E Wildfire Safety Community Advisory Council (WSCAC) is a forum allowing prominent community leaders to provide direct and constructive input, feedback, recommendations, and support to SDG&E senior management and the Safety Committee of SDG&E's Board of Directors. SDG&E takes the information discussed during these meetings very seriously, as the council members provide useful insight into how SDG&E can continue to help protect the region from wildfires.

This specialized group of diverse and independent leaders from public safety, tribal government, business, nonprofit, and academic organizations in the San Diego region possess extensive experience in public safety, wildfire management, community-based services, and applied technology.

WSCAC meetings are led by SDG&E's Chief Operating Officer and are attended by members of the Safety Committee of the SDG&E Board. At WSCAC meetings, SDG&E annually presents its Wildfire Mitigation Plan and subsequent updates for discussion, suggestions, and recommendations by WSCAC members. SDG&E also welcomes input from WSCAC members on relevant emerging community issues on wildfire safety and preparedness. The WSCAC meets quarterly.

Future improvements to initiative

Webinars in 2021 will continue to educate the communities with additional educational efforts and collaboration with both CAL FIRE and 2-1-1. Pending the pandemic in 2021, SDG&E's past open house events will be scheduled to continue to bring rural customers together to educate, share updated information as well as build relationships.

Wildfire Safety Fairs will continue to serve the communities with information, education, resiliency and opportunities to help before, during and after a PSPS activation and/or any other emergency situation. The Company will also review and assess the prevalent languages identified. The expanded CBO collaboration will help with this effort. Many of these organizations target in-language communities and can help refine communications and further identify non-English speaking populations within the territory. SDG&E will continue to utilize these important partnerships and will look to expand efforts in the coming years.

SDG&E plans to continue strategically enhancing collaboration with community partners, including Fire Safe Councils, local Fire Departments, CERT, local town organizations and other CBOs to educate on PSPS, emergency response and programs available to all communities.

Additionally, SDG&E will continue to partner with CBOs, and in 2021 will be especially focused on building new partnerships with organizations that represent the needs of customers with AFN.

7.3.10.1.1 PSPS communication practices

Risk to be mitigated */ problem to be addressed*

As the climate changes and the threat of wildfire increases across California, SDG&E utilizes PSPS, a last resort mitigation tool, to reduce the risk of infrastructure-related, catastrophic wildfires. As a result of these efforts, the Company executes a robust communications and outreach effort to educate customers and the public about PSPS and how to prepare for

potential outages. The goal of this effort is the increase awareness and community resiliency to wildfire and PSPS.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Similar to and in coordination with its wildfire safety communications, SDG&E conducts PSPS-specific communications in three phases: prior to, during and following a PSPS event. Efforts before a PSPS focus on educating customers and the public about what a PSPS is and tactics they can employ to remain safe, resilient and updated during a PSPS occurrence. During a PSPS, the company focuses on providing real-time awareness and updates about the event and how to remain safe. Following a PSPS, the Company examines communications and solicits customer feedback with the intent of refining and improving communication efforts for the following year.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Public education and communication efforts target SDG&E's entire service territory with a particular focus on the areas that are most at risk of PSPS or wildfire (High Fire Threat District).

Progress on initiative *(amount spent, regions covered) and plans for next year*

Before a Public Safety Power Shutoff

In 2020, SDG&E expanded its public education and outreach efforts associated with its PSPS Communications Plan. PSPS safety and resiliency communications were part of a territory-wide public education campaign. These communications included promotions for the Company's Online Wildfire Safety Webinars, Drive-Thru Wildfire Safety Fairs, promotion of a new PSPS Mobile App, and activation of a dedicated AFN public-education campaign, all of which focused on PSPS preparation and resiliency this year. Also, in light of COVID-19 considerations, special emphasis was placed on reaching and educating customers and the public in new and novel manners.

<u>Online Webinars and Drive-Thru Wildfire Safety Fairs</u>

As mentioned in the Wildfire Communications section above, Online Webinars and Drive-Thru Wildfire Safety Fairs were offered this year to customers and the general public. A large portion of these events were dedicated to providing information about PSPS and how to prepare and remain resilient through the events. Record attendance was reached in 2020 and planning for future events will focus expanding participation in these community events.

PSPS Mobile App

At the beginning of September 2020, the Company launched its novel PSPS Mobile App (Alerts by SDG&E). This new tool enables customers to receive information including, but not limited to, notifications, Community Resource Center information with GPS directions, and other real-time updates and safety information related to PSPS activities. A dedicated paid promotional campaign accompanied the September launch and ran through December. The campaign mainly enlisted digital tactics to reach customers and the public with direct links to app stores on available mobile platforms. To date, promotional efforts have garnered nearly 6,000 app downloads and counting.

Access and Functional Needs Populations Dedicated Campaign

Last year, the Company initiated a new public education campaign designed to reach AFN communities. The purpose of the campaign was to promote the newly established collaboration between SDG&E and local community-based organizations across the service territory, helping connect customers with services and resources available to the public during PSPS events.

Prior to the start of this year's fire season, the Company finalized formal agreements with 2-1-1 San Diego and 2-1-1 Orange County. Both organizations coordinate service delivery with their consortiums of CBOs across SDG&E's service territory during PSPS events. The 2-1-1 organizations serve as a resource hub for affected communities, particularly those within AFN populations. 2-1-1 staff help direct constituents to resources such as food delivery, transportation and hotel stays, and an extensive list of other services. For more information see Section 8.4 below.

SDG&E has been deliberate to communicate its expanded collaboration with the 2-1-1 organizations. SDG&E launched a new co-branded public education campaign and deploys mass-communications such as print advertising, radio, and digital media platforms, including paid social all targeted towards vulnerable and hard to reach populations.

The Company's mass communications have achieved substantial reach to date. Digital banners have run 3.2 million impressions (or touchpoints) and social media messaging on Facebook has garnered over 397,000 impressions. Print advertising, particularly in-language local community newspapers and magazine publications, helped reach affected communities more readily as well as AFN and 16 hard-to-reach audiences. Print provided over 1 million campaign impressions. SDG&E's traditional radio buy reached over 4 million impressions, with streaming radio adding another 1.8 million. As part of the radio buy, SDG&E also received over 1.7 million station newsletters, 75,000 social posts and 675,000 targeted emails to their listeners. SDG&E also developed and disseminated event-specific community flyers that were posted in community centers and high traffic areas in affected communities. These flyers were intended to reach audiences that may not have had readily available internet or cable access.

Along with the public education campaign, SDG&E provided PSPS messaging and creative assets for the 2-1-1 websites and social media platforms. Digital versions of SDG&E collateral, such as the High Fire Threat District Newsletter and the PSPS Resource Fact Sheet, were distributed to 2-1-1 San Diego and 2-1-1 Orange County for inclusion on their websites.

SDG&E also worked with the San Diego County AFN Working Group in September to create PSPS Safety Content for their Emergency Preparedness Guide. SDG&E also printed a supply of the guides for the Working Group's network of service providers and CBOs, and for outreach planned in 2021.

Media Collaboration

SDG&E continues to foster partnerships with local broadcast and print media to inform customers of proactive safety and preparedness outreach prior to a PSPS event. Local broadcast and print media, including the designated emergency broadcast radio, amplify SDG&E's messaging during a wildfire or wildfire-related event (PSPS).

Prior to 2020, broadcast and print media were brought into SDG&E's Emergency Operation Center, before a potential wildfire-related event, and provided situation awareness that they could begin disseminating to the public. Due to COVID-19, SDG&E has adapted its approach and now pre-records event briefings from the meteorology team that are shared via the Company's social media channels (YouTube, Twitter, Facebook and Nextdoor). The media is kept informed throughout the duration of an event by media representatives and real-time updates via the NewsCenter (sdgenews.com) and social media channels. These efforts will continue through 2021.

During a PSPS

During the 2020 PSPS events, SDG&E continued to execute standard communication protocols such as, but not limited to, customer notifications, media updates and situational awareness postings across social media channels. In addition, the Company activated new tactics to inform customers and the public about the latest developments during PSPS events.

One of the new tools the Company used is the PSPS Mobile App (Alerts by SDG&E). As noted previously, during an event, PSPS notifications for up to five customizable addresses are pushed directly to the app at the same time as other PSPS phone, text and email alerts are sent. The app also provides real-time updates about each PSPS and information for the user about what stage of the PSPS process they are currently in. Users can also get information about any Community Resource Centers as well as 2-1-1 resources. The app is closely aligned content to the Company's dedicated PSPS website landing page (sdge.com/ready), including the outage map and new list of affected communities display.

As part of its expanded outreach to vulnerable communities during an event, SDG&E had roadside electronic message signs placed in strategic, highly-traveled locations, throughout affected communities, to keep impacted residents informed. These signs were critically important to communicating with travelers going in and out of affected communities. A total of 31 signs were deployed in 2020.

During PSPS events, SDG&E assigns a dedicated 2-1-1 organization liaison who is responsible for conveying real-time updates and talking points. The Company will also employ standard communication channels to promote 2-1-1 service resources including, but not limited to social media channels, broadcast and print media, and the SDG&E NewsCenter and website.

During the 2020 PSPS events, SDG&E also produced and distributed a digital document that listed communities affected by a PSPS and shared it with local municipalities and agencies. This effort was intended to give additional context about PSPS events and help communities prepare.

To expand on its digital outreach, the Company produced radio-script templates for DJs to read live on the airwaves. These scripts are intended for use on San Diego's designated regional Emergency Broadcast radio station. The templates allow for the addition of real-time awareness details and provide referral to the Company's website for additional safety information and updates.

Finally, the Company reevaluated the language library of PSPS email, text and voice notifications for customers. The Company used feedback solicited at the end of 2019, from customers affected by PSPS events, to simplify notification messaging and make content more representative of the conditions being experienced. The updated notifications we translated and recorded in the eight required languages for PSPS notifications (English, Spanish, Tagalog, Mandarin, Cantonese, Vietnamese, Korean and Russian).

Following a PSPS

Communicating and engaging customers and the public early and often is essential to the region's wildfire preparedness. This engagement is not limited to those in the HFTD – SDG&E has made it a point to dialogue with all customers and stakeholders. SDG&E engages in discussions and solicits feedback from its communities and stakeholders regarding proactive safety preparations, mitigation measures and community support strategies to reduce infrastructure-related ignitions and mitigate impacts of PSPS.

SDG&E is reaching out to customers, through formal surveys, to establish a baseline awareness of PSPS-related messaging and communications at the beginning of wildfire season. At the end of wildfire season, customers will again be surveyed to measure the effectiveness of public education efforts and communications. The Company will use the gathered feedback to evaluate, refine and improve customer and public education efforts for 2021 and follow a similar process in the coming years.

Future improvements to initiative

In 2021, SDG&E will be investing in improvements that enhance both the wildfire safety and PSPS communications. Future improvements will be available and utilized for both communications initiatives. As previously noted in Section 7.3.9.2, these efforts include the expansion of the AFN campaign to better communicate with hard-to-reach populations. The public education campaign will start sooner in the year and will work to expand the reach of communications within the service territory. The formal CBO contract established in 2020 will continue and the lessons learned during the 2020 wildfire season will be applied to the 2021 campaign.

The Company will also review and assess the prevalent languages identified. The expanded CBO collaboration will help with this effort. Many of these organizations target in-language communities and can help refine communications and further identify non-English speaking populations within the territory. SDG&E will continue these collaborations and looks to expand efforts in the coming years.

Additionally, the Company is considering and evaluating additional efforts including, but not limited to, working with local school districts to enhance public education efforts. Considerations include school newsletters, communications to parents as well as leveraging established school communication platforms (emails, text messages and collateral materials).

SDG&E is also examining new opportunities within its established partnerships with local Tribal Councils and other resources that serve Native American communities. Currently, 2021 planning efforts are under way with organizations such as, but not limited to, Indian Health Councils, the Inter-Tribal Long Term Recovery Foundation and third-party, AdPro, that specialize in tribal communications. SDG&E is working to significantly expand 2021 wildfire safety and PSPS outreach communications to Native American communities. Along with the expanded communication efforts, SDG&E is working to develop new communications in a culturally appropriate and relevant manner.

7.3.10.2 Cooperation and best practice sharing with agencies outside California

7.3.10.2.1 Emergency Management and Fire Science & Climate Adaptation

SDG&E's Emergency Management and Fire Science & Climate Adaptation departments are identified as world-class and innovators both nationally and internationally. SDG&E has hosted numerous knowledge sharing tours of the EOC and weather center for utility personnel from throughout the U.S., as well as international utility partners. In 2020, utility representatives from across the United States and other countries have sought to learn best practices from SDG&E. SDG&E prioritizes cooperation and sharing of best practices as an important

component of our fire mitigation activities. SDG&E plans to continue these practices and believes that its cooperation and sharing practices have been effective and a contributor to its success in wildfire mitigation activities over the last decade. SDG&E maintains membership in multiple international utility organizations designed to collaborate and share best wildfire practices from around the world. Prior to the upcoming wildfire season and before the next Plan update, as well as over the next three to ten years, SDG&E plans to continue its practice of cooperation and sharing of best practices outside of California. For 2021, SDG&E already has several events planned.

***Risk to be mitigated** / problem to be addressed*

Wildfire is the most pressing climate hazard for the San Diego region today. Through cooperation and best practice sharing with agencies outside of California SDG&E is deeply committed to building resilience to wildfire.

***Initiative selection** ("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

The increasing occurrence of significant weather events across the globe has become more evident in recent years, which has led to national discussions about climate resiliency. Because of SDG&E's progressive wildfire risk mitigation strategies, the Company was tapped to join the U.S. Department of Energy's (DOE) Partnership for Energy Sector Climate Resilience initiative. As a leading participant in the partnership, SDG&E has collaborated with the DOE and 16 other utilities to improve the resilience of the nation's energy infrastructure against extreme weather and climate change impacts. The goal of the partnership is to identify the challenges national energy partners are facing today and work together to develop sustainable solutions. The value of this collaboration extends back into the San Diego region. SDG&E looks forward to bringing new best practices and innovations to continue the region's climate resiliency leadership.

***Region prioritization** ("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

Understanding the issues at hand and having the best information with which to address these issues is an integral aspect of building smart, long-term solutions to climate change issues. Thus, SDG&E is committed to using and developing the best climate science in California and the country. Part of this process is found in SDG&E's strategic partnerships with academic and research institutions, in association to the DOE Partnership for Energy Sector Climate Resilience initiative.

Overall, SDG&E's comprehensive partnerships with prestigious research institutions have put the utility in the best possible position to understand and adapt to the adverse conditions climate change will bring through the next several decades. This research is unique in that it

not only serves SDG&E's adaptation and planning needs but can be used by a multitude of other stakeholders across the region.

***Progress on initiative** (amount spent, regions covered) and plans for next year*

Fire Science and Climate Adaptation department has developed the concept for a Fire Science and Innovation Lab (as discussed in Section 7.3.2.4.1 above). The lab will bring together leading thinkers and problem solvers in academia, government, and the community to create forward-looking solutions to help prevent ignitions, mitigate the impacts of fires, and ultimately help build a more resilient region.

SDG&E is partnering with academia, government, and public safety professionals to innovate and implement more advanced technologies designed to further improve wildfire safety. Initial innovations include maximizing artificial intelligence and machine learning to improve situational awareness. SDG&E aims to lead the development of the next generation of fire science and wildfire innovation. Lab construction was paused in late March 2020 due to the onset of the COVID-19 pandemic.

Future improvements to initiative

To continue to build comprehensive resilience to wildfire and other climate hazards, SDG&E will expand its proven formula of cooperation and best practice sharing with agencies outside California. This will be achieved by combining the best available science (spearheading the development of that science where it is lacking), cutting-edge situational awareness technology, and subject matter expertise dedicated to solving complex climate change-related issues.

7.3.10.2.2 International Wildfire Risk Mitigation Consortium

SDG&E is a member of a consortium of utilities brought together by UMS Group Inc., an international management consulting firm specializing in solutions for the global energy and utility industries. The International Wildfire Risk Mitigation Consortium (IWRMC) is comprised of multiple utilities from the United States, Australia, South America, and other areas.

***Risk to be mitigated** / problem to be addressed*

The IWRMC was established to facilitate members of the global utility community who face wildfire risk a system of sharing of data, information, technology and safe practices. This will reduce the risk of siloed approaches, avoid repeating unsuccessful initiatives other utilities may already have pursued, and allow for more comprehensive development of new solutions.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

Engaging with this international consortium provides an opportunity to leverage global experience instead of just local or regional wildfire risk mitigation experience. It also may accelerate learnings and development of new solutions, helping to lead industry direction, and innovative approaches to risk mitigation.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The consortium voted on the focus areas member utilities thought would most benefit wildfire risk advancements. These four areas are vegetation management, risk management, asset management, and operations and protocols.

Progress on initiative *(amount spent, regions covered) and plans for next year*

IWRMC established the four areas of focus and the four working groups who will work on the activities within the groups. These areas of focus were formed after input from the various participating utilities. Specific topics and activities are in development. The working groups will conduct webinars and other sessions to develop ideas and share results over the next year.

Future improvements to initiative

The consortium plans to continue to add utilities interested in participating and contribute to the collaboration and learnings. It is hoped experiences with various mitigation approaches and implementations will inform future SDG&E wildfire risk mitigation related work. In the future, more details regarding the progress of the various activities from this consortium may be shared.

7.3.10.3 Cooperation with suppression agencies

Risk to be mitigated */ problem to be addressed*

SDG&E's service territory spans multiple local, state, tribal, and federal fire jurisdictions. Cooperation with suppression agencies enables the efficient and safe response to emergency incidents as well as strengthening the overall resiliency of the region.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

One of the goals of SDG&E's efforts to cooperate with suppression agencies it to prevent situations where breakdowns in communications can cause someone to get injured. Fire is a constant risk and utility equipment in or around a fire presents an added complexity to any incident. By ensuring good communication and regularly strengthening relationships before,

during, and after incidents SDG&E can increase the likelihood of achieving positive outcomes during emergencies.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

SDG&E attempts to engage as many cooperating agencies as possible. This work spans San Diego County, Orange County, and Imperial Valley. SDG&E also regularly attends and meets with training officers from around the service territory.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E has successfully built relationships with suppression agencies and provides in person trainings at a Chief and engine level throughout the year. SDG&E also participates in, and sponsors, the County Wildland Exercise that brings together a variety of suppression and law enforcement agencies.

Future improvements to initiative

SDG&E is constantly refining training and solicits input from training officers for topics that firefighters are interested in knowing more about. These topics, as well as lessons learned on incidents, are incorporated into training.

7.3.10.4 Forest service and fuel reduction cooperation and joint roadmap

Please refer to Section 7.3.5.2 above for a detailed description of SDG&E's forest service and fuel reduction joint roadmap.

7.3.10.5 Non-Conductive Balloon Initiative

Risk to be mitigated */ problem to be addressed*

Metallic foil balloons continue to disrupt the reliability of the electric grid and are a source of reportable ignitions. In 2020, SDG&E attributed two CPUC reportable ignitions to balloons, and according to SDG&E's 2020 Wildfire Mitigation Plan (Table 11a), SDG&E reported an average of 3.6 ignitions per year caused by balloons from 2015 to 2019.

Initiative selection *("why" engage in activity) – include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*

SDG&E is pursuing the development of a non-conductive balloon with a major manufacturer in the balloon industry. SDG&E brings expertise in electrical engineering and the distribution power grid, and the balloon manufacturer brings expertise in manufacturing processes and retail commercialization. Both companies are working collaboratively to develop a prototype non-conductive balloon, which will not cause an electrical fault when it comes in contact with

overhead distribution power lines. Both companies are also involved in drafting an industry standard to test balloons in distribution power lines to identify whether a balloon will cause a fault to overhead distribution power lines. Such a test standard might be adopted by local authorities to limit the sale of balloons that do not pass the test. Prior efforts within the California legislature to ban these foil balloons has failed, namely Assembly Bill 2709 (Quirk) in 2016. Current laws that require metallic foil balloons to be attached to a weight are ineffective, as demonstrated by the annual ignitions and power outages caused by balloons. The alternative is to accept the status quo and allow Californians to face fire risks from these balloons.

This initiative does not have an RSE because the current scope of this initiative is focused on outreach efforts to drive adoption of the alternative technology for metallic foil balloons. No current deployment of this technology is in place to allow for a calculation of RSEs based on measurable indicators of effectiveness.

Region prioritization *("where" to engage activity) – include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*

The balloons are being tested according to distribution power voltages, rather than geographic areas. The balloons so far have passed tests at 12 kV and 21 kV, in conditions that represent the highest distribution voltages in SDG&E's territory and PG&E's territory. Currently, tests are underway to test higher distribution voltages in use within SCE's territory and some municipal electric utilities in the State.

Progress on initiative *(amount spent, regions covered) and plans for next year*

SDG&E and the balloon manufacturer developed a prototype foil balloon that has successfully passed tests within configurations representing a 12kV circuit and a 21 kV circuit. SDG&E spending is focused on the high voltage test labs, thin film consultants with expertise in electrical conductivity, efforts to develop the non-conductive prototype, and activities to support the development of the test standard.

The next high-voltage tests will address 33kV to model distribution voltages used across other Californian electric utilities. The work will also clarify what standard test conditions should apply to an industry-wide standard test.

The test standard is being developed within the Institute of Electrical and Electronic Engineers (IEEE, ieee.org). The draft trial-use standard is in the drafting stage, and is being developed by a task force within the Distribution Reliability Working Group of IEEE. The task force is made up of representatives from electric utilities across the U.S., a high voltage test lab, a balloon manufacturer, and other consultants and experts. The draft standard is titled "Trial Use Standard for Testing and Evaluating the Dielectric Performance of Celebratory Balloons in Contact with Overhead Power Distribution Lines Rated up to 38 kV System Voltage." The goal is to have a standard test that could be performed by any high-voltage lab to determine if a

celebratory foil balloon will cause a fault in overhead distribution lines or not. According to the IEEE process for developing draft standards, the expected date of submitting the draft for initial sponsor ballot is December 2022.

Future improvements to initiative

If the prototypes continue to have success in the high voltage tests, the balloon manufacturer may seek improvements to lower the production costs and apply the technology to complex balloon designs. SDG&E shall not fund any of those product improvements but may participate in ensuring the industry standard test applies to any new product developments.

8 Public Safety Power Shutoff, Including Directional Vision for PSPS

8.1 Directional Vision for Necessity of PSPS

Instructions: *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.

Safety is paramount at SDG&E. Over the years, wildfire has become one of the top safety risks in California. Following the catastrophic October 2007 wildfires experienced in SDG&E's service territory and across Southern California, SDG&E dedicated itself to revamping and enhancing its wildfire prevention and mitigation measures across a wide spectrum of disciplines and activities. Key achievements included: developing the ability to forecast fire danger; building the first of its kind utility-owned weather network; and pioneering the use of de-energization (PSPS) as a last resort measure to protect public safety.

SDG&E leverages a multitude of situational awareness data and input from its subject matter experts when deciding whether to de-energize. SDG&E implemented its first PSPS in 2013, and since then, continues to refine and improve its protocols. Through experience, SDG&E learned that it is not appropriate to use a prescriptive technique to determine when to use PSPS as wildfire conditions are dynamic and not every situation is the same. In determining whether to employ a PSPS in a given area of its system, SDG&E analyzes and weighs several facts in real-time, including: meteorology and weather conditions, vegetation conditions and Vegetation Risk Index, field observations, information from first responders, flying and falling debris, expected duration of conditions, and location of existing fires or wildfire activity in the region or state that would affect resource availability. SDG&E's PSPS protocols and thresholds for implementation are discussed in further detail in Section 8.2 below.

SDG&E continues to focus on minimizing the impact of PSPS events. In 2020, SDG&E's PSPS Mitigation Engineering team developed mitigation strategies that reduced impacts to customers that had been exposed to PSPS in the past. Mitigations deployed included a combination of strategic undergrounding, remote sectionalizing, covered conductor, overhead hardening, microgrids, and SDG&E-provided customer battery backup generator to reduce customer impacts. In 2020, this resulted in an approximately 30% reduction in customers impacted by PSPS (compared to 2019 PSPS events). In 2021, SDG&E will continue to implement

solutions to further reduce the impact, both scope and duration, of PSPS events. This is discussed in greater detail in Section 8.3 below.

Over the past year, SDG&E continued to listen, learn, and improve upon its PSPS practices. Beginning in 2017, SDG&E has experienced a notable increase in strong Santa Ana wind conditions leading to an increased impact from PSPS events. The 2020 wildfire season demonstrated a continuation of these extreme fire weather events in SDG&E's service territory as well as throughout the state. Notably, a series of strong Santa Ana Winds impacted SDG&E's service territory late November through early December at which time the National Weather Service classified the weather as "Extremely Critical." During the strongest of the three Red Flag Warnings that occurred during this time period, wind speed records were set at 43 of SDG&E's weather stations with the average peak gusts across the 20 windiest locations topping 70 mph for the first time since the weather network was built in 2010. Additionally, across the SDG&E weather network, peak wind gusts exceeded their 99th percentile measurements at 126 weather stations, driving winds out of the mountains and into lower elevation communities, increasing the areas impacted by PSPS during this event.

The trends that have been observed across the SDG&E service territory over the last several years have been consistent with the latest climate science released in California's Fourth Climate Assessment[34] indicating that higher temperatures and less reliable fall rainfall will result in an increased potential for wildfire. As such, reliance on PSPS to mitigate the increasing wildfire risk will be needed in the near-term. That said, continuous and ongoing efforts remain in place to offset the increased risk with the intent to decrease the impact of PSPS moving forward.

SDG&E's 2020 wildfire mitigation initiatives included mitigation for PSPS impacts to customers. Over the past year, significant progress has been made to complete activities designed to reduce PSPS impacts. For example, the number of customers affected by SDG&E's December 2-5, 2020 weather event would have been higher by over 7,000 but for the mitigations SDG&E implemented in 2020. The PSPS impacts were successfully reduced through the various mitigation programs, including microgrid installations, customer generator programs, strategic undergrounding, installing additional sectionalizing switches, additional weather stations, and operational changes such as transferring sections of circuits to other circuits with less impacts from winds.

As discussed in Section 7.3.5.8.2 above, four new microgrids sites were deployed in 2020 at the Ramona Air Attack Base, Cameron Corners, Shelter Valley, and Butterfield Ranch. Ramona Air Attack Base is an important CAL FIRE air resource dispatch center. For SDG&E's 2020 weather events of December 2-5 and December 7-9, a 300 kW diesel generator was deployed to serve the load needed for air resource support. The Cameron Corners microgrid site was planned for

[34] California's Fourth Climate Change Assessment (January 16, 2019).

backup power to key customer services such as a convenience store, a CAL FIRE station, a school, and a telecom switching center. During the December 2-5 and December 7-9 events, a 545 kW diesel generator was deployed to Cameron Corners providing power to these businesses. During the same December 2020 events, a 825 kW diesel generator was deployed to Shelter Valley, a desert community in the far eastern section of the service territory providing power to 221 customers and a fourth deployment was to Butterfield Ranch serving a desert community with 119 customers also in the eastern part of the service territory with a 825 kW diesel generator. These four sites will eventually have renewable resources, however, due to the pandemic these solutions were delayed, and conventional generators were deployed to serve customers. SDG&E will also explore temporary portable renewable generator options to deploy during PSPS events for critical loads or microgrid sites awaiting the final construction. A fifth microgrid site has served customers in the town center of Julian for several years during PSPS events and this year a 1,000 kW diesel generator was deployed providing backup power to 221 customers. Additional customers were able to benefit from the Julian generator site due to some strategic undergrounding completed in 2020 allowing for more customers to be connected to the section of circuit fed from the generator. For the events of December 2-5 and December 7-9, a sixth diesel generator of 125 kW was deployed to assist an essential customer to provide backup power.

In 2020, SDG&E installed new weather stations and upgraded existing stations to enable reporting every 30 seconds, rather than every 10 minutes. This has proven to be useful as it provides more real-time and detailed situational awareness, and also helps reduce PSPS impacts. Because the 30 second data flows are enabled as adverse conditions arise, the near-real-time monitoring of wind gusts helps provide decision-makers with information on the frequency of stronger gusts that are not reflected in the usual 10-minute observations. For instance, if a weather station has several consecutive 30 second reads at or above any defined threshold, that would increase the probability that a PSPS event would occur because consistent high winds are being reported. However, if the 30 second reads show one brief gust above that same threshold, followed by several observations of much weaker winds, it would indicate that conditions are not quite as severe. This was the case during SDG&E's December 2020 Red Flag Warning events, where more than 6,000 customers accounts were not de-energized during the December 2-4 event and around 20,000 customer accounts were not de-energized during the December 7-9 event.

SDG&E's FPI (discussed in detail in Section 4.5.1.7 above)has a similar influence on reducing PSPS impacts to customers. In early December 2020, as Santa Ana winds entered the forecast after a prolonged dry period, the FPI began indicating the potential for an Extreme FPI rating across all inland districts. Due to the potential for rapid wildfire growth, alert speeds at which to consider enacting PSPS were lowered to reflect the higher risk. However, the Red Flag Warning event in late December was preceded by scattered showers just a few days prior. As such, the FPI rating was Normal for the San Diego County coastal districts and Elevated for all other districts at the peak of the event. With extreme fire growth less likely, the alert speeds to

consider enacting PSPS were raised in an effort to reduce customer impact during a lower risk event. As a result, more than 19,000 customer accounts were not de-energized during the December 23-24, 2020 event.

Instructions for Table 8-1:

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.

In evaluating Table 8-1 below, it is important to note that the listed PSPS characteristics are not independent from each other. In many instances, when one characteristic is targeted for reduction, another one will also be reduced. For example, if reducing the number of customers impacted by PSPS is the number 1 priority, it will also result in reducing the scope of PSPS events. As such, giving a lower ranking to any one of these characteristics does not imply a level of priority in mitigating the issues. The suite of initiatives that SDG&E deploys to mitigate PSPS impacts target all these characteristics simultaneously. Additionally, the effects of climate change can significantly influence the outlook of these PSPS characteristics. Another record for wildfire risk in California was set in 2020 and the trend continues to point to an increasing level of risk year after year, which could limit progress on decreasing PSPS and require adapting wildfire mitigation strategies for the evolving risk in the future. Compared to past years, in 2020, the number of RFWs increased driving the frequency of PSPS events and scope up in SDG&E's service territory, which could be an indication of future trends. However, due to all of its PSPS mitigation work, SDG&E forecasts a general decrease in PSPS event impacts compared to the impacts if there was not a focus on PSPS mitigation.

Table 8-1: 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	Number of customers affected by PSPS events (total)	Decrease	One of SDG&E's key objectives is to reduce the number of customers impacted by PSPS through the various initiatives outlined in the WMP.
2	Number of customers affected by PSPS events (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	See above.
5	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)	Decrease	Long-term strategies under consideration include enhanced grid hardening to reduce the need for PSPS and reduce the risk of wildfires. However, it is important to note that the frequency of PSPS events is dependent on weather conditions which continue to evolve year after year.
6	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)	Decrease	See above.
3	Scope of PSPS events in circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization (total)	Decrease	The objective of reducing number of customers impacted by PSPS inherently includes a need to reduce the scope of PSPS events.
4	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)	Decrease	See above.

Rank order 1 – 9	PSPS characteristic	Significantly increase; increase; no change; decrease; significantly decrease	Comments
7	Duration of PSPS events in customer hours (total)	Decrease	As the scope of PSPS events decreases over time, durations of PSPS should also be reduced. However, this is another characteristic that is heavily dependent on weather. PSPS patrols initiation are dependent on weather conditions and if climate change affects the duration of RFW events or strong wind events, this would limit our ability to reduce the duration.
8	Duration of PSPS events in customer hours (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	See above.
9	Other		

8.2 Protocols on Public Safety Power Shutoff

Instructions: *Describe protocols on Public Safety Power Shut-off (PSPS or de-energization), highlighting changes since the previous WMP report:*

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.*

Understanding the difficulties endured during de-energizations, SDG&E has developed and implemented numerous programs and initiatives to minimize adverse impacts to those experiencing PSPS events. In 2020, SDG&E formed a cross-functional team consisting of members from various customer service-oriented departments. This team's focus was to identify pain points felt by customers and create initiatives to mitigate those difficulties during PSPS events. Through data collection and community feedback, SDG&E introduced multiple new programs, improved communications, enhanced partnerships, and improved utility processes.

Some of the new improvements SDG&E has introduced in 2020 include: installing changeable and moveable road signs that display PSPS-related messages in highly traveled HFTD intersections which, provide information to otherwise hard-to-reach customers or non-SDG&E account holders; deploying enhanced AM radio spots regarding PSPS; offering pre-produced informational "how-to" videos which, provide viewers crucial information to prepare for and navigate a PSPS event; and launching a PSPS mobile phone application allowing users to customize up to five locations to receive alerts and updates related to a PSPS event. In 2021, SDG&E has plans to enable geo-targeted alerts for users that are within the boundaries of a PSPS event.

To help mitigate the impacts of PSPS to customers, SDG&E opens Community Resource Centers (CRCs) near affected areas. After the devasting wildfires in San Diego County in 2007, SDG&E held a number of meetings in impacted communities throughout its service territory. As a result of the community feedback, SDG&E established a network of CRCs to help communities in real-time during extreme weather events, including PSPS events. Specifically, SDG&E employees volunteer to staff the CRCs to provide situational awareness, including updates and real-time information directly to the impacted community. SDG&E also provides the following resources at each CRC: bottled water, light snacks, Wi-Fi access, medical device charging, ice, outage updates, water truck for animals, portable restrooms, cold weather blankets, and hand warmers. In 2020, SDG&E also provided care kits containing: face mask, an emergency radio (crank/solar/battery operated), 150W car power inverter, an insulated bag (for perishables like food and medications), a solar powered energy bank, a solar powered LED light bulb, a cooling pad, an emergency first-aid kit, an SDG&E blanket, an SDG&E 5-gallon bucket, a small roll of duct tape, and a sharpie pen.

In 2020, SDG&E had agreements with facility owners to establish 10 Community Resources Centers located at a fixed facility. Generally, the CRCs are open from 8 a.m. to 10 p.m. when activated to support PSPS events. In response to the COVID-19 pandemic, SDG&E made adjustments to its CRC program to deploy health and safety precautions consistent with prevailing guidelines. For the 2020 wildfire season, SDG&E operated its CRCs as drive-thrus. No entry to the CRC building was allowed except for building owners and SDG&E employees. All personnel (employees, volunteers, CRC partners) were instructed to use proper personal protective equipment (PPE) such as face coverings and gloves, and were subject to routine temperature checks. Resources and care kits were pre-assembled and handed to vehicles visiting the CRC in a drive-thru fashion. The following is a list of SDG&E's 2020 CRCs. For 2021, SDG&E is in discussions and early stages of planning for two new sites to support communities located in the Northern portion of its service territory (e.g., Southern Orange County and the Community of Fallbrook). In 2020, SDG&E supported these communities via mobile tactical command trailers, as needed.

Table 8-2: SDG&E Community Resource Centers

Community Resource Center	Area Served	Facility Name	Location	Site Description
Descanso Community Resource Center	Descanso	Descanso County Library	9545 River Drive Descanso, 91916	Building + Trailer
Lake Morena Community Resource Center	Lake Morena	Lake Morena Community Church	29765 Oak Drive Campo, 91906	Building + Trailer
Pine Valley Community Resource Center	Pine Valley	Pine Valley Improvement Club	28890 Old Hwy 80 Pine Valley, 91962	Building + Trailer
Julian Community Resource Center	Julian	Whispering Winds Catholic Camp	17606 Harrison Park Road Julian, 92036	Building + Trailer
Jacumba Communit y Resource Center	Jacumba	Jacumba Highlands Community Center	44645 Old Highway 80 Jacumba, 91934	Building + Trailer
Dulzura Community Resource Center	Dulzura	Dulzura Community Development Center	1136 Community Building Road Dulzura, 91917	Building + Trailer

Community Resource Center	Area Served	Facility Name	Location	Site Description
Warner Springs Community Resource Center	Warner Springs	Warner Springs Community Resource Center	30950 Highway 79 Warner Springs, 92086	Building + Trailer
Potrero Community Resource Center	Potrero	Potrero Community Center	24550 Highway 94 Potrero, 91963	Building + Trailer
Valley Center Community Resource Center	Valley Center	Valley Center Branch Library	29200 Cole Grade Rd, Valley Center, CA 92082	Building + Trailer
Ramona Community Resource Center	Ramona	Ramona Branch Library	1275 Main Street, Ramona, CA 92065	Building + Trailer

In 2020, SDG&E introduced additional programs and services to minimize public safety risks during PSPS events. These services are described in greater detail in Section 8.4 below, and include: hotel stays; accessible transportation; food, ice, and blanket delivery; welfare checks; resiliency item delivery; and emergency generator delivery for medical emergencies.

2. *Outline of tactical and strategic decision-making protocol for initiating a PSPS/de-energization (e.g., decision tree).*

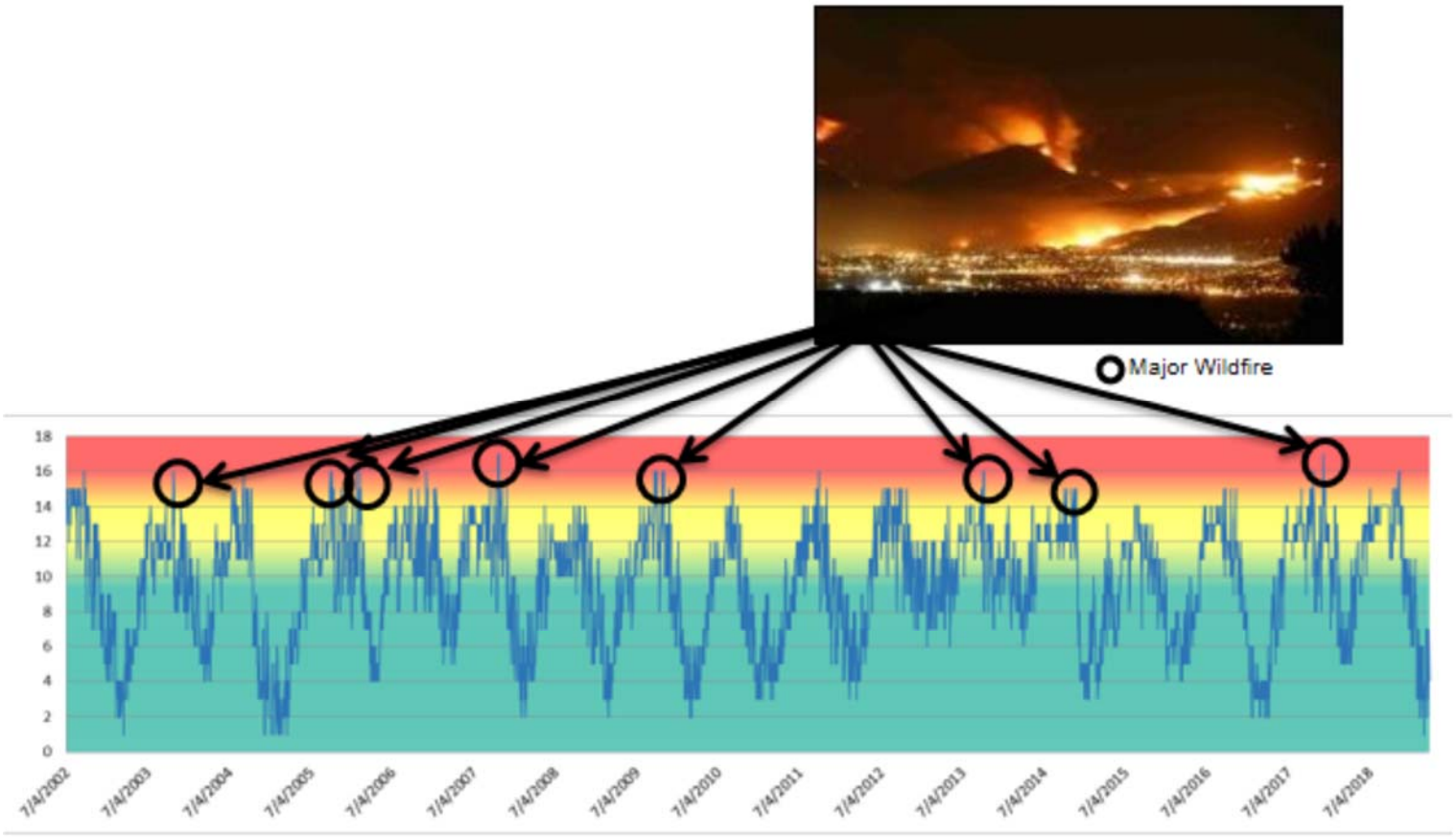
SDG&E considers a wide variety of inputs to determine whether to de-energize portions of its system. Due to the dynamic nature of wildfire conditions, it is not appropriate to use a prescriptive technique to determine when to use PSPS. Instead, SDG&E considers a variety of factors such as:

- Weather Condition – Fire Potential Index (FPI), Red Flag Warnings and the Santa Ana Wildfire Threat Index (SAWTI)
- Vegetation conditions and Vegetation Risk Index
- Field Observations and flying/falling debris
- Information from first responders
- Meteorology, including 10 years of history, 99th and 95th percentile winds
- Expected duration of conditions
- Location of any existing fires
- Wildfire activity in other parts of the state affecting resource availability
- Information on temporary construction

Currently, SDG&E does not have a specific PSPS algorithm that lists, quantifies, and calculates the weight of each factor that is incorporated into a PSPS. SDG&E, however, is exploring the development of a model that may be used in the future. Since SDG&E began utilizing PSPS to protect public safety, it has been transparent in how it approaches PSPS decision-making. The factors and weights that go into the determination of the fire environment severity is included in the FPI and SAWTI sections of SDG&E's 2020 WMP, as well as discussed in Sections 4.5.1.7 and 4.5.18 above. The following is a description of the factors listed above, and how SDG&E utilizes this information to inform decisions on PSPS. The specific examples provided below are for 2019 as the full analysis of 2020 PSPS events was not available by the date of this filing.

