APPENDIX A - MGRA DATA REQUESTS

MGRA 2020 WMP Comments – Attachment A-1

PG&E Data Requests

PG&E – MGRA – Data Request Response 1

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_001-Q02Rev01		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_001-Q02Rev01		
Request Date:	January 7, 2021	Requester DR No.:	WMP-2021 MGRA DataRequest1
Date Sent:	January 22, 2021 Rev01: February 12, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Utilities are required to provide data upon request to stakeholders under WSD-001. At the request of the Wildfire Safety Division, utilities have begun to provide GIS data to WSD in geodatabase format via a secure Commission website, with updates provided as part of quarterly reports.

As per WSD-011, utility data is provided in quarterly reports so that analysis can be "frontloaded" prior to the issuance of the Wildfire Mitigation Plans.[1] IOUs provided GIS data to WSD in September and December 2020.

This data request is being issued to SCE, PG&E, and SDG&E. Response time specified in WSD-01 is three business days, with exceptions requiring notification of the Wildfire Safety Division director.

QUESTION 02

If updates to the GIS database are to be released to WSD contemporaneously with the Wildfire Mitigation Plans, the IOUs shall make non-confidential versions of the GIS data available to MGRA and other interested stakeholders at the same time that they are released to WSD. Deadline for this request is therefore the same as that for GIS data release to WSD.

ANSWER 02 REVISED 01

On January 27, 2021, PG&E met with MGRA to discuss this request. After discussing the challenge of providing a non-confidential version of the GIS data, PG&E and MGRA agreed that PG&E would provide non-confidential GIS data relating to PSPS events, outages, and ignitions from our February 5, 2021 submission. PG&E asked the Wildfire Safety Division ("WSD") for an extension to respond to the request in a letter dated January 28, 2021. The WSD approved the extension on January 29, 2021. The parties spoke again on February 2, 2021 and agreed that PG&E would produce the agreed-

1 WSD-011; Attachment 2.1; p. 1 – "Accordingly, the WSD will consider these four key elements for the 2021 WMP Update submission and review process:

1.) Frontload data collection. This would extend the timeframe for WSD and stakeholder review of relevant utility data in advance of the WMP submission and review period, in addition to reducing the need for follow-up data requests. This means some data is collected prior to the annual WMP through Quarterly Reports..."

upon, non-confidential GIS data on or before February 12, 2021. PG&E produces the agreed-upon, non-confidential GIS data in WildfireMitigationPlans_DR_MGRA_007-Q02Rev01-Atch01 with this response.

PG&E – MGRA – Data Request Response 2

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_008-Q01		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_008-Q01		
Request Date:	1/25/2021	Requester DR No.:	WMP-2021 MGRA DR-2
Date Sent:	February 12, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Utilities are required to provide data upon request to stakeholders under WSD-001. At the request of the Wildfire Safety Division, utilities have begun to provide GIS data to WSD in geodatabase format via a secure Commission website, with updates provided as part of quarterly reports. As per WSD-011, utility data is provided in quarterly reports so that analysis can be "frontloaded" prior to the issuance of the Wildfire Mitigation Plans.[1] IOUs provided GIS data to WSD in September and December 2020.