Weather Condition - Fire Potential Index: The FPI is created through three separate components. There is the green up which utilizes satellite data to determine the state of existing vegetation from very wet (lush) to very dry (cured). There is a fuels component that considers live fuel and dead fuel moisture across the service territory based on fire agency measurements and advanced analytics. And finally, there is a weather component that considers wind speeds and dewpoint depression, which is an indication of atmospheric dryness. The FPI is a forecasted value, based on measured data looking seven days in the future. However, even though it is a forecast, certain components like green-up and live fuel moisture do not materially change over a seven-day period, so that data very much grounds the FPI in reality. The specific wind speeds and dead fuel moisture are more volatile and can change significantly in seven days, which is why SDG&E prepares for PSPS using FPI, but does not implement PSPS on FPI alone, but on the real time conditions which will be described in greater detail below. SDG&E has found that FPI has proven to be historically accurate in predicting the potential for large fires. The figure below depicts the historical FPI from 2002 to 2019.

Figure 12: Historical FPI from 2002 to 2019



As shown in the figure above, there are peaks which depict Extreme FPI days and the circles indicate that major wildfires ignited during those conditions. Thus, catastrophic wildfires are closely correlated with Extreme FPI days. In addition, when studying SDG&E's reliability and ignition data from 2015 – 2019, SDG&E's ignition percentage for faults increases significantly with higher FPI. The following chart shows that extreme FPIs in the HFTD are more than 5 times more likely that a fault will result in an ignition and over twice as likely when compared to elevated conditions. Note that these are results that have been mitigated through the historical use of PSPS and would likely be even higher had SDG&E not executed PSPS during Extreme FPI from 2015 – 2019.

5-year Average from 2015 - 2019

	Ignition Rate			
Location	**Normal**	**Elevated**	**Extreme**	**ALL**
Non-HFTD	1.17%	2.91%	0.00%	1.46%
Tier 2	2.20%	5.07%	10.34%	3.37%
Tier 3	1.62%	4.31%	10.00%	2.74%
HFTD (Tier 2 + Tier 3)	1.92%	4.69%	10.20%	3.07%
System	1.42%	3.91%	6.10%	2.09%

Weather Condition – Red Flag Warnings: SDG&E also utilizes the National Weather Service's declaration of Red Flag Warnings (RFW). Red Flag Warnings use similar weather data as the FPI incorporating the forecast for low humidity and high winds to make the declaration. In 2019, SDG&E forecasted an extreme FPI on nine of 365 days; The National Weather Service issued a Red Flag Warning on eight of those days, demonstrating that the two are correlated.

Vegetation Conditions and Vegetation Risk Index: The Vegetation Risk Index (VRI) was developed internally using information from SDG&E's vegetation management database and SDG&E's reliability database. The VRI considers the species of trees, growth rates of trees, quantities and heights of trees, and vegetation-initiated outage and ignition history in proximity to electrical circuits. All of this data is measured with the exception of growth rate, which is calculated based on the measured growth and the time between the last trim and the current inspection. Vegetation risk is broken down into high, medium, and low. The role it has in general as far as PSPS criteria is concerned is that a circuit with a high VRI may inform a more conservative wind speed shutoff decision in an extremely high-risk event. For example, on an Extreme FPI day where a RFW was declared, if the real-time wind speeds were exceeding their 95th percentile winds for a given circuit segment on the associated weather station, subject matter experts confirmed that winds were increasing and forecast to persist at high levels, and the VRI was considered high, the decision could be made to de-energize, though there are additional factors that are taken into consideration, such as those listed later. Whereas, in the same situation described above, though the VRI had been low, the decision may have been to wait until the 99th percentile wind was exceeded. Again, the general logic here is that vegetation gets accustomed to experiencing a certain amount of wind, when that wind begins to exceed the levels its accustomed to experiencing (95th and 99th percentile winds for that area), the risk of a vegetation contact is increased. Thus, as wind speeds increase, the risk of vegetation contacts increases, that is why in an area with high vegetation risk already, it is prudent to be more conservative with wind speed.

Field Observations and Flying/Falling Debris: When SDG&E forecasts an Extreme FPI and a Red Flag Warning is declared, SDG&E activates its PSPS protocols and prepares for a PSPS should real time conditions meet or exceed the forecasted values. As part of the preparation, qualified electrical workers are sent to various locations across the territory based on where weather forecasts were expected to be the most extreme. These qualified electrical workers serve as

field observers and their responsibility is to report back in real time what they observe in real time. While SDG&E has weather stations in the areas that are measuring the actual wind, they are at a fixed location. The field observers can move around the area and regardless of measured wind, can see the risk in the environment. Some things they look out for are whether there are tree branches and unsecured customer items (tarps, umbrellas) blowing around in the area, or whether SDG&E's conductors are holding still, swaying, or galloping in the wind. Depending on the situation, a field observer may report on an hourly basis, or may be asked to report on a far more frequent basis. They always have the ability to radio in and declare a situation is unsafe based on their observations. Depending on their reports, SDG&E may make the decision to PSPS in a more conservative way or less conservative way depending on the field observer reports. These reports are not measurements, but they provide strong qualitative situational awareness that combines with other quantitative information sources for improved overall decision making.

Information from First Responders: During Extreme FPI days, in preparation of PSPS events, many of the first responder agencies including police and fire are active as part of the event. In many of these events, 2019 included, fires began in SDG&E's service territory that were not started by the utility and CAL FIRE may make a request to de-energize a line so they can more safely suppress a fire. Other information they may provide could be that wind speeds are too high to utilize helicopters to combat fires should one occur. This type of warning would lead SDG&E to make more conservative PSPS decisions in regard to actual local wind speeds, understanding that if a fire were to occur, some of the more impactful fire suppression resources would be unavailable, increasing the chance that a fire could become catastrophic.

Meteorology including 10-year History, 95th and 99th Percentile Winds: SDG&E's weather data plays a major role in PSPS decision making. SDG&E now has over 190 unique weather stations in various parts of the service territory that are tied to certain circuits or circuit segments. There are four components of the wind data that are used in this process. The first is 95th and 99th percentile wind gust, these are calculated values based on a statistical analysis of a10-year history of 10-minute wind reads for each of the 190 weather stations. The 99th percentile wind is simply the wind speed that represents the cutoff between the top 1% of wind speeds and the bottom 99th percent of wind speeds based on all data points. To further illustrate the amount of data SDG&E relies on, 10 years of data for one weather station equates to 525,600 total data points (e.g., Total data points = (10 years * 365 days/year * 24 hours/day * 60 minutes/hour)/ 10 minutes reads = 525,600 wind speed measurements for a particular weather station). SDG&E then sorts the data from highest wind speed recorded to lowest. The data point 5,256 down from the highest ever recorded wind speed would represent the 99th percentile wind or the highest 1% of all wind recorded within the 10-year period. This same concept is applied for the 95th percentile wind, except now SDG&E would go all the way down to sorted data point 26,280 representing the top 5% of all wind speeds recorded within the 10-year period. The logic behind using these speeds as thresholds is that even though for a given weather station, the 99th percentile wind may only be 40mph, which is within the design

criteria of most electric lines, the fact that the environment rarely sees that wind increases the chances of foreign object in line contacts, because the vegetation and other environmental factors are not used to seeing that relative level of wind speed, which increases the risk.

The next data point is the wind forecast for an event. Again, for this to even matter, it must coincide with an extreme FPI day. SDG&E have had many days with wind that was forecasted to exceed 99th percentile winds, but the FPI was normal due to high moisture levels. Under those conditions, PSPS protocols are not initiated. But if FPI is forecasted to be extreme, and weather stations are forecasted to exceed their 95th and/or 99th percentile levels, the PSPS protocols are initiated. The forecast by weather station of areas that will exceed these wind speeds creates a circuit watch list for the event, informs which customers and community partners must be notified, and informs the additional inspections of the circuit segments forecasted to be impacted to ensure they are in good condition before the event begins.

The final piece of wind data is the actual 10 minute (and in some cases 30 second reads) that are being recorded real-time during the event. SDG&E understands that while its weather forecasts are typically very good, when it is forecasting at very granular levels (an individual forecast for 190 weather stations) it is possible to have two kinds of error. The first and most common is that the wind speeds do not actually meet the forecasted values, or they never reach speeds that exceed their 99th and/or 95th percentile wind speeds. In most of these cases, the circuit segments associated with this wind speed would not be de-energized. Another type of error that can occur that is less common is that wind exceeds the forecast in a way where circuits not on the original forecasted watch list exceed their 99th and or 95th percentile winds, potentially leading to a shutoff. The takeaway here is that even though SDG&E prepares forecasts to be as prepared as possible for a PSPS event, it makes its ultimate decisions based off all the real time conditions described in bullet points above, including the real time recorded wind speed of its weather stations.

Expected Duration of Conditions: The length of the forecasted high-risk conditions also has a role on the PSPS decision making. This is a forecasted value based on meteorology measurements and models. If the event is forecasted to be a short duration, maybe exceed the 99th percentile winds for a short period of time, and there are no active fires, and wind speeds are not grounding CAL FIRE helicopters, a decision may be made to continue to monitor versus PSPS. However, the event is expected to last multiple days, there is little value in waiting it out because the risk exposure is prolonged. In these cases, SDG&E tends to make more conservative PSPS decisions in alignment with the 99th percentile winds.

Location of Existing Fires: Location of existing fires is communicated and tracked through SDG&E's relationships with CAL FIRE and other first responder agencies. Active fires can influence PSPS decisions in multiple ways. One way is it can pull resources from future fires, which causes SDG&E to take a more conservative approach to PSPS. Another impact active fires may have is the de-energization of circuits for safety that are in proximity of the fire so that first responders can safely suppress the active fire.

Wildfire Activity Across the State: This is another data point that is communicated through emergency response partners. The issue here is that fires in other parts of the state could impact response resources in San Diego if they are being diverted up north. If resources become limited in San Diego due to response efforts across the state, SDG&E responds by being more conservative with PSPS decisions.

Information on Temporary Construction: SDG&E continues to harden the highest risk areas of its electric system. This does involve replacing existing lines with new construction, which requires temporary configurations to keep customers energized while the new lines are being built and the old lines are being removed. Temporary construction can include lines being left in rollers in preparation for pulling new conductor, or temporary "shoe flies" that use temporary structures to reroute power around the construction area. SDG&E documents these areas of temporary construction and de-rates their wind speeds thresholds. Sometimes this de-rated wind speed threshold is higher than the 99th percentile wind and will not be a deciding factor in PSPS, and sometimes its lower and it will be a deciding factor, along with the other circumstances listed in the bulleted items above.

3. *Strategy to provide for safe and effective re-energization of any area that was de-energized due to PSPS protocol.*

High winds, low relative humidity, and other unfavorable weather conditions can increase the risk of wildfire in some of the communities that SDG&E serves. As explained in the preceding sections, SDG&E has spent more than a decade enhancing its wildfire safety program, which includes hardening its infrastructure, and building a fire science and meteorology department to better forecast and prepare for wildfires. Even with all of the investments to reduce the risk of wildfire, there may be times when SDG&E still has to shut off power to electrical circuits to protect public safety, which is a decision that SDG&E's does not take lightly. During windy conditions, flying debris can damage power lines and create sparks that could cause ignition. Depending on the severity of the weather and other factors, PSPS-related outages can last between a few hours to multiple days. Thus, restoring power to customers can be a long process.

During the course of the event, SDG&E has a dedicated PSPS prioritization team. The goal of this team is to evaluate the current operating conditions to establish priorities during the event to ensure proper order of operations and resource alignment. The prioritization team in conjunction with Meteorology team, the Emergency Operations Center and other operational units determines the orders-of-priority for inspection of circuits and re-energizing those circuits to restore power to SDG&E customers. The prioritization team considers many data elements during the development of the prioritization plan, such as the weather conditions, critical customers and facilities, field resource availability, impacts to SDG&E electric infrastructure, and the duration of outage. The prioritization team in partnership with the Resource Coordination team ensures appropriate resources are planned to support inspections, to make critical repairs and restore customers in a safe manner.

Re-energization takes place after the SDG&E weather network shows that wind speeds have decreased, and the forecast does not indicate that the wind speeds will re-accelerate above certain thresholds. SDG&E requires 4–8 hours of daylight for SDG&E field crews to inspect lines to determine whether there is any damage and deem it safe to restore power. When the crews are inspecting, they are looking for safety hazards such as debris, downed lines, broken hardware, tree branches caught on the line, or issues related to communication wires. If there is any damage to the power lines or poles, repairs must be made first before power can be restored.

It is difficult to predict the time needed to conduct an inspection, given the terrain and varied length of each power line, access to SDG&E facilities may hinder inspection by foot and whether aerial inspections are required. Some circuits are located in rural, mountainous areas that require a helicopter to inspect. In those cases, wind speeds need to be below 35 mph in order for the helicopter to fly safely. In other cases, patrol can be made by foot or vehicle. The amount and severity of damage found during inspections may also affect restoration times. Once a line has been inspected and all damage has been repaired, the lines are then safely re-energized.

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.*

As described above, SDG&E conducts extensive analysis of multiple indexes prior to any PSPS event. Complimenting these analyses is precise circuit-level weather forecasts. Notifications are then sent to customers on the circuits identified by Meteorology, via the Enterprise Notification System (ENS). SDG&E sends notifications to customers in the cadence mandated by the Commission.[35] These communications are sent via phone call, text and email to customers with whom SDG&E has contact information on file using SDG&E's ENS. The ENS system provides the PSPS information in eight languages (English, Spanish, Korean, Vietnamese, Mandarin, Cantonese, Tagalog and Russian). Prior to impacted customers being notified, public safety partners and critical facilities are provided advanced notification of a looming PSPS event, as prescribed by the Commission.

In addition, it is SDG&E's protocol to ensure all impacted Medical Baseline (MBL) customers are notified prior to PSPS interruptions of electrical service. This process includes Customer Care Center employees attempting to reach MBL customers for which SDG&E did not receive

[35] D.19-05-042 and D.20-05-051.

confirmation of receipt of ENS notification. If a live agent is unable to speak to and inform the MBL customer of the imminent PSPS, a subsequent service order is issued for an employee in Customer Service Field to notify the customer by visiting their address. If no contact can be made still, the SDG&E employee leaves an informational door hanger. New in 2020, all Customer Service Field employees conducting these in-person visits were required to watch all videos in the County of San Diego's First Responder Access and Functional Needs Training Series.

Notifying vulnerable customers of PSPS, or those with access and functional needs, is equally important to SDG&E. As previously described in preceding sections, SDG&E strategically partners with myriad CBOs year-round whom. These organizations help prepare customers – their constituents – for wildfires, especially those who may be vulnerable, through presentations, meetings and amplification of emergency preparedness information. Additionally, when a possible PSPS event is identified, SDG&E provides notifications and updates to these organizations who then serve as a critical channel to amplify that messaging and communicate it to customers who may not utilize traditional channels. Through this Partner Network, SDG&E is able to reach diverse, multicultural, multilingual, senior, special needs, disadvantaged and access and functional needs communities.

SDG&E realizes that not all customers can be reached in the moment with an automated, text, email or phone call. This could be due to customers choosing not to share contact information with SDG&E. Additionally, it is understood not all persons being impacted by PSPS are SDG&E account holders. For these reasons, SDG&E make great strides to find alternative and creative means to notify those impacted by PSPS beyond the required communications.

A result of SDG&E's customer service project team, created to turn stakeholder feedback into tangible PSPS solutions, were many alternate methods of notifying impacted communities. These methods include:

- Alerts by SDG&E – a mobile application allowing the user to customize five address for which they receive real-time notifications leading up to and through the de-energization event. The application also contained helpful links to resources, including 2-1-1 San Diego
- Expanded partnership with 2-1-1 San Diego and Orange County – collaborating with local 2-1-1 organizations to share SDG&E messaging ensure their call center employees had current information to share
- Changeable and moveable roadside signs – partnering with Caltrans to identify highly traveled HFTD intersections, SDG&E deployed roadside signage to inform communities of PSPS events and provide updates
- Tribal Nation casino and school marquees – leveraging existing marquees, SDG&E partnered with tribal nations and schools in the HFTD to display PSPS messaging before, during and after PSPS events

- Enhanced AM radio spots – increased information disseminated on AM radio frequencies to include 30-seconds plays and scripts provided to disc jockeys

Please refer to Attachment C for a complete list of Priority Essential Service providers.

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.*

SDG&E has well established relationships with many of the partners that operate critical facilities such as first responder facilities, health care facilities, operators of telecommunication infrastructure and water utilities/agencies. Throughout the year SDG&E has maintained on-going engagement with these critical customers by collaborating and partnering through Wildfire Preparedness meetings, with focus on continuous improvement and discussion of enhancements from all. This has been successful with external partners, which is primarily indicated through direct feedback.

Preplanning and education with our customers through webinars, meetings, EOC tours, and After Action Reviews have allowed both SDG&E and our communication partners to better understand PSPS protocols. These meetings have also provided an opportunity for our partners to express concern for their operations, which ultimately help with shared understanding. One of the most impactful improvements was the provision of historically impacted meter information, which helps inform future operations and areas requiring additional focus.

As a core component of its preparedness efforts, SDG&E annually updates its PSPS contact lists to ensure proper notifications for critical facilities and flag critical facilities. Additionally, SDG&E assesses backup generation capabilities of these facilities, to capture the facilities with backup generation and specific type, assuming the customer authorizes this data share. That said, this process is not easy as some critical facilities declined to provide any backup generation information without a properly executed Non-Disclosure Agreement to protect sensitive information.

8.3 Projected Changes to PSPS Impact

Instructions: *Describe organization-wide plan to reduce scale, scope and frequency of PSPS for each of the following time periods, highlighting changes since the prior WMP report and including key program targets used to track progress over time,*

1. *By June 1 of current year*
2. *By September 1 of current year*
3. *By next Annual WMP Update*

As mentioned in Section 7.3.5 above, SDG&E has a number of programs with either a sole or dual purpose of mitigating the customer impacts of PSPS. These include SDG&E's customer resiliency and microgrid programs, the PSPS sectionalizing enhancement program, and strategic undergrounding. Based on the goals and time frames of these programs, estimates that it SDG&E estimates an additional 3,000 to 5,000 customers could benefit from reduced PSPS impacts by the next Annual WMP update. 2022The actual reductions will depend largely on the scale and severity of events experienced in 2021. The estimated savings are further broken out by program below.

Figure 13: PSPS Reduced Impacts

Project	2020 Number of Locations	2020 Customer PSPS Impact Reduction	2021 Number of Locations	2021 Customer PSPS Impact Reduction
PSPS Sectionalizing	23	9202 – 12870*	10	3223 – 5145*
Standby Power Programs	75	32	300	300**
Resiliency Grant Programs	~	1300	~	1000
Microgrids	5	570	6	578
Undergrounding	7	276****	9***	1127***

*Weather events will dictate the actual number of customers reduced by the project
**Portable generators
*** Based on current scope of 26.7 miles. Any design change can affect the customer PSPS impact count.
****Based on customer accounts.

8.4 Engaging Vulnerable Communities

Instructions: *Report on the following:*

1. *Describe protocols for PSPS that are intended to mitigate the public safety impacts of PSPS on vulnerable, marginalized and/or at-risk communities. Describe how the utility is identifying these communities.*

SDG&E leverages a multi-pronged approach to identifying marginalized and at-risk communities and AFN customers including: 1) partnering with community organizations who represent AFN constituencies; 2) participating in working groups composed of AFN regional representatives to focus on PSPS support; and 3) utilizing its database and call center procedures to support customers who self-identify with AFN, to ensure it is serving marginalized and at-risk communities.

SDG&E has established several support services for AFN customers in an effort to mitigate adverse impacts to those experiencing PSPS events. In 2020, SDG&E launched its AFN Support Models with 2-1-1 San Diego and 2-1-1 Orange County acting as a resource for information, education and support services. These incremental partnerships have resulted in an expanded offering of services, programs and collateral for AFN and vulnerable populations including:

- Enhanced identification of AFN customers through partner lists and phone screening;
- Assessment of AFN population needs and aligning them with existing and new regional services
- Referral of customers to resources for assistance with services such as evacuation planning;
- Additional services including hotel stays, assisted transportation, food security and welfare checks;
- Navigation support (e.g., personalized case management and follow-up for impacted individuals with the greatest need);
- Outreach campaign to customers in advance of and during PSPS events through a broad range of communications channels; and
- Proactive community engagement outside of the fire season to ensure AFN individuals have the resources they need ahead of time.

In order to address potential limitations on support such as PSPS events occurring outside of normal business hours, SDG&E also contracted directly with Facilitating Access to Coordinated Transportation (FACT) to provide accessible transportation between the hours of 5:30 a.m. - 11:00 p.m. and Jewish Family Services (JFS) to provide shelf-stable food and ice, welfare checks, transportation, hotel stays and resiliency kits to AFN customers.

SDG&E coordinates efforts with inter-tribal agencies, such as Indian Health Councils within SDG&E's territory, and inter-tribal organizations set up to provide support to tribal communities during emergencies and inter-tribal resource centers. SDG&E also works directly with tribal governments to provide advanced education, resources and notifications to support PSPS events. SDG&E continues to identify and explore new support solutions for this population based on customer need, as well as to scale solutions based on the scope and duration of events. Some of the solutions SDG&E is evaluating include:

- Delivery of resiliency kits containing snacks, water, hand cranked radio-flashlight combo, ice, rechargeable battery powerbank (for small electronics such as cell phones), and a blanket to AFN customers on de-energized circuits
- Emergency generator delivery for medical emergencies
- Delivery of blankets to customers through Meals on Wheels
- Facilitation of food distribution sites in tribal communities through organizations such as Feeding San Diego and Indian Health Councils

Customer and community feedback will play a key role in informing additional support that may be needed by this population.

2. *List all languages which are "prevalent" in utility's territory. A language is prevalent if it is spoken by 1,000 or more persons in the utility's territory or if it is spoken by 5% or more of the population within a "public safety answering point" in the utility territory17 (D.20-03-004).*

To complement the public education channels across the service territory, SDG&E has developed access to in-language Public Safety Power Shutoff (PSPS) and Wildfire Safety preparedness and event information designed to reach disadvantaged communities and non-English proficient audiences within the territory. Though the PSPS public education campaign and the Wildfire Safety public education campaign are available in multiple languages, the language requirements applicable to each campaign are distinct. SDG&E provides the respective campaigns in the required languages set by regulation.

Required PSPS languages

SDG&E provide PSPS related communications in the following required languages for PSPS:

1. English
2. Spanish
3. Mandarin
4. Cantonese
5. Vietnamese
6. Korean
7. Tagalog
8. Russian

Required Wildfire Safety Languages

SDG&E wildfire safety related communications are accessible in the following prevalent languages identified for SDG&E's service territory, as defined by regulation:

1. Spanish
2. Mandarin
3. Tagalog
4. Vietnamese
5. Russian
6. Korean
7. Cantonese
8. Arabic
9. French
10. German
11. Armenian
12. Farsi
13. Japanese
14. Khmer
15. Thai
16. Hindi
17. Portuguese
18. Punjabi
19. Somali
20. Mixteco
21. Zapoteco

Based on the requirements above, SDG&E conducts its public education efforts in the corresponding languages to expand its reach into under-represented communities in the Company's service territory.

3. *List all languages for which public outreach material is available, in written or oral form.*

SDG&E's wildfire safety materials are accessible in 21 prevalent languages identified for SDG&E's service territory, as outlined above.

4. *Detail the community outreach efforts for PSPS and wildfire-related outreach. Include efforts to reach all languages prevalent in utility territory.*

Please see Section 7.3.9.2 above, which describes SDG&E's PSPS and wildfire-related outreach in detail.

8.5 PSPS-Specific Metrics

Instructions: *PSPS data reported quarterly. Placeholder tables below to be filled in based on quarterly data.*

Please see Attachment B, Table 11. The data provided in Table 11 is based on the most current information available at the time and is subject to modification resulting from additional analyses, internal outage audits and assessments, completed following submission of this 2021 WMP Update.

9 Appendix

9.1 Definitions of initiative activities by category[36]

Category	Initiative activity	Definition
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.

[36] This table of definitions of initiative activities by category was provided by the Wildfire Safety Division in their template.

Category	Initiative activity	Definition
	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.
	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

Category	Initiative activity	Definition
		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.
	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.

Category	Initiative activity	Definition
	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 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

Category	Initiative activity	Definition
		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 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

Category	Initiative activity	Definition
		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 equipment, beyond inspections mandated by rules and regulations	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 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.
	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;

Category	Initiative activity	Definition
		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 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	Inspections of right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method

Category	Initiative activity	Definition
	distribution electric lines and equipment	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 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

Category	Initiative activity	Definition
		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 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

Category	Initiative activity	Definition
		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.

Category	Initiative activity	Definition
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 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.

Category	Initiative activity	Definition
	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.
	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).

9.2 Citations for relevant statutes, Commission directives, proceedings, and orders

***Instructions**: Throughout the WMP, cite relevant state and federal statutes, Commission directives, orders, and proceedings. Place the title or tracking number of the statute in parentheses next to comment, or in the appropriate column if noted in a table. Provide in this section a brief description or summary of the relevant portion of the statute. Track citations as end-notes and order (1, 2, 3…) across sections (e.g., if section 1 has 4 citations, section 2 begins numbering at 5).*

Table 9- 1: Citations

Citation	Description/Summary	WMP Sections
Public Utilities Code § 8386	Law that, among other things, requires electric corporations to submit wildfire mitigation plans	Section 5.2
Public Resources Code § 4292	CAL FIRE requires 10 feet of minimum clearance around the base of the pole cleared of all flammable vegetation down to bare soil and the removal of all dead tree branches within this cylinder up to the cross-arm (within the State Responsibility Area)	Section 7.3.4 Section 7.3.4.2 Section 7.3.5.5 Section 7.3.5.20
Public Resources Code § 4293	CAL FIRE requires 10 feet of minimum clearance around the base of the pole cleared of all flammable vegetation down to bare soil and the removal of all dead tree branches within this cylinder up to the cross-arm (within the State Responsibility Area)	Section 5.4 Section 7.3.4 Section 7.3.4.2 Section 7.3.5.20
Resolution WSD-002	Guidance Resolution on 2020 Wildfire Mitigation Plans Pursuant to Public Utilities Code Section 8386.	Section 4.5.1 Section 4.6
Resolution WSD-005	Resolution Ratifying Action of the Wildfire Safety Division on San Diego Gas & Electric Company's 2020 Wildfire Mitigation Plan Pursuant to Public Utilities Code Section 8386.	Section 4.6
Resolution WSD-011	Resolution implementing the requirements of Public Utilities Code Sections 8389(d)(1), (2) and (4), related to catastrophic wildfire caused by electrical corporations subject to the Commission's regulatory authority	Section 1
Resolution M-4835	Orders emergency residential and non-residential customer protections for wildfire victims	Section 7.3.9.3
R.18-10-007	Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018)	Section 7.3.9.2

Citation	Description/Summary	WMP Sections
R.20-07-013	Order Instituting Rulemaking to Further Develop a Risk-based Decision-making Framework for Electric and Gas Utilities	Section 4.2
D.14-02-015	CPUC Decision Adopting Regulations to Reduce the Fire Hazards Associated with Overhead Electric Utility Facilities and Aerial Communication Facilities; Requires annual reportable ignitions report	Section 4.2.b.1 Section 4.2.c Section 4.4.2.1 Section 4.4.2.7
D.15-11-021	CPUC Decision on Test Year 2015 General Rate Case for Southern California Edison Company	Section 9.1
D.16-08-018	CPUC Interim Decision Adopting the Multi-Attribute Approach (or Utility Equivalent Features) and Directing Utilities to Take Steps Toward a More Uniform Risk Management Framework	Section 4.2.a.1 Section 4.2.c.1
D.18-12-014	CPUC Phase 2 Decision Adopting Safety Model Assessment Proceeding Settlement Agreement with Modifications	Section 4.2.a.1 Section 4.2.a.2
D.19-05-042	CPUC Decision Adopting De-Energization (Public Safety Power Shutoff) Guidelines (Phase 1 Guidelines)	Section 8.2
D.19-05-039	CPUC Decision on SDG&E's 2019 WMP Pursuant to Senate Bill 901	Section 7.3.9.3
D.19-07-015	CPUC Decision Adopting an Emergency Disaster Relief Program for Electric, Natural Gas, Water, and Sewer Utility Customers	Section 7.3.9.3
D.20-05-051	CPUC Decision Adopting Phase 2 Updated and Additional Guidelines for De-Energization of Electric Facilities to Mitigate Wildfire Risk	Section 8.2
D.20-03-004	CPUC Decision on Community Awareness and Public Outreach Before, During, and After a Wildfire, and Explaining Next Steps for Other Phase 2 Issues	Section 4.5.2
General Order 95	Overhead electric line design, construction, and maintenance requirements in order to ensure adequacy of service and safety; covers topics such as proper grounding, clearances, strength requirements, and tree trimming	Section 4.2.d Section 4.4.2.6 Section 5.4 Section 7.1 Section 7.3.3.3 Section 7.3.3.9 Section 7.3.3.16 Section 7.3.3.17.1 Section 7.3.3.17.3 Section 7.3.4.2 Section 7.3.4.5 Section 7.3.9.1 Section 9.1

Citation	Description/Summary	WMP Sections
General Order 128	Underground electric line design, construction, and maintenance requirements in order to ensure adequacy of service and safety; covers clearance and depths	Section 7.1 Section 7.3.4.2 Section 7.3.9.1 Section 9.1
General Order 131-D	CPUC Rules relating to the planning and construction of electric operation, transmission/power/distribution line facilities and substations located in California	Section 7.3.3.17.2
General Order 165	Inspection requirements for transmission and distribution facilities in order to ensure safety and high-quality electrical service; sets maximum allowable inspection cycle lengths, scheduling and performance of corrective action, record-keeping, and reporting	Section 5.3, Section 5.4 Section 7.1 Section 7.3.3.6 Section 7.3.4.1 Section 7.3.4.6 Section 7.3.4.9.1 Section 7.3.4.10 Section 9.1
General Order 174	Inspection requirements for substations to promote the safety of workers, the public, and enable adequacy of service	Section 5.3 Section 7.1 Section 7.3.4.14
NERC FAC-003-4	Federal reliability standard; establishes a minimum clearance that must be maintained at all times between trees and transmission line rights of way that include consideration for line sag and wind sway	Section 5.4 Section 7.3.4.8
WSD GIS Data Standards	Wildfire Safety Division Draft Geographic Information System Data Reporting Requirements and Schema for California Electrical Corporations (August 21, 2020); Sets forth requirements for WMP spatial data submissions	Section 4.1 Section 7.1 Section 7.3.7
WSD Evaluation of SDG&E RCP	Wildfire Safety Division Evaluation of San Diego Gas & Electric Company's Remedial Compliance Plan (December 30, 2020); Assessing SDG&E's 2020 WMP Class A Deficiencies	Section 4.6 Section 4.4.2.9 Section 7.3.b
WSD Quality Control Report on SDG&E GIS Data	Wildfire Safety Division Quality Control Report on GIS Data Submitted by San Diego Gas & Electric on September 9, 2020 (December 29, 2020); Assesses SDG&E spatial data submission	Section 4.6
WSD Evalutation of SDG&E Initial Quarterly Report	Wildfire Safety Division Evaluation of San Diego Gas & Electric Company's First Quarterly Report (January 8, 2021); Assessing SDG&E's 2020 WMP Class B Deficiencies	Section 4.6

Attachment A

SDG&E WMP Objectives: Long-Term Vision

SDG&E Wildfire Mitigation Plan Objectives: Long-Term Vision[37]

As a recognized leader in wildfire mitigation, SDG&E's vision for wildfire mitigation continues to focus on reducing the risk of wildfires as well as reducing the impacts of PSPS to customers. While SDG&E aspires to the goal of minimizing the need for PSPS over the next 10 years to the greatest extent practicable, California continues to experience increasing levels of risk as a result of climate change. As such, SDG&E will continue to modernize its system to mitigate the risk of wildfires and build a more resilient grid for the future. But PSPS may continue to be part of SDG&E's portfolio of mitigation options to be implemented as a measure of last resort to protect public safety.

To achieve its vision, SDG&E will focus on enhancing its data analytics capabilities across the organization to continue to support a more granular view of risk across its system. This will include better integration of data captured over the years from its weather stations and situational awareness tools in addition to new data from new technology applications. This enhanced data analytics capability will support a better understanding of risk across the system and allow for improved optimization of SDG&E's resources by allowing more refined targeting of mitigations, enhanced alternatives analysis as well as prioritization of its mitigations based on risk.

SDG&E continuously seeks input and guidance both internally and externally on the Company's vision and long-term roadmap for maturing its wildfire mitigation capabilities. As demonstrated in its 2020 WMP, SDG&E provided some high-level objectives for each of the ten categories of capabilities depicting its vision for enhancing its program in the 2020 WMP cycle and by 2030. To provide further detail, SDG&E undertook an extensive effort across the Company to build more refined objectives and annual timelines to portray its vision for maturing its wildfire mitigation capabilities over the next 10 years. While this effort lacks certainty due to the long timeframe and the rapid changes in technologies, evolving regulatory and legislative efforts, SDG&E views this as a guiding vision that it will continue to work towards and develop as time passes.

In the following sections, SDG&E sets forth its current view of how it plans to mature its capabilities in each of the ten categories outlined in its 2020 WMP with the emphasis that it will continue to update this vision and timeline to incorporate new technologies, methodologies and best practices identified in consequent years and as the dynamic world of wildfire mitigation continues to evolve. As such, the response to this deficiency is structured in accordance with each of the ten categories below.

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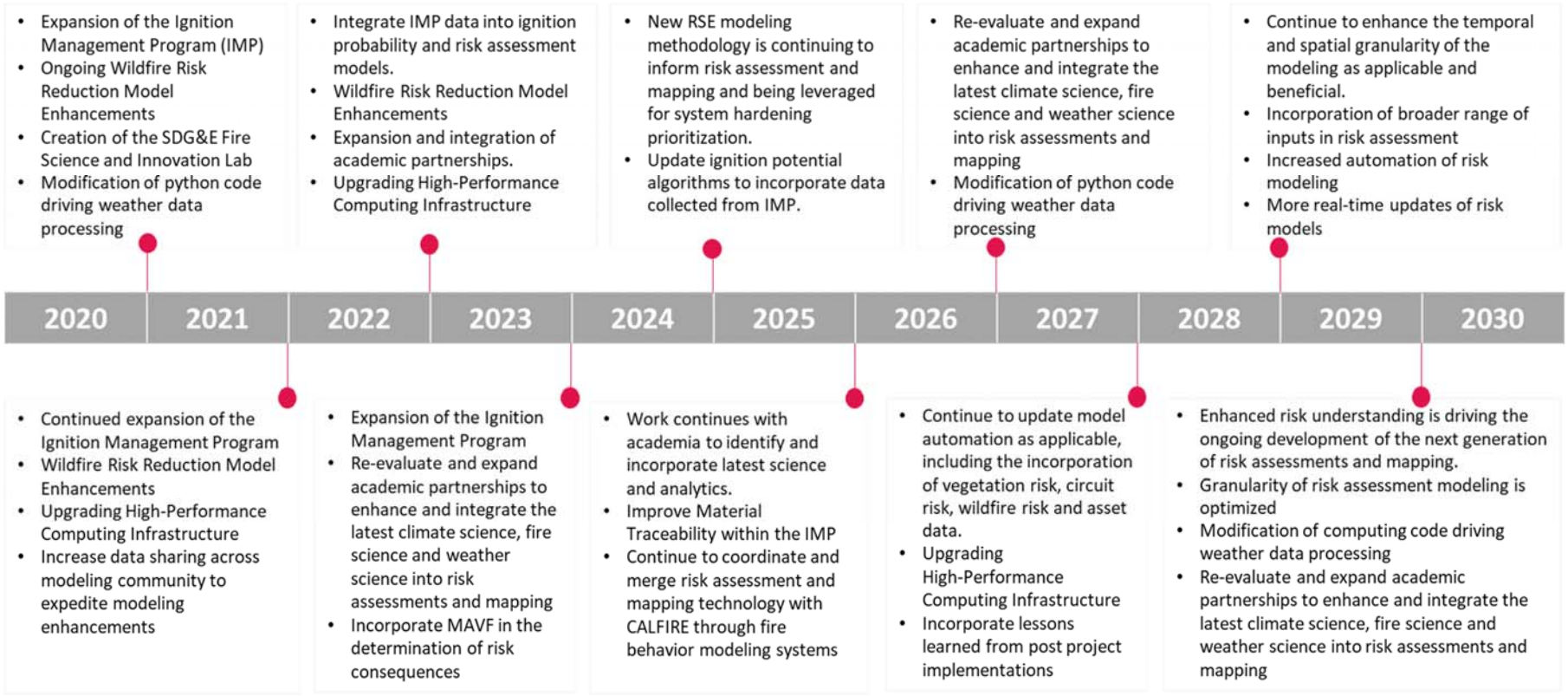
[37] This long-term vision is from SDG&E's Quarterly Report on 2020 WMP (September 9, 2020), with a few updates.

Risk Assessment & Mapping – State of Capabilities in 10 Years

Risk Assessment and Mapping capabilities are foundational elements of enhancing SDG&E's wildfire mitigation program. As the company continues to mature its risk assessment and modeling capabilities, its focus will include increasing granularity and accuracy in assessments to better manage the wildfire risk, as well as incorporating broader ranges of inputs in risk assessment. Pursuits in automation will enable more real-time updates to its risk maps which will facilitate scenario planning and focus mitigation efforts.

By 2030, SDG&E expects to expand its academic partnerships to enhance its risk assessment capabilities by integrating the latest intelligence related to climate, fire and weather into its models. SDG&E will increase automation and enable real-time learning capabilities to continue to enhance its algorithms. Additionally, while SDG&E has already established asset-level risk assessments for key assets, it plans to further enhance its granularity by 2030 to incorporate assets-level analyses and to better understand risk at granularities ranging from asset level to system-wide so as to enable a broader view of risk tailored to various applications. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Risk Assessment & Mapping – Annual Timeline



Risk Assessment & Mapping – List of Activities

1. The continued development of ongoing key initiatives that enhance our understanding of wildfire risk such as:
    a. Climate change risk analysis
    b. Enhanced weather modeling and forecasting capabilities
    c. Improvements to fuel moisture assessments and modeling
    d. Continued development of the Ignition Management Program
    e. Ongoing developments and enhancements to the fire behavior modeling capability and the resulting consequence modeling if fires occur
2. Ensure that the latest science-driven understanding of SDG&E's wildfire risk is integrated into the ongoing development of the next generation of RSE models.
3. Improve the wildfire risk assessments through leveraging the MAVF development and using historical data and expert input.
4. As applicable, continuously focus on the identification of new risk drivers, increased the granularity in risk assessments and increased the automation and updates of risk modeling as applicable and beneficial to decision making.
5. Enhance and integrate technology system to enable real time display of risk and "what-if" scenario planning

Risk Assessment & Mapping – 2020 WMP

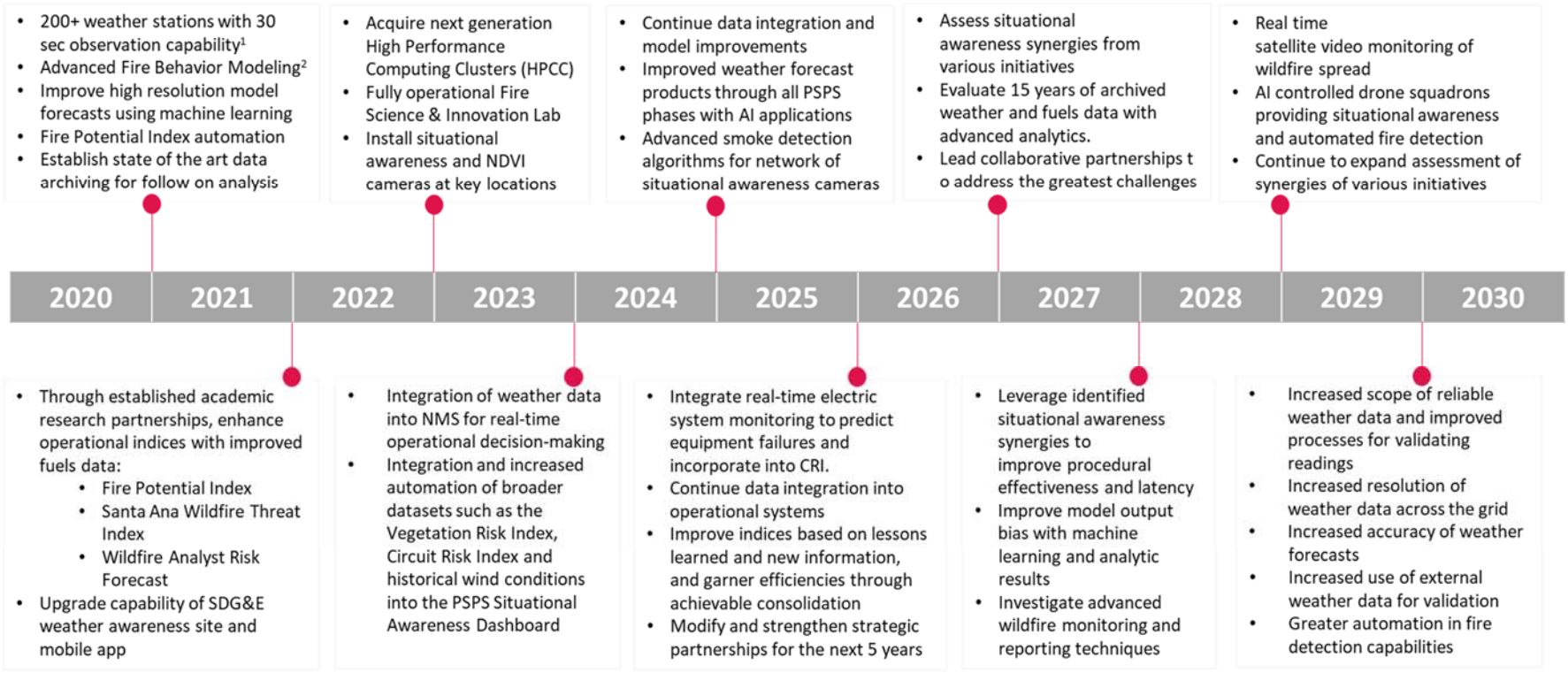
SDG&E's 2020 WMP is foundational to achieving the Company's 10-year plan for expanding upon SDG&E's robust risk assessment and mapping capabilities. SDG&E's capability to increase the accuracy and usefulness of risk mapping is dependent upon a very strong foundational understanding of the risk. SDG&E has in the past, and will continue in the future to integrate and analyze climate, fire and weather related data for incorporation of the best possible data into the risk assessment and mapping tools for ongoing decision support.

In addition to the integration of the latest science, SDG&E is already leveraging its enhanced understanding to develop the next generation of risk-based RSE model. These models will be continuously refined and improved moving forward. Particular focus will be given to increasing the granularity of the model, establishing new principal components for the modeling as applicable, and increasing the granularity and accuracy of the modeling and resultant mapping. The innovations and integration of science and data that is happening in the current WMP can and will be developed further in future WMPs.

Situational Awareness and Forecasting - State of Capabilities in 10 Years

As SDG&E continues to enhance its situational awareness capabilities, it will focus on increasing the scope of reliable weather data, improve its process for validating readings, increase the resolution of weather data across the grid with the overall objective of increasing accuracy of its forecasts. By 2030, SDG&E expects to advance its fire behavior modeling capabilities, automate its Fire Potential Index and invest in additional technologies such as NDVI cameras, enhanced smoke detection capabilities in cameras and enable real-time satellite monitoring of wildfire spread to aid with its mitigation and response measures in the future. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Situational Awareness and Forecasting – Annual Timeline



1 Weather network modernization and expansion
2 Integration of disparate dashboards of weather and camera data into Wildfire Analyst Software

Situational Awareness and Forecasting – List of Activities

1. Identify gaps in meteorological observation coverage and continue new station installations
2. Develop a scalable, cyclic plan of weather station maintenance and modernization
3. Incrementally enhance all data gathering capabilities to achieve increasing levels of granularity
4. Innovate across applications and lead California in wildfire forecasting, modeling, and mitigation
5. Build on existing data share and archiving initiatives and expand joint ventures with the research community
6. Leverage utility best practices in situational awareness innovations across California
7. Utilize artificial intelligence to optimize across categories of mitigations based on risk spend efficiencies
8. Continue to expand into space-based solution to enhance situational awareness and to improve indices
9. Improve desktop and mobile visualization to accommodate cutting edge data analytics and management
10. Exploit rapidly changing, wide-spread drone surveillance, imaging, and weather observation capabilities

Situational Awareness and Forecasting – 2020 WMP

The Situational Awareness and Forecasting capability at SDG&E is class leading and robust, representing a solid technological and data rich foundation in which to build the next generation of advanced prediction and analytics. With a weather network exceeding 200 stations in only 4,100 square miles and collecting over 28,000 observations per day, this data helps initialize six different high-resolution models operating on 3 supercomputers that generate nearly 200GB of daily data. This data is archived for accessibility and findability through a joint venture with the San Diego Super Computing Center and represents the first of its kind to advance wildfire science and research.

The data is foundational to fire potential and fire weather indices that are based on fuels and weather. Further automation of product generation coupled with an unending quest for increased resolution will continue to refine and innovate early warning tools of impending fire risk. In addition to increased data collection and improved post processing for product refinement, in-situ sensor observations from fixed multi-spectral cameras and airborne drone assets will be a data multiplier demanding greater management and analysis.

Grid Design and System Hardening – State of Capabilities in 10 Years

Over the next 10 years, SDG&E will continue to identify the highest risk areas to apply specific mitigation efforts, including mitigation strategies such as: strategic undergrounding; overhead

system hardening such as covered conductors, sectionalizing or circuit reconfigurations; enhanced vegetation management, and fuels management; and backup generators and microgrid solutions. These mitigation solutions will focus on improving public safety by reducing the risk of wildfire associated with utility infrastructure, all while reducing the PSPS impacts to customers.

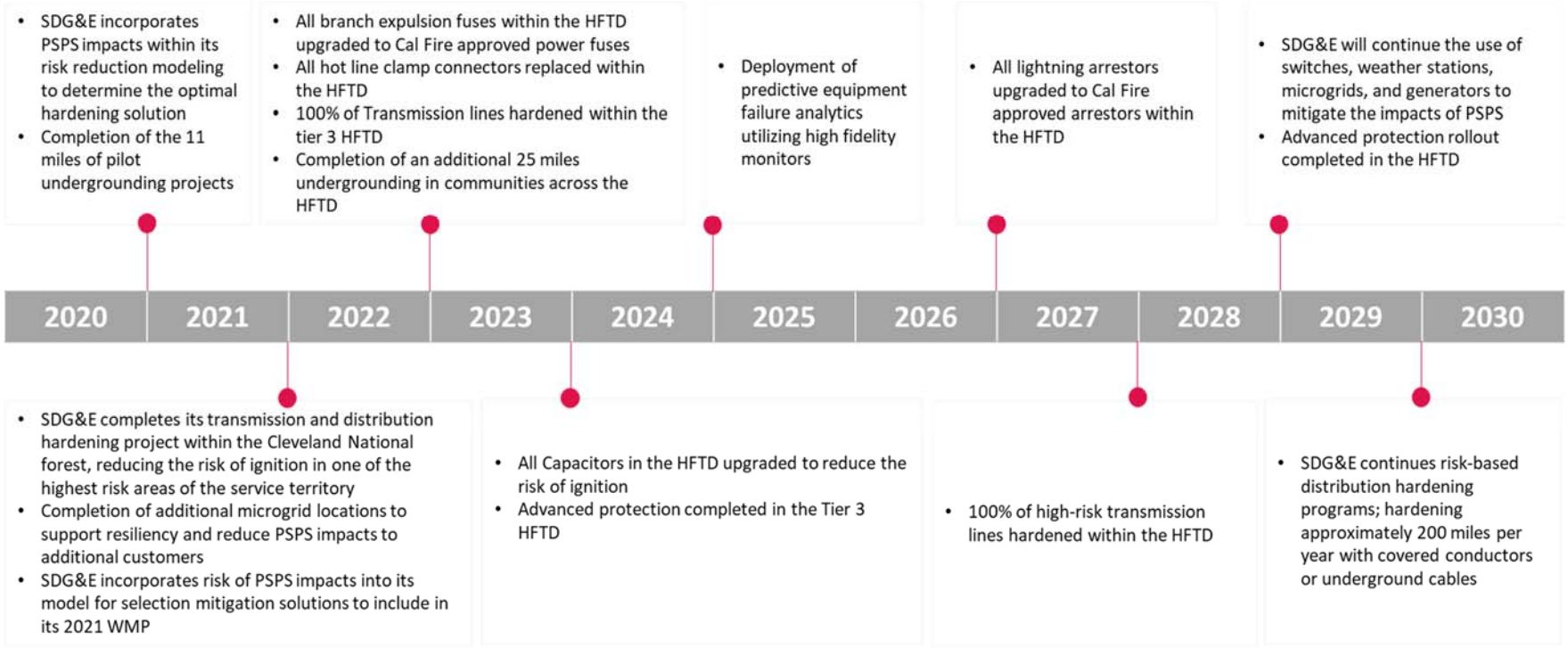
Within this 10-year period, SDG&E's specific equipment programs – that include capacitors, fuses, hot line clamps, and lightning arrestors – will be 100% converted to CAL FIRE approved equipment or other fire safe standard within the HFTD. During this 10-year period, SDG&E also plans to complete the hardening of its transmission system, starting with completing the Tier 3 by 2022, and then completing the Tier 2 by 2027. SDG&E still has over 2,800 miles of unhardened overhead distribution located within the HFTD.

SDG&E will utilize its improved risk modeling to prioritize its core mitigation strategies (strategic undergrounding, covered conductor, and traditional hardening) in a way that mitigates the greatest risk first. SDG&E's new risk model now includes the PSPS impacts to customers, which improves the value of mitigations like undergrounding and covered conductor that not only significantly reduce the risk of wildfire, but can also do so in higher risk operating conditions, allowing for more lines to stay energized during high risk operational periods. The new models are calling for a shift in hardening strategy, with less traditional hardening, and more covered conductor and undergrounding in SDG&E's 10-year hardening plan.

The enhancement to the model to incorporate the risks associated with PSPS impacts to customers means that additional mitigation strategies such as microgrids and backup generations can be fully evaluated against more traditional hardening methods to determine the most appropriate solution. In addition to its core hardening strategies, SDG&E will be building out its advanced protection capabilities and communication network across the Tier 3 HFTD, and eventually the Tier 2, providing additional risk reduction. SDG&E's hardening programs reduce the risk of a fault occurring in the first place, and if one does occur, SDG&E's advanced protection program reduces the chance that the fault actually leads to an ignition.

The 10-year plan also includes the deployment of new monitoring technology that looks at electrical property anomalies to try and predict system faults before they occur, providing yet another layer of fire hardening protection. As SDG&E completes these programs, SDG&E will continue to look at data on at least an annual basis to measure the effectiveness of its mitigations. In most cases, this is done by measuring the reliability performance of electric assets before the hardening was completed, divided by the number of years it was operated in this manner to create a rate, and then comparing that to the reliability performance rate after hardening was completed. SDG&E's risk models are then updated with the latest effectiveness measures based on actual data, to ensure SDG&E continues to prioritize the most efficient mitigations. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Grid Design and System Hardening– Annual Timeline



Grid Design and System Hardening– List of Activities

1. Enhance understanding of risk across system to better target efforts including strategic undergrounding, overhead system hardening, sectionalizing and implementation of microgrid solutions.
2. Convert all capacitors, fuses, hot line clamps and lightning arrestors to CAL FIRE approved equipment or other fire safe standards in the HFTD
3. Complete transmission hardening efforts
4. Build out advanced protection capabilities
5. Build resiliency in the grid by incorporating microgrids at strategic locations

Grid Design and System Hardening– 2020 WMP

SDG&E's three-year WMP includes significant milestones along the way to SDG&E's 10-year goal. Among the most significant milestones is the completion of the fire hardening programs within the Cleveland National Forest (CNF). This geographic location has some of the highest wildfire consequence risk within the entire service territory, and SDG&E has spent over 10 years in design, permitting, and construction to move this project forward. The project is scheduled for completion in 2021 and represents significant wildfire risk reduction. This includes the removal of a transmission line near Boulder Creek and Sill Hill, areas where there is an abundance of dry fuels, very poor access for suppression efforts, and that consistently experience the highest level winds in SDG&E's service territory. This project also has PSPS impact reduction benefits by hardening transmission lines into that Descanso Substation, that would occasionally see PSPS exposure due to the high winds near the unhardened CNF transmission lines.

In addition, in the three year period, SDG&E is launching the strategic undergrounding program and covered conductor program, which will become the preferred strategies based on SDG&E's new risk model and hardening approach that focuses both on wildfire risk reduction and mitigating PSPS impacts to customers. SDG&E's new model now tranches risk at the circuit segment level, which coincides with how SDG&E operates the system during high risk events. Now that SDG&E will be hardening whole circuit segments versus high risk assets, customers will see more tangible benefits of hardening in the form of reduced PSPS.

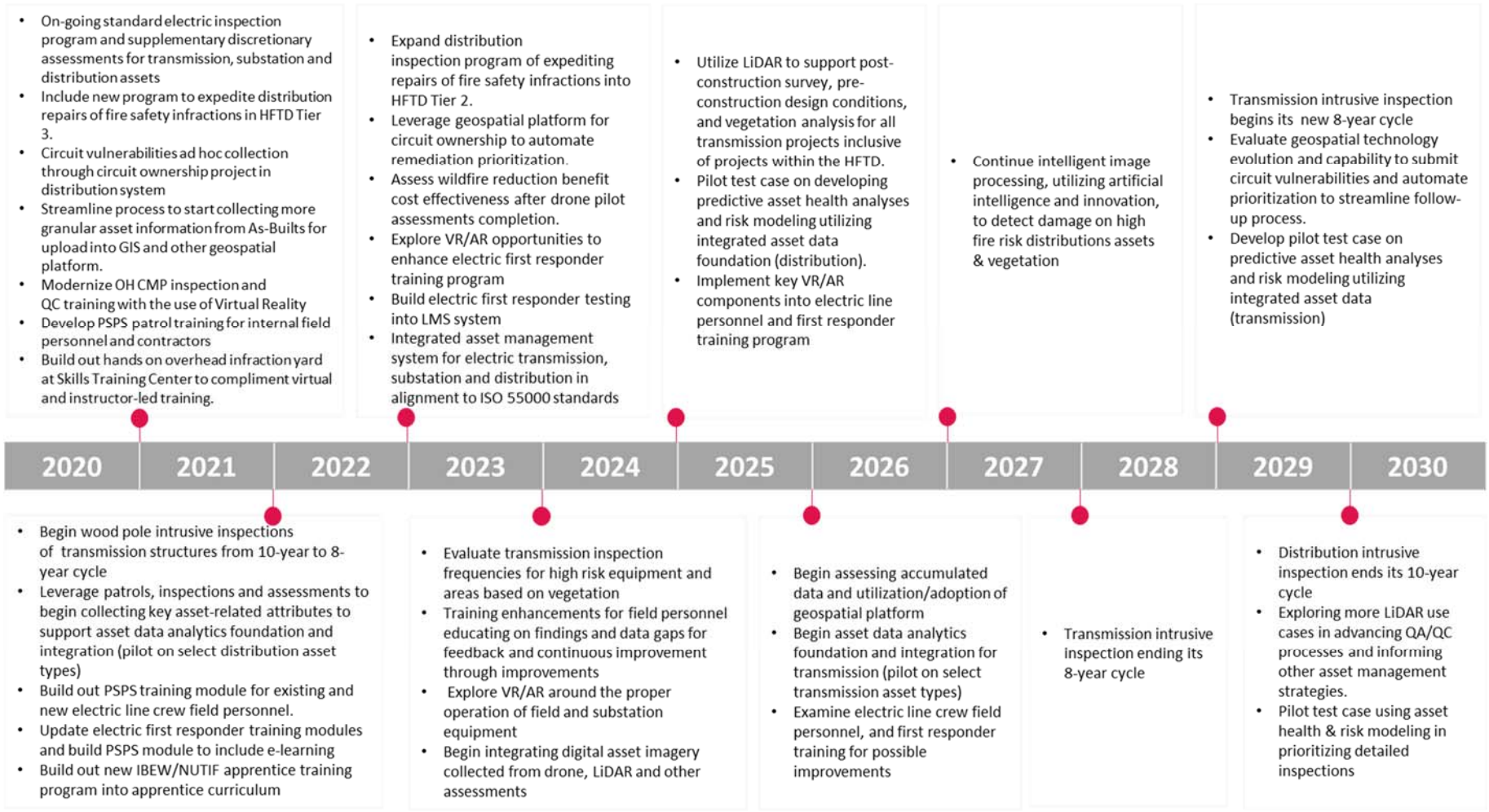
In addition, SDG&E is making significant progress on its high-risk equipment replacement program, including the forecasted completion of its branch fuse replacement programs within the HFTD in 2022. This three-year period will see the beginning of the capacitor and lighting arrestor replacement programs within the HFTD, as well continued progress on the hot line clamp replacement program, targeting risk reduction on the types of equipment that have led to ignitions in the past. Finally, this three-year period will expand the advanced protection working towards a goal of apply this protection to every circuit within the Tier 3 HFTD by 2026. As stated in its 2020 WMP, SDG&E planned to have FCP enabled on all HFTD Tier 3 circuits by 2023. Due to a number of factors such as the strategic reprioritization of FiRM circuit

deployments, specialized resource constraints such as Relay Technician, SCADA Technician and Distribution System Operator availability, and switch plan cancellations, SDG&E forecasts its HFTD Tier 3 FCP deployment to be complete by 2026.

Asset Management and Inspections – State of Capabilities in 10 Years

As SDG&E continues aligning its practices with ISO 55000, SDG&E's 10-year asset management vision focuses on enhancing data collection and analysis to better understand asset health, enable predictive modeling and improve its inspection programs based on quantitative risk assessments. By 2030, SDG&E expects to continue its inspection programs while continuing to further integrate and expand use of new technologies such as infrared, LIDAR, drones and intelligent image processing, along with lessons learned and procedural updates. In addition, SDG&E expects to have established asset management plans with predictive analytics for each of its asset classes and types to inform its asset management and risk mitigation strategies. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Asset Management and Inspections – Annual Timeline



Asset Management and Inspections – List of Activities

1. Continue existing standard electric inspection program, which includes existing non-discretionary routine patrols and inspections, to serve as both wildfire mitigation and control. These activities include:
    - Performing patrols and detailed inspections on transmission, substation and distribution systems, with heightened focus in completing Tier 3 areas before wildfire season.
    - Ongoing evaluation of inspection frequencies considering equipment type, location, historical inspections, highly vegetated areas, and eventually when asset health and risk analyses are available.
    - Intrusive inspections for transmission and distribution wood structures on a ten-year cycle, while reviewing opportunities to transition to eight-year cycle, further cycle changes or additional targeted asset inspections.
2. Continue existing supplementary discretionary assessments to further observe, collect more asset type related data and augment the standard electric inspection program. These activities include:
    - Pole loading assessments in transmission and distribution structures as additional follow-up verification and to support further development of asset health analysis and risk modeling.
    - QA/QC as additional proactive assessments to identify potential structural and mechanical problems and heightened focus in areas where maintenance would improve fire safety and reliability.
    - Enhance annual infrared (IR) assessments by increasing the number of distribution structures in heavily vegetated areas, which experience high number of faults and circuits with high previous findings, while continuing existing IR assessments on transmission structures.
3. Expansion of enhanced electric assessment program, which includes supplementary discretionary assessments with innovative use of new technologies, streamlined processes and/or new industry best practices. These activities include:
    - Refinement of circuit ownership project in distribution system to identify ad hoc circuit vulnerabilities and prioritize remediations by fire risk criticality based on HFTD areas, while leveraging geospatial platform for data collection and automated prioritization.
    - Evaluation of drone pilot assessment upon completion to determine appropriate cycle/frequency, verify quantity & quality of collected data and wildfire reduction benefit cost effectiveness.
    - Leveraging imagery data collection from drone assessments to support transmission and distribution fire hardening efforts.
    - Continue intelligent image processing, utilizing artificial intelligence and innovation, to detect damage on high fire risk distributions assets & vegetation

- LiDAR acquisition and inspections to continue support post-construction survey, pre-construction design conditions, and vegetation analysis for all transmission projects inclusive of projects within the HFTD.

4. Develop asset data foundation integrating key asset-related attributes to enable predictive asset health analyses and risk modeling and improve inspection/assessment strategies and prioritization.
    - Leverage patrols, inspections and assessments to collect asset-related data attributes
    - Evaluate and streamline process to start collecting more granular asset information from As-Builts for GIS geospatial platform upload.
5. Continue monitoring and auditing of standard electric inspection programs
6. Develop training enhancements for field employees
    - Implement IBEW/NUTIF apprentice program
    - Build out OH CMP inspection and QC Virtual Reality/Augmented Reality (VR/AR) training program
    - Build out OH QC infraction yard at Skills Training Center for hands on application
    - Modernize electric first responder training program to include e-learning, VR/AR
    - Build out all training in LMS to provide findings/follow-ups and for continuous improvement.
    - Integrate PSPS and ICS processes into all facets of electric line crew field personnel and first responder training

Asset Management and Inspections – 2020 WMP

SDG&E's 2020 WMP, including the key initiatives listed under Asset Management and Inspections section, continues to reinforce the safe management and reliable operations of electric assets. In alignment to the Company's 10-year plan, SDG&E intends to continue the existing standard electric inspection program, which includes existing non-discretionary routine patrols and inspections, to serve as both wildfire mitigation and control. SDG&E will also continually perform supplementary discretionary assessments to further observe, collect more asset type related data, and augment the standard electric inspection program. These supplementary assessments allow incremental validation of the asset condition or state flagged for follow-up during the standard electric inspection program.

SDG&E leverages technological advancements to further expand the current enhanced electric assessment program, which includes the supplementary discretionary assessments. SDG&E examines opportunities for innovative use of new technologies, streamlining processes or adopting new industry best practices to make asset management and inspections adaptable to ever-changing regulatory, compliance and wildfire mitigation direction. For feedback and continuous improvement, SDG&E intends to continually perform monitoring and audit of standard electric inspection program, and to utilize findings to develop training enhancements

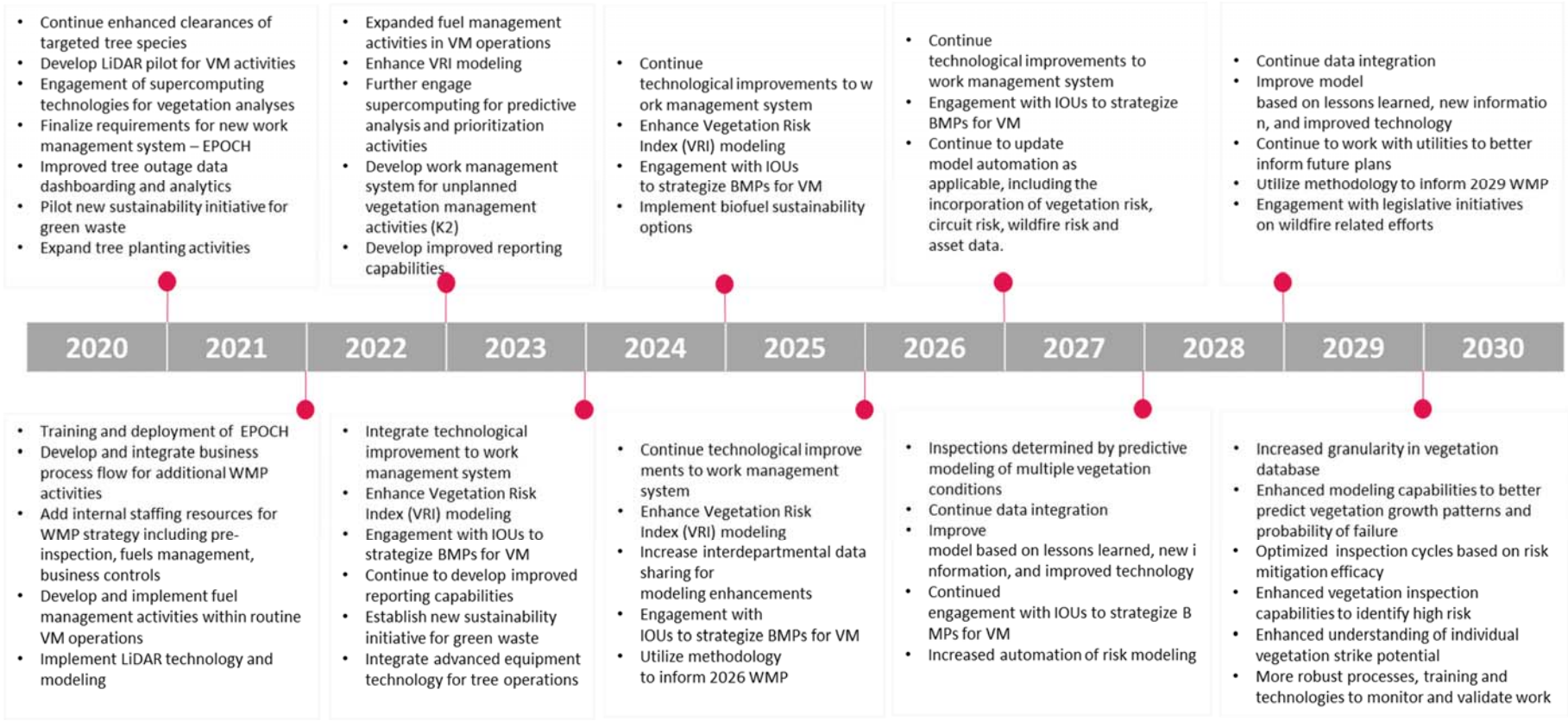
for field employees instrumental in performing these critical asset management and inspections. To reinforce data-driven performance evaluation, sustainable and integrated risk-informed asset management, SDG&E is pursuing to align to ISO 55000 standards through the implementation of the Asset Integrity Management (AIM) Program. As one of the several key workstreams of the AIM Program, asset data foundation project is in progress in integrating key asset-related attributes to enable predictive asset health analyses and risk modeling, and with the ultimate goal of providing data and insight to optimize inspection/assessment strategies and prioritization.

Skills Training Center has a robust plan to further enhance our Overhead QC inspection program in 2020 through the use of Virtual Reality and a physical build out of our Skills training yard with 15 poles and infractions in 2020. In 2021 further enhancement will take place to enhance our Electric Troubleshooter Curriculum to promote learning and retention, tools such e-learning and exploring the use 2.5D and VR/AR where applicable will be utilized. In addition, PSPS training is being developed and implemented to prepare our internal employees and contractors to support all operational facets of PSPS. Finally, in August 2020 an eight-week Climbing School and Advanced Secondary Apprentice class session was launched and for the first time, the Line school Instructors and Apprentices began using the newly structured curriculum obtained from the National Utility Industry Training Fund (NUITF) a product of the Electrical Training Alliance and the IBEW that was modified by SDG&E's internal instructional design team to ultimately develop a best in class lineman.

Vegetation Management Plan – State of Capabilities in 10 Years

SDG&E will continue to maintain its vegetation management program, while incorporating new and improved approaches. By 2030, SDG&E expects to further increase the granularity of its vegetation database, enhance modeling capabilities to better predict vegetation growth patterns and probability of failures, optimize its vegetation inspection cycles based on risk, enhance its vegetation inspection capabilities to better identify and target high risk areas, evolve its understanding of tree strike potential, and build more robust processes, training and technologies to monitor and validate work performed by its crews. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Vegetation Management Plan – Annual Timeline



Vegetation Management Plan – List of Activities

1. Engage contractors to facilitate local recruitment and training of qualified resources
2. Implement the Strategic workforce plan to increase internal resources for additional WMP activities
3. Engage IT for enhancements to the Work Management tools to support current and future WMP activities
4. Outreach and education with customers and agencies to achieve enhanced clearances and fuels reduction
5. Engage in legislation supporting language that aligns with the IOU's WMP initiatives
6. Pilot technological solutions that help validate inspection and audit results
7. Engage IT to build data integration capabilities to enable more real-time data updates and dashboards
8. Development of system sharing capabilities across company, agencies, IOU's and research communities with embedded security protocol
9. Engagement of IOU's on best practices in vegetation management operations
10. Design and implement data analyses to justify risk spend efficiencies
11. Expand VRI and supercomputing technologies for improved predictive modeling
12. Where possible, increase the granularity in risk assessments and increase the automation of risk modeling as applicable and beneficial to decision making

Vegetation Management Plan – 2020 WMP

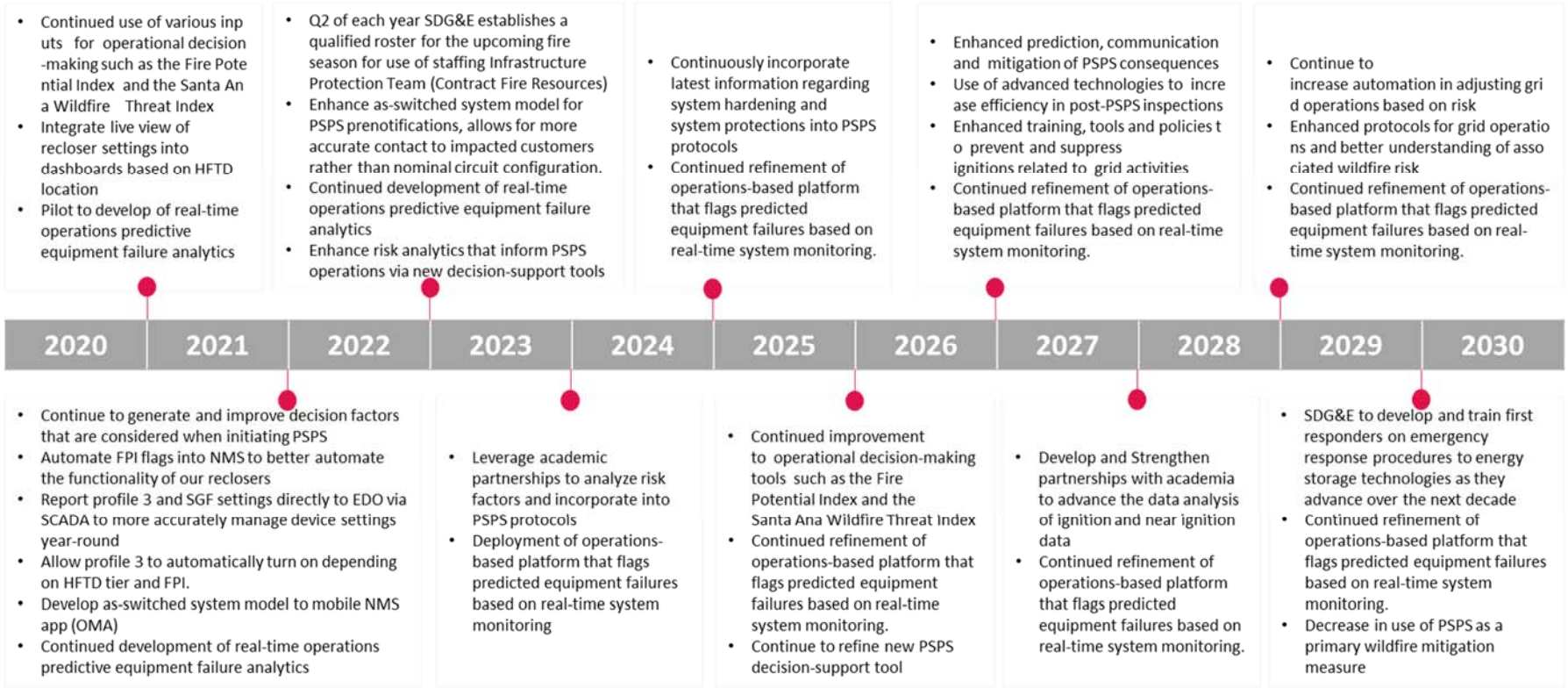
SDG&E has nearly completed the design and development of its new electronic work management system (EPOCH), which will greatly enhance performance and efficiency, including improved mapping functionality, asset (trees/poles) geolocating, and data management. SDG&E continues to refine its application of expanded trim clearances at the tree asset level applying site-specific considerations for risk reduction and tree health. SDG&E continues to expand its use of data to improve operational awareness and management options, including the initial engagement of external supercomputing analyses, and further refinement of its Vegetation Risk Index.

In 2020 SDG&E began an expansion of its use of LiDAR on transmission to a pilot initiative on its distribution system to determine the functional use of the technology and the potential for integration into its routine operations. SDG&E has begun the expansion of its workforce for WMP implementation with the addition of internal staffing to perform inspection activities and to support PSPS operations.

Grid Operations and Protocols – State of Capabilities in 10 Years

As SDG&E continues to mature its grid operations capabilities, it will focus on increasing automation in grid operations based on risk, enhance protocols to decrease the use of PSPS over time, enhance prediction, communication and mitigation of PSPS consequences as well as deploy advanced technologies to increase efficiency in post-PSPS restoration efforts. In addition, SDG&E will continue to enhance training, tools and policies to prevent and reduce the consequence of ignitions related to grid activities and will expand its public education campaigns to better inform AFN and LEP populations during emergencies. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Grid Operations and Protocols – Annual Timeline



Grid Operations and Protocols – List of Activities

1. Enhancements to Distribution Operating Procedures (DOPs) to adequately capture recloser automation practices through scripting and more strategic use of SCADA systems
2. Relay Settings Database enhancements to facilitate the automation of providing operations with recloser programming
3. Enhancements to outage management system to include HFTD polygons and Fire Potential Index for improved troubleshooting on emergency outages, automated reclosing and safety documents, and proactive cancellation of discretionary work (ESP 113.1)
4. Enhancements to outage management mobile application to include as-switched model and damage assessment functionality for PSPS
5. Utilize key partners and Community Based Organizations to amplify PSPS preparedness and notification messaging and reach hard-to-reach customers.
6. Expanded public education and communication tools before and during events
7. Develop and pilot new tool with advanced risk analytics to support PSPS decision-making with the goal of enhancing targeting of PSPS operations to minimize impacts to customers

Grid Operations and Protocols – 2020 WMP

Within the category of Grid Operations and Protocols, SDG&E's three-year WMP is aimed at accomplishing milestones to meet our ten-year goal of maximizing capabilities with respect to operations technology, risk-based decision making, accurate event forecasting, and policies around preventing and suppressing fire ignitions. These milestones include the following:

- Recloser Protocols will be significantly enhanced through the development of more efficient automated processes in lieu of the less efficient and maintenance-intensive manual processes which exist today. These enhancements include improved situational awareness dashboards to easily verify how reclosers are set from a systemwide viewpoint, real-time settings change management, and dynamic recloser sensitivity adjustment and will enable the operations teams to react faster to changing climate conditions.

- Protocols to reduce the impacts of PSPS will be improved through the enhancement of operations technology. The as-switched model of Network Management System (NMS)will be ported over to the PSPS dashboard for more refined customer pre-notifications. Currently, the PSPS dashboard more closely ties to the as-built condition of our electric transmission and distribution system with respect to infrastructure and customer meter counts. This means any abnormal configuration present on the system will not be directly reflected in customer meter counts on the PSPS dashboard, so it is currently up to our electric operations experts to reconcile these customer meter counts

to get notifications sent out correctly. Automating the as-switched model, which accounts for abnormal circuit conditions, into the PSPS dashboard will significantly expedite the customer notification process and make better use of internal resources to prep for extreme weather events. The as-switched model will also be rolled out to SDG&E's mobile NMS app to improve situational awareness for field personnel.

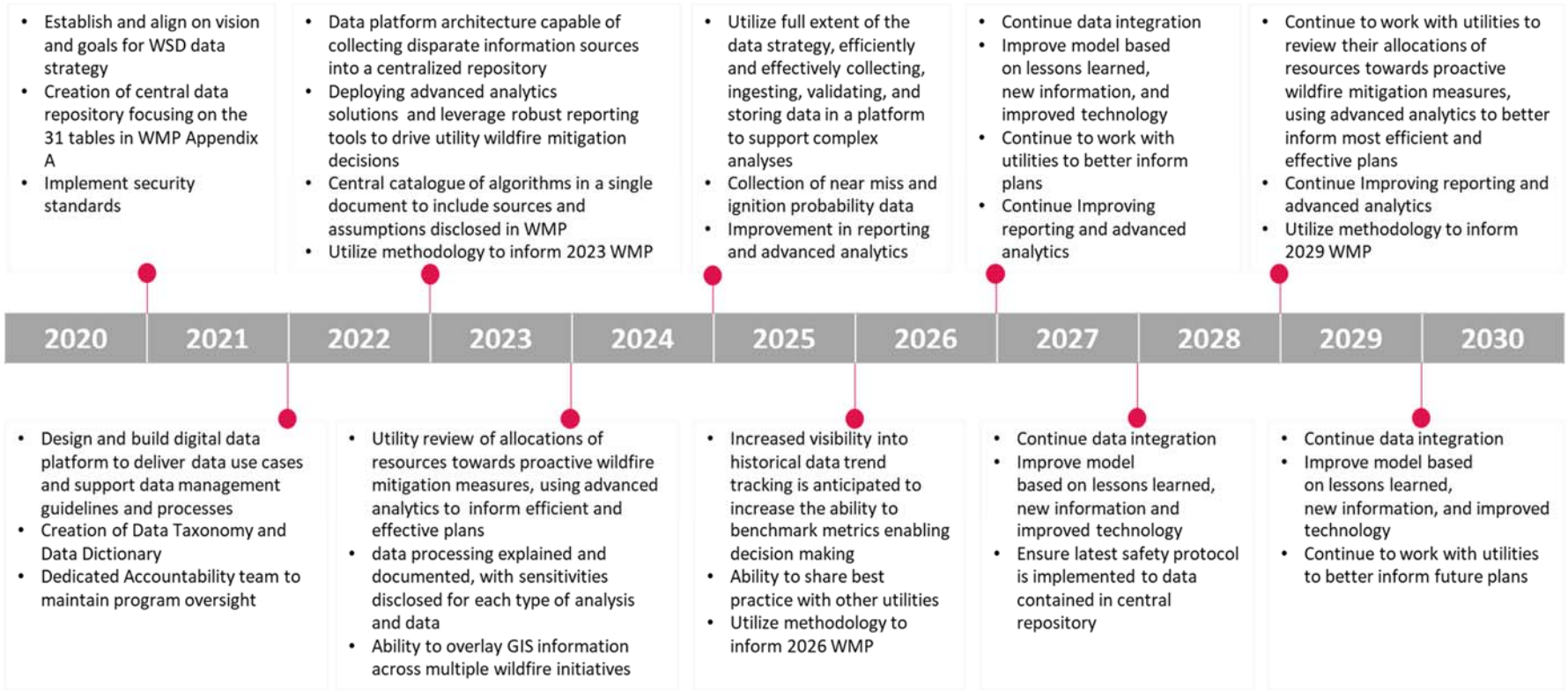
- Protocols for PSPS re-energization will be enhanced to reduce the restoration timeframes for customers once electric infrastructure is cleared for patrol. To expedite the operations center's capabilities for managing the re-energization process, SDG&E's enterprise NMS is being enhanced to include the pre-requisite checklists to verify patrols are complete, contracted fire resources are on-scene, and that the appropriate approvals have been given to allow for re-energization. Helicopter and ground patrols are also being reorganized to follow known routes to flexibly and safely patrol our lines as quickly as possible. SDG&E is increasing the availability of Unmanned Aerial Systems (UAS) to patrol lines that are both difficult to reach from the ground and difficult to see from helicopters while also focusing on long term investments in this technology to make it more efficient and safer to operate.
- The Aviation Firefighting program will enhance our stationed on-call ignition prevention and suppression resources and services. A key contributor to this enhancement will be the incorporation of a Sikorsky S-70M Firehawk into full operation to augment air resource capabilities.
- The Industrial Fire Brigade will complete its emergency pre-plans for critical electric substations, along with continuing research, development, and implement training for local fire departments on emergency response procedures for energy storage resources located within the HFTD.
- Coordination of contract fire resources will be enhanced for support during extreme weather events. These enhancements include formalizing the process of documenting qualified firefighter (QFF) requirements, continuing to strengthen the coordination with local, state, and federal fire agencies, and building up a yearly cadence in updating our available contract resources which can response during contractual periods and extreme weather events.
- SDG&E will continue to coordinate and form partnerships with local, state, and federal agencies to support the development of effective strategies and tactics to reduce the impacts of extreme weather events to our communities. This includes building on operations technology enhancements to provide advanced notification to critical customers and government agencies ahead of PSPS de-energizations, expanding public education on Medical Baseline enrollments, engaging customers on PSPS

communication and notification practices, and always conducting after-action event review to understand how we can improve in the future.

Data Governance – State of Capabilities in 10 Years

Over the next ten years, SDG&E plans to build out its data and analytics capabilities by establishing a data governance framework to guide all its wildfire-related analytics. By 2030, SDG&E expects to enhance its analytics capabilities by continuing to integrate various data points into its wildfire mitigation data warehouse, enable real-time reporting, establish advanced sharing capabilities, enhance tracking of near-misses and increase its role in utility-ignited wildfires research. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Data Governance – Annual Timeline



Data Governance – List of Activities

1. Creation of data strategy in alignment with WSD strategic data vision
2. Build central data repository to house all required metrics specific to SDG&E's WM efforts
3. Document Process and Procedures cataloging data sources and assumptions, to include analysis and algorithms across relative to WM Business Units 3
4. Creation Master Data Governance Plan that encompasses all BU Data activity once centralized in data repository
5. Pilot improvements to verify and validate model with third-party experts
6. Build data integration capabilities to enable more real-time data updates
7. System capable of sharing across tiered level of permissions with embedded security protocol
8. Establish ability to data share within the research community and other utilities to leverage best practices in situational and operational research in California and beyond
9. Utilize data to optimize across categories of mitigations to justify risk spend efficiencies

Data Governance – 2020 WMP

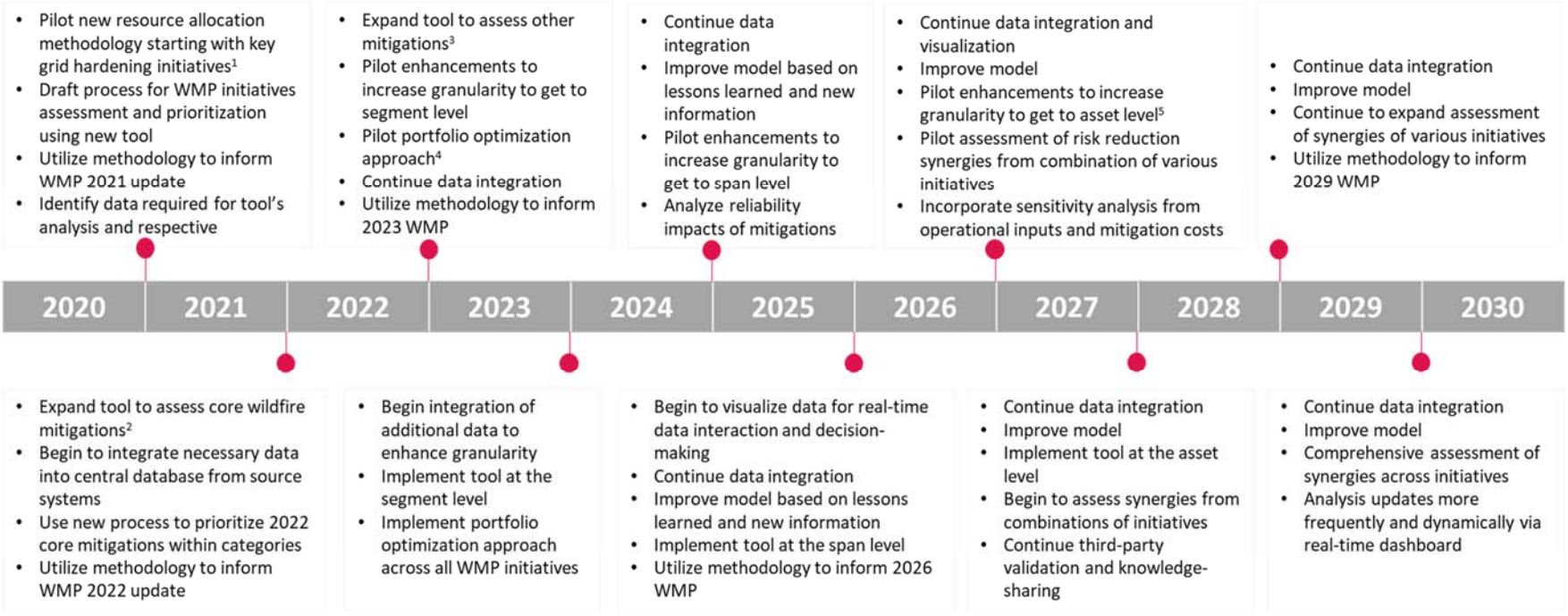
SDG&E's 2020 WMP includes the creation of a comprehensive data strategy and data governance plan to achieve the Company's 10-year goal to combine and cross reference data sources and align processes across business units with associated programs that support the wildfire mitigation effort. As described in the 2020WMP, development of an Enterprise Asset Management Platform (EAMP) will enable SDG&E to predict and assign asset health indexes (AHI) on its critical electric assets to identify and compare assets based on its likelihood for failure. Integrating this asset risk information with other inputs, such as circuit risk index for situational awareness, will inform the appropriate asset-related operational decision-making and strategy for enhanced reliability and safe operation of assets. SDG&E believes this will provide a means to optimize the risk, performance, and investments, while meeting or exceeding safety and regulatory objectives.

Resource Allocation Methodology – State of Capabilities in 10 Years

Over the next ten years, SDG&E will continue to enhance its approach to resource allocation for risk-based decision-making. As data becomes more available and integrated across systems, SDG&E plans to increase the granularity of its RSE calculations, moving from a system-level assessment to an asset-level assessment with flexibility to aggregate and disaggregate assets for various modeling applications. This visibility will enable real-time scenario and sensitivity analyses for mature risk-based decision-making. By 2030, SDG&E expects to enable real-time updates of RSEs as new projects and programs are implemented and enhance its ability to

conduct risk-based portfolio-wide optimizations across its various wildfire mitigation programs. Knowledge-sharing will continue to be a cornerstone of our approach as SDG&E validates and reviews advances with peer utilities and external parties. A year-by-year timeline of SDG&E's roadmap for maturing this category is provided below.

Resource Allocation Methodology – Annual Timeline



1 Key grid hardening initiatives include covered conductor, undergrounding and traditional hardening
2 Core wildfire mitigations include major programs such as grid hardening, asset management and vegetation management
3 Other mitigations include situational awareness tools, operating protocols and other activities that support core mitigations
4 Portfolio optimization approach refers to the ability to optimize spend across various programs such as hardening vs vegetation management, etc.
5 Increasing granularity to get to the asset level will begin earlier in the timeline but may not be fully implemented until a later stage as new asset information and analytics capabilities mature over time

Resource Allocation Methodology – List of Activities

1. Develop a model that includes an assessment of both wildfire risk as well as risks of mitigations such as PSPS
2. Update Multi-Attribute Value Function to fit evolving needs to assess additional risks such as quantifying impacts of PSPS
3. Pilot improvements to verify and validate model with third-party experts
4. Build data integration capabilities to enable more real-time updates
5. Utilize model to assess alternatives and inform selection of mitigations
6. Utilize model to prioritize mitigation implementation within categories such as prioritizing hardening work and vegetation management work
7. Analyze effect of portfolio mitigations on reliability
8. Utilize model to optimize across categories of mitigations based on risk spend efficiencies
9. Incorporate sensitivity analysis from operational inputs and mitigation costs
10. Continuously and incrementally enhance data gathering capabilities to achieve increasing levels of granularity in models (gradually move from system-level to circuit-level, span-level and ultimately to asset-level assessments)
11. Establish a formalized process for evaluating wildfire mitigation initiatives and informing priorities on an annual or more frequent basis

Resource Allocation Methodology – 2020 WMP

SDG&E's 2020 WMP includes initiatives critical to achieving the Company's 10-year plan for building a robust resource allocation methodology. As described in the filing, SDG&E's Asset Management team has been working on developing a resource allocation tool. In addition to that, SDG&E's wildfire mitigation department has built on the efforts of the asset management organization to develop a tool specific to the wildfire mitigation program to align with the maturity model laid out by the Wildfire Safety Division. In addition to the specific initiatives discussed in the Resource Allocation methodology category, other initiatives such as the centralization of data, the improvement of asset analytics, situational awareness tools as well as PSPS mitigation engineering are all supporting the improvement of SDG&E's resource allocation methodologies as they provide critical data points and key considerations to incorporate in the decision-making framework.

Emergency Planning and Preparedness – State of Capabilities in 10 Years

Emergency Planning and Preparedness is an area that involves an extensive amount of coordination, both internally and externally. SDG&E's mission is to safeguard the public protecting lives, property and assets, while encouraging proper use of our resources. The Company plans on focusing and engaging the best industry practices to successfully fulfill our mission.

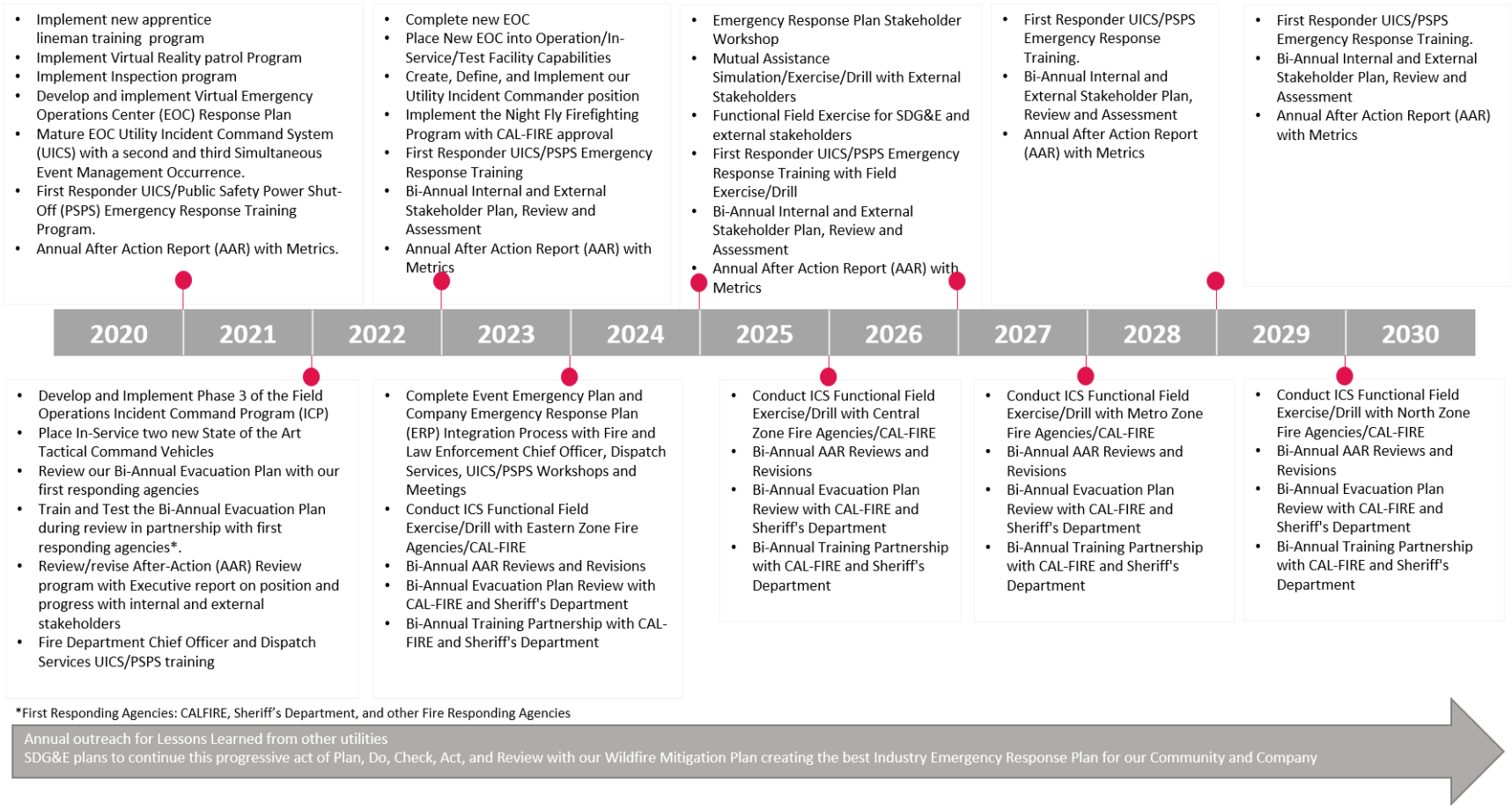
SDG&E continues to build a coordinated National Incident Management System (NIMS) Incident Command System (ICS) framework, accessing resources and knowledge across our region in our planning and response efforts. This framework focuses on SDG&E's engagement with stockholders, as well as building a knowledge-structure foundation with our customers, utility companies, CAL FIRE, and other local, state, and federal resources. Through these efforts, SDG&E will gather experiences shared by both community and regulatory partners to ensure improvements to our Wildfire Emergency Response Plan are implemented.

SDG&E' seeks to increase stakeholder engagement. SDG&E plans to use simulations to stress-test its Wildfire Emergency Response Plan, while increasing granularity and customization from lessons-learned. SDG&E will continue to focus on enhancing customer communication with focus on reaching its vulnerable populations before and during emergencies, to ensure family safety, preservation of homes and businesses, by sharing knowledge and preparation to potential hazards leading to wildfires.

SDG&E seeks to build and strengthen our partnership with outreach programs with local and regional governments. If local communities are well educated and knowledgeable of the hazards and risks of wildfires, it will increase public confidence. This process will include developing procedures and processes which engage the community with SDG&E, while benchmarking new and evolving industry practices with our customers and fellow community leaders.

SDG&E has created an annual timeline representing goals in a roadmap to our progressive goals for Emergency Preparedness and Response wildfire concerns, which includes engaging our stakeholders and employees towards mutual capabilities. This Wildfire Emergency Response Plan is designed to mitigate the territory in order to limit the occurrence of wildfires, and if they occur, our plan to protect lives and lessen any property/asset loss, then increase response times in restoring power to customers. It will also provide knowledge to other utility companies in effectively and successfully planning for wildfires, recognizing planning, preparedness, incident control measures, preservation methods, and recovery efforts.

Emergency Planning and Preparedness – Annual Timeline



Emergency Planning and Preparedness – List of Activities

1. SDG&E's mission is to provide continued collaboration with government and community-based partners to evolve our opportunities for year-after-year improvements to our customers and community in education, outreach and coordination
2. SDG&E will build-out and engage in Resource Coordination through methods of benchmarking, changing and advancing processes and current and new technology which can be implemented to ensure proper and effective use of mitigation and response resources and assets.
3. SDG&E will continue expanding public education to all customers, especially to those identified as AFN and limited English proficiency (LEP) populations. SDG&E's goal is to reach everyone within our region.
4. SDG&E plans to ensure continued staff development and succession planning to be industry leaders in wildfire mitigation planning, preparedness, response, and recovery.

Emergency Planning and Preparedness – 2020 WMP

At the core of SDG&E's 2020 WMP for emergency planning and preparedness is collaboration with key internal and external stakeholders, as well as lessons learned from past incidents, trainings and exercises. Collaboration with external stakeholders is essential, as County and other local government agencies and Community Based Organizations are primarily responsible for emergency planning across the region. While SDG&E has strong existing relationships with many of these agencies, continuing to improve education, outreach and coordination today, can result in expanded information and resource sharing in the future.

SDG&E plans to use the information gathered to aid in review and revisions of its current WMP. SDG&E will engage with other industries, community, and volunteer agencies, to train together, learn from each other, and adapt to these experiences.

Stakeholder Cooperation and Community Engagement – State of Capabilities in 10 Years

As described above in Emergency Planning and Preparedness, stakeholder cooperation and community engagement are at the core of SDG&E's WMP. For more than a decade, SDG&E has continuously invested in building partnerships with community organizations, in order to strengthen overall community preparedness, response and resiliency.

SDG&E has actively solicited feedback from our customers, local public agencies and other stakeholders through town hall community meetings, open houses, community fairs and one-on-one- meetings to refine and improve its wildfire and PSPS operational protocols, public outreach, communications and coordination. Those efforts will continue over the next ten years. SDG&E has significant existing collaborative partnerships with its local governments,

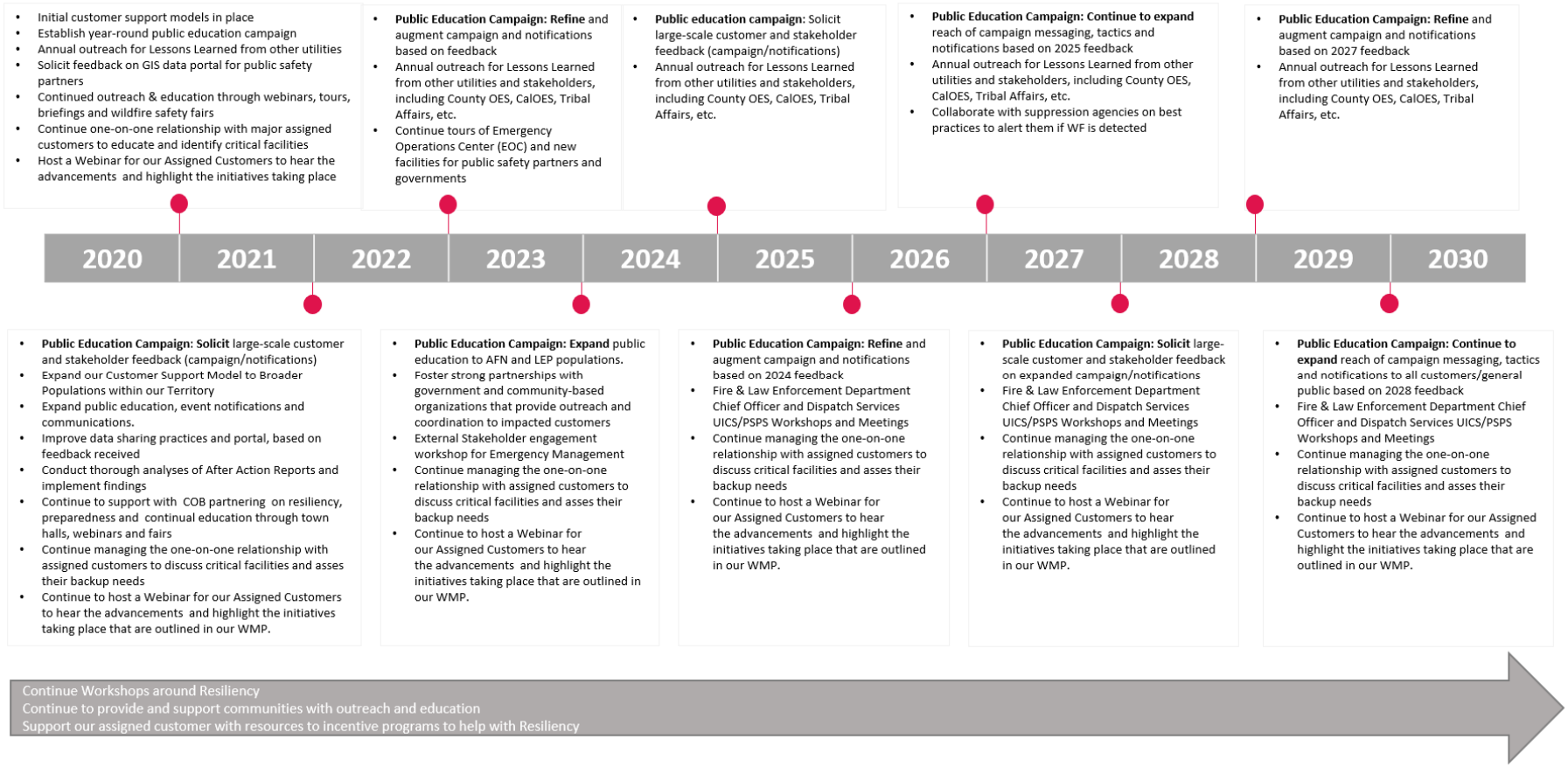
regional partners and Community Based Organizations, which it will continue to build upon over the next decade to further strengthen resilience and preparedness in our region.

As SDG&E looks out to its ten-year vision on stakeholder cooperation and community engagement, its primary goal will be to reach 95-100% of the territory population with a focus on AFN and LEP customers. It is essential that there is breadth and depth of communications and outreach, and that SDG&E has a diverse set of measures that reach audiences in a meaningful way. Equally important is being purposeful in soliciting continuous feedback to refine, adapt and enhance the measures being utilized, especially with more vulnerable AFN and LEP customers.

Additionally, SDG&E's efforts will focus on formalizing processes to learn from peers in and outside of California, and will continue to expand community relationships and enhance partnerships. This process will broaden our engagement and planning efforts with emergency and non-emergency planning agencies as well as manage and direct comprehensive communication campaigns to our communities. Using support from community-based organizations and their emergency management and preparedness efforts, SDG&E will advance wildfire mitigation over the next few years.

SDG&E's roadmap has identified steps over the next ten years to be implemented for stakeholder cooperation and furthering community engagement with customers and first responders.

Stakeholder Cooperation and Community Engagement – Annual Timeline



Stakeholder Cooperation and Community Engagement – List of Activities

1. Building off previous town hall events, in 2020 SDG&E held four Wildfire & Resiliency Webinar Events. During these live, interactive events, SDG&E identified knowledge gaps and educates stakeholders and customers on various topics regarding PSPS. SDG&E shared knowledge on public safety, planning and best practices for home and work preparedness for wildfire safety, technology and situational awareness, vegetation management, emergency preparedness, and overall wildfire resilience with over 500 attendees.

2. In 2020, SDG&E held its second annual Wildfire Safety Fair events, designed to bring communities together and connect them with resources. These events engage the community and promote SDG&E departments and community partners (i.e., 2-1-1, CAL FIRE, Feeding San Diego, American Red Cross, Fire Safety Councils, First Responders, plus many other volunteer agencies; local, state, and federal entities). To date in 2020, SDG&E has held three drive-thru fairs, with over 1,200 attendees, with two more events slated for September.

3. This year, SDG&E continued its annual education and outreach to our local jurisdictions, including tribal governments, public safety partners and agency partners and offered PSPS webinars, virtual Emergency Operations Center tours and individual briefings.

4. SDG&E will identify and create support models for customers, particularly those vulnerable populations (AFN). During PSPS events, key community partners (2-1-1 San Diego, 2-1-1 Orange County, and Indian Health Councils) are invited to aid and assist in these events.

5. SDG&E will create and engage in regional and statewide working groups and advisory councils to identify and understand the needs of customers during PSPS events. SDG&E will also identify potential solutions to best aid and respond to customer needs – immediate and future. This information will assist AFN support models and enable organizations such as 2-1-1 to serve as resource hubs for vulnerable customers who may need support or service like transportation, food security or health and welfare checks during PSPS events. These are well known organizations that have relationships with hundreds of community base organizations that can meet the needs of vulnerable customers. The agreements that have been established with these organizations include communications and outreach to vulnerable populations, especially in advance of PSPS events. SDG&E believes this regional model that links SDG&E customers with experts who serve vulnerable populations every day is a foundation to build upon over the next ten years.

6. SDG&E is actively engaged on AFN policy issues through a variety of forums, providing leadership at statewide and regional levels. This area of focus will continue to be developed and matured over the course of the next ten years. SDG&E has formed a Wildfire Safety Community Advisory Council with a group of diverse local leaders from public safety, tribal government, business, nonprofit, telecommunications, public health and academia. The council provides feedback and recommendations on how SDG&E can continue to help protect the region from wildfires. This advisory council will likely continue to expand over the next ten years to include representation from additional stakeholder groups as they are identified. SDG&E has also helped form a PSPS Working Group, which is a new sub-committee of the existing County AFN Working Group. The purpose of this group is to focus on more regionalized issues. The Working Group will share lessons-learned to help us refine our wildfire and PSPS protocols. Participants include, but not limited to, critical customers such as water agencies and telecommunications providers, tribal nations, local governments, public safety partners, municipal utilities and community choice providers, and others. Over the next ten years, SDG&E will also grow and mature this working group and incorporate wildfire and PSPS lessons learned into its future protocols and contingency planning.
7. SDG&E will expand public education campaign and direct communications to target both AFN and LEP populations. This will involve Identifying and creating additional support materials and messaging to our community-based organizations, their constituents, and the media. It will also include soliciting customers, community-based organizations and stakeholder feedback each year to improve our overall SDG&E's internal and external communications.

SDG&E's commitment to the safety of the communities it serves is unwavering. Over the next ten years, SDG&E will continue to strive every day for continuous improvement. SDG&E will continue to work with customers, community leaders and community partners to help identify and implement the right solutions to adequately address wildfire risk and minimize PSPS. Continuous improvement is a hallmark of SDG&E's company culture.

Stakeholder Cooperation and Community Engagement – 2020 WMP

SDG&E's goal is to create an environment where its internal and external stakeholders can network and provide each other the necessary knowledge and expertise to engage each other through these tragedies, when wildfires strike our territory, region or state.

United with our community members and leaders, other service providers and first responders—SDG&E plans to create and implement the best wildfire resiliency training. SDG&E aims to gather and share relevant and pertinent information to all stakeholders.

Building upon the relationships SDG&E has built over time with regional stakeholders and the community, SDG&E was able to quickly adapt in 2020 in the face of a global pandemic and continue to educate and outreach with stakeholders and customers, transitioning from in

person events to virtual and drive-thru events. Education and outreach will remain pivotal in the next decade as improvements and enhancements are made to SDG&E's infrastructure, communications and technology. Communication with stakeholders and customers is an important element in helping them prepare them for a PSPS.

Attachment B

WMP Tables 1 through 12

Excel versions are available on SDG&E's website: https://www.sdge.com/2021-wildfire-mitigation-plan

Wildfire Safety Division Attachment 2.3

Wildifire Mitigation Plan Quarterly report - non-spatial data template

Resolution WSD-011 Attachment 2.3

Instructions for use	
1.	Fill out the tan cells (color represented here) starting with the cell below (D17: Utility). The Utility name will populate the Table tabs to follow. Date modified will vary by table.
2.	Cells will only accept valid entries. For most cells, this is positive numbers
3.	For each Table tab, after a modification is made, denote the date of the change in cell C4 for each Table tab.
4.	Some columns have an additional header in row 5 to serve as clarification for several columns. With the exception of projected data, row 5 will be highlighted in blue (color represented here)
5.	Some required metrics are future projections. For these, row 5, above the projections will be highlighted light green (color represented here)
	In future submissions, report updated projected numbers if / when projections have changed, and report actuals once the quarter / year has passed.
6.	For data required annually rather than quarterly (see Tables 7.3 - 10), report for entire year even if part of the year is projected. Once year has passed, update cell with actuals
7.	Some tables will have additional instructions provided in a **Notes** box located in cells D2 - D4
	Notes will explain terms, signal where projections are required, and provide other useful information.
8.	For the initial quarterly submission, utilities are required to submit data on annual metrics for 2015 - 2020, which should represent the most updated data from the 2020 WMP for years 2015-2019
*	Do not add or manipulate the template for any of the tabs

Update the below table to establish which year, quarter of the WMP cycle this submission this represents.

Utility	SDG&E
First year of 3-year WMP cycle	2020
Submission year	2021
Submission quarter	Q4
Date Modified	#REF!

Utility	SDG&E
Table No.	1
Date Modified	2/5/2021

Notes:
Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.

Note: These columns are placeholders for future QR submissions.

Table 1: Recent performance on progress metrics

Metric type	#	Progress metric name	2015	2016	2017	2018	2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Unit(s)	Comments
1. Grid condition findings from inspection - Distribution lines in HFTD	1.a.	Number of circuit miles inspected from patrol inspections in HFTD - Distribution lines	3443.0	3443.0	3443.0	3443.0	3443.0	1295.0	1246.0	800.0	102.0									# circuit miles	
	1.b.	Number of circuit miles inspected from detailed inspections in HFTD - Distribution lines	756.0	880.0	692.0	510.0	680.0	361.0	289.0	90.0	20.0									# circuit miles	
	1.c.	Number of circuit miles inspected from other inspections (list types of "other" inspections in comments) in HFTD - Distribution lines	766.0	542.0	644.0	948.0	261.0	490.0	0.0	0.0	0.0									# circuit miles	
	1.d.	Level 1 findings in HFTD for patrol inspections - Distribution lines	15.0	7.0	4.0	8.0	9.0	7.0	4.0	1.0	1.0									# findings	
	1.e.	Level 1 findings in HFTD for detailed inspections - Distribution lines	242.0	100.0	50.0	45.0	24.0	4.0	8.0	2.0	0.0									# findings	
	1.f.	Level 1 findings in HFTD for other inspections (list types of "other" inspections in comments) - Distribution lines	50.0	2.0	19.0	60.0	2.0	5.0	0.0	0.0	0.0									# findings	
	1.g.	Level 2 findings in HFTD for patrol inspections - Distribution lines	157.0	177.0	177.0	141.0	201.0	42.0	52.0	48.0	14.0									# findings	
	1.h.	Level 2 findings in HFTD for detailed inspections - Distribution lines	576.0	720.0	370.0	354.0	488.0	262.0	231.0	11.0	10.0									# findings	
	1.i.	Level 2 findings in HFTD for other inspections (list types of "other" inspections in comments) - Distribution lines	438.0	612.0	449.0	313.0	409.0	451.0	0.0	0.0	0.0									# findings	
	1.j.	Level 3 findings in HFTD for patrol inspections - Distribution lines	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A									# findings	
	1.k.	Level 3 findings in HFTD for detailed inspections - Distribution lines	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A									# findings	
	1.l.	Level 3 findings in HFTD for other inspections (list types of "other" inspections in comments) - Distribution lines	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A									# findings	
1. Grid condition findings from inspection - Distribution lines total	1.a.ii.	Number of total circuit miles inspected from patrol inspections - Distribution lines	6445.0	6445.0	6445.0	6445.0	6445.0	2242.0	2188.0	1564.0	451.0									# circuit miles	
	1.b.ii.	Number of total circuit miles inspected from detailed inspections - Distribution lines	756.0	880.0	692.0	510.0	680.0	361.0	289.0	90.0	20.0									# circuit miles	
	1.c.ii.	Number of total circuit miles inspected from other inspections (list types of "other" inspections in comments) - Distribution lines	766.0	542.0	644.0	948.0	261.0	490.0	0.0	0.0	0.0									# circuit miles	
	1.d.ii.	Level 1 findings for patrol inspections - Distribution lines	50.0	23.0	27.0	26.0	28.0	8.0	11.0	2.0	0.0									# findings	
	1.e.ii.	Level 1 findings for detailed inspections - Distribution lines	21.0	100.0	65.0	47.0	32.0	13.0	20.0	10.0	0.0									# findings	
	1.f.ii.	Level 1 findings for other inspections (list types of "other" inspections in comments) - Distribution lines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
	1.g.ii.	Level 2 findings for patrol inspections - Distribution lines	620.0	960.0	791.0	795.0	756.0	209.0	103.0	28.0	7.0									# findings	
	1.h.ii.	Level 2 findings for detailed inspections - Distribution lines	2043.0	2073.0	1683.0	1354.0	1572.0	570.0	591.0	337.0	87.0									# findings	
	1.i.ii.	Level 2 findings for other inspections (list types of "other" inspections in comments) - Distribution lines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
	1.j.ii.	Level 3 findings for patrol inspections - Distribution lines	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A									# findings	
	1.k.ii.	Level 3 findings for detailed inspections - Distribution lines	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A									# findings	
	1.l.ii.	Level 3 findings for other inspections (list types of "other" inspections in comments) - Distribution lines	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A									# findings	
1. Grid condition findings from inspection - Transmission lines in HFTD	1.a.iii.	Number of circuit miles inspected from patrol inspections in HFTD - Transmission lines	915.4	945.9	945.9	960.9	973.8	696.4	176.1	101.3	0.0									# circuit miles	
	1.b.iii.	Number of circuit miles inspected from detailed inspections in HFTD - Transmission lines	353.9	263.6	328.4	332.9	285.9	40.6	97.3	84.1	133.1									# circuit miles	
	1.c.iii.	Number of circuit miles inspected from other inspections (list types of "other" inspections in comments) in HFTD - Transmission lines	958.7	933.7	933.7	961.1	961.6	0.0	0.0	473.3	469.5									# circuit miles	
	1.d.iii.	Level 1 findings in HFTD for patrol inspections - Transmission lines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
	1.e.iii.	Level 1 findings in HFTD for detailed inspections - Transmission lines	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0									# findings	
	1.f.iii.	Level 1 findings in HFTD for other inspections (list types of "other" inspections in comments) - Transmission lines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0									# findings	
	1.g.iii.	Level 2 findings in HFTD for patrol inspections - Transmission lines	25.0	19.0	8.0	9.0	4.0	0.0	2.0	0.0	0.0									# findings	
	1.h.iii.	Level 2 findings in HFTD for detailed inspections - Transmission lines	469.0	100.0	156.0	451.0	226.0	116.0	122.0	56.0	63.0									# findings	
	1.i.iii.	Level 2 findings in HFTD for other inspections (list types of "other" inspections in comments) - Transmission lines	30.0	22.0	9.0	6.0	9.0	0.0	0.0	10.0	4.0									# findings	
	1.j.iii.	Level 3 findings in HFTD for patrol inspections - Transmission lines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
	1.k.iii.	Level 3 findings in HFTD for detailed inspections - Transmission lines	32.0	30.0	42.0	31.0	27.0	0.0	8.0	0.0	6.0									# findings	
	1.l.iii.	Level 3 findings in HFTD for other inspections (list types of "other" inspections in comments) - Distribution lines	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
1. Grid condition findings from inspection - Transmission lines total	1.a.iv.	Number of total circuit miles inspected from patrol inspections - Transmission lines	1651.8	1701.2	1705.2	1725.6	1741.6	1146.3	467.4	135.1	0.0									# circuit miles	
	1.b.iv.	Number of total circuit miles inspected from detailed inspections - Transmission lines	639.1	530.7	565.8	585.6	527.3	104.3	194.8	148.2	177.6									# circuit miles	
	1.c.iv.	Number of total circuit miles inspected from other inspections (list types of "other" inspections in comments) - Transmission lines	1699.0	1663.9	1664.2	1695.6	1703.2	0.0	17.5	936.5	722.3									# circuit miles	
	1.d.iv.	Level 1 findings for patrol inspections - Transmission lines	1.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
	1.e.iv.	Level 1 findings for detailed inspections - Transmission lines	3.0	1.0	1.0	8.0	2.0	0.0	0.0	0.0	0.0									# findings	
	1.f.iv.	Level 1 findings for other inspections (list types of "other" inspections in comments) - Transmission lines	6.0	1.0	1.0	1.0	8.0	0.0	0.0	1.0	1.0									# findings	
	1.g.iv.	Level 2 findings for patrol inspections - Transmission lines	69.0	42.0	11.0	11.0	8.0	1.0	3.0	0.0	0.0									# findings	
	1.h.iv.	Level 2 findings for detailed inspections - Transmission lines	1026.0	334.0	448.0	909.0	543.0	322.0	242.0	152.0	150.0									# findings	
	1.i.iv.	Level 2 findings for other inspections (list types of "other" inspections in comments) - Transmission lines	66.0	46.0	17.0	10.0	27.0	0.0	2.0	13.0	8.0									# findings	
	1.j.iv.	Level 3 findings for patrol inspections - Transmission lines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
	1.k.iv.	Level 3 findings for detailed inspections - Transmission lines	60.0	63.0	66.0	65.0	51.0	12.0	9.0	2.0	38.0									# findings	
	1.l.iv.	Level 3 findings for other inspections (list types of "other" inspections in comments) - Transmission lines	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0									# findings	
2. Vegetation clearance findings from inspection - total	2.a.i	Number of spans inspected where at least some vegetation was found in non-compliant condition - total	1906.0	2124.0	2550.0	2827.0	2010.0	483.0	390.0	772.0	661.0									# of spans inspected with noncompliant clearance based on applicable rules and regulations at the time of inspection	During data cleaning process, invalid poleID are eleminated from the count of the Spans
	2.a.ii	Number of spans inspected for vegetation compliance - total	175974.0	175756.0	175330.0	175053.0	175870.0	43987.0	44080.0	43698.0	43809.0									# of spans inspected for vegetation compliance	Vegetation compliance-when all trees are compliant in a given territory
2. Vegetation clearance findings from inspection - in HFTD	2.b.i	Number of spans inspected where at least some vegetation was found in non-compliant condition in HFTD	825.0	874.0	1322.0	1565.0	1034.0	293.0	313.0	478.0	218.0									# of spans inspected with noncompliant clearance based on applicable rules and regulations at the time of inspection	During data cleaning process, invalid poleID are eleminated from the count of the Spans
	2.b.ii	Number of spans inspected for vegetation compliance in HFTD	77428.0	77379.0	76931.0	76688.0	77219.0	19270.3	19250.3	19085.3	19345.3									# of spans inspected for vegetation compliance	Vegetation compliance-when all trees are compliant in a given territory
3. Community outreach metrics	3.a.	# Customers in an evacuation zone for utility-ignited wildfire	NA	NA	NA	NA	NA	NA	NA	NA	NA									# customers (if customer was in an evacuation zone for multiple wildfires, count the customer for each relevant wildfire)	
	3.b.	# Customers notified of evacuation orders	NA	NA	NA	NA	NA	NA	NA	NA	NA									# customers (count customer multiple times for each unique wildfire of which they were notified)	
	3.c.	% of customers notified of evacuation in evacuation zone of a utility-ignited wildfire	NA	NA	NA	NA	NA	NA	NA	NA	NA									Percentage of customers notified of evacuation	

Utility	SDG&E
Table No.	2
Date Modified	2/5/2021

Notes:
Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.

Note: These columns are placeholders for future QR submissions.

Table 2: Recent performance on outcome metrics

								Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Metric type	**#**	**Outcome metric name**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2020**	**2020**	**2020**	**2021**	**2021**	**2021**	**2021**	**2022**	**2022**	**2022**	**2022**	**Unit(s)**	**Comments**
1. Risk events	1.a.	Number of all events with probability of ignition, including wires down, contacts with objects, line slap, events with evidence of heat generation, and other events that cause sparking or have the potential to cause ignition	1116	1385	1252	1151	1212	263	272	356	259	298.763	298.763	298.763	298.763	295.45	295.45	295.45	295.45	Number per year	
	1.b.	Number of wires down (total)	73	161	151	105	125	27	18	20	23	30.048	30.048	30.048	30.048	29.649	29.649	29.649	29.649	Number of wires down per year	
	1.c.	Number of outage events not caused by contact with vegetation (total)	1089	1324	1185	1118	1187	252	265	351	250	283.609	283.609	283.609	283.609	280.963	280.963	280.963	280.963	Number of outage events per year	
	1.d.	Number of outage events caused by contact with vegetation (total)	28	62	67	34	25	11	7	5	9	15.154	15.154	15.154	15.154	14.487	14.487	14.487	14.487	Number of outage events per year	
2. Utility inspection findings - Distribution	2.a.	Number of Level 1 findings (distribution - total)	378	232	165	186	95	37	43	15	1									# findings	
	2.b.	Number of Level 2 findings (distribution - total)	3834	4542	3470	2957	3426	1534	977	424	118									# findings	
	2.c.	Number of Level 3 findings (distribution - total)	NA	NA	NA	NA	NA	NA	NA	NA	NA									# findings	
	2.d.	Number of distribution circuit miles inspected	12166	12190	11916	11856	11509	4749	4012	2544	593									# circuit miles	
2. Utility inspection findings - Transmission	2.a.ii	Number of Level 1 findings (transmission - total)	10	2	4	9	10	0	0	1	1									# findings	
	2.b.ii	Number of Level 2 findings (transmission - total)	1161	422	476	930	578	323	247	165	158									# findings	
	2.c.ii	Number of Level 3 findings (transmission - total)	60	63	84	65	51	12	9	2	38									# findings	
	2.d.ii	Number of transmission circuit miles inspected	3989.9	3895.8	3935.2	4006.8	3972.1	1250.6	679.7	1219.8	899.9									# circuit miles	
3. Utility ignited wildfire fatalities	3.a.	Fatalities due to utility-ignited wildfire (total)	0	0	0	0	0	0	0	0	0									Number of fatalities per year	
	3.b.	Injuries due to utility-ignited wildfire (total)	0	0	0	0	0	0	0	0	0									Number of injuries per year	
4. Value of assets destroyed by utility-ignited wildfire, listed by asset type	4.a.	Value of assets destroyed by utility-ignited wildfire (total)				2900														Dollars of damage or destruction per year	
5. Structures damaged or destroyed by utility-ignited wildfire	5.a.	Number of structures destroyed by utility-ignited wildfire (total)				0.043729														Number of structures destroyed per year	
	5.b.	Critical infrastructure damaged/destroyed by utility-ignited wildfire (total)																		Number of critical infrastructure damaged/destroyed per year	
6. Acreage burned by utility-ignited wildfire	6.a.	Acreage burned by utility-ignited wildfire (total)																		Acres burned per year	
7. Number of utility wildfire ignitons	7.a.	Number of ignitions (total) according to existing ignition data reporting requirement	32	30	23	26	21	3	5	16	5									Number per year	
	7.b.	Number of ignitions in HFTD (subtotal)	19	18	15	13	12	2	4	12	5	7.114	7.114	7.114	7.114	6.9062	6.9062	6.9062	6.9062	Number in HFTD per year	
	7.c.	Number of ignitions in HFTD Zone 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Number in HFTD Zone 1 per year	
	7.c.ii.	Number of ignitions in HFTD Tier 2	13	11	7	7	9	1	2	5	3	4.4256	4.4256	4.4256	4.4256	4.3327	4.3327	4.3327	4.3327	Number in HFTD Tier 2 per year	
	7.c.iii.	Number of ignitions in HFTD Tier 3	6	7	8	6	3	1	2	7	2	2.6884	2.6884	2.6884	2.6884	2.5735	2.5735	2.5735	2.5735	Number in HFTD Tier 3 per year	
	7.d.	Number of ignitions in non-HFTD (subtotal)	13	12	8	13	9	1	1	4	0	5.348125	5.348125	5.348125	5.348125	5.347125	5.347125	5.347125	5.347125	Number in non-HFTD per year	
8. Fatalities resulting from utility wildfire mitigation initiatives	8.a.	Fatalities due to utility wildfire mitigation activities (total) - "activities" defined as all activities accounted for in the 2020 WMP proposed WMP spend	1	0	0	0	0	0	0	0	0									Number of fatalities per year	
9. OSHA-reportable injuries from utility wildfire mitigation initiatives	9.a.	OSHA-reportable injuries due to utility wildfire mitigation activities (total) - "activities" defined as all activities accounted for in the 2020 WMP proposed WMP spend	0	1	0	0	0	0	0	0	0									Number of OSHA-reportable injuries per year	

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Table 3: List and description of additional metrics

Note: These columns are placeholders for future QR submissions.

Metric	#	Metric Name	Definition	Purpose	Assumptions made to connect metric to purpose	Third-party validation (if any)	2015	2016	2017	2018	2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Unit(s)	Comments
1. Elevated FPI and Red Flag Warning Days	1.a.	Number of elevated or extreme FPI			Elevated or extreme FPI is associated with greater wildfire risk	No	108	138	169	182	137	0	13	92	59									Days	
	1.b.	Number of RFW days			RFW is associated with greater wildfire	No	4	19	22	12	10	0	0	6	13									Days	Time is not included when calculating the number of RFW days.
2. Ignition Events	2.a.	Vegetation caused ignitons in HFTD with elevated or higher FPI				No	3	1	2	0	0	0	0	0	0									Incidents	
	2.b.	Vegetation caused ignitons in HFTD with RFW				No	0	0	1	0	0	0	0	0	0									Incidents	
	2.c.	Equipment caused ignitions in HFTD with elevated or higher FPI				No	2	6	4	2	5	0	0	9	3									Incidents	
	2.d.	Equipment caused ignitions in HFTD with RFW				No	0	0	2	1	2	0	0	1	1									Incidents	
	2.e.	Balloons caused ignitions in HFTD with Elevated FPI				No	1	0	3	3	0	0	0	0	0									Incidents	
	2.f.	Balloons caused ignitions in HFTD with RFW				No	0	0	0	0	0	0	0	0	0									Incidents	
	2.g.	Vehicles caused ignitions in HFTD with elevated or higher FPI				No	0	0	1	1	0	0	0	2	0									Incidents	
	2.h.	Vehicles caused ignitions in HFTD with RFW				No	0	0	0	0	0	0	0	0	0									Incidents	
3. Distribution Outages	3.a.	Vegetation caused outages in HFTD with Elevated FPI				No	3	7	8	4	9	0	0	1	2									Outages	
	3.b.	Vegetation caused outages in HFTD with RFW				No	0	0	2	3	0	0	0	1	0									Outages	
	3.c.	Overhead faults on circuits in HFTD with Elevated FPI				No	114	104	134	134	132	0	7	112	48									Outages	SDG&E has developed a more precise methodology for identifying the HFTD location of outages by utilizing the pole/asset location instead of the overall circuit location.
	3.d.	Overhead faults on circuits in HFTD with RFW				No	1	2	22	27	13	0	0	31	10									Outages	
	3.e.	Energized wire down events in HFTD with Elevated FPI				No	4	7	10	5	8	0	0	7	2									Outages	
	3.f.	Energized wire down events in HFTD with RFW				No	0	0	0	1	1	0	0	2	0									Outages	
	3.g.	Number of non-CALFIRE rated fuse operations in HFTD with Elevated FPI				No	60	53	61	61	43	0	3	21	8									Outages	
	3.h.	Number of non-CALFIRE rated fuse operations in HFTD with RFW				No	1	1	9	10	3	0	0	1	1									Outages	

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Note: These columns are placeholders for future QR submissions.

Table 4: Fatalities due to utility wildfire mitigation initiatives

Metric type	#	Outcome metric name	2015	2016	2017	2018	2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Unit(s)	Comments
1. Fatalities - Full-time Employee	1.a.	Fatalities due to utility inspection - Full-time employee	0	0	0	0	0	0	0	0	0									# fatalities	
	1.b.	Fatalities due to vegetation management - Full-time employee	0	0	0	0	0	0	0	0	0									# fatalities	
	1.c.	Fatalities due to utility fuel management - Full-time employee	0	0	0	0	0	0	0	0	0									# fatalities	
	1.d.	Fatalities due to grid hardening - Full-time employee	0	0	0	0	0	0	0	0	0									# fatalities	
	1.e.	Fatalities due to other - Full-time employee	0	0	0	0	0	0	0	0	0									# fatalities	
2. Fatalities - Contractor	2.a.	Fatalities due to utility inspection - Contractor	0	0	0	0	0	0	0	0	0									# fatalities	
	2.b.	Fatalities due to vegetation management - Contractor	1	0	0	0	0	0	0	0	0									# fatalities	
	2.c.	Fatalities due to utility fuel management - Contractor	0	0	0	0	0	0	0	0	0									# fatalities	
	2.d.	Fatalities due to grid hardening - Contractor	0	0	0	0	0	0	0	0	0									# fatalities	
	2.e.	Fatalities due to other - Contractor	0	0	0	0	0	0	0	0	0									# fatalities	
3. Fatalities - Member of public	3.a.	Fatalities due to utility inspection - Public	0	0	0	0	0	0	0	0	0									# fatalities	
	3.b.	Fatalities due to vegetation management - Public	0	0	0	0	0	0	0	0	0									# fatalities	
	3.c.	Fatalities due to utility fuel management - Public	0	0	0	0	0	0	0	0	0									# fatalities	
	3.d.	Fatalities due to grid hardening - Public	0	0	0	0	0	0	0	0	0									# fatalities	
	3.e.	Fatalities due to other - Public	0	0	0	0	0	0	0	0	0									# fatalities	

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Note: These columns are placeholders for future QR submissions.

Table 5: OSHA-reportable injuries due to utility wildfire mitigation initiatives

Metric type	#	Outcome metric name	2015	2016	2017	2018	2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Unit(s)	Comments
1. OSHA injuries - Full-time Employee	1.a.	OSHA injuries due to utility inspection - Full-time employee	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	1.b.	OSHA injuries due to vegetation management - Full-time employee	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	1.c.	OSHA injuries due to utility fuel management - Full-time employee	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	1.d.	OSHA injuries due to grid hardening - Full-time employee	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	1.e.	OSHA injuries due to other - Full-time employee	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
2. OSHA injuries - Contractor	2.a.	OSHA injuries due to utility inspection - Contractor	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	2.b.	OSHA injuries due to vegetation management - Contractor	0	1	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	2.c.	OSHA injuries due to utility fuel management - Contractor	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	2.d.	OSHA injuries due to grid hardening - Contractor	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	2.e.	OSHA injuries due to other - Contractor	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
3. OSHA injuries - Member of public	3.a.	OSHA injuries due to utility inspection - Public	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	3.b.	OSHA injuries due to vegetation management - Public	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	3.c.	OSHA injuries due to utility fuel management - Public	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	3.d.	OSHA injuries due to grid hardening - Public	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	
	3.e.	OSHA injuries due to other - Public	0	0	0	0	0	0	0	0	0									# OSHA-reportable injuries	

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Note: These columns are placeholders for future QR submissions

Table 6: Weather patterns								Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Metric type	**#**	**Outcome metric name**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2020**	**2020**	**2020**	**2021**	**2021**	**2021**	**2021**	**2022**	**2022**	**2022**	**2022**	**Unit(s)**	**Comments**
1. Red Flag Warning Overhead circuit mile Days	1.a.	Red Flag Warning Overhead circuit mile days - entire utility territory	16,920.1	53,095.8	190,384.4	125,715.0	53,465.3	-	-	34,854.9	62,067.6									Sum of overhead circuit miles of utility grid subject to Red Flag Warning each day within a given time period, calculated as the number of overhead circuit miles that were under an RFW multiplied by the number of days those circuit miles were under said RFW. For example, if 100 overhead circuit miles were under an RFW for 1 day, and 10 of those miles were under RFW for an additional day, then the total RFW OH circuit mile days would be 110.	
	1.b.	Red Flag Warning Overhead circuit mile days - HFTD Zone 1																		Red Flag Warning Overhead circuit mile days, see above for definition	
	1.c.	Red Flag Warning Overhead circuit mile days - HFTD Tier 2	6,493.7	20,031.6	55,340.5	38,720.3	20,081.3			12,884.4	23,562.0									Red Flag Warning Overhead circuit mile days, see above for definition	
	1.d.	Red Flag Warning Overhead circuit mile days - HFTD Tier 3	3,730.3	14,896.7	30,730.9	22,283.9	12,369.0			9,105.0	14,430.5									Red Flag Warning Overhead circuit mile days, see above for definition	circuit/tieline spans that cross tier 2 and tier 3 are grouped in tier 3
	1.e.	Red Flag Warning Overhead circuit mile days - Non-HFTD	6,696.0	18,167.5	104,312.9	64,710.8	21,014.9			12,865.5	24,075.1									Red Flag Warning Overhead circuit mile days, see above for definition	
2. Wind conditions	2.a.	High wind warning overhead circuit mile days	51,193.2	13,749.3	107,904.6	53,249.0	26,826.1	- 8,635.0 - - - -	- - - - -	-	16,998.5									Sum of overhead circuit miles of utility grid subject to High Wind Warnings (HWW, as defined by the National Weather Service) each day within a given time period, calculated as the number of overhead circuit miles that were under an HWW multiplied by the number of days those miles were under said HWW. For example, if 100 overhead circuit miles were under an HWW for 1 day, and 10 of those miles were under HWW for an additional day, then the total HWW OH circuit mile days would be 110.	
3. Other	3.a.	Other relevant weather pattern metrics tracked (add additional rows as needed)																			

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Notes:
Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.
Data from 2015 - 2020 Q2 should be actual numbers. 2020 Q3 - 2023 should be projected. In future submissions update projected numbers with actuals

Table 7.1: Key recent and projected drivers of risk events

						Number of risk events									Projected risk events									
											Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Risk Event category	**Cause category**	**#**	**Sub-cause category**	**Are risk events tracked for ignition driver? (yes / no)**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2020**	**2020**	**2020**	**2021**	**2021**	**2021**	**2021**	**2022**	**2022**	**2022**	**2022**	**Unit(s)**	**Comments**
x	Wire down event - Distribution	1. Contact from object - Distribution	1.a.	Veg. contact- Distribution	Yes	11	25	32	15	18	3	4	2	4	4.828203	4.828203	4.828203	4.828203	4.613993	4.613993	4.613993	4.613993	# risk events (excluding ignitions)	
			1.b.	Animal contact- Distribution	Yes	0	8	2	2	0	1	1	1	0	0.592335	0.592335	0.592335	0.592335	0.585729	0.585729	0.585729	0.585729	# risk events (excluding ignitions)	
			1.c.	Balloon contact- Distribution	Yes	1	5	8	3	5	1	2	1	1	1.095731	1.095731	1.095731	1.095731	1.090404	1.090404	1.090404	1.090404	# risk events (excluding ignitions)	
			1.d.	Vehicle contact- Distribution	Yes	6	13	16	21	28	10	5	7	7	4.184402	4.184402	4.184402	4.184402	4.171376	4.171376	4.171376	4.171376	# risk events (excluding ignitions)	
			1.e.	Other contact from object - Distribution	Yes	6	12	7	5	6	2	0	0	0	1.793012	1.793012	1.793012	1.793012	1.784292	1.784292	1.784292	1.784292	# risk events (excluding ignitions)	
		2. Equipment / facility failure - Distribution	2.a.	Connector damage or failure- Distribution	Yes	5	0	0	3	4	3	2	0	2	0.557359	0.557359	0.557359	0.557359	0.546677	0.546677	0.546677	0.546677	# risk events (excluding ignitions)	
			2.b.	Splice damage or failure — Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			2.c.	Crossarm damage or failure - Distribution	Yes	0	1	0	1	2	0	0	1	0	0.19196	0.19196	0.19196	0.19196	0.189762	0.189762	0.189762	0.189762	# risk events (excluding ignitions)	
			2.d.	Insulator damage or failure- Distribution	Yes	0	1	0	0	0	1	0	0	0	0.047993	0.047993	0.047993	0.047993	0.047441	0.047441	0.047441	0.047441	# risk events (excluding ignitions)	
			2.e.	Lightning arrestor damage or failure- Distribution	Yes	0	1	0	0	1	0	0	0	0	0.09598	0.09598	0.09598	0.09598	0.094879	0.094879	0.094879	0.094879	# risk events (excluding ignitions)	
			2.f.	Tap damage or failure - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			2.g.	Tie wire damage or failure - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			2.h.	Other - Distribution	Yes	29	47	32	35	33	3	3	3	5	8.446321	8.446321	8.446321	8.446321	8.34942	8.34942	8.34942	8.34942	# risk events (excluding ignitions)	
		3. Wire-to-wire contact - Distribution	3.a.	Wire-to-wire contact / contamination- Distribution	Yes	0	1	1	1	0	0	1	1	0	0.148141	0.148141	0.148141	0.148141	0.146511	0.146511	0.146511	0.146511	# risk events (excluding ignitions)	
		4. Contamination - Distribution	4.a.	Contamination - Distribution	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		5. Utility work / Operation	5.a.	Utility work / Operation	Yes	1	1	1	2	2	1	0	1	2	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	# risk events (excluding ignitions)	
		6. Vandalism / Theft - Distribution	6.a.	Vandalism / Theft - Distribution	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		7. Other- Distribution	7.a.	All Other- Distribution	No	14	45	51	17	26	1	0	3	2	7.620303	7.620303	7.620303	7.620303	7.583241	7.583241	7.583241	7.583241	# risk events (excluding ignitions)	
		8. Unknown- Distribution	8.a.	Unknown - Distribution	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
x	Wire down event - Transmission	9. Contact from object - Transmission	9.a.	Veg. contact- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			9.b.	Animal contact- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			9.c.	Balloon contact- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			9.d.	Vehicle contact- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			9.e.	Other contact from object - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		10. Equipment / facility failure - Transmission	10.a.	Connector damage or failure- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			10.b.	Splice damage or failure — Transmission	No	0	1	0	0	0	0	0	0	0	0.047859	0.047859	0.047859	0.047859	0.047578	0.047578	0.047578	0.047578	# risk events (excluding ignitions)	
			10.c.	Crossarm damage or failure - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			10.d.	Insulator damage or failure- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			10.e.	Lightning arrestor damage or failure- Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			10.f.	Tap damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			10.g.	Tie wire damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			10.h.	Other - Transmission	Yes	0	0	1	0	0	1	0	0	0	0.04805	0.04805	0.04805	0.04805	0.0478	0.0478	0.0478	0.0478	# risk events (excluding ignitions)	
		11. Wire-to-wire contact - Transmission	11.a.	Wire-to-wire contact / contamination- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		12. Contamination - Transmission	12.a.	Contamination - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		13. Utility work / Operation	13.a.	Utility work / Operation	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		14. Vandalism / Theft - Transmission	14.a.	Vandalism / Theft - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		15. Other- Transmission	15.a.	All Other- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		16. Unknown- Transmission	16.a.	Unknown - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
x	Outage - Distribution	17. Contact from object - Distribution	17.a.	Veg. contact- Distribution	Yes	27	61	67	33	25	11	7	5	9	10.18225	10.18225	10.18225	10.18225	9.7305	9.7305	9.7305	9.7305	# risk events (excluding ignitions)	
			17.b.	Animal contact- Distribution	Yes	70	80	77	74	90	16	29	30	14	19.30025	19.30025	19.30025	19.30025	19.085	19.085	19.085	19.085	# risk events (excluding ignitions)	
			17.c.	Balloon contact- Distribution	Yes	70	84	120	112	92	19	40	27	22	23.80725	23.80725	23.80725	23.80725	23.6915	23.6915	23.6915	23.6915	# risk events (excluding ignitions)	
			17.d.	Vehicle contact- Distribution	Yes	93	95	94	99	101	30	24	25	26	24.0105	24.0105	24.0105	24.0105	23.93575	23.93575	23.93575	23.93575	# risk events (excluding ignitions)	
			17.e.	Other contact from object - Distribution	Yes	27	44	23	36	31	11	10	7	12	8.01875	8.01875	8.01875	8.01875	7.97975	7.97975	7.97975	7.97975	# risk events (excluding ignitions)	
		18. Equipment / facility failure - Distribution	18.a.	Capacitor bank damage or failure- Distribution	Yes	12	5	3	11	12	4	2	3	2	2.0635	2.0635	2.0635	2.0635	2.03975	2.03975	2.03975	2.03975	# risk events (excluding ignitions)	
			18.b.	Conductor damage or failure — Distribution	Yes	31	53	38	42	46	9	6	5	16	10.07775	10.07775	10.07775	10.07775	9.96225	9.96225	9.96225	9.96225	# risk events (excluding ignitions)	
			18.c.	Fuse damage or failure - Distribution	Yes	67	110	57	55	67	10	22	33	18	17.084	17.084	17.084	17.084	16.888	16.888	16.888	16.888	# risk events (excluding ignitions)	
			18.d.	Lightning arrestor damage or failure- Distribution	Yes	22	28	26	20	28	2	4	6	10	5.95075	5.95075	5.95075	5.95075	5.8825	5.8825	5.8825	5.8825	# risk events (excluding ignitions)	
			18.e.	Switch damage or failure- Distribution	Yes	8	15	10	19	15	5	4	2	3	3.21525	3.21525	3.21525	3.21525	3.17825	3.17825	3.17825	3.17825	# risk events (excluding ignitions)	
			18.f.	Pole damage or failure - Distribution	Yes	19	27	54	22	62	8	9	5	5	8.83	8.83	8.83	8.83	8.72875	8.72875	8.72875	8.72875	# risk events (excluding ignitions)	
			18.g.	Insulator and brushing damage or failure - Distribution	Yes	2	7	7	9	9	2	2	0	0	1.63175	1.63175	1.63175	1.63175	1.613	1.613	1.613	1.613	# risk events (excluding ignitions)	
			18.h.	Crossarm damage or failure - Distribution	Yes	4	15	20	30	32	10	3	5	11	4.847	4.847	4.847	4.847	4.7915	4.7915	4.7915	4.7915	# risk events (excluding ignitions)	
			18.i.	Voltage regulator / booster damage or failure - Distribution	Yes	0	0	1	1	0	0	0	0	1	0.09625	0.09625	0.09625	0.09625	0.09525	0.09525	0.09525	0.09525	# risk events (excluding ignitions)	
			18.j.	Recloser damage or failure - Distribution	Yes	1	0	0	1	2	0	0	5	0	0.192	0.192	0.192	0.192	0.19	0.19	0.19	0.19	# risk events (excluding ignitions)	
			18.k.	Anchor / guy damage or failure - Distribution	Yes	2	3	1	2	1	0	0	1	0	0.432	0.43225	0.43225	0.43225	0.427	0.42725	0.42725	0.42725	# risk events (excluding ignitions)	
			18.l.	Sectionalizer damage or failure - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			18.m.	Connection device damage or failure - Distribution	Yes	51	50	38	48	61	20	9	18	7	11.51875	11.51875	11.51875	11.51875	11.298	11.298	11.298	11.298	# risk events (excluding ignitions)	
			18.n.	Transformer damage or failure - Distribution	Yes	72	52	38	62	45	17	10	23	4	12.90875	12.90875	12.90875	12.90875	12.76075	12.76075	12.76075	12.76075	# risk events (excluding ignitions)	
			18.o.	Other - Distribution	Yes	1	12	13	19	24	3	0	0	0	3.3115	3.3115	3.3115	3.3115	3.2735	3.2735	3.2735	3.2735	# risk events (excluding ignitions)	
		19. Wire-to-wire contact - Distribution	19.a.	Wire-to-wire contact / contamination- Distribution	Yes	3	6	8	2	4	1	0	0	1	1.13575	1.13575	1.13575	1.13575	1.12325	1.12325	1.12325	1.12325	# risk events (excluding ignitions)	
		20. Contamination - Distribution	20.a.	Contamination - Distribution	Yes	1	0	0	0	2	0	0	0	0	0.1495	0.1495	0.1495	0.1495	0.14875	0.14875	0.14875	0.14875	# risk events (excluding ignitions)	
		21. Utility work / Operation	21.a.	Utility work / Operation	Yes	5	6	1	3	5	1	2	4	4	1	1	1	1	1	1	1	1	# risk events (excluding ignitions)	
		22. Vandalism / Theft - Distribution	22.a.	Vandalism / Theft - Distribution	Yes	1	1	1	1	0	1	1	1	0	0.19925	0.19925	0.19925	0.19925	0.19875	0.19875	0.19875	0.19875	# risk events (excluding ignitions)	
		23. Other- Distribution	23.a.	All Other- Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		24. Unknown- Distribution	24.a.	Unknown - Distribution	Yes	371	401	350	286	291	39	55	123	62	83.90375	83.90375	83.90375	83.90375	82.969	82.969	82.969	82.969	# risk events (excluding ignitions)	
x	Outage - Transmission	25. Contact from object - Transmission	25.a.	Veg. contact- Transmission	Yes	1	1	0	1	0	0	0	0	0	0.1435	0.1435	0.1435	0.1435	0.14275	0.14275	0.14275	0.14275	# risk events (excluding ignitions)	
			25.b.	Animal contact- Transmission	Yes	9	5	4	2	5	2	2	0	0	1.1965	1.1965	1.1965	1.1965	1.1965	1.1965	1.1965	1.1965	# risk events (excluding ignitions)	
			25.c.	Balloon contact- Transmission	Yes	17	24	22	27	16	6	8	2	5	5.073	5.073	5.073	5.073	5.073	5.073	5.073	5.073	# risk events (excluding ignitions)	
			25.d.	Vehicle contact- Transmission	Yes	1	2	0	3	1	1	0	0	0	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	# risk events (excluding ignitions)	
			25.e.	Other contact from object - Transmission	Yes	1	0	2	1	3	0	0	0	0	0.335	0.335	0.335	0.335	0.333	0.333	0.333	0.333	# risk events (excluding ignitions)	

Table 7.1: Key recent and projected drivers of risk events

	Risk Event category	Cause category	#	Sub-cause category	Are risk events tracked for ignition driver? (yes / no)	2015	2016	2017	2018	2019	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	Unit(s)	Comments
		26. Equipment / facility failure - Transmission	26.a.	Capacitor bank damage or failure- Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.b.	Conductor damage or failure — Transmission	Yes	2	6	6	2	0	4	0	2	0	0.76575	0.76575	0.76575	0.76575	0.76125	0.76125	0.76125	0.76125	# risk events (excluding ignitions)	
			26.c.	Fuse damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.d.	Lightning arrestor damage or failure- Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.e.	Switch damage or failure- Transmission	Yes	3	0	1	0	0	0	1	1	0	0.1915	0.1915	0.1915	0.1915	0.19025	0.19025	0.19025	0.19025	# risk events (excluding ignitions)	
			26.f.	Pole damage or failure - Transmission	Yes	1	0	0	4	3	0	0	0	0	0.38275	0.38275	0.38275	0.38275	0.3805	0.3805	0.3805	0.3805	# risk events (excluding ignitions)	
			26.g.	Insulator and brushing damage or failure - Transmission	Yes	29	13	6	3	8	0	0	0	0	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	# risk events (excluding ignitions)	
			26.h.	Crossarm damage or failure - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.i.	Voltage regulator / booster damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.j.	Recloser damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.k.	Anchor / guy damage or failure - Transmission	Yes	0	0	1	0	0	0	0	0	0	0.04775	0.04775	0.04775	0.04775	0.0475	0.0475	0.0475	0.0475	# risk events (excluding ignitions)	
			26.l.	Sectionalizer damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.m.	Connection device damage or failure - Transmission	Yes	0	0	0	1	1	0	0	0	0	0.09575	0.09575	0.09575	0.09575	0.09525	0.09525	0.09525	0.09525	# risk events (excluding ignitions)	
			26.n.	Transformer damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
			26.o.	Other - Transmission	Yes	1	0	0	0	0	0	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	# risk events (excluding ignitions)	
		27. Wire-to-wire contact - Transmission	27.a.	Wire-to-wire contact / contamination- Transmission	Yes	1	0	0	0	0	0	0	0	0	0.04775	0.04775	0.04775	0.04775	0.0475	0.0475	0.0475	0.0475	# risk events (excluding ignitions)	
		28. Contamination - Transmission	28.a.	Contamination - Transmission	Yes	3	8	0	3	1	0	1	0	0	0.718	0.718	0.718	0.718	0.71375	0.71375	0.71375	0.71375	# risk events (excluding ignitions)	
		29. Utility work / Operation	29.a.	Utility work / Operation	Yes	0	0	2	0	0	1	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	# risk events (excluding ignitions)	
		30. Vandalism / Theft - Transmission	30.a.	Vandalism / Theft - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# risk events (excluding ignitions)	
		31. Other- Transmission	31.a.	All Other- Transmission	Yes	1	0	0	0	0	0	0	0	0	0.04775	0.04775	0.04775	0.04775	0.0475	0.0475	0.0475	0.0475	# risk events (excluding ignitions)	
		32. Unknown- Transmission	32.a.	Unknown - Transmission	Yes	13	10	10	12	4	3	3	3	4	2.345	2.345	2.345	2.345	2.331	2.331	2.331	2.331	# risk events (excluding ignitions)	
x	Ignition - Distribution	33. Contact from object - Distribution	33.a.	Veg. contact- Distribution	Yes	5	4	3	3	0	0	0	0	0	0.730788	0.730788	0.730788	0.730788	0.707938	0.707938	0.707938	0.707938	# ignitions	
			33.b.	Animal contact- Distribution	Yes	0	2	1	1	1	0	1	1	0	0.24715	0.24715	0.24715	0.24715	0.2436	0.2436	0.2436	0.2436	# ignitions	
			33.c.	Balloon contact- Distribution	Yes	2	3	5	8	0	0	2	0	0	0.898	0.898	0.898	0.898	0.89335	0.89335	0.89335	0.89335	# ignitions	
			33.d.	Vehicle contact- Distribution	Yes	6	4	4	1	3	0	1	2	0	0.897725	0.897725	0.897725	0.897725	0.893875	0.893875	0.893875	0.893875	# ignitions	
			33.e.	Other contact from object - Distribution	Yes	3	2	2	1	1	0	0	0	0	0.449025	0.449025	0.449025	0.449025	0.44695	0.44695	0.44695	0.44695	# ignitions	
		34. Equipment / facility failure - Distribution	34.a.	Capacitor bank damage or failure- Distribution	Yes	0	1	0	0	0	0	0	1	0	0.03825	0.03825	0.03825	0.03825	0.02575	0.02575	0.02575	0.02575	# ignitions	
			34.b.	Conductor damage or failure — Distribution	Yes	2	3	1	0	0	0	0	0	0	0.2835	0.2835	0.2835	0.2835	0.27815	0.27815	0.27815	0.27815	# ignitions	
			34.c.	Fuse damage or failure - Distribution	Yes	0	0	1	0	1	0	0	1	0	0.0665	0.0665	0.0665	0.0665	0.05	0.05	0.05	0.05	# ignitions	
			34.d.	Lightning arrestor damage or failure- Distribution	Yes	0	2	1	0	0	1	0	2	2	0.15	0.15	0.15	0.15	0.1475	0.1475	0.1475	0.1475	# ignitions	
			34.e.	Switch damage or failure- Distribution	Yes	1	0	0	1	1	0	0	1	0	0.141125	0.141125	0.141125	0.141125	0.137625	0.137625	0.137625	0.137625	# ignitions	
			34.f.	Pole damage or failure - Distribution	Yes	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	# ignitions	
			34.g.	Insulator and brushing damage or failure - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			34.h.	Crossarm damage or failure - Distribution	Yes	0	0	0	0	1	0	0	0	0	0.049975	0.049975	0.049975	0.049975	0.04995	0.04995	0.04995	0.04995	# ignitions	
			34.i.	Voltage regulator / booster damage or failure - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			34.j.	Recloser damage or failure - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			34.k.	Anchor / guy damage or failure - Distribution	Yes	0	0	0	1	1	0	0	0	1	0.09995	0.09995	0.09995	0.09995	0.0999	0.0999	0.0999	0.0999	# ignitions	
			34.l.	Sectionalizer damage or failure - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			34.m.	Connection device damage or failure - Distribution	Yes	2	3	0	0	1	1	0	2	0	0.29045	0.29045	0.29045	0.29045	0.2868	0.2868	0.2868	0.2868	# ignitions	
			34.n.	Transformer damage or failure - Distribution	Yes	1	2	0	1	0	0	0	1	0	0.184875	0.184875	0.184875	0.184875	0.1804	0.1804	0.1804	0.1804	# ignitions	
			34.o.	Other - Distribution	Yes	0	1	1	3	3	0	0	2	0	0.38305	0.38305	0.38305	0.38305	0.376875	0.376875	0.376875	0.376875	# ignitions	
		35. Wire-to-wire contact - Distribution	35.a.	Wire-to-wire contact / contamination- Distribution	Yes	0	0	0	1	2	0	0	0	0	0.14905	0.14905	0.14905	0.14905	0.148175	0.148175	0.148175	0.148175	# ignitions	
		36. Contamination - Distribution	36.a.	Contamination - Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		37. Utility work / Operation	37.a.	Utility work / Operation	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		38. Vandalism / Theft - Distribution	38.a.	Vandalism / Theft - Distribution	Yes	0	1	1	0	0	0	0	0	0	0.09965	0.09965	0.09965	0.09965	0.099125	0.099125	0.099125	0.099125	# ignitions	
		39. Other- Distribution	39.a.	All Other- Distribution	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		40. Unknown- Distribution	40.a.	Unknown - Distribution	Yes	2	0	1	0	0	0	0	0	0	0.1472	0.1472	0.1472	0.1472	0.1437	0.1437	0.1437	0.1437	# ignitions	
x	Ignition - Transmission	41. Contact from object - Transmission	41.a.	Veg. contact- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			41.b.	Animal contact- Transmission	Yes	3	0	0	1	0	0	0	0	1	0.1937	0.1937	0.1937	0.1937	0.19175	0.19175	0.19175	0.19175	# ignitions	
			41.c.	Balloon contact- Transmission	Yes	1	0	1	0	1	0	0	0	0	0.1437	0.1437	0.1437	0.1437	0.14175	0.14175	0.14175	0.14175	# ignitions	
			41.d.	Vehicle contact- Transmission	Yes	0	0	0	3	0	0	0	0	0	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	# ignitions	
			41.e.	Other contact from object - Transmission	Yes	0	1	0	1	0	0	0	0	0	0.0937	0.0937	0.0937	0.0937	0.09175	0.09175	0.09175	0.09175	# ignitions	
		42. Equipment / facility failure - Transmission	42.a.	Capacitor bank damage or failure- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.b.	Conductor damage or failure — Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.c.	Fuse damage or failure - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.d.	Lightning arrestor damage or failure- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.e.	Switch damage or failure- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.f.	Pole damage or failure - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.g.	Insulator and brushing damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.h.	Crossarm damage or failure - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.i.	Voltage regulator / booster damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.j.	Recloser damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.k.	Anchor / guy damage or failure - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.l.	Sectionalizer damage or failure - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.m.	Connection device damage or failure - Transmission	Yes	1	0	0	0	0	0	0	0	0	0.04685	0.04685	0.04685	0.04685	0.045875	0.045875	0.045875	0.045875	# ignitions	
			42.n.	Transformer damage or failure - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
			42.o.	Other - Transmission	Yes	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		43. Wire-to-wire contact - Transmission	43.a.	Wire-to-wire contact / contamination- Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		44. Contamination - Transmission	44.a.	Contamination - Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		45. Utility work / Operation	45.a.	Utility work / Operation	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		46. Vandalism / Theft - Transmission	46.a.	Vandalism / Theft - Transmission	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		47. Other- Transmission	47.a.	All Other- Transmission	No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	# ignitions	
		48. Unknown- Transmission	48.a.	Unknown - Transmission	Yes	0	1	0	0	1	0	1	0	0	0.09685	0.09685	0.09685	0.09685	0.095875	0.095875	0.095875	0.095875	# ignitions	

Table 7.1: Key recent and projected drivers of risk events

	Risk Event category	Cause category	#	Sub-cause category	Are risk events tracked for ignition driver? (yes / no)	2015	2016	2017	2018	2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Unit(s)	Comments
x	Ignition - Secondary	49. All - Secondary	49.a.	All - Secondary	Yes	3	0	1	0	4	0	0	3	0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	# ignitions	SDG&E does not track all secondary outages

Utility	SDG&E
Table No.	7.2
Date Modified	2/5/2021

Notes:
Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.
Data from 2015 - 2019 should be actual numbers. 2020 - 2023 should be projected. In future submissions update projected numbers with actuals

Table 7.2: Key recent and projected

| | | | | | | | Number of ignitions by HFTD tier | | | | | | | | | | | | | | | | | | | | Projected ignitions by HFTD tier | | | | | | | | | | | | | | | | | | |

Utility	SDG&E
Table No.	8
Date Modified	2/5/2021

Table 8: State of service territory and utility equipment

Note: These columns are placeholders for future QR submissions.

	Metric type	#	Outcome metric name	Non-HFTD 2015	HFTD Zone 1 2015	HFTD Tier 2 2015	HFTD Tier 3 2015	Non-HFTD 2016	HFTD Zone 1 2016	HFTD Tier 2 2016	HFTD Tier 3 2016	Non-HFTD 2017	HFTD Zone 1 2017	HFTD Tier 2 2017	HFTD Tier 3 2017	Non-HFTD 2018	HFTD Zone 1 2018	HFTD Tier 2 2018	HFTD Tier 3 2018	Non-HFTD 2019	HFTD Zone 1 2019	HFTD Tier 2 2019	HFTD Tier 3 2019	Non-HFTD 2020	HFTD Zone 1 2020	HFTD Tier 2 2020	HFTD Tier 3 2020	HFTD Tiers 2 and 3 2020	Non-HFTD 2021	HFTD Zone 1 2021	HFTD Tier 2 2021	HFTD Tier 3 2021	Non-HFTD 2022	HFTD Zone 1 2022	HFTD Tier 2 2022	HFTD Tier 3 2022	Unit(s)	Comments
x	1. State of service territory and equipment in urban areas	1.a.	Circuit miles (including WUI and non-WUI)																				9276.9	0.1	1113.7	5.7	1119.4										Circuit miles	
		1.b.	Circuit miles in WUI																				105.6	0.0	2.3	0.0	2.3										Circuit miles in WUI	
		1.c.	Number of critical facilities (including WUI and non-WUI)																				13115.0	0.0	959.0	2.0	961.0										Number of critical facilities	
		1.d.	Number of critical facilities in WUI																				109.0	0.0	0.0	0.0	0.0										Number of critical facilities in WUI	
		1.e.	Number of customers (including WUI and non-WUI)																				1037581.0	2.0	83589.0	115.0	83704.0										Number of customers	
		1.f.	Number of customers in WUI																				5445.0	2.0	0.0	0.0	0.0										Number of customers in WUI	
		1.g.	Number of customers belonging to access and functional needs populations (including WUI and non-WUI)																				40564.0	0.0	3678.0	14.0	3692.0										Number of customers belonging to access and functional needs populations	
		1.h.	Number of customers belonging to access and functional needs populations in WUI																				171.0	0.0	0.0	0.0	0.0										Number of customers belonging to access and functional needs populations in WUI	
		1.i.	Circuit miles of overhead transmission lines (including WUI and non-WUI)																				429.2	0.0	110.7	0.0	110.7										Circuit miles of overhead transmission lines	
		1.j.	Circuit miles of overhead transmission lines in WUI																				33.9	0.0	1.7	0.0	1.7										Circuit miles of overhead transmission lines in WUI	
		1.k.	Circuit miles of overhead distribution lines (including WUI and non-WUI)																				2499.0	0.1	181.4	5.2	186.6										Circuit miles of overhead distribution lines	
		1.l.	Circuit miles of overhead distribution lines in WUI																				41.6	0.0	0.1	0.0	0.1										Circuit miles of overhead distribution lines in WUI	
		1.m.	Number of substations (including WUI and non-WUI)																				79.0	0.0	6.0	0.0	6.0										Number of substations	
		1.n	Number of substations in WUI																				1.0	0.0	0.0	0.0	0.0										Number of substations in WUI	
		1.o.	Number of weather stations (including WUI and non-WUI)																				15.0	0.0	6.0	0.0	6.0										Number of weather stations	
		1.p.	Number of weather stations in WUI																				3.0	0.0	0.0	0.0	0.0										Number of weather stations in WUI	
x	2. State of service territory and equipment in rural areas	2.a.	Circuit miles (including WUI and non-WUI)																				1854.0	49.3	2789.1	1845.2	4634.3										Circuit miles	
		2.b.	Circuit miles in WUI																				182.0	0.0	6.5	0.0	6.5										Circuit miles in WUI	
		2.c.	Number of critical facilities (including WUI and non-WUI)																				2427.0	4.0	1467.0	896.0	2363.0										Number of critical facilities	
		2.d.	Number of critical facilities in WUI																				66.0	0.0	0.0	0.0	0.0										Number of critical facilities in WUI	
		2.e.	Number of customers (including WUI and non-WUI)																				87487.0	79.0	77782.0	21139.0	98921.0										Number of customers	
		2.f.	Number of customers in WUI																				3984.0	0.0	0.0	0.0	0.0										Number of customers in WUI	
		2.g.	Number of customers belonging to access and functional needs populations (including WUI and non-WUI)																				3102.0	7.0	4630.0	1811.0	6441.0										Number of customers belonging to access and functional needs populations	
		2.h.	Number of customers belonging to access and functional needs populations in WUI																				137.0	0.0	0.0	0.0	0.0										Number of customers belonging to access and functional needs populations in WUI	
		2.i.	Circuit miles of overhead transmission lines (including WUI and non-WUI)																				152.3	6.4	551.7	248.2	799.8										Circuit miles of overhead transmission lines	
		2.j.	Circuit miles of overhead transmission lines in WUI																				19.7	0.0	1.0	0.0	1.0										Circuit miles of overhead transmission lines in WUI	
		2.k.	Circuit miles of overhead distribution lines (including WUI and non-WUI)																				363.7	42.4	1470.3	1449.9	2920.1										Circuit miles of overhead distribution lines	
		2.l.	Circuit miles of overhead distribution lines in WUI																				63.7	0.0	0.6	0.0	0.6										Circuit miles of overhead distribution lines in WUI	
		2.m.	Number of substations (including WUI and non-WUI)																				31.0	1.0	28.0	11.0	39.0										Number of substations	
		2.n	Number of substations in WUI																				1.0	0.0	0.0	0.0	0.0										Number of substations in WUI	
		2.o.	Number of weather stations (including WUI and non-WUI)																				4.0	2.0	51.0	82.0	133.0										Number of weather stations	
		2.p.	Number of weather stations in WUI																				1.0	0.0	0.0	0.0	0.0										Number of weather stations in WUI	
x	3. State of service territory and equipment in highly rural areas	3.a.	Circuit miles (including WUI and non-WUI)																				216.5	35.3	184.9	213.6	398.5										Circuit miles	
		3.b.	Circuit miles in WUI																				0.0	0.0	0.0	0.0	0.0										Circuit miles in WUI	
		3.c.	Number of critical facilities (including WUI and non-WUI)																				129.0	8.0	85.0	87.0	172.0										Number of critical facilities	
		3.d.	Number of critical facilities in WUI																				0.0	0.0	0.0	0.0	0.0										Number of critical facilities in WUI	
		3.e.	Number of customers (including WUI and non-WUI)																				296.0	79.0	203.0	569.0	772.0										Number of customers	
		3.f.	Number of customers in WUI																				0.0	0.0	0.0	0.0	0.0										Number of customers in WUI	
		3.g.	Number of customers belonging to access and functional needs populations (including WUI and non-WUI)																				4.0	4.0	5.0	20.0	25.0										Number of customers belonging to access and functional needs populations	
		3.h.	Number of customers belonging to access and functional needs populations in WUI																				0.0	0.0	0.0	0.0	0.0										Number of customers belonging to access and functional needs populations in WUI	
		3.i.	Circuit miles of overhead transmission lines (including WUI and non-WUI)																				24.8	1.5	23.4	23.7	47.1										Circuit miles of overhead transmission lines	
		3.j.	Circuit miles of overhead transmission lines in WUI																				0.0	0.0	0.0	0.0	0.0										Circuit miles of overhead transmission lines in WUI	
		3.k.	Circuit miles of overhead distribution lines (including WUI and non-WUI)																				144.1	30.5	174.3	187.2	361.5										Circuit miles of overhead distribution lines	
		3.l.	Circuit miles of overhead distribution lines in WUI																				0.0	0.0	0.0	0.0	0.0										Circuit miles of overhead distribution lines in WUI	
		3.m.	Number of substations (including WUI and non-WUI)																				3.0	2.0	1.0	2.0	3.0										Number of substations	
		3.n	Number of substations in WUI																				0.0	0.0	0.0	0.0	0.0										Number of substations in WUI	
		3.o.	Number of weather stations (including WUI and non-WUI)																				2.0	2.0	8.0	18.0	26.0										Number of weather stations	
		3.p.	Number of weather stations in WUI																				0.0	0.0	0.0	0.0	0.0										Number of weather stations in WUI	

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Notes:
Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV. Report net additions using positive numbers and net removals and undergrounding using negative numbers for circuit miles and numbers of substations. Only report changes expected within the target year.

Table 9: Location of actual and planned utility equipment additions or removal year over year

	Metric type	#	Outcome metric name	Actual Non-HFTD 2020	Actual HFTD Zone 1 2020	Actual HFTD Tier 2 2020	Actual HFTD Tier 3 2020	Projected Non-HFTD 2021	Projected HFTD Zone 1 2021	Projected HFTD Tier 2 2021	Projected HFTD Tier 3 2021	Projected Non-HFTD 2022	Projected HFTD Zone 1 2022	Projected HFTD Tier 2 2022	Projected HFTD Tier 3 2022	Unit(s)	Comments
x	1. Planned utility equipment net addition (or removal) year over year - in urban areas	1.a.	Circuit miles of overhead transmission lines (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]				
		1.b.	Circuit miles of overhead distribution lines (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]				
		1.c.	Circuit miles of overhead transmission lines in WUI		[redacted]				[redacted]				[redacted]				
		1.d.	Circuit miles of overhead distribution lines in WUI		[redacted]				[redacted]				[redacted]				
		1.e.	Number of substations (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]				
		1.f.	Number of substations in WUI		[redacted]				[redacted]				[redacted]			Number of substations in WUI	
		1.g.	Number of weather stations (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Number of weather stations	
		1.h.	Number of weather stations in WUI		[redacted]				[redacted]				[redacted]			Number of weather stations in WUI	
x	2. Planned utility equipment net addition (or removal) year over year - in rural areas	2.a.	Circuit miles of overhead transmission lines (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Circuit miles	
		2.b.	Circuit miles of overhead distribution lines (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Circuit miles	
		2.c.	Circuit miles of overhead transmission lines in WUI		[redacted]				[redacted]				[redacted]			Circuit miles in WUI	
		2.d.	Circuit miles of overhead distribution lines in WUI		[redacted]				[redacted]				[redacted]			Circuit miles in WUI	
		2.e.	Number of substations (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Number of substations	
		2.f.	Number of substations in WUI		[redacted]				[redacted]				[redacted]			Number of substations in WUI	
		2.g.	Number of weather stations (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Number of weather stations	
		2.h.	Number of weather stations in WUI		[redacted]				[redacted]				[redacted]			Number of weather stations in WUI	
x	3. Planned utility equipment net addition (or removal) year over year - in highly rural areas	3.a.	Circuit miles of overhead transmission lines (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Circuit miles	
		3.b.	Circuit miles of overhead distribution lines (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Circuit miles	
		3.c.	Circuit miles of overhead transmission lines in WUI		[redacted]				[redacted]				[redacted]			Circuit miles in WUI	
		3.d.	Circuit miles of overhead distribution lines in WUI		[redacted]				[redacted]				[redacted]			Circuit miles in WUI	
		3.e.	Number of substations (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Number of substations	
		3.f.	Number of substations in WUI		[redacted]				[redacted]				[redacted]			Number of substations in WUI	
		3.g.	Number of weather stations (including WUI and non-WUI)		[redacted]				[redacted]				[redacted]			Number of weather stations	
		3.h.	Number of weather stations in WUI		[redacted]				[redacted]				[redacted]			Number of weather stations in WUI	

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Table No.	10
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Notes:
Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.
In future submissions update planned upgrade numbers with actuals
In the comments column on the far-right, enter the relevant program target(s) associated

Table 10: Location of actual and planned utility infrastructure upgrades year over year

	Metric type	#	Outcome metric name	Actual Non-HFTD 2020	Actual HFTD Zone 1 2020	Actual HFTD Tier 2 2020	Actual HFTD Tier 3 2020	Projected Non-HFTD 2021	Projected HFTD Zone 1 2021	Projected HFTD Tier 2 2021	Projected HFTD Tier 3 2021	Projected Non-HFTD 2022	Projected HFTD Zone 1 2022	Projected HFTD Tier 2 2022	Projected HFTD Tier 3 2022	Unit(s)	Comments
x	1. Planned utility infrastructure upgrades year over year - in urban areas	1.a.	Circuit miles of overhead transmission lines planned for upgrades (including WUI and non-WUI)	0.2		9.6	0	0		0	0	0.2		0.3	0	Circuit miles	
		1.b.	Circuit miles of overhead distribution lines planned for upgrades (including WUI and non-WUI)	1.9		0.3	0	0		0	0	0		0	0	Circuit miles	
		1.c.	Circuit miles of overhead transmission lines planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Circuit miles in WUI	
		1.d.	Circuit miles of overhead distribution lines planned for upgrades in WUI	0.7		0	0	0		0	0	0		0	0	Circuit miles in WUI	
		1.e.	Number of substations planned for upgrades (including WUI and non-WUI)	0		0	0	0		0	0	0		0	0	Number of substations	
		1.f.	Number of substations planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Number of substations in WUI	
		1.g.	Number of weather stations planned for upgrades (including WUI and non-WUI)	0		0	0	2				2		0	0	Number of weather stations	
		1.h.	Number of weather stations planned for upgrades in WUI	0		0	0	2		0	0	2		0	0	Number of weather stations in WUI	
x	2. Planned utility infrastructure upgrades year over year - in rural areas	2.a.	Circuit miles of overhead transmission lines planned for upgrades (including WUI and non-WUI)	0.4		10.8	29	0		6.7	0	0		36.3	1.8	Circuit miles	
		2.b.	Circuit miles of overhead distribution lines planned for upgrades (including WUI and non-WUI)	1.6		21.5	50.8	4		20.6	62.4			10.8	54.2	Circuit miles	
		2.c.	Circuit miles of overhead transmission lines planned for upgrades in WUI	0		0	0	4		0	0	0		0	0	Circuit miles in WUI	
		2.d.	Circuit miles of overhead distribution lines planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Circuit miles in WUI	
		2.e.	Number of substations planned for upgrades (including WUI and non-WUI)	0		0	0	0		0	0	0		0	0	Number of substations	
		2.f.	Number of substations planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Number of substations in WUI	
		2.g.	Number of weather stations planned for upgrades (including WUI and non-WUI)	0		15	13	1		15	0	1		15	0	Number of weather stations	
		2.h.	Number of weather stations planned for upgrades in WUI	0				1		0	0	1		0	0	Number of weather stations in WUI	
x	3. Planned utility infrastructure upgrades year over year - in highly rural areas	3.a.	Circuit miles of overhead transmission lines planned for upgrades (including WUI and non-WUI)	0		0	0	0		0	0	0		0	0	Circuit miles	
		3.b.	Circuit miles of overhead distribution lines planned for upgrades (including WUI and non-WUI)	0		22.8	21.3	0		20	19.9	0		0	0	Circuit miles	
		3.c.	Circuit miles of overhead transmission lines planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Circuit miles in WUI	
		3.d.	Circuit miles of overhead distribution lines planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Circuit miles in WUI	
		3.e.	Number of substations planned for upgrades (including WUI and non-WUI)	0		0	0	0		0	0	0		0	0	Number of substations	
		3.f.	Number of substations planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Number of substations in WUI	
		3.g.	Number of weather stations planned for upgrades (including WUI and non-WUI)	0		0	2	0		0	2	0		0	2	Number of weather stations	
		3.h.	Number of weather stations planned for upgrades in WUI	0		0	0	0		0	0	0		0	0	Number of weather stations in WUI	

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Notes:
"PSPS" = Public Safety Power Shutoff
In future submissions update planned upgrade numbers with actuals

Table 11: Recent use of PSPS and other PSPS metrics

			Actual									Projected								
Metric type	**#**	**Outcome metric name**	**2015**	**2016**	**2017**	**2018**	**2019**	**Q1 2020**	**Q2 2020**	**Q3 2020**	**Q4 2020**	**Q1 2021**	**Q2 2021**	**Q3 2021**	**Q4 2021**	**Q1 2022**	**Q2 2022**	**Q3 2022**	**Q4 2022**	**Unit(s)**	**Comments**
1. Recent use of PSPS	1.a.	Frequency of PSPS events (total)	0	0	5	4	4	0	0	1	4	0	0	0.50	3.75					Number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability, per year. Only include events in which de-energization ultimately ocurred	
	1.b.	Scope of PSPS events (total)	0	0	200	265	324	0	0	2	508	0	0	0.50	322.50					Circuit-events, measured in number of events multiplied by number of circuits de-energized per year	
	1.c.	Duration of PSPS events (total)	0	0	279	201	174	0	0	13	184	0	0	14.50	168.50					Customer hours per year	Duration calculated from first device de-energized to last device restored
2. Customer hours of PSPS and other outages	2.a.	Customer hours of planned outages including PSPS (total)	106,210	883,385	1,826,807	2,192,064	2,433,617	324,613	107,053	490,461	2,884,884	310,013	308,413	312,575	1,618,889					Total customer hours of planned outages per year	SDG&E does not include PSPS as "planned" ouatges
	2.b.	Customer hours of unplanned outages, not including PSPS (total)	1,504,042	2,058,237	2,090,995	1,887,418	1,705,636	346,753	401,987	1,096,906	507,255	496,735	314,087	600,865	521,518					Total customer hours of unplanned outages per year	
	2.c.	System Average Interruption Duration Index (SAIDI) (including PSPS)	63.26	86.01	117.49	121.02	122.96	13.95	16.17	44.14	111.45	21.75	12.93	24.69	76.64					SAIDI index value = sum of all interruptions in time period where each interruption is defined as sum(duration of interruption * # of customer interruptions) / Total number of customers served	
	2.d.	System Average Interruption Duration Index (SAIDI) (excluding PSPS)	63.26	86.01	86.64	77.45	69.21	13.95	16.17	44.13	20.41	20.49	12.93	24.69	21.44					SAIDI index value = sum of all interruptions in time period where each interruption is defined as sum(duration of interruption * # of customer interruptions) / Total number of customers served	
	2.e.	System Average Interruption Frequency Index (SAIFI) (including PSPS)	0.62	0.68	0.58	0.66	0.64	0.13	0.17	0.26	0.20	0.16	0.13	0.19	0.18					SAIFI index value = sum of all interruptions in time period where each interruption is defined as (total # of customer interruptions) / (total # of customers served)	
	2.f.	System Average Interruption Frequency Index (SAIFI) (excluding PSPS)	0.62	0.68	0.57	0.64	0.61	0.13	0.17	0.26	0.14	0.16	0.13	0.19	0.15					SAIFI index value = sum of all interruptions in time period where each interruption is defined as (total # of customer interruptions) / (total # of customers served)	
3. Critical infrastructure impacted by PSPS	3.a.	Critical infrastructure impacted by PSPS	0	0	633	832	968	0	0	0	2340	0	0	0	1,193					Number of critical infrastructure (in accordance with D.19-05-042) locations impacted per hour multiplied by hours offline per year	
4. Community outreach of PSPS metrics	4.a.	# of customers impacted by PSPS	0	0	17,619	30,069	49,880	0	0	49	99,735	0	0	26	40,205					# of customers impacted by PSPS (if multiple PSPS events impact the same customer, count each event as a separate customer)	
	4.b.	# of medical baseline customers impacted by PSPS	0	0	937	1,812	2,853	0	0	6	6,370	0	0	2	2,590					# of customers impacted by PSPS (if multiple PSPS events impact the same customer, count each event as a separate customer)	
	4.c.	# of customers notified prior to initiation of PSPS event	0	0	19,612	30,692	47,969	0	0	49	90,991	0	0	26	38,195					# of customers notified of PSPS event prior to initiation (if multiple PSPS events impact the same customer, count each event in which customer was notified as a separate customer)	
	4.d.	# of medical baseline customers notified prior to initiation of PSPS event	0	0	656	1,812	2,756	0	0	6	6,262	0	0	2	2,590					# of customers notified of PSPS event prior to initiation (if multiple PSPS events impact the same customer, count each event in which customer was notified as a separate customer)	
	4.e.	% of customers notified prior to a PSPS event impacting them	0	0	111%	102%	96%	0	0	100%	91%	0	0	100%	95%					=4.c. / 4.a.	
	4.f.	% of medical baseline customers notified prior to a PSPS event impacting them	0	0	70%	100%	97%	0%	0%	100%	98%	0	0	100%	100%					=4.d. / 4.b.	
5. Other PSPS metrics	5.a.	Number of PSPS events triggered where no de-energization occurred	0	0	0	0	1	0	0	1	1	0	0	0.25	0.50					Number of instances where utility notified the public of a potential PSPS event but no de-energization followed	
	5.b.	Number of customers located on de-energized circuit	0	0	67,266	79,587	112,582	0	0	4,214	153,033	0	0	2,816	97,388					Number of customers	
	5.c.	Customer hours of PSPS per RFW OH circuit mile day	0	0	0.0015	0.0016	0.0033	0	0	0.0004	0.0030	0	0	0.0005	0.0018					=1.c. / RFW OH circuit mile days in time period	
	5.d.	Frequency of PSPS events (total) - High Wind Warning wind conditions	0	0	1	3	2	0	0	0	3	0	0	0.25	2.25					Events over time period that overlapped with a High Wind Warning as defined by the National Weather Service	
	5.e.	Scope of PSPS events (total) - High Wind Warning wind conditions	0	0	16,848	30,048	49,462	0	0	0	89,995	0	0	0	36,814					Estimated customers impacted over time period that overlapped with a High Wind Warning as defined by the National Weather Service	
	5.f.	Duration of PSPS events (total) - High Wind Warning wind conditions	0	0	128	91	75	0	0	0	80	0	0	0	69					Customer hours over time period that overlapped with a High Wind Warning as defined by the National Weather Service	

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Notes:
Risk-Spend-Efficiency (RSE) is defined as "An estimate of the cost-effectiveness of initiative, 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."

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Table 12: Mitigation initiative financials

Metric type	WMP Table # / Category	2021 WMP Initiative #	Initiative activity	2020 WMP Initiative #	Primary driver targeted	Secondary driver targeted	Year initiated	Estimated RSE in non-HFTD region	Estimated RSE in HFTD Zone 1	Estimated RSE in HFTD Tier 2	Estimated RSE in HFTD Tier 3	If existing: most recent proceeding that has reviewed program	If new: memorandum account	Current compliance status _ in / exceeding compliance with regulations	Associated rule(s) - if multiple, separate by semi-colon - ";"	If spend not disaggregated by category, note spend category or mark general operations	Alternative units in which initiative is reported (if not line miles); still required to report line miles	Comments	2020 CAPEX ($ thousands)	2020 OPEX ($ thousands)	2020 Line miles to be treated	2020 Alternative units (if used)	2021 CAPEX ($ thousands)	2021 OPEX ($ thousands)	2021 Line miles to be treated	2021 Alternative units (if used)	2022 CAPEX ($ thousands)	2022 OPEX ($ thousands)	2022 Line miles to be treated	2022 Alternative units (if used)	Notes
Asset inspection	Asset Management & Inspections	7.3.4.15	Substation inspections	5.3.4.15.			1997			0	0				G.O. 174															The way SDG&E designs and constructs its substations, with the steel structures and gravel and concrete base makes it difficult for a fire to spread outside the substation. With very little ignition history, SDG&E performs substation inspection and maintenance more for the importance of substation reliability.
Vegetation management project	Vegetation Management & Inspections	7.3.5.1	Additional efforts to manage community and environmental impacts	5.3.5.1.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.2	Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)	5.3.5.2.	Contact with vegetation		1998	3,04		128.44	230.3	2019 GRC		Meets	P.U. Code § 451		Inspections		-		57,791	NA	451207		49,765	NA	455000		49,765	NA	455000	
Vegetation inspection	Vegetation Management & Inspections	7.3.5.3	Detailed inspections of vegetation around transmission electric lines and equipment	5.3.5.3.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.4	Emergency response vegetation management due to red flag warning or other urgent conditions	5.3.5.4.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.5	Fuel management and reduction of "slash" from vegetation management activities	5.3.5.5.	Contact with vegetation		2019				28.58	2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Sturctures Cleared		-		5,805	NA	324		6,206	NA	500		6,206	NA	500	
Vegetation inspection	Vegetation Management & Inspections	7.3.5.6	Improvement of inspections	5.3.5.6.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.7	LiDAR inspections of vegetation around distribution electric lines and equipment (vegetation management technology)	5.3.5.7.			2019									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.8	LiDAR inspections for vegetation around transmission electric lines and equipment	5.3.5.8.			2019									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.9	Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)	5.3.5.9.	Contact with vegetation		2019			66.93	119.84	2019 GRC		Exceeds	P.U. Code § 451		Trees Trimmed to enahced levels		-		10,235	NA	17095		10,235	NA	17000		10,235	NA	17000	
Vegetation inspection	Vegetation Management & Inspections	7.3.5.10	Other discretionary inspection of vegetation around transmission electric lines and equipment, beyond inspections mandated by rules and regulations	5.3.5.10.			2019									Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.11	Patrol inspections of vegetation around distribution electric lines and equipment	5.3.5.11.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.12	Patrol inspections of vegetation around transmission electric lines and equipment	5.3.5.12.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.13	Quality assurance / quality control of vegetation inspections	5.3.5.13.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.14	Recruiting and training of vegetation management personnel	5.3.5.14.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.15	Remediation of at-risk species	5.3.5.15.			2019									Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.16	Removal and remediation of trees with strike potential to electric lines and equipment (Hazard tree removal and Right Tree-Right Place)	5.3.5.16.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation inspection	Vegetation Management & Inspections	7.3.5.17	Substation inspections	5.3.5.17.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.18	Substation vegetation management	5.3.5.18.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.19	Vegetation inventory system (Tree database)	5.3.5.19.			2002									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Vegetation management project	Vegetation Management & Inspections	7.3.5.20	Vegetation management to achieve clearances around electric lines and equipment (Pole brushing)	5.3.5.20.	Contact with vegetation		1998			162.48	272.48	2019 GRC		Meets	P.U. Code § 451		Poles Brushed		-		5,433	NA	36563		5,433	NA	35500		5,433	NA	35500	
Other	Grid Operations & Operating Protocols	7.3.6.1.1	Recloser protocols	5.3.6.1.	Other contact with object	Equipment failure	2008	NA	NA	372838.28	532348.21	2019 GRC		Exceeds	P.U. Code § 451				-		NA	NA			NA	NA			NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.1.2	Sensitive/Fast Protection settings		Other contact with object	Equipment failure	2015			47363.6	106433.39	2019 GRC		Exceeds	P.U. Code § 451				-		NA	NA	-		NA	NA	-		NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.2	Crew accompanying ignition prevention and suppression resources and services (Wildfire infrastructure protection teams – Contract fire resources)	5.3.6.2.	Equipment failure	Other contact with object	2009			68.58	69.69	2019 GRC		Exceeds	P.U. Code § 451				-		2,588	NA	NA		2,936	NA	NA		2,936	NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.3	Personnel work procedures and training in conditions of elevated fire risk (Other special work procedures)	5.3.6.3.	Equipment failure	Other contact with object	2008			61.9	84.57	2019 GRC		Exceeds	P.U. Code § 451				-		NA	NA	-		NA	NA	-		NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.4	Protocols for PSPS re-energization	5.3.6.4.	Other contact with object	Equipment failure	2013					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				-		663	NA	NA			NA	NA			NA	NA	This is an activity that is foundational to supporting wildfire mitigation efforts and is part of core PSPS operations. Costs for protocols cannot be separated out and evluating benefits for having protocols cannot be meaningfully measured.
Other	Grid Operations & Operating Protocols	7.3.6.5	PSPS events and mitigation of PSPS impacts	5.3.6.5.	Other contact with object	Equipment failure	2013			92.98	93.89					Other - Emergency management Operations			-											
Other	Grid Operations & Operating Protocols	7.3.6.6.1	Aviation firefighting program	5.3.6.6.1.	Equipment failure	Other contact with object	2008	1.1		15.72	26.07	2019 GRC		Exceeds	P.U. Code § 451				-		7,092	6,766	NA	NA	10,185	7,610	NA	NA	2,463	10,320	NA	NA	
Other	Data Governance	7.3.7.1	Centralized repository for data	5.3.7.1.			2019					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				-		5,272		NA	NA	19,004		NA	NA	12,890		NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Data Governance	7.3.7.2	Collaborative research on utility ignition and/or wildfire (Innovation lab and other collaboration)	5.3.7.2.			2012									Fire science and climate adaptation department			-											
Other	Data Governance	7.3.7.3	Documentation and disclosure of wildfire-related data and algorithms	5.3.7.3.			2020					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				-		2,208		NA	NA	3,689		NA	NA	3,689		NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Data Governance	7.3.7.4.1	Ignition management program	5.3.7.4.1.			2019									Fire science and climate adaptation department			-											
Other	Data Governance	7.3.7.4.2	Reliability database	5.3.7.4.2.			2000									Centralized repository for data														
Other	Resource Allocation Methodology	7.3.8.1	Allocation methodology development and application (Asset management)	5.3.8.1.			2019					2019 GRC		Exceeds	P.U. Code § 451				-		1,623		329	NA	NA	2,845		387	NA	NA		387	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Resource Allocation Methodology	7.3.8.2	Risk reduction scenario development and analysis	5.3.8.2.			2019									Allocation methodology development and application (Asset management)			-		-									
Other	Resource Allocation Methodology	7.3.8.3	Risk spend efficiency analysis - not to include PSPS	5.3.8.3.			2019									Allocation methodology development and application (Asset management)														
Other	Resource Allocation Methodology	7.3.8.4.1	Wildfire mitigation personnel	5.3.8.4.1.			2019					2020 WMP		Exceeds	P.U. Code § 451				-		3,389	NA	NA		4,155	NA	NA		5,230	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Resource Allocation Methodology	7.3.8.4.2	PSPS mitigation engineering team	5.3.8.4.2.			2020									Wildfire mitigation personnel			-											
Other	Emergency Planning & Preparedness	7.3.9.1	Adequate and trained workforce for service restoration	5.3.9.4.1			2013									Other - Emergency management Operations			-											
Other	Emergency Planning & Preparedness	7.3.9.2	Community outreach, public awareness, and communications efforts	5.3.9.4.2			2013									Other - Emergency management Operations														
Other	Emergency Planning & Preparedness	7.3.9.3	Customer support in emergencies	5.3.9.4.3			2013									Other - Emergency management Operations			-											
Other	Emergency Planning & Preparedness	7.3.9.4	Disaster and emergency preparedness plan (CERP)	5.3.9.4.4			2013									Other - Emergency management Operations			-											
Other	Emergency Planning & Preparedness	7.3.9.5	Preparedness and planning for service restoration (Mutual assistance and contractors)	5.3.9.4.5			2013									Other - Emergency management Operations			-											
Other	Emergency Planning & Preparedness	7.3.9.6	Protocols in place to learn from wildfire events (After action reports)	5.3.9.4.6			2017									Other - Emergency management Operations			-											
Other	Emergency Planning & Preparedness	7.3.9.7	Other - Emergency management Operations	5.3.9.4.7			2013					2019 GRC		Exceeds	P.U. Code § 451				-		2,140		12,214	NA	NA	5,473		12,153	NA	NA		3,078		12,153	NA	NA	
Other	Stakeholder Cooperation & Community Engagement	7.3.10.1	Community engagement	5.3.10.1.			2013					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				-				448	NA	NA			NA	NA			NA	NA	This initiative is primarily around educating the community about wildfire safety, resiliency and emergency preparedness. Quantifying an RSE for it would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring effectiveness of that reduction.
Other	Stakeholder Cooperation & Community Engagement	7.3.10.1.1	PSPS communication practices	5.3.6.5.3.			2013					2019 GRC		Exceeds	P.U. Code § 451				-		4,474		8,227	NA	NA	3,302		9,386	NA	NA		2,656		9,189	NA	NA	
Other	Stakeholder Cooperation & Community Engagement	7.3.10.2	Cooperation and best practice sharing with agencies outside California	5.3.10.2.			2013									PSPS communication practices			-											
Other	Stakeholder Cooperation & Community Engagement	7.3.10.3	Cooperation with suppression agencies	5.3.10.3.			2013									PSPS communication practices														
Other	Stakeholder Cooperation & Community Engagement	7.3.10.4	Forest service and fuel reduction cooperation and joint roadmap	5.3.10.4.			2019									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-											
Other	Stakeholder Cooperation & Community Engagement	7.3.10.5	Mylar Balloon Alternative				2012					2021 WMP Update	WMPMA	Exceeds	P.U. Code § 451				-				86	NA	NA			88	NA	NA			NA	NA	The current scope of this initiative is focused on outreach efforts to drive adoption of the alternative technology for Mylar balloons. No current deployment of this technology is in place to allow for a calculation of RSEs based on measureable indicators of effectiveness.
																			-												

Notes:

1) Amounts shown above are CPUC-jurisdiction direct costs

2) Only CPUC-related costs are recorded in the Wildfire Mitigation Plan Memorandum Account for recovery.

Attachment C

List of Priority Essential Service Providers

A listing of entities that SDG&E considers to be priority essential services is provided in Attachment C. This list is current as of February 2021 and given the dynamic nature of some categories, is subject to change.

Priority Essential Services SDG&E Customer List

Entity Name	Category
AMERICAN RED CROSS	BLOOD BANKS
SAN DIEGO BLOOD BANK	BLOOD BANKS
SOLANA ENERGY ALLIANCE	CCA
AA BLOCKS LLC	CHEMICAL
ABOVCHEM LLC	CHEMICAL
ACADIA PHARMACEUTICALS	CHEMICAL
AIRGAS WEST INC	CHEMICAL
ALDILA GOLF DBA VICTORY ARCH	CHEMICAL
ALICHEM	CHEMICAL
ALL ONE GOD FAITH INC	CHEMICAL
ALLERMED LABS INC	CHEMICAL
AMERICAN FIRE COATING INC	CHEMICAL
AMERICAN PEPTIDE COMPANY INC	CHEMICAL
AMERICAN PHARMA CORP	CHEMICAL
AMERICAN POWDER COAT LLC	CHEMICAL
AMERIWEST TECH INC	CHEMICAL
AMPLYX PHARMACEUTICALS	CHEMICAL
ANGIONETICS INC	CHEMICAL
ARA CHEM	CHEMICAL
ARENA PHARMACEUTICALS INC	CHEMICAL
ARGONAUT MANUFACTURING SRV	CHEMICAL
ARMOR CONTRACT GLAZING	CHEMICAL
ARTIFICIAL TURF SUPPLY LLC	CHEMICAL
AT SCIENTIFIC	CHEMICAL
ATLAS CHEMICAL CO	CHEMICAL
AVISTA TECHNOLOGIES INC	CHEMICAL
AVISYN PHARMA INC	CHEMICAL
AZTEC PERLITE COMPANY INC	CHEMICAL
BELOTECA INC	CHEMICAL
BEN REDLICH	CHEMICAL
BIO D PRODUCTS	CHEMICAL
BIOFILM INCORPORATED	CHEMICAL
BIOFUELS ENERGY LLC	CHEMICAL
BIOMAX HEALTH PRODUCTS INC	CHEMICAL
BIOMED REALTY LP	CHEMICAL
BIOSETTIA INC	CHEMICAL
BIOTICS RESEARCH CORP	CHEMICAL

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Priority Essential Services SDG&E Customer List

Entity Name	Category
BRENNTAG PACIFIC INC	CHEMICAL
CA BOTANA INT'L INC	CHEMICAL
CALASIA PHARMACEUTICALS	CHEMICAL
CALIFIA PHARMA INC	CHEMICAL
CARLSBAD MANUFACTURING CORP	CHEMICAL
CARLSBAD TECHNOLOGY INC	CHEMICAL
CAROMATECH INC	CHEMICAL
CHONTECH INC	CHEMICAL
CLINIQA CORP	CHEMICAL
COLORESCIENCE INC	CHEMICAL
COMBI BLOCKS INCORPORATION	CHEMICAL
COOLA SUN CARE	CHEMICAL
CP KELCO	CHEMICAL
CURTIS TECHNOLOGY INC	CHEMICAL
CW SAN DIEGO LLC	CHEMICAL
DIVERSIFIED NANO SOLUTIONS	CHEMICAL
DUN EDWARDS CORP	CHEMICAL
DYNAMIC DESIGN PHARMA INC	CHEMICAL
EBERT COMPOSITES CORP	CHEMICAL
ELEMENTARY DESIGN	CHEMICAL
EMERALD HEALTH PHARMA	CHEMICAL
EMERGING PHARMACIES LLC	CHEMICAL
ENERGY SUSPENSIONS	CHEMICAL
EPICUREN DISCOVERY INC	CHEMICAL
EPIGEN BIOSCIENCES INC	CHEMICAL
FIZZIQUE LLC	CHEMICAL
FOLEXPORT INC	CHEMICAL
FOODAROM USA INC	CHEMICAL
FX LABS	CHEMICAL
GABRIEL COSTILLA	CHEMICAL
GINOLIS INC	CHEMICAL
GLOBAL PLASTICS LP	CHEMICAL
GREATSOIL LLC	CHEMICAL
GREEN-GO RECYCLING INC	CHEMICAL
H AND M DIST INC	CHEMICAL
HARRELLS LLC	CHEMICAL
HEMPEL USA INC	CHEMICAL

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Priority Essential Services SDG&E Customer List

Entity Name	Category
HOCKING INTERNATIONAL LABS	CHEMICAL
HYDRO AGRI	CHEMICAL
HYDROGENICS USA INC	CHEMICAL
ILLUMINA INC	CHEMICAL
IMMUNO ACTIVA	CHEMICAL
INK SYSTEMS INC	CHEMICAL
INNOMINATA	CHEMICAL
INNOVATIVE BIOSCIENCES INC	CHEMICAL
INNOVUS PHARMACEUTICALS INC	CHEMICAL
INOVA DIAGNOSTICS	CHEMICAL
INTERNATIONAL BUS ENT	CHEMICAL
INTERNATIONAL STEM CELL CORP	CHEMICAL
INVIVOSCRIBE TECH	CHEMICAL
IRISYS LLC	CHEMICAL
J & D LABORATORIES INC	CHEMICAL
JACOB RUBENSTEIN	CHEMICAL
JAMES S PYER	CHEMICAL
JESSUP SERVICES	CHEMICAL
KBI BIOPHARMA INC	CHEMICAL
KUNHUA CHEN	CHEMICAL
LATITUDE PHARM INC	CHEMICAL
LEEMARC INDUSTRIES	CHEMICAL
LIFE TECHNOLOGIES	CHEMICAL
MC BRADFORD INC	CHEMICAL
METACRINE INC	CHEMICAL
NATURAL ALTERNATIVES INTNL	CHEMICAL
NATURAL THOUGHTS INC	CHEMICAL
NEOMPS INC	CHEMICAL
NEURELIS INC	CHEMICAL
NEURMEDIX	CHEMICAL
NEUVOGEN INC	CHEMICAL
NEW LEAF BIOFUEL LLC	CHEMICAL
NEWOPP BIO PHARMACEUTICALS	CHEMICAL
NICOPHARM PHARMACEUTICAL SOL	CHEMICAL
NITTO BIO PHARMA	CHEMICAL
O A L ASSOC INC	CHEMICAL
OTONOMY	CHEMICAL

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Priority Essential Services SDG&E Customer List

Entity Name	Category
PACIFIC BIOPHARMA LOGISTICS	CHEMICAL
PACK LAB INC	CHEMICAL
PARKER HANNIFIN CORP	CHEMICAL
PATHWAY GENOMICS CORP	CHEMICAL
PFENEX INC	CHEMICAL
PHARMAFIND	CHEMICAL
PHASEBIO PHARMACEUTICALS INC	CHEMICAL
PLANT DEVAS INC	CHEMICAL
PLASTIFAB INC	CHEMICAL
POLYPEPTIDE LABORATORIES SD	CHEMICAL
PROCHEM SPECIALTY PROD	CHEMICAL
PROMETHEUS LABS INC	CHEMICAL
PURETY COSMETICS	CHEMICAL
QPEX BIOPHARMA	CHEMICAL
QUIDEL CORP	CHEMICAL
RECYCLED AGGREGATE MATERIALS	CHEMICAL
RECYCLING TECH KNOWLEDGE	CHEMICAL
REJUVENATION THERAPEUTICS	CHEMICAL
RENEO PHARMACEUTICALS INC	CHEMICAL
RETROPHIN INC	CHEMICAL
RHINO LININGS USA INC	CHEMICAL
SALIS INTERNATIONAL INC	CHEMICAL
SCANTIBODIES LAB INC	CHEMICAL
SCRIPPS LABORATORIES INC	CHEMICAL
SENSIENT COLORS LLC	CHEMICAL
SENTE	CHEMICAL
SENTISS PHARMACEUTICALS	CHEMICAL
SHELBY J STANFILL	CHEMICAL
SHIRE PHARMACEUTICAL COMPANY	CHEMICAL
SPECIALTY MANUFACTURING INC	CHEMICAL
SPOERRI INC	CHEMICAL
STA PHARMACETICAL US LLC	CHEMICAL
STAR HEALTH LLC	CHEMICAL
STEGO INDUSTRIES LLC	CHEMICAL
STEMELL INC	CHEMICAL
STEROGENE BIO SEPR INC	CHEMICAL
STRATUM MEDICAL INC	CHEMICAL

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Priority Essential Services SDG&E Customer List

Entity Name	Category
SUN BUM LLC	CHEMICAL
SUNREZ CORP	CHEMICAL
SUNSET PHARMECUTICALS INC	CHEMICAL
SYNTHETIC GENOMICS	CHEMICAL
SYNTHETIC PROTEOMICS INC	CHEMICAL
TAO OF MAN LLC	CHEMICAL
TARSAL PHARMACEUTICALS	CHEMICAL
TENOVA PHARMACEUTICALS	CHEMICAL
TOTAL POWER INC	CHEMICAL
TRICITY PAINT	CHEMICAL
TRIPLE BEST LLC	CHEMICAL
VERSUM MATERIALS US LLC	CHEMICAL
VERTEX PHARMACEUTICALS LLC	CHEMICAL
WESTAIR GASES & EQUIPMENT	CHEMICAL
WESTBRIDGE AGRICULTURAL	CHEMICAL
WONDFO USA CORPORATION LTD	CHEMICAL
XCOVERY BETTA PHARMA INC	CHEMICAL
XEN BIOFLUIDX INC	CHEMICAL
XERIS PHARMACEUTICALS INC	CHEMICAL
XTRACTA PHARMA	CHEMICAL
A T & T COMM OF CA INC	COMMUNICATIONS
A WIRELESS	COMMUNICATIONS
AT&T	COMMUNICATIONS
AT&T MOBILITY	COMMUNICATIONS
AT&T MOBILITY LLC	COMMUNICATIONS
AT&T SERVICES INC	COMMUNICATIONS
ATC TOWER CORP	COMMUNICATIONS
CALIFORNIA COX PCS	COMMUNICATIONS
CALVARY CHAPEL	COMMUNICATIONS
CHARTER COMMUNICATIONS HLDG	COMMUNICATIONS
CITY OF CARLSBAD	COMMUNICATIONS
CLEAR CHANNEL RADIO DIP	COMMUNICATIONS
CO OF SAN DIEGO	COMMUNICATIONS
COX COMMUNICATIONS CALIF LLC	COMMUNICATIONS
COX COMMUNICATIONS INC	COMMUNICATIONS
CRICKET COMMNICATIONS INC	COMMUNICATIONS
CRICKET COMMUNICATIONS INC	COMMUNICATIONS

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Priority Essential Services SDG&E Customer List

Entity Name	Category
CW SAN DIEGO	COMMUNICATIONS
ENTERCOM COMMUNICATIONS CORP	COMMUNICATIONS
FAMILY STATIONS INC	COMMUNICATIONS
FRONTIER CALIFORNIA INC DIP	COMMUNICATIONS
HERRING BROADCASTING INC	COMMUNICATIONS
HIT MOBILE	COMMUNICATIONS
K N S D	COMMUNICATIONS
K29DX DIP	COMMUNICATIONS
KBNT CHANNEL 17	COMMUNICATIONS
KSYY RADIO	COMMUNICATIONS
LEVEL 3 COMMUNICATIONS	COMMUNICATIONS
MARCUS EVANS CO	COMMUNICATIONS
MCKINNON BROADCASTING	COMMUNICATIONS
MCKINNON ENTERPRISES	COMMUNICATIONS
MIDWEST TV INC	COMMUNICATIONS
MILTON E BLACK	COMMUNICATIONS
PAUMA VILLAGE CABLE CO	COMMUNICATIONS
RADIO 1210 INC	COMMUNICATIONS
RAMONA TOWN RADIO INC	COMMUNICATIONS
RF EXPOSURE LAB LLC	COMMUNICATIONS
ROBEY & ASSOCIATES INC	COMMUNICATIONS
SCRIPPS MEDIA INC	COMMUNICATIONS
SEUNG PAIK	COMMUNICATIONS
SPECTRASITE COMMUNICATIONS	COMMUNICATIONS
SPRINT NEXTEL CORPORATION	COMMUNICATIONS
SPRINT SPECTRUM LP	COMMUNICATIONS
T W TELECOM	COMMUNICATIONS
TELEPORT COMMUNICATIONS	COMMUNICATIONS
T-MOBILE USA INC	COMMUNICATIONS
T-MOBILE WEST LLC	COMMUNICATIONS
TRIBUNE	COMMUNICATIONS
U S SPRINT CO	COMMUNICATIONS
VERIZON WIRELESS	COMMUNICATIONS
VLY CTR CABLE SYSTEMS	COMMUNICATIONS
VOICE STREAM WIRELESS	COMMUNICATIONS
WILLIAMS COMMUNICATIONS	COMMUNICATIONS
XO COMMUNICATIONS	COMMUNICATIONS

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Priority Essential Services SDG&E Customer List

Entity Name	Category
833 ASH ST LLC	COVID RELATED TEMP SITES*
ACE PARKING	COVID RELATED TEMP SITES*
ALERE SAN DIEGO	COVID RELATED TEMP SITES*
ALLIANCE FOR QUALITY ED	COVID RELATED TEMP SITES*
AMERICAN CAMPUS MANAGEMENT	COVID RELATED TEMP SITES*
APOSTOLIC ASSEMBLY	COVID RELATED TEMP SITES*
BEYLER FEECE DEVELOPMENT	COVID RELATED TEMP SITES*
C C A E	COVID RELATED TEMP SITES*
C PATRICK COWAN TRUSTEE	COVID RELATED TEMP SITES*
C R ASSOCIATES	COVID RELATED TEMP SITES*
CALIFORNIA BANK & TRUST	COVID RELATED TEMP SITES*
CARLTON HILLS LUTHERAN	COVID RELATED TEMP SITES*
CASA FAMILIAR INC	COVID RELATED TEMP SITES*
CATH CHARITIES DIOCESE OF SD	COVID RELATED TEMP SITES*
CHICANO FEDERATION OF SD	COVID RELATED TEMP SITES*
CITY OF CHULA VISTA	COVID RELATED TEMP SITES*
CITY OF IMPERIAL BEACH	COVID RELATED TEMP SITES*
CITY OF LEMON GROVE	COVID RELATED TEMP SITES*
CITY OF NATIONAL CITY	COVID RELATED TEMP SITES*
CITY OF OCEANSIDE	COVID RELATED TEMP SITES*
CITY OF SAN DIEGO	COVID RELATED TEMP SITES*
CLINICAL MICRO SENSORS INC	COVID RELATED TEMP SITES*
CO OF SAN DIEGO	COVID RELATED TEMP SITES*
CSU SAN MARCOS	COVID RELATED TEMP SITES*
DAVITA INC	COVID RELATED TEMP SITES*
DOVE PROFESSIONAL GRP 2 LLC	COVID RELATED TEMP SITES*
DREAMS FOR CHANGE LLC	COVID RELATED TEMP SITES*
EAST COUNTY TRANSITIONAL	COVID RELATED TEMP SITES*
EL CAJON MAGNOLIA ASSOC LLC	COVID RELATED TEMP SITES*
FALLBROOK REG HEALTH DIST	COVID RELATED TEMP SITES*
GENENTECH INC	COVID RELATED TEMP SITES*
GENETRONICS INC	COVID RELATED TEMP SITES*
GON-REY LLC	COVID RELATED TEMP SITES*
GROSSMONT HEALTHCARE DIST	COVID RELATED TEMP SITES*
GROSSMONT HOSPITAL CORP	COVID RELATED TEMP SITES*
HOLOGIC INC	COVID RELATED TEMP SITES*
INTERFAITH COMMUNITY SERVICE	COVID RELATED TEMP SITES*

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Priority Essential Services SDG&E Customer List

Entity Name	Category
ISHVERBHAI PATEL	COVID RELATED TEMP SITES*
JEWISH FAMILY SERVICE	COVID RELATED TEMP SITES*
JIF PAK MFG INC	COVID RELATED TEMP SITES*
KAISER PERMANENTE	COVID RELATED TEMP SITES*
LABORATORY CORP OF AMERICA	COVID RELATED TEMP SITES*
MEADOW LAKE COUNTRY CLUB LLC	COVID RELATED TEMP SITES*
MENTAL HEALTH SYSTEMS INC	COVID RELATED TEMP SITES*
MEXICAN CONSULATE	COVID RELATED TEMP SITES*
MONICA PERLMAN MD INC	COVID RELATED TEMP SITES*
MV CHRISTIAN FELLOWSHIP	COVID RELATED TEMP SITES*
NAVAL HOSPITAL CAMP PENDLTN	COVID RELATED TEMP SITES*
NORTHGATE GONZALEZ LLC	COVID RELATED TEMP SITES*
OAK VALLEY HOTEL LLC	COVID RELATED TEMP SITES*
OPERATION HOPE N COUNTY INC	COVID RELATED TEMP SITES*
PALOMAR HEALTH	COVID RELATED TEMP SITES*
PATH	COVID RELATED TEMP SITES*
PHARMINGEN	COVID RELATED TEMP SITES*
QUEST DIAGNOSTICS	COVID RELATED TEMP SITES*
RADY CHILDREN'S HOSPITAL-SD	COVID RELATED TEMP SITES*
RICHARD E STRINGHAM CO	COVID RELATED TEMP SITES*
ROMAN CATHOLIC BISHOP SD	COVID RELATED TEMP SITES*
ROYAL HOSPITALITY INC	COVID RELATED TEMP SITES*
RVN INC	COVID RELATED TEMP SITES*
SALK INSTITUTE	COVID RELATED TEMP SITES*
SALVATION ARMY	COVID RELATED TEMP SITES*
SAN DIEGO FOOD BANK	COVID RELATED TEMP SITES*
SAN DIEGO RESCUE MISSION INC	COVID RELATED TEMP SITES*
SAN LUIS REY MISSION	COVID RELATED TEMP SITES*
SCRIPPS HEALTH	COVID RELATED TEMP SITES*
SCRIPPS MEM MED OFFICES	COVID RELATED TEMP SITES*
SCRIPPS MERCY HOSP	COVID RELATED TEMP SITES*
SCRIPPS RESEARCH INSTITUTE	COVID RELATED TEMP SITES*
SCRIPPS-GREEN HOSPITAL	COVID RELATED TEMP SITES*
SD CONVENTION CTR CORP	COVID RELATED TEMP SITES*
SD YOUTH SERVICES	COVID RELATED TEMP SITES*
SDLGBT COMMUNITY CENTER	COVID RELATED TEMP SITES*
SEA WORLD LLC	COVID RELATED TEMP SITES*

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Entity Name	Category
SERITAGE GRWTH PROPERTIES LP	COVID RELATED TEMP SITES*
SHARP HEALTHCARE	COVID RELATED TEMP SITES*
SOUTH EAST MEDICAL CENTER	COVID RELATED TEMP SITES*
ST ANTHONYS CHURCH	COVID RELATED TEMP SITES*
ST JAMES CATHOLIC PARISH	COVID RELATED TEMP SITES*
ST VINCENT DE PAUL VLG INC	COVID RELATED TEMP SITES*
SURTI DEVELOPERS LLC	COVID RELATED TEMP SITES*
SWTR UN HI SCH DIST	COVID RELATED TEMP SITES*
TOWNSPEOPLE	COVID RELATED TEMP SITES*
TRUECARE	COVID RELATED TEMP SITES*
UNIV OF SAN DIEGO	COVID RELATED TEMP SITES*
UNIVERSAL PROPTY LAP TWO LLC	COVID RELATED TEMP SITES*
VA MEDICAL CTR	COVID RELATED TEMP SITES*
VENCOR HOSPITALS OF CALIFORN	COVID RELATED TEMP SITES*
CITY OF ALISO VIEJO	CRITICAL FIRST RESPONDER
CITY OF CARLSBAD	CRITICAL FIRST RESPONDER
CITY OF CHULA VISTA	CRITICAL FIRST RESPONDER
CITY OF CORONADO	CRITICAL FIRST RESPONDER
CITY OF DANA POINT	CRITICAL FIRST RESPONDER
CITY OF DEL MAR	CRITICAL FIRST RESPONDER
CITY OF EL CAJON	CRITICAL FIRST RESPONDER
CITY OF ENCINITAS	CRITICAL FIRST RESPONDER
CITY OF ESCONDIDO	CRITICAL FIRST RESPONDER
CITY OF IMPERIAL BEACH	CRITICAL FIRST RESPONDER
CITY OF LA MESA	CRITICAL FIRST RESPONDER
CITY OF LAGUNA BEACH	CRITICAL FIRST RESPONDER
CITY OF LAGUNA HILLS	CRITICAL FIRST RESPONDER
CITY OF LAGUNA NIGUEL	CRITICAL FIRST RESPONDER
CITY OF LEMON GROVE	CRITICAL FIRST RESPONDER
CITY OF MISSION VIEJO	CRITICAL FIRST RESPONDER
CITY OF NATIONAL CITY	CRITICAL FIRST RESPONDER
CITY OF OCEANSIDE	CRITICAL FIRST RESPONDER
CITY OF POWAY	CRITICAL FIRST RESPONDER
CITY OF RANCHO SANTA MARGARITA	CRITICAL FIRST RESPONDER
CITY OF SAN CLEMENTE	CRITICAL FIRST RESPONDER
CITY OF SAN DIEGO	CRITICAL FIRST RESPONDER
CITY OF SAN JUAN CAPISTRANO	CRITICAL FIRST RESPONDER

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Priority Essential Services SDG&E Customer List

Entity Name	Category
CITY OF SAN MARCOS	CRITICAL FIRST RESPONDER
CITY OF SANTEE	CRITICAL FIRST RESPONDER
CITY OF SOLANA BEACH	CRITICAL FIRST RESPONDER
CITY OF VISTA	CRITICAL FIRST RESPONDER
HEARTLAND FIRE DISPATCH	CRITICAL FIRST RESPONDER
MONTE VISTA FIREDISPATCH	CRITICAL FIRST RESPONDER
NORTH COMM DISPATCH	CRITICAL FIRST RESPONDER
ORANGE COUNTY FIRE AUTHORITY	CRITICAL FIRST RESPONDER
SD COUNTY SHERIFF	CRITICAL FIRST RESPONDER
SD FIRE DISPATCH	CRITICAL FIRST RESPONDER
SD SHERIFF DISPATCH	CRITICAL FIRST RESPONDER
AMERICAN ACCESS CARE OF SD	DIALYSIS CENTERS
BIO-MEDICAL APPL OF CALIF	DIALYSIS CENTERS
DAVITA INC	DIALYSIS CENTERS
DIALYSIS NEWCO INC	DIALYSIS CENTERS
FMC SAN JUAN CAPISTRANO LLC	DIALYSIS CENTERS
FRESENIUS MEDICAL CARE	DIALYSIS CENTERS
HOME DIALYSIS THERAPIES SD	DIALYSIS CENTERS
INNOVATIVE DIALYSIS OF LJ	DIALYSIS CENTERS
LP SCRIPPS LOT I LLC	DIALYSIS CENTERS
NORTH COUNTY KIDNEY CTR	DIALYSIS CENTERS
RENAL ADVANTAGE INC	DIALYSIS CENTERS
SAN DIEGO DIALYSIS CTR	DIALYSIS CENTERS
SAN DIEGO DIALYSIS SRV	DIALYSIS CENTERS
SAN DIEGO DIALYSIS SVC	DIALYSIS CENTERS
SATELLITE HEALTH CARE	DIALYSIS CENTERS
CITY OF CARLSBAD	EMERGENCY OPERATING CNTRS
CITY OF CHULA VISTA	EMERGENCY OPERATING CNTRS
CITY OF CORONADO	EMERGENCY OPERATING CNTRS
CITY OF DEL MAR	EMERGENCY OPERATING CNTRS
CITY OF EL CAJON	EMERGENCY OPERATING CNTRS
CITY OF ENCINITAS	EMERGENCY OPERATING CNTRS
CITY OF LEMON GROVE	EMERGENCY OPERATING CNTRS
CITY OF NATIONAL CITY	EMERGENCY OPERATING CNTRS
CITY OF OCEANSIDE	EMERGENCY OPERATING CNTRS
CITY OF POWAY	EMERGENCY OPERATING CNTRS
CITY OF SAN DIEGO	EMERGENCY OPERATING CNTRS

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Entity Name	Category
CITY OF SAN MARCOS	EMERGENCY OPERATING CNTRS
CITY OF SANTEE	EMERGENCY OPERATING CNTRS
CITY OF SOLANA BEACH	EMERGENCY OPERATING CNTRS
CITY OF VISTA	EMERGENCY OPERATING CNTRS
CO OF SAN DIEGO	EMERGENCY OPERATING CNTRS
SD UNIFIED PORT DIST	EMERGENCY OPERATING CNTRS
SDCWA	EMERGENCY OPERATING CNTRS
C O MCAS MIRAMAR	FEDERAL ACCOUNTS
C O NAVAL CONSOLID BRIG	FEDERAL ACCOUNTS
CBP AIR	FEDERAL ACCOUNTS
CMDR NAVAL SPEC WARFARE GRP1	FEDERAL ACCOUNTS
COMMANDER NAVY REGION SW	FEDERAL ACCOUNTS
CUSTOMS & BORDER PROTECTION	FEDERAL ACCOUNTS
FAA	FEDERAL ACCOUNTS
GSA	FEDERAL ACCOUNTS
MCAS MIRAMAR COMMISSARY	FEDERAL ACCOUNTS
MCAS MIRAMAR EXCHANGE	FEDERAL ACCOUNTS
MCAS MIRAMAR RESERVE CENTER	FEDERAL ACCOUNTS
NATIONAL MARINE FISHERIES	FEDERAL ACCOUNTS
NAVAL MEDICAL CENTER	FEDERAL ACCOUNTS
NAVFAC SOUTHWEST	FEDERAL ACCOUNTS
NAVY EXCHANGE	FEDERAL ACCOUNTS
NAVY REGIONL PLANT EQUIP OFC	FEDERAL ACCOUNTS
NAVY RESOURCE MGMT OFFICE	FEDERAL ACCOUNTS
NAVY WARNER SPRINGS TRNG GRP	FEDERAL ACCOUNTS
NOAA MARINE OPS PACIFIC	FEDERAL ACCOUNTS
US BORDER PATROL	FEDERAL ACCOUNTS
US COAST GUARD	FEDERAL ACCOUNTS
US IMM & NAT SER	FEDERAL ACCOUNTS
US NAVY SHIP SUPPORT UNIT SD	FEDERAL ACCOUNTS
US RADIO STA CODE 611	FEDERAL ACCOUNTS
USMC CPEN M00681	FEDERAL ACCOUNTS
USMC MAINTNCE OFFICER	FEDERAL ACCOUNTS
USN CMDG OFF CODE 5	FEDERAL ACCOUNTS
USN CMDG OFF CODE N8	FEDERAL ACCOUNTS
ALPINE FIRE PROTECTION DIST	FIRE STATIONS
BARONA FIRE DEPARTMENT	FIRE STATIONS

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Priority Essential Services SDG&E Customer List

Entity Name	Category
BLACK CONTRACTORS ASSOC SD	FIRE STATIONS
BO SUNNYSIDE FIRE PROTECTION	FIRE STATIONS
BORREGO SPGS FIRE DEPT	FIRE STATIONS
CALIFORNIA DEPT FORESTRY	FIRE STATIONS
CAMPO FIRE DEPT	FIRE STATIONS
CAMPO IND RES/FIRE STN	FIRE STATIONS
CAPSTONE FIRE MANAGEMENT INC	FIRE STATIONS
CITY OF CARLSBAD	FIRE STATIONS
CITY OF CHULA VISTA	FIRE STATIONS
CITY OF CORONADO	FIRE STATIONS
CITY OF DEL MAR	FIRE STATIONS
CITY OF EL CAJON	FIRE STATIONS
CITY OF ENCINITAS	FIRE STATIONS
CITY OF ESCONDIDO	FIRE STATIONS
CITY OF IMPERIAL BEACH	FIRE STATIONS
CITY OF LA MESA	FIRE STATIONS
CITY OF LAGUNA NIGUEL	FIRE STATIONS
CITY OF LEMON GROVE	FIRE STATIONS
CITY OF NATIONAL CITY	FIRE STATIONS
CITY OF OCEANSIDE	FIRE STATIONS
CITY OF POWAY	FIRE STATIONS
CITY OF SAN CLEMENTE	FIRE STATIONS
CITY OF SAN DIEGO	FIRE STATIONS
CITY OF SAN MARCOS	FIRE STATIONS
CITY OF SANTEE	FIRE STATIONS
CITY OF SANTEE	FIRE STATIONS
CITY OF SOLANA BEACH	FIRE STATIONS
CITY OF VISTA	FIRE STATIONS
CO OF SAN DIEGO	FIRE STATIONS
DE LUZ VOLL FIRE DEPT	FIRE STATIONS
DEER SPGS VOL FIRE DEPT	FIRE STATIONS
DEER SPRINGS FIRE PROTECTION	FIRE STATIONS
ELFIN FOREST VLNTEER FD	FIRE STATIONS
JULIAN COMM SERV DIST	FIRE STATIONS
JULIAN CUYMCA FIRE DIST	FIRE STATIONS
JULIAN VOLUNTEER FIRE CO	FIRE STATIONS
LAKESIDE FIRE DEPT	FIRE STATIONS

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Entity Name	Category
LAKESIDE FIRE PROTECTION DIS	FIRE STATIONS
LAKESIDE FIRE PROTECTN	FIRE STATIONS
MANZANITA FIRE DEPT	FIRE STATIONS
MESA GRANDE B O M I FIRE DPT	FIRE STATIONS
NORTH CNTY DISPATCH JPA	FIRE STATIONS
NORTH COUNTY FIRE	FIRE STATIONS
ORANGE COUNTY FIRE AUTHORITY	FIRE STATIONS
PALA BAND OF MISSION INDIANS	FIRE STATIONS
PAUMA BAND MSN INDIANS	FIRE STATIONS
POTRERO COMM CTR FOUNDATION	FIRE STATIONS
R R IVY	FIRE STATIONS
RAMONA MUN WTR DIST	FIRE STATIONS
RANCHO SANTA FE ASSOC	FIRE STATIONS
RANCHO SANTA FE FIRE DIST	FIRE STATIONS
RINCON INDIAN RESERVATION	FIRE STATIONS
ROBBY RAY IVY JR	FIRE STATIONS
SAN DIEGO RURAL FIRE PROTECT	FIRE STATIONS
SAN MIGUEL FIRE PRO DST	FIRE STATIONS
SAN PASQ BAND OF DIEGUENO MI	FIRE STATIONS
SAN PASQUAL ACADEMY	FIRE STATIONS
SANTA YSABEL BAND OF DIEGUEN	FIRE STATIONS
SD CITY FIRE FIGHTERS	FIRE STATIONS
SN MIGUEL FIRE PRO DIST	FIRE STATIONS
STATE OF CALIF	FIRE STATIONS
STATE OF CALIFORNIA	FIRE STATIONS
STATE OF CALIFORNIA DEPT	FIRE STATIONS
SYCUAN KUYEYAAY INDIANS	FIRE STATIONS
U S FOREST SERVICE	FIRE STATIONS
USDA-FOREST SERVICE	FIRE STATIONS
VIEJAS BAND OF KUMEYAAY IND	FIRE STATIONS
VLY CTR FIRE PROTECTION	FIRE STATIONS
AESTHETICARE MED CORP	HEALTHCARE/PUBLIC HEALTH
AIJ INC	HEALTHCARE/PUBLIC HEALTH
ALFA SURGERY CENTER LLC	HEALTHCARE/PUBLIC HEALTH
ALICIA SURGERY CENTER LLC	HEALTHCARE/PUBLIC HEALTH
ALTERNATIVES PREGNANCY	HEALTHCARE/PUBLIC HEALTH
ALVARADO PKWY INSTITUTE	HEALTHCARE/PUBLIC HEALTH

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Entity Name	Category
AMBULATORY CARE SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
ASSISTED HEALTH SYSTEMS	HEALTHCARE/PUBLIC HEALTH
AT HOME CARE SOLUTIONS	HEALTHCARE/PUBLIC HEALTH
BENJAMIN CAMACHO	HEALTHCARE/PUBLIC HEALTH
BEST START BIRTH CENTER	HEALTHCARE/PUBLIC HEALTH
BORREGO COMM HLTH FOUNDATION	HEALTHCARE/PUBLIC HEALTH
CAL CTR FOR REPRODUCTIVE SCI	HEALTHCARE/PUBLIC HEALTH
CALIFORNIA FERTILITY EXPERTS	HEALTHCARE/PUBLIC HEALTH
CAMINO HEALTH CENTERS	HEALTHCARE/PUBLIC HEALTH
CARLSBAD VILLAGE ORTHO	HEALTHCARE/PUBLIC HEALTH
CARMEL VALLEY ENDODONTICS	HEALTHCARE/PUBLIC HEALTH
CATH CHARITIES DIOCESE OF SD	HEALTHCARE/PUBLIC HEALTH
CENTRO DE SALUD DE SY	HEALTHCARE/PUBLIC HEALTH
CLEARCHOICE SAN DIEGO	HEALTHCARE/PUBLIC HEALTH
CO OF SAN DIEGO	HEALTHCARE/PUBLIC HEALTH
COAST SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
CPMS MEDICAL GROUP INC	HEALTHCARE/PUBLIC HEALTH
CRESTWOOD BEHAVIORAL HEALTH	HEALTHCARE/PUBLIC HEALTH
DEL MAR MEDICAL IMAGING	HEALTHCARE/PUBLIC HEALTH
DEL RIO MEDICAL & DENTAL PLZ	HEALTHCARE/PUBLIC HEALTH
DR TAWFILIS	HEALTHCARE/PUBLIC HEALTH
EGOSCUE	HEALTHCARE/PUBLIC HEALTH
EMERALD TRIUNE HOME HEALTH	HEALTHCARE/PUBLIC HEALTH
ENCOMPASS FAMILY & INTERNAL	HEALTHCARE/PUBLIC HEALTH
ESCONDIDO CARE CTR	HEALTHCARE/PUBLIC HEALTH
EXODUS RECOVERY INC	HEALTHCARE/PUBLIC HEALTH
EYE PHYSICIANS MED GRP	HEALTHCARE/PUBLIC HEALTH
EYE SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
FRIENDSHIP DEVELOPMENT SVCS	HEALTHCARE/PUBLIC HEALTH
GARDEN VIEW COURT LLC	HEALTHCARE/PUBLIC HEALTH
GIL Q GALLOWAY MD INC	HEALTHCARE/PUBLIC HEALTH
GROSSMONT SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
HERALD CHRISTIAN HEALTH CNTR	HEALTHCARE/PUBLIC HEALTH
JAMES A DAVIES MD	HEALTHCARE/PUBLIC HEALTH
JASON CARPADAKIS	HEALTHCARE/PUBLIC HEALTH
JOHN QIAN MD INC	HEALTHCARE/PUBLIC HEALTH
KARI J KNOWLES	HEALTHCARE/PUBLIC HEALTH

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LA JOLLA ORTHOPAEDIC SURGERY	HEALTHCARE/PUBLIC HEALTH
LA MAESTRA FAMILY CLINIC INC	HEALTHCARE/PUBLIC HEALTH
LA MAESTRA FOUNDATION	HEALTHCARE/PUBLIC HEALTH
LAGUNA NIGUEL SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
LINDA VISTA HEALTH CARE CTR	HEALTHCARE/PUBLIC HEALTH
LUIS A CONTRERAS	HEALTHCARE/PUBLIC HEALTH
MISSION MEDICAL INVES LLC	HEALTHCARE/PUBLIC HEALTH
MISSION VALLEY OPSC LP	HEALTHCARE/PUBLIC HEALTH
MOUNTAIN HEALTH & COMM SRVCS	HEALTHCARE/PUBLIC HEALTH
MSN AMBULATORY SURGICAL	HEALTHCARE/PUBLIC HEALTH
MUNISH BATRA MDPC	HEALTHCARE/PUBLIC HEALTH
NAVAJO LLC	HEALTHCARE/PUBLIC HEALTH
NEW RESTORATION MINISTRIES	HEALTHCARE/PUBLIC HEALTH
NO CTY GASTROENTEROLOGY	HEALTHCARE/PUBLIC HEALTH
NORTH COAST SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
NORTH COUNTY SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
NORTH CTY HEALTH SERV	HEALTHCARE/PUBLIC HEALTH
OTAY LAKES SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
PACIFIC ONCOLOGY	HEALTHCARE/PUBLIC HEALTH
PACIFIC SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
PRICE CHARITIES	HEALTHCARE/PUBLIC HEALTH
R K MASSENGILL MD	HEALTHCARE/PUBLIC HEALTH
RAZAVI CORP	HEALTHCARE/PUBLIC HEALTH
ROCHELLE MCLEAN	HEALTHCARE/PUBLIC HEALTH
S C MEDICAL PLAZA	HEALTHCARE/PUBLIC HEALTH
SACRED HEART HLTHCR PROV INC	HEALTHCARE/PUBLIC HEALTH
SAN CLEMENTE MEDICAL BLDG	HEALTHCARE/PUBLIC HEALTH
SAN DIEGO ENDOSCOPY CTR	HEALTHCARE/PUBLIC HEALTH
SAN DIEGO FACE & NECK	HEALTHCARE/PUBLIC HEALTH
SAN DIEGO FERTILITY CENTER	HEALTHCARE/PUBLIC HEALTH
SC PROFESSIONAL PLAZA LLC	HEALTHCARE/PUBLIC HEALTH
SCHOEMANN PLASTIC SURGERY	HEALTHCARE/PUBLIC HEALTH
SCRIPPS MEM - ENCINITAS	HEALTHCARE/PUBLIC HEALTH
SD COMPREHENSIVE PAINMGMT	HEALTHCARE/PUBLIC HEALTH
SD MUSCULOSKELETAL INSTITUTE	HEALTHCARE/PUBLIC HEALTH
SERVING SENIORS	HEALTHCARE/PUBLIC HEALTH
SEVA PROPERTY HOLDINGS LLC	HEALTHCARE/PUBLIC HEALTH

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Entity Name	Category
SEVILLE PLAZA PROPCO LLC	HEALTHCARE/PUBLIC HEALTH
SO CALIFORNIA LIVER CENTERS	HEALTHCARE/PUBLIC HEALTH
SOLUTIONS IN RECOVERY	HEALTHCARE/PUBLIC HEALTH
SOUTH EAST MEDICAL CENTER	HEALTHCARE/PUBLIC HEALTH
SPECIALTY OBSTETRICS OF SD	HEALTHCARE/PUBLIC HEALTH
ST PAULS EPISCOPAL HOME	HEALTHCARE/PUBLIC HEALTH
STUART B KIPPER MD	HEALTHCARE/PUBLIC HEALTH
SURGE CENTER OF SD LLC	HEALTHCARE/PUBLIC HEALTH
SURGICAL CENTER OF SAN DIEGO	HEALTHCARE/PUBLIC HEALTH
TERI INC	HEALTHCARE/PUBLIC HEALTH
THE A R C OF SAN DIEGO	HEALTHCARE/PUBLIC HEALTH
THE CTR FOR ENDOSCOPY	HEALTHCARE/PUBLIC HEALTH
THE VINE	HEALTHCARE/PUBLIC HEALTH
THERAPY SPECIALISTS	HEALTHCARE/PUBLIC HEALTH
TOGETHER WE GROW	HEALTHCARE/PUBLIC HEALTH
TRIUMSHIRE MANAGEMENT INC	HEALTHCARE/PUBLIC HEALTH
TRUECARE	HEALTHCARE/PUBLIC HEALTH
UCMP LLC	HEALTHCARE/PUBLIC HEALTH
UCSD	HEALTHCARE/PUBLIC HEALTH
UTC SURGI CENTER	HEALTHCARE/PUBLIC HEALTH
VISTA COMMUNITY CLINIC	HEALTHCARE/PUBLIC HEALTH
W A T INVESTMENTS LLC	HEALTHCARE/PUBLIC HEALTH
AL NOUR CENTER INC	HOSPICE FACILITIES
ANC CORPORATION	HOSPICE FACILITIES
ARDENT HOSPICE& PAL CARE INC	HOSPICE FACILITIES
CULTURE OF LIFE FAMILY SVCS	HOSPICE FACILITIES
DUNYA ANTWAN	HOSPICE FACILITIES
ESC CHIROPRACTIC OFFICE	HOSPICE FACILITIES
GROSSMONT HOSPITAL CORP	HOSPICE FACILITIES
HOME OF GUIDING HANDS	HOSPICE FACILITIES
HOSPICE OF THE COAST INC	HOSPICE FACILITIES
MARGUERITE HOLDINGS LLC	HOSPICE FACILITIES
PHILIP D SZOLD MD INC	HOSPICE FACILITIES
SH & PC-SD LLC	HOSPICE FACILITIES
STONECREST CA HOLDING LLC	HOSPICE FACILITIES
TERI INC	HOSPICE FACILITIES
THE ELIZABETH HOSPICE	HOSPICE FACILITIES

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Entity Name	Category
UNI CARE HOME HEALTH INC	HOSPICE FACILITIES
UNICARE HOSPICE INC	HOSPICE FACILITIES
VITAS HEALTHCARE	HOSPICE FACILITIES
WESTCOAST HEALTHCARE LLC	HOSPICE FACILITIES
ALVARADO HOSPITAL LLC	HOSPITALS
CO OF SAN DIEGO	HOSPITALS
GROSSMONT HOSPITAL CORP	HOSPITALS
KAISER PERMANENTE	HOSPITALS
MISSION HOSPITAL	HOSPITALS
PALOMAR HEALTH	HOSPITALS
PARADISE VALLEY HOSP	HOSPITALS
PT LOMA CONVALESCENT HSPTL	HOSPITALS
RADY CHILDREN'S HOSPITAL-SD	HOSPITALS
SADDLEBACK MEMORIAL MED CTR	HOSPITALS
SCRIPPS MEM - ENCINITAS	HOSPITALS
SCRIPPS MEM HOSP - LJ	HOSPITALS
SCRIPPS MERCY HOSP	HOSPITALS
SCRIPPS MERCY HOSP - CV	HOSPITALS
SCRIPPS-GREEN HOSPITAL	HOSPITALS
SHARP CHULA VISTA M C	HOSPITALS
SHARP CORONADO HOSPITAL	HOSPITALS
SHARP HEALTHCARE	HOSPITALS
SHARP MEMORIAL HOSPITAL	HOSPITALS
TRI CITY MEDICAL CTR	HOSPITALS
UCSD MEDICAL CENTER	HOSPITALS
VA MEDICAL CTR	HOSPITALS
VENCOR HOSPITALS OF CALIFORN	HOSPITALS
ZOOLOGICAL SOCIETY SAN DIEGO	HOSPITALS
CO OF SAN DIEGO	JAILS
STATE OF CALIFORNIA	JAILS
CALIF HIGHWAY PATROL	POLICE STATIONS
CALTRANS	POLICE STATIONS
CITY OF CARLSBAD	POLICE STATIONS
CITY OF CHULA VISTA	POLICE STATIONS
CITY OF CORONADO	POLICE STATIONS
CITY OF EL CAJON	POLICE STATIONS
CITY OF ESCONDIDO	POLICE STATIONS

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Priority Essential Services SDG&E Customer List

Entity Name	Category
CITY OF LA MESA	POLICE STATIONS
CITY OF LEMON GROVE	POLICE STATIONS
CITY OF NATIONAL CITY	POLICE STATIONS
CITY OF OCEANSIDE	POLICE STATIONS
CITY OF SAN DIEGO	POLICE STATIONS
CITY OF SAN MARCOS	POLICE STATIONS
CITY OF VISTA	POLICE STATIONS
CO OF SAN DIEGO	POLICE STATIONS
COUNTY OF ORANGE	POLICE STATIONS
LOS COYOTES INDIAN RESVRN	POLICE STATIONS
RINCON INDIAN RESERVATION	POLICE STATIONS
SD UNIFIED PORT DIST	POLICE STATIONS
STATE OF CALIFORNIA	PRISONS
CO OF SAN DIEGO	PUBLIC HEALTH DEPARTMENT
FAMILY HEALTH CENTERS OF SD	PUBLIC HEALTH DEPARTMENT
CALFIRE	PUBLIC SAFETY PARTNER
CALOES	PUBLIC SAFETY PARTNER
CPUC	PUBLIC SAFETY PARTNER
ORANGE COUNTY OES	PUBLIC SAFETY PARTNER
SD COUNTY OES	PUBLIC SAFETY PARTNER
ALBERT EINSTEIN ACADEMY	SCHOOLS
ALPINE UNION SCH DIST	SCHOOLS
BONSALL UNION SCHOOL DIST	SCHOOLS
BORREGO UNIF SCH DIST	SCHOOLS
CAJON VLY UN SCH DIST	SCHOOLS
CAPISTRANO UNIF SCHOOL DIST	SCHOOLS
CARDIFF SCHOOL DIST	SCHOOLS
CARLSBAD UNIF SCH DIST	SCHOOLS
CHULA VISTA ELEM SCH DIST	SCHOOLS
CORONADO UNIF SCH DIST	SCHOOLS
DARNALL SCHOOL	SCHOOLS
DEHESA SCHOOL DISTRICT	SCHOOLS
DEL MAR UNION SCH DIST	SCHOOLS
ENCINITAS UN SCH DIST	SCHOOLS
ESCONDIDO CHARTER	SCHOOLS
ESCONDIDO CHARTER HIGH SCHL	SCHOOLS
ESCONDIDO UN HI SCH DIS	SCHOOLS

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Priority Essential Services SDG&E Customer List

Entity Name	Category
ESCONDIDO UN SCH DIST	SCHOOLS
FALLBROOK UN HI SCH DIS	SCHOOLS
FALLBROOK UN SCH DIST	SCHOOLS
FRANCIS W PARKER SCHOOL	SCHOOLS
GOMPERS CHARTER MIDDLE SCH	SCHOOLS
GRSMT COMM COLL DIST	SCHOOLS
GRSMT CUY COM COLL DIST	SCHOOLS
GRSMT UN HI SCH DIST	SCHOOLS
GUAJOME PARK ACADEMY	SCHOOLS
HARRIET TUBMAN VLG CHARTER	SCHOOLS
HELIX CHARTER HIGH SCHOOL	SCHOOLS
HERITAGE DIGITAL ACADEMY	SCHOOLS
HIGH TECH HIGH	SCHOOLS
JAMUL-DULZURA SCH DIST	SCHOOLS
JULIAN CHARTER SCHOOL	SCHOOLS
JULIAN U HIGH SCH DIST	SCHOOLS
JULIAN UNION SCHOOL DISTRICT	SCHOOLS
KING CHAVEZ ACADEMY OF EXCEL	SCHOOLS
KING CHAVEZ PRIM A&A ACADEMY	SCHOOLS
L J COUNTRY DAY SCHOOL	SCHOOLS
LA MESA SPR VLY SCH DIS	SCHOOLS
LAKESIDE UN SCH DIST	SCHOOLS
LEMON GROVE SCH DIST	SCHOOLS
MAR VISTA ADULT SCHOOL	SCHOOLS
MCGILL SCHOOL OF SUCCESS	SCHOOLS
MIRACOSTA COMM COL DIST	SCHOOLS
MISSION SAN ANTONIO	SCHOOLS
MT EMPIRE UNIF SCH DIST	SCHOOLS
NATIONAL SCHOOL DIST	SCHOOLS
NATIONAL UNIVERSITY	SCHOOLS
OCEANSIDE UNIF SCH DIST	SCHOOLS
PALOMAR COMM COLLEGE	SCHOOLS
POWAY UNIF SCH DIST	SCHOOLS
POWAY UNIF SCHOOL DIST	SCHOOLS
RAMONA UNIF SCH DIST	SCHOOLS
RHO STA FE SCHOOL DIST	SCHOOLS
SADLBK VLY UNF SCH DST	SCHOOLS

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Priority Essential Services SDG&E Customer List

Entity Name	Category
SAN DIEGUITO HI SCH DIS	SCHOOLS
SAN MARCOS UNIF SCH DIS	SCHOOLS
SAN PASQUAL UN SCHL DIS	SCHOOLS
SAN YSIDRO SCH DIST	SCHOOLS
SANTEE SCH DIST	SCHOOLS
SD CNTY OFC OF EDUCATION	SCHOOLS
SD CNTY OFC OF EDUCATN	SCHOOLS
SD UNIF SCH DIST	SCHOOLS
SDCCD	SCHOOLS
SO ORANGE CNTY COM COL DIST	SCHOOLS
SOLANA BEACH SCH DIST	SCHOOLS
SOUTH BAY UN SCH DIST	SCHOOLS
SOUTHWESTERN COMM COLLEGE	SCHOOLS
SPENCER VALLEY SCHOOL	SCHOOLS
SPRINGALL ACADEMY	SCHOOLS
SWTR UN HI SCH DIST	SCHOOLS
THERESA HESSLING CHART PROJ	SCHOOLS
UCSD	SCHOOLS
VALLECITOS SCHOOL	SCHOOLS
VISTA UNIF SCH DIST	SCHOOLS
VLY CTR PAUMA UNIF SCH DIST	SCHOOLS
WARNER UN SCH DIST	SCHOOLS
SDG&E	SDGE CRITICAL
SDG&E - SDSU DLP	SDGE CRITICAL
SDG&E 018410400	SDGE CRITICAL
SDG&E 018461100	SDGE CRITICAL
SDG&E 018461210	SDGE CRITICAL
SDG&E 018461211	SDGE CRITICAL
SDG&E 018461220	SDGE CRITICAL
SDG&E 018461221	SDGE CRITICAL
SDG&E 018461230	SDGE CRITICAL
SDG&E 018461240	SDGE CRITICAL
SDG&E 018461241	SDGE CRITICAL
SDG&E 018461260	SDGE CRITICAL
SDG&E 018461270	SDGE CRITICAL
SDG&E 018461310	SDGE CRITICAL
SDG&E 018461311	SDGE CRITICAL

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Priority Essential Services SDG&E Customer List

Entity Name	Category
SDG&E 018461330	SDGE CRITICAL
SDG&E 018461380	SDGE CRITICAL
SDG&E 018461500	SDGE CRITICAL
SDG&E 018461732	SDGE CRITICAL
SDG&E 018461740	SDGE CRITICAL
SDG&E 018461780	SDGE CRITICAL
SDG&E 050600000	SDGE CRITICAL
SDG&E 055200000	SDGE CRITICAL
SDG&E 056210000	SDGE CRITICAL
SDG&E 056600000	SDGE CRITICAL
SDG&E 058210000	SDGE CRITICAL
SDG&E 058360000	SDGE CRITICAL
SDG&E 058450000	SDGE CRITICAL
SDG&E 085520000	SDGE CRITICAL
SDG&E 085700000	SDGE CRITICAL
SDG&E 087500000	SDGE CRITICAL
SDG&E 088730000	SDGE CRITICAL
SDG&E 392124100	SDGE CRITICAL
SDG&E 393511100	SDGE CRITICAL
SDG&E 393515100	SDGE CRITICAL
SDG&E 393515400	SDGE CRITICAL
SDG&E 536400000	SDGE CRITICAL
SDG&E 592124100	SDGE CRITICAL
SDG&E 593021300	SDGE CRITICAL
SDG&E CO OF SAN DIEGO DLP	SDGE CRITICAL
SDG&E CYL 20	SDGE CRITICAL
SDG&E KW METER	SDGE CRITICAL
SDG&E MAG TAPE ID101339	SDGE CRITICAL
SDG&E Q HR METER	SDGE CRITICAL
SDG&E SAMPSON SUB UNIT2	SDGE CRITICAL
SDG&E SCRIPPS SUB BK 31	SDGE CRITICAL
SDG&E/PACIFIC BELL DLP	SDGE CRITICAL
SDGE	SDGE CRITICAL
SDGE ELEC & FUEL PROCUREMENT	SDGE CRITICAL
SDGE IHD 11	SDGE CRITICAL
SDGE KEARNY NGV STATION	SDGE CRITICAL
SDGE LOAD RESEARCH	SDGE CRITICAL

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Entity Name	Category
SDGE MIRAMAR NGV STATION	SDGE CRITICAL
SDGE NORTH COAST NGV STATION	SDGE CRITICAL
SDGE PRP COMP USE	SDGE CRITICAL
SDGE TES	SDGE CRITICAL
SDGE/ESCO SUB	SDGE CRITICAL
SDGE/OTAY MESA MTRSTA	SDGE CRITICAL
SDGE/SCE	SDGE CRITICAL
SDGE/YARD	SDGE CRITICAL
SDGL CAPITAL LLC	SDGE CRITICAL
AAA HOME HEALTH INC	SKLLED NURSING/NURSING HM
AB HOME CARE	SKLLED NURSING/NURSING HM
ABSOLUTE CARE HEALTH SYSTEMS	SKLLED NURSING/NURSING HM
ACCENTCARE HOME HEALTH OF CA	SKLLED NURSING/NURSING HM
ADVANTAGE HEALTH SYSTEMS	SKLLED NURSING/NURSING HM
AEGIS ASSISTED LIVING LLC	SKLLED NURSING/NURSING HM
AETAS HEALTH SERVICES	SKLLED NURSING/NURSING HM
ALPINE SPECIAL TREATMENT CTR	SKLLED NURSING/NURSING HM
ALZHEIMER'S FAMILY CTR	SKLLED NURSING/NURSING HM
AMERICAN HEALTH SVCS OF SD	SKLLED NURSING/NURSING HM
AMERICARE ADHC INC	SKLLED NURSING/NURSING HM
ANCHOR DOWN OWNER ASSC INC	SKLLED NURSING/NURSING HM
ANGELICUM HOME HEALTH INC	SKLLED NURSING/NURSING HM
ANZA HEALTHCARE INC	SKLLED NURSING/NURSING HM
ARBA GROUP FACILITIES OPERAT	SKLLED NURSING/NURSING HM
ASD6 LLC	SKLLED NURSING/NURSING HM
ASPIRE HOME HEALTH CARE INC	SKLLED NURSING/NURSING HM
BALBOA HEALTHCARE INC	SKLLED NURSING/NURSING HM
BAYSIDE HEALTCARE INC	SKLLED NURSING/NURSING HM
BAYVIEW O P CHURCH	SKLLED NURSING/NURSING HM
BERNARDO HEIGHTS HEALTH CARE	SKLLED NURSING/NURSING HM
BIRCH HOLDINGS LLC	SKLLED NURSING/NURSING HM
BORREGO COMM HLTH FOUND	SKLLED NURSING/NURSING HM
BRIAN STORRS	SKLLED NURSING/NURSING HM
BRIGHTON PLACE EAST	SKLLED NURSING/NURSING HM
BRIGHTON PLACE SVC	SKLLED NURSING/NURSING HM
BRIGHTSTAR LLC	SKLLED NURSING/NURSING HM
CA DEPT OF VETERAN AFFAIRS	SKLLED NURSING/NURSING HM

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Entity Name	Category
CAPISTRANO BEACH CARE CENTER	SKLLED NURSING/NURSING HM
CASA DE LAS CAMPANAS	SKLLED NURSING/NURSING HM
CASA PACIFICA	SKLLED NURSING/NURSING HM
CASA PACIFICA ADHC	SKLLED NURSING/NURSING HM
CASA PALMERA	SKLLED NURSING/NURSING HM
CCW LA JOLLA LLC	SKLLED NURSING/NURSING HM
CHARLES W MATHIS	SKLLED NURSING/NURSING HM
CHURCH OF JESUS CHRIST	SKLLED NURSING/NURSING HM
CITY HEIGHTS HEALTH ASSOC	SKLLED NURSING/NURSING HM
CLAIREMONT HEALTHCARE CENTRE	SKLLED NURSING/NURSING HM
CLAYDELLE HEALTHCARE INC	SKLLED NURSING/NURSING HM
CO OF SAN DIEGO	SKLLED NURSING/NURSING HM
COASTAL THERAPY GROUP	SKLLED NURSING/NURSING HM
COMMUNITY CONV HOSPITAL	SKLLED NURSING/NURSING HM
CONTINUING LIFE COMM LLC	SKLLED NURSING/NURSING HM
COVENANT CARE CALIFORNIA LLC	SKLLED NURSING/NURSING HM
CRESCENT HEALTH CARE	SKLLED NURSING/NURSING HM
EAST COUNTY TRANSITIONAL	SKLLED NURSING/NURSING HM
EC OPCO GROSSMONT GARDENS LP	SKLLED NURSING/NURSING HM
EC OPCO LAS VILLAS DEL CB LP	SKLLED NURSING/NURSING HM
EIAD H HADDAD	SKLLED NURSING/NURSING HM
EL DORADO CARE CENTER	SKLLED NURSING/NURSING HM
ELM HOLDINGS LLC	SKLLED NURSING/NURSING HM
EMERITUS SENIOR LIVING	SKLLED NURSING/NURSING HM
ENCINITAS HERITAGE PRTNR LLC	SKLLED NURSING/NURSING HM
ESCONDIDO MEDICAL INVESTORS	SKLLED NURSING/NURSING HM
FALLBROOK HEALTHCARE LLC	SKLLED NURSING/NURSING HM
FCAW FOUR POINTS LLC	SKLLED NURSING/NURSING HM
FIVE STAR QUALITY CARE	SKLLED NURSING/NURSING HM
FRIENDSHIP MANOR LKSIDE	SKLLED NURSING/NURSING HM
FRONT PORCH	SKLLED NURSING/NURSING HM
G H C OF NAT CITY 2 LLC	SKLLED NURSING/NURSING HM
GABRIEL PERPETUA	SKLLED NURSING/NURSING HM
GENTIVA	SKLLED NURSING/NURSING HM
GHC OF KEARNY MESA LLC	SKLLED NURSING/NURSING HM
GHC OF LA MESA LLC	SKLLED NURSING/NURSING HM
GHC OF LAKESIDE LLC	SKLLED NURSING/NURSING HM

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Entity Name	Category
GHC OF NATIONAL CITY I LLC	SKLLED NURSING/NURSING HM
GHC OF SANTEE LLC	SKLLED NURSING/NURSING HM
GLENN M BALFOUR MD	SKLLED NURSING/NURSING HM
GOLDEN LIVING INC	SKLLED NURSING/NURSING HM
GRANITE HILLS H C	SKLLED NURSING/NURSING HM
HEBREW HOME	SKLLED NURSING/NURSING HM
HERITAGE POINTE	SKLLED NURSING/NURSING HM
HILLCREST MANOR SANITARIUM	SKLLED NURSING/NURSING HM
IGLESIA DEL SENOR JESUS	SKLLED NURSING/NURSING HM
INTERIM HEALTH CARE	SKLLED NURSING/NURSING HM
ITALIAN MAPLE LLC	SKLLED NURSING/NURSING HM
JACOB HEALTH CARE CTR	SKLLED NURSING/NURSING HM
JAMES R EASTERLY	SKLLED NURSING/NURSING HM
JEFFERSON HEALTHCARE INC	SKLLED NURSING/NURSING HM
JEFFREY PINE HLDNGS LLC	SKLLED NURSING/NURSING HM
KATHLEEN PLEASANTS	SKLLED NURSING/NURSING HM
KINGDOM HALL	SKLLED NURSING/NURSING HM
KOA HOLDINGS LLC	SKLLED NURSING/NURSING HM
LEMON GROVE HEALTH ASSOC LLC	SKLLED NURSING/NURSING HM
LIFE HEALTH SERVICES	SKLLED NURSING/NURSING HM
LINERS CORP	SKLLED NURSING/NURSING HM
LOVING CARE LLC	SKLLED NURSING/NURSING HM
LUMBER CYCLE	SKLLED NURSING/NURSING HM
MAXIM HEALTHCARE SERVICES	SKLLED NURSING/NURSING HM
MEADOWBROOK VILLAGE	SKLLED NURSING/NURSING HM
MISSION HOME HEALTH INC	SKLLED NURSING/NURSING HM
MISSION TRAILS HEALTH CARE	SKLLED NURSING/NURSING HM
MODERN HOME HEALTH CARE INC	SKLLED NURSING/NURSING HM
MONTERA MSL LLC	SKLLED NURSING/NURSING HM
MOUNT MIGUEL COVNT VLG	SKLLED NURSING/NURSING HM
MTN SHADOWS SUPPORT GRP	SKLLED NURSING/NURSING HM
MYRNA F ARCELAO	SKLLED NURSING/NURSING HM
NAUTILUS HEALTHCARE INC	SKLLED NURSING/NURSING HM
OLIVE HOLDINGS LLC	SKLLED NURSING/NURSING HM
PAC REGENT CONDO ASSOC	SKLLED NURSING/NURSING HM
PACIFICA EASTLAKE LLC	SKLLED NURSING/NURSING HM
PALOMAR HEIGHTS CARE CTR	SKLLED NURSING/NURSING HM

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Entity Name	Category
PARKSIDE HEALTHCARE INC	SKLLED NURSING/NURSING HM
PARKWAY OPERATIONS LLC	SKLLED NURSING/NURSING HM
PEPPERBUSH HOLDINGS LLC	SKLLED NURSING/NURSING HM
POMERADO OPERATIONS LLC	SKLLED NURSING/NURSING HM
POPLAR HOLDINGS LLC	SKLLED NURSING/NURSING HM
PORTSIDE HEALTHCARE INC	SKLLED NURSING/NURSING HM
PREGNANCY CARE CENTER	SKLLED NURSING/NURSING HM
REDWOOD SNR HOMES & SERVICES	SKLLED NURSING/NURSING HM
REGUS GROUP	SKLLED NURSING/NURSING HM
REO VISTA HEALTH CARE CENTER	SKLLED NURSING/NURSING HM
SAMUEL HOROWITZ INC	SKLLED NURSING/NURSING HM
SAN DIEGO HOME HEALTH CARE	SKLLED NURSING/NURSING HM
SAN DIEGO NEW CHURCH	SKLLED NURSING/NURSING HM
SD CHRISTIAN FOUNDATION	SKLLED NURSING/NURSING HM
SEACREST VILLAGE RB	SKLLED NURSING/NURSING HM
SEVEN OAKS CARE CENTER	SKLLED NURSING/NURSING HM
SHARP MEMORIAL HOSPITAL	SKLLED NURSING/NURSING HM
SO CAL PRESBYTERIAN HMS	SKLLED NURSING/NURSING HM
ST PAUL HEALTH CARE CTR	SKLLED NURSING/NURSING HM
ST PAULS EPISCOPAL HOME	SKLLED NURSING/NURSING HM
SUN & SEA ASSISTED LIVING	SKLLED NURSING/NURSING HM
SUNLAND HOME FOUNDATION	SKLLED NURSING/NURSING HM
SUNRISE ASSISTED LIVING	SKLLED NURSING/NURSING HM
THE MUSIC THERAPY CENTER INC	SKLLED NURSING/NURSING HM
THE POOR SISTERS OF NAZ	SKLLED NURSING/NURSING HM
THE ROYAL HOME	SKLLED NURSING/NURSING HM
VIBRA HOSPITAL OF SAN DIEGO	SKLLED NURSING/NURSING HM
VILLA RHO BRDO HEALTH	SKLLED NURSING/NURSING HM
VILLAGE SQ HEALTHCARE CTR	SKLLED NURSING/NURSING HM
VISTA DEL MAR CARE CTR	SKLLED NURSING/NURSING HM
VISTA KNOLL	SKLLED NURSING/NURSING HM
VISTA POST ACUTE CENTER LLC	SKLLED NURSING/NURSING HM
VOLUNTEERS OF AMERICA	SKLLED NURSING/NURSING HM
WEST ESCONDIDO HEALTHCARE	SKLLED NURSING/NURSING HM
WINDSOR CARE CTR NC INC	SKLLED NURSING/NURSING HM
WINDSOR CARE CTR OF SD	SKLLED NURSING/NURSING HM
XIANG SIX LLC	SKLLED NURSING/NURSING HM

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Entity Name	Category
YVONNE V LUNA	SKLLED NURSING/NURSING HM
1ST COAST CARGO INC	TRANSPORTATION
A C TOWING INC	TRANSPORTATION
A TO Z ENTERPRISES INC	TRANSPORTATION
ABF FREIGHT SYSTEMS INC	TRANSPORTATION
ACE AVIATION SVC INC	TRANSPORTATION
ADAMS TOWING	TRANSPORTATION
ADEPT PROCESS SERVICES	TRANSPORTATION
ADMIRALTY MARINE	TRANSPORTATION
ADVANCED SHUTTLE SVCS LLC	TRANSPORTATION
ADVANTAGE TOWING	TRANSPORTATION
AERONET INC	TRANSPORTATION
AEROTRACK INC	TRANSPORTATION
AEROWELD INC	TRANSPORTATION
AGA INVESTMENTS	TRANSPORTATION
AHM LLC	TRANSPORTATION
AIRPORT SELF STORAGE LLC	TRANSPORTATION
AIRWAYS OWNERS ASSOC	TRANSPORTATION
AIRWORLD LLC	TRANSPORTATION
ALBERT CRUZ	TRANSPORTATION
ALEX MARTINEZ	TRANSPORTATION
ALL STREET TOWING	TRANSPORTATION
A-LOGISTICS AND TRADING CORP	TRANSPORTATION
ALVIN BANTAD	TRANSPORTATION
AM MEX INTERNATIONAL	TRANSPORTATION
AME TWNG & AUTO DSM INC	TRANSPORTATION
AMER TWNG & AUTO DSM INC	TRANSPORTATION
AMERICAN AIRLINES	TRANSPORTATION
AMERICAN CARGOSERVICE	TRANSPORTATION
AMIR ETEMADZADEH	TRANSPORTATION
AMTRAK	TRANSPORTATION
AMUZA INC	TRANSPORTATION
ANDREA M RUBIN	TRANSPORTATION
ANGELO'S TOWING	TRANSPORTATION
ARCES IMPORT CORP	TRANSPORTATION
ASAP TOWING	TRANSPORTATION
ATLANTIC AVIATION CAM	TRANSPORTATION

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Entity Name	Category
ATLAS FREIGHT	TRANSPORTATION
BAJA FREIGHT FORWARDING	TRANSPORTATION
BARILOCHE ADVENTURA LTD	TRANSPORTATION
BBS GLOBAL TRADING	TRANSPORTATION
BENDER CCP INC	TRANSPORTATION
BIG BAY MARINE SERVICES	TRANSPORTATION
BILL HAY INTERNATIONAL	TRANSPORTATION
BILL'S GOING TOWING INC	TRANSPORTATION
BIOCAIR	TRANSPORTATION
BLACK TIGER LIMO	TRANSPORTATION
BNSF RAILWAY COMPANY	TRANSPORTATION
BRICEHOUSE INC	TRANSPORTATION
C & D TOWING SPECIALISTS	TRANSPORTATION
C R Q HANGAR 12 LLC	TRANSPORTATION
CAHUENGA ASSOCIATES II	TRANSPORTATION
CAL MEEKER	TRANSPORTATION
CALIF MARINE CLEANING	TRANSPORTATION
CALIF YACHT MARINA INC	TRANSPORTATION
CALTRANS	TRANSPORTATION
CANNON PACIFIC SERVICES INC	TRANSPORTATION
CARLSBAD AIR SERVICE INC	TRANSPORTATION
CARLSBAD JET CENTER	TRANSPORTATION
CAROLYN GODING	TRANSPORTATION
CASUAL CASCADE DE LLC	TRANSPORTATION
CAVALIER FORWARDING INC	TRANSPORTATION
CEDAR TOWING	TRANSPORTATION
CENTURY TRANSPORTATION SERV	TRANSPORTATION
CERTIFIED TRANSPORTATION SRV	TRANSPORTATION
CHARLES BUEL	TRANSPORTATION
CHP LOGISTICS INC	TRANSPORTATION
CHRISTOPHER L LOUGHRIDGE	TRANSPORTATION
CHUCK HALL AVIATION	TRANSPORTATION
CHULA VISTA MARINA	TRANSPORTATION
CIRCLE AIR GROUP LLC	TRANSPORTATION
CIRCLE S PRODUCTIONS INC	TRANSPORTATION
CITY OF SAN DIEGO	TRANSPORTATION
CLANCY'S TOWING	TRANSPORTATION

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Entity Name	Category
CLASSIC FORWARDING INC	TRANSPORTATION
CO OF SAN DIEGO	TRANSPORTATION
COASTAL PRIDE TOWING INC	TRANSPORTATION
COMMERCIAL TRANSPORT CONCEPT	TRANSPORTATION
COMPLETE LOGISTICS CO	TRANSPORTATION
COUTURE FORMAL	TRANSPORTATION
CROWLEY MARINE SERVICES INC	TRANSPORTATION
CROWNAIR	TRANSPORTATION
CRUISEAIR AVIATION INC	TRANSPORTATION
CRYSTAL FORWARDING	TRANSPORTATION
CURTISS WRIGHT ELECTRO MECH	TRANSPORTATION
CYMSE BROKERS	TRANSPORTATION
CYTOLOGISTICS	TRANSPORTATION
DANA POINT MARINA CO	TRANSPORTATION
DANA WEST MARINA	TRANSPORTATION
DANA WEST YACHT CLUB	TRANSPORTATION
DANIEL LAMONTAGNE	TRANSPORTATION
DAVE C STILLINGER	TRANSPORTATION
DEHBOK LOGISTICS INC	TRANSPORTATION
DEL NORTE FORWRDING INC	TRANSPORTATION
DELTA AIR LINES INC	TRANSPORTATION
DENNIS INCE	TRANSPORTATION
DHL GLOBAL FORWARDING	TRANSPORTATION
DICK'S TOWING	TRANSPORTATION
DMC & ASSOCS	TRANSPORTATION
DONALD L MELOCHE	TRANSPORTATION
DOWNTOWN PEDICABS	TRANSPORTATION
DRISCOLL MARINA	TRANSPORTATION
DSV AIR & SEA INC	TRANSPORTATION
E GARTH WATKINS	TRANSPORTATION
EAX WORLDWIDE LLC	TRANSPORTATION
ELEANOR E BEADLE	TRANSPORTATION
ENRIQUE SANCHEZ	TRANSPORTATION
ENTERPRISE TOWING	TRANSPORTATION
ESM CORPORATION	TRANSPORTATION
ETHYL G BENNETT	TRANSPORTATION
EX EX PM LLC	TRANSPORTATION

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Entity Name	Category
EXCELLENT SERVICE & TOWING	TRANSPORTATION
EXECUTIVES FLIGHT SUP'T INC	TRANSPORTATION
EXPEDITE TOWING	TRANSPORTATION
EXPORTALIA CUSTOMS BROKER	TRANSPORTATION
FACT INC	TRANSPORTATION
FALLBROOK AG-PRO	TRANSPORTATION
FIDDLERS COVE MARINA & RV	TRANSPORTATION
FIRST FLIGHT CORPORATION	TRANSPORTATION
FIRST STUDENT TRANSPORT	TRANSPORTATION
FLAT TOP POWER ASSOC	TRANSPORTATION
FLYING DOG HANGAR LLC	TRANSPORTATION
FORWARD AIR	TRANSPORTATION
FRANCISCO GOMEZ	TRANSPORTATION
FRITZ MEHRER	TRANSPORTATION
G A T AIRLINE GROUND SUPPORT	TRANSPORTATION
G B CAPITAL HOLDINGS LLC	TRANSPORTATION
G GLOBAL LOGISTICS INC	TRANSPORTATION
GANN LOGISTICS	TRANSPORTATION
GARY AND MARY WEST PACE	TRANSPORTATION
GARY J PELZER	TRANSPORTATION
GEORGE MOUAWAD	TRANSPORTATION
GIBBS FLYING SERVICE	TRANSPORTATION
GILLESPIE AIR CENTER	TRANSPORTATION
GILLESPIE FIELD PARTNRS	TRANSPORTATION
GIZELLE INVESTMENT INC	TRANSPORTATION
GLOBAL AIR LOGISTICS & TRNG	TRANSPORTATION
GLOBAL BROKERAGE SOLUTIONS	TRANSPORTATION
GLOBAL PACKAGING SOLTN INC	TRANSPORTATION
GOLDFIELD STAGE	TRANSPORTATION
GONZALEZ TOWING	TRANSPORTATION
GONZALO PADILLA	TRANSPORTATION
GREAT VALUE LLC	TRANSPORTATION
GREATER SD BUS DEV COUNCIL	TRANSPORTATION
GREITZER BROKERS INC	TRANSPORTATION
GREYHOUND LINES INC	TRANSPORTATION
GT CARRIERS	TRANSPORTATION
GUARDIAN TOWING INC	TRANSPORTATION

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Priority Essential Services SDG&E Customer List

Entity Name	Category
GUILLERMO ADAME	TRANSPORTATION
GUILLERMO LIZARRAGA	TRANSPORTATION
HAN CHUA	TRANSPORTATION
HANGER SEVEN LLC	TRANSPORTATION
HARBOR ISLAND WEST MAR	TRANSPORTATION
HIGH SEAS MARINE ENTERPRISES	TRANSPORTATION
HOANG VAN CARGO	TRANSPORTATION
HOME EXPRESS DELIVERY SERVIC	TRANSPORTATION
HOSSEIN JALEHMAFMOUDI	TRANSPORTATION
HUDSON MARINE MGMNT INC	TRANSPORTATION
ID ENTERPRISE	TRANSPORTATION
IGNACIO MONTIEL	TRANSPORTATION
INTEGRATED AIRLINE SERVICES	TRANSPORTATION
INTEGRATED MARINE SVC INC	TRANSPORTATION
INTERNATIONAL AUTO LOGISTICS	TRANSPORTATION
INTERNATIONAL CUSTOMS BROKER	TRANSPORTATION
INTERNATIONAL LOGISTICS LLC	TRANSPORTATION
INTERSTATE GROUP LLC	TRANSPORTATION
INTRNL AUTO BROKERS INC	TRANSPORTATION
IPT OTAY LOGISTICS CENTER LP	TRANSPORTATION
IRIS LOGISTICS LLC	TRANSPORTATION
IRONSMITH INC	TRANSPORTATION
IWS CORPORATION	TRANSPORTATION
JACK MATTHIAS	TRANSPORTATION
JAMES RUTLEDGE	TRANSPORTATION
JAS FORWARDING USA	TRANSPORTATION
JASON STEFFEN	TRANSPORTATION
JB JK CORP III	TRANSPORTATION
JC LOGISTICS INTERNATIONAL	TRANSPORTATION
JEFF TISDALE ENTERPRISES INC	TRANSPORTATION
JESUS IVAN GARCIA	TRANSPORTATION
JET SOURCE INC	TRANSPORTATION
JFAT LLC	TRANSPORTATION
JILL M HASSE	TRANSPORTATION
JIMSAIR AVIATION SVCS	TRANSPORTATION
JIVAN INVESTMENT INC	TRANSPORTATION
JJX LLC	TRANSPORTATION

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Entity Name	Category
JMAC LOGISTICS INC	TRANSPORTATION
JOE W DAVIES	TRANSPORTATION
JOHN LLOYD & ASSOCIATES	TRANSPORTATION
JOHN S WATKINS	TRANSPORTATION
JRE LOGISTICS	TRANSPORTATION
JUAN CORTEZ	TRANSPORTATION
JUSTIN WOOLSEY	TRANSPORTATION
JV BROKERS INC	TRANSPORTATION
K & O ENTERPRISES LLC	TRANSPORTATION
K LINE AIR INC	TRANSPORTATION
K P I LOGISTICS INC	TRANSPORTATION
K SKY LOGISTICS INC	TRANSPORTATION
KEN MCKEON	TRANSPORTATION
KGL AMERCIA INC	TRANSPORTATION
KINDER MORGAN ENERGY PARTNER	TRANSPORTATION
KRAUSS HELICOPTERS	TRANSPORTATION
KUEHNE AND NAGEL INC	TRANSPORTATION
L18 AIRPARK LLC	TRANSPORTATION
LAKESIDE SERVICE & TOW LLC	TRANSPORTATION
LANCAIR CORPORATION	TRANSPORTATION
LEN J BUCKEL	TRANSPORTATION
LEONOR FERRER	TRANSPORTATION
LINK SHUTTLE INC	TRANSPORTATION
LOGIPIA AMERICA CORP	TRANSPORTATION
LOGIX SALES LLC	TRANSPORTATION
LOTHLORIEN PARTNERS INC	TRANSPORTATION
LUIS LARA	TRANSPORTATION
LYFT INC	TRANSPORTATION
M&G FORWARDING LLC	TRANSPORTATION
MACKENZIE AVIATION INC	TRANSPORTATION
MAINFREIGHT INC	TRANSPORTATION
MARIANA VINCENT	TRANSPORTATION
MARINA CORTEZ INC	TRANSPORTATION
MARINA VLGS LTD	TRANSPORTATION
MAXXUM EXPO LOGISTICS INC	TRANSPORTATION
MEADIOCRITY MEADERY LLC	TRANSPORTATION
MEL CAIN	TRANSPORTATION

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Entity Name	Category
MEX PRO LOGISTICS	TRANSPORTATION
MEXPORT LOGISTICS INC	TRANSPORTATION
MEYERS LOGISTICS	TRANSPORTATION
MICHIGAN LOGISTICS SOLUTIONS	TRANSPORTATION
MIGHTY TRUCKING & SERVICES	TRANSPORTATION
MIGUEL ANGEL HERNANDEZ	TRANSPORTATION
MITRE AVIATION	TRANSPORTATION
MONICA GOMEZ	TRANSPORTATION
MOUNTAIN WEST TOWING INC	TRANSPORTATION
MSE EXPRESS AMERICA INC	TRANSPORTATION
MTS	TRANSPORTATION
NANCAR INC	TRANSPORTATION
NEED A TOW INC	TRANSPORTATION
NEUTRONICS ENTERPRISES	TRANSPORTATION
NIPPON EXPRESS USA INC	TRANSPORTATION
NK TOWING AND ROADSIDE SERVI	TRANSPORTATION
NO COUNTY TRANSIT DIST	TRANSPORTATION
NORMAN KRIEGER INC	TRANSPORTATION
NORTH COUNTY STUDENT TRANSP	TRANSPORTATION
ON TIME PERMITS LLC	TRANSPORTATION
ONE STOP AVIATION	TRANSPORTATION
OTAY BORDER PROPERTY LLC	TRANSPORTATION
P T S	TRANSPORTATION
PA LOGISTICS SERVICES INC	TRANSPORTATION
PACBLUE LOGISTICS LLC	TRANSPORTATION
PACIFIC AUTOW	TRANSPORTATION
PACIFIC CHEMICAL LABS INC	TRANSPORTATION
PACIFIC TOWING & RECOVERY	TRANSPORTATION
PALOMAR PREMIER HANGER 4 LLC	TRANSPORTATION
PANASONIC LOGISTICS SOLUTION	TRANSPORTATION
PASHA AUTOMOTIVE SERVICES	TRANSPORTATION
PASHA SERVICES	TRANSPORTATION
PAXTON SHREVE & HAYS INC	TRANSPORTATION
PCM LOGISTICS LLC	TRANSPORTATION
PELLO	TRANSPORTATION
PIER 32 MARINA LLC	TRANSPORTATION
PLATINUM LOGISTICS WY INC	TRANSPORTATION

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Entity Name	Category
POINT LOMA MARINA LLC	TRANSPORTATION
POWAY GROUP INC	TRANSPORTATION
PREMIER TWO 1 FOUR LLC	TRANSPORTATION
PREMIERE WEST LEASING	TRANSPORTATION
PRIMUS LOGISTICS	TRANSPORTATION
PRIORITY CARGO EXPEDITORS	TRANSPORTATION
PRO TRAFFIC SERVICES INC	TRANSPORTATION
QUALITY TOWING	TRANSPORTATION
R & I LOGISTIC	TRANSPORTATION
R & R INT'L FREIGHT INC	TRANSPORTATION
R L JONES	TRANSPORTATION
RAMON J WHITE	TRANSPORTATION
RESCUE TOWING & RECOVERY	TRANSPORTATION
RICHARD MORGAN	TRANSPORTATION
ROAD ONE TOWING	TRANSPORTATION
ROAD ONE TOWNING	TRANSPORTATION
ROADWAY AUTO TOWING	TRANSPORTATION
ROBERT REID SCHMALFELDT	TRANSPORTATION
ROBERTO LOPEZ	TRANSPORTATION
RO-CO	TRANSPORTATION
ROLANDO ROMERO	TRANSPORTATION
ROY MILLER FREIGHT INC LINE	TRANSPORTATION
ROY SIMONSON	TRANSPORTATION
ROYAL JET INC	TRANSPORTATION
ROYAL LINES CHARTER LLC	TRANSPORTATION
RUBEN GONZALEZ	TRANSPORTATION
RUFFO DE ALBA FORWARDERS LP	TRANSPORTATION
RWAD THOUZEN	TRANSPORTATION
RYDER INTERGRATED LOGISTIC	TRANSPORTATION
S & R TOWING INC	TRANSPORTATION
S D TRANSIT CORP	TRANSPORTATION
SADDLE CREEK CORP	TRANSPORTATION
SAFARI AVIATION OF CA INC	TRANSPORTATION
SAI LOGISTICS EXPORTS INC	TRANSPORTATION
SALAZAR FORWARDINGSPECIALIST	TRANSPORTATION
SAN DIEGO BOAT MOVERS	TRANSPORTATION
SAN DIEGO HELICOPTER SERVICE	TRANSPORTATION

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Entity Name	Category
SAN DIEGO TROLLEY INC	TRANSPORTATION
SANDAG	TRANSPORTATION
SANGBIN IM	TRANSPORTATION
SCHIESS CONSTR LOGISTICS INC	TRANSPORTATION
SCRRA METROLINK	TRANSPORTATION
SD & IMP VLY RAILROAD	TRANSPORTATION
SD AIR FREIGHT SRVC INC	TRANSPORTATION
SD CTY REGIONAL AIRPORT AUTH	TRANSPORTATION
SD UNIFIED PORT DIST	TRANSPORTATION
SEABRIGHT AT CARLSBAD	TRANSPORTATION
SEAFORTH MARINA	TRANSPORTATION
SELIM ASLAN	TRANSPORTATION
SENATOR INTERNATIONAL	TRANSPORTATION
SEPULVEDAS INT CORPORATION	TRANSPORTATION
SERGIO I OJEDA	TRANSPORTATION
SEVERIN MOBILE TOWING INC	TRANSPORTATION
SEVERIN TOWING	TRANSPORTATION
SFPP L P	TRANSPORTATION
SHELTER COVE MARINA	TRANSPORTATION
SICA FORWARDING & FREIGHT	TRANSPORTATION
SIGNATURE TOWING	TRANSPORTATION
SILVER RIDGE FORWARDING INC	TRANSPORTATION
SJ TOWING INC	TRANSPORTATION
SKYLITE LOGISTICS	TRANSPORTATION
SOL TRANSPORTATION INC	TRANSPORTATION
SOLITA HINES	TRANSPORTATION
SPACE BORDER LOGISTICS	TRANSPORTATION
SPIDERS AIR SERV	TRANSPORTATION
STARRUE INCORPORATED	TRANSPORTATION
STATE OF CALIFORNIA	TRANSPORTATION
SUN HARBOR MARINA	TRANSPORTATION
SUNBELT TOWING INC	TRANSPORTATION
SUNDANCE STAGE LINES	TRANSPORTATION
SUNROAD MARINA PARTNERS LP	TRANSPORTATION
SURERIDE CHARTER INC	TRANSPORTATION
SURERIDE INC	TRANSPORTATION
TAG A LONG SAN DIEGO LLC	TRANSPORTATION

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Entity Name	Category
TAPATIO AUTO WRECKING INC	TRANSPORTATION
TETON JET INC	TRANSPORTATION
THE SAN DIEGO MOORING CO	TRANSPORTATION
THOMAS K CLARK	TRANSPORTATION
THOMAS MINICHIELLO	TRANSPORTATION
TIDE WATER INC	TRANSPORTATION
TIM G SWIFT	TRANSPORTATION
TJC LOGISTICS	TRANSPORTATION
TONKA TOW	TRANSPORTATION
TOTAL AVIATION SRVS	TRANSPORTATION
TOWING SAN DIEGO INC	TRANSPORTATION
TOYOTA TSUSHO AMERICA INC	TRANSPORTATION
TRAFFIC TECH INC	TRANSPORTATION
TRANS LOGISTICS LLC	TRANSPORTATION
TRANS WEST EXPRESS	TRANSPORTATION
TRANSCORE	TRANSPORTATION
TRES ESTRELLAS DE ORO	TRANSPORTATION
TRI STAR INTERNTL FORWARDING	TRANSPORTATION
TRUMP CARD HOLDINGS LLC	TRANSPORTATION
TURBINE COMPONENTS INC	TRANSPORTATION
UEBER HAUN I LLC	TRANSPORTATION
UNIPACK GLOBAL RELOCATION CO	TRANSPORTATION
UNITED AIRLINES INC	TRANSPORTATION
UNITED CALIFORNIA FREIGHT	TRANSPORTATION
UPS SUPPLIES CHAIN SOLUTIONS	TRANSPORTATION
US CAB COMPANY	TRANSPORTATION
US OCEAN SAFETY INC	TRANSPORTATION
USA CAB COMPANY	TRANSPORTATION
VELOCITY CEA SD LLC	TRANSPORTATION
VFR IMPORT EXPORT INC	TRANSPORTATION
VINTAGE MARINA PARTNERS LP	TRANSPORTATION
VINTAGE POINT PARTNERS LP	TRANSPORTATION
VIP PEDICABS LLC	TRANSPORTATION
VISUAL PAK SAN DIEGO	TRANSPORTATION
VMA LOGISTICS AND DIST INC	TRANSPORTATION
WESCO SALES CORPORATION	TRANSPORTATION
WESTERN FLIGHT INC	TRANSPORTATION

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Entity Name	Category
WESTERN TOWING	TRANSPORTATION
WESTONE LOGISTICS LLC	TRANSPORTATION
WHEELS LABS INC	TRANSPORTATION
WHIRL WIND	TRANSPORTATION
WILLIAM GAMBLE	TRANSPORTATION
WILLIAM MACLEOD	TRANSPORTATION
WILLSON SHIPPING INC	TRANSPORTATION
WINGS-N-WRENCHES DIY LLC	TRANSPORTATION
WOODS WESTERN WORLD INC	TRANSPORTATION
XPO LOGISTICS/LAST MILE	TRANSPORTATION
YACHUAN CHENG	TRANSPORTATION
YELLOW CAB OF SAN DIEGO	TRANSPORTATION
YELLOW FREIGHT SYSTEM	TRANSPORTATION
YUEMA INTL LOGISTICS USA CO	TRANSPORTATION
YVONNE ABERLE	TRANSPORTATION
BARONA BAND MSN INDIANS	TRIBE
BARONA CHURCH	TRIBE
BARONA COMMUNITY CTR	TRIBE
BARONA TRIBAL COUNCIL	TRIBE
BARONA TRIBAL GAMING AUTH	TRIBE
BARONA TRIBAL OFC	TRIBE
BARONA TRIBAL WATER	TRIBE
CAMPO BAND MSN INDIANS	TRIBE
CAMPO BAND OF MSN INDIANS	TRIBE
CAMPO INDIAN RESERVATN	TRIBE
CAMPO MATERIALS	TRIBE
CASINO PAUMA	TRIBE
GOLDEN ACORN CASINO	TRIBE
HARRAHS RINCON CASINO & RSRT	TRIBE
KUMEYAAY WIND LLC	TRIBE
LA JOLLA BAND OF INDIANS	TRIBE
LA POSTA BAND OF MSN INDIANS	TRIBE
LOS COYOTES GREENHOUSE	TRIBE
LOS COYOTES INDIAN RESVRN	TRIBE
MANZANITA ACTIVITY CTR	TRIBE
MANZANITA BAND MSN INDIANS	TRIBE
MANZANITA INDIAN RES	TRIBE

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Entity Name	Category
MESA GRANDE BAND MSN INDIANS	TRIBE
MESA GRANDE INDIAN HOUSING	TRIBE
PALA BAND OF MISSION INDIANS	TRIBE
PALA ENTERTAINMENT CENTER	TRIBE
PAUMA BAND MSN INDIANS	TRIBE
PAUMA TRIBAL HALL	TRIBE
PAUMA TRIBE	TRIBE
RINCON GAMING ENTERPRISE	TRIBE
RINCON INDIAN RESERVATION	TRIBE
SAN PASQ BAND OF DIEGUENO MI	TRIBE
SYCUAN	TRIBE
SYCUAN BAND KUMEYAAY INDIANS	TRIBE
SYCUAN BAND OF KUMEYAAY	TRIBE
SYCUAN CHURCH	TRIBE
SYCUAN DAYCARE	TRIBE
SYCUAN HEALTH CENTER	TRIBE
SYCUAN TRIBAL DEVELOPMENT CO	TRIBE
VALLEY VIEW CASINO	TRIBE
CALPEAK POWER LLC	UTILITIES
CARLSBAD ENERGY CENTER LLC	UTILITIES
CV ENERGY CENTER LLC	UTILITIES
ESC ENERGY CENTER LLC	UTILITIES
LS POWER ASSOCIATES LP	UTILITIES
ORANGE GROVE ENERGY LP	UTILITIES
OTAY MESA ENERGY CENTER LLC	UTILITIES
SOUTHERN CALIFORNIA EDISON	UTILITIES
BORDEN RANCHES	WATER & WASTEWATER SYSTMS
BORREGO WATER DISTRICT	WATER & WASTEWATER SYSTMS
BOY SCOUTS - SDIC	WATER & WASTEWATER SYSTMS
CAL DEPT OF FISH & GAME	WATER & WASTEWATER SYSTMS
CALTRANS	WATER & WASTEWATER SYSTMS
CITY OF CARLSBAD	WATER & WASTEWATER SYSTMS
CITY OF CHULA VISTA	WATER & WASTEWATER SYSTMS
CITY OF CORONADO	WATER & WASTEWATER SYSTMS
CITY OF DANA POINT	WATER & WASTEWATER SYSTMS
CITY OF DEL MAR	WATER & WASTEWATER SYSTMS
CITY OF ENCINITAS	WATER & WASTEWATER SYSTMS

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Entity Name	Category
CITY OF ESCONDIDO	WATER & WASTEWATER SYSTMS
CITY OF IMPERIAL BEACH	WATER & WASTEWATER SYSTMS
CITY OF MISSION VIEJO	WATER & WASTEWATER SYSTMS
CITY OF NATIONAL CITY	WATER & WASTEWATER SYSTMS
CITY OF OCEANSIDE	WATER & WASTEWATER SYSTMS
CITY OF POWAY	WATER & WASTEWATER SYSTMS
CITY OF S J CAPISTRANO	WATER & WASTEWATER SYSTMS
CITY OF SAN CLEMENTE	WATER & WASTEWATER SYSTMS
CITY OF SAN CLEMENTE	WATER & WASTEWATER SYSTMS
CITY OF SAN DIEGO	WATER & WASTEWATER SYSTMS
CITY OF SAN MARCOS	WATER & WASTEWATER SYSTMS
CITY OF VISTA	WATER & WASTEWATER SYSTMS
CO OF SAN DIEGO	WATER & WASTEWATER SYSTMS
DESCANSO COMM WATR DIST	WATER & WASTEWATER SYSTMS
FPUD - SANITARY	WATER & WASTEWATER SYSTMS
GOLDEN ACORN CASINO	WATER & WASTEWATER SYSTMS
HARRISON PARK MUTUAL WATER	WATER & WASTEWATER SYSTMS
HELIX WATER DISTRICT	WATER & WASTEWATER SYSTMS
JACUMBA COMM SERV DIST	WATER & WASTEWATER SYSTMS
JULIAN COMM SERV DIST	WATER & WASTEWATER SYSTMS
LA JOLLA BAND OF INDIANS	WATER & WASTEWATER SYSTMS
LAKESIDE IRRIG DIST	WATER & WASTEWATER SYSTMS
LAKESIDE WATER DISTRICT	WATER & WASTEWATER SYSTMS
LAZY H WATER COMPANY	WATER & WASTEWATER SYSTMS
LEUCADIA CNTY WATER DIST	WATER & WASTEWATER SYSTMS
LOS COYOTES INDIAN RESVRN	WATER & WASTEWATER SYSTMS
LOS TULES MUT WATER CO	WATER & WASTEWATER SYSTMS
MESA GRANDE B O M I FIRE DPT	WATER & WASTEWATER SYSTMS
MESA GRANDE BAND MSN INDIANS	WATER & WASTEWATER SYSTMS
MOULTON NIGUEL WTR DIST	WATER & WASTEWATER SYSTMS
OLIVENHAIN MUN WTR DIST	WATER & WASTEWATER SYSTMS
OTAY WATER DISTRICT	WATER & WASTEWATER SYSTMS
P V MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
PADRE DAM MUN WTR DIST	WATER & WASTEWATER SYSTMS
PALA BAND OF MISSION INDIANS	WATER & WASTEWATER SYSTMS
PALOMAR MTN MUN WTR DST	WATER & WASTEWATER SYSTMS
PAUMA BAND MSN INDIANS	WATER & WASTEWATER SYSTMS

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PAUMA VALLEY COMMUNITY	WATER & WASTEWATER SYSTMS
PAUMA VLY WATER CO	WATER & WASTEWATER SYSTMS
POSEIDON RSRCS (CHANNELSIDE)	WATER & WASTEWATER SYSTMS
QUEST HAVEN MUN WTR	WATER & WASTEWATER SYSTMS
RAINBOW MUN WTR DIST	WATER & WASTEWATER SYSTMS
RAMONA MUN WTR DIST	WATER & WASTEWATER SYSTMS
RANCHO PAUMA MNT WTR CO	WATER & WASTEWATER SYSTMS
RANCHO PAUMA MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
RANCHO SANTA TERESA WATER	WATER & WASTEWATER SYSTMS
RHO PAUMA MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
RINCON DEL DIABLO MWD	WATER & WASTEWATER SYSTMS
RINCON INDIAN RESERVATION	WATER & WASTEWATER SYSTMS
SAN DIEGUITO WATER DIST	WATER & WASTEWATER SYSTMS
SAN DIEGUITO WATER DISTRICT	WATER & WASTEWATER SYSTMS
SAN ELIJO JNT PWR AUTH	WATER & WASTEWATER SYSTMS
SAN PASQ BAND OF DIEGUENO MI	WATER & WASTEWATER SYSTMS
SDCWA	WATER & WASTEWATER SYSTMS
SERJ MUTUAL WATER COMPANY	WATER & WASTEWATER SYSTMS
SO COAST WATER DISTRICT	WATER & WASTEWATER SYSTMS
STA MARGARITA WTR DIST	WATER & WASTEWATER SYSTMS
STATE OF CA/PARKS & REC	WATER & WASTEWATER SYSTMS
STATE OF CALIFORNIA	WATER & WASTEWATER SYSTMS
SUMMIT EST MUTUAL WATER	WATER & WASTEWATER SYSTMS
SWEETWATER AUTHORITY	WATER & WASTEWATER SYSTMS
SYCUAN BAND OF KUMEYAAY	WATER & WASTEWATER SYSTMS
USDA-FOREST SERVICE	WATER & WASTEWATER SYSTMS
USMC CPEN M00681	WATER & WASTEWATER SYSTMS
VALLECITOS WTR DIST	WATER & WASTEWATER SYSTMS
VISTA IRRIGATION DIST	WATER & WASTEWATER SYSTMS
VLY CENTER MUN WTR DIST	WATER & WASTEWATER SYSTMS
WEST CUCA MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
YUIMA MUN WATER DIST	WATER & WASTEWATER SYSTMS
ZOOLOGICAL SOCIETY SAN DIEGO	WATER & WASTEWATER SYSTMS

Note: Asterisk (*) indicates COVID-19 related temporary sites, including: housing, testing, vaccination administering, etc.)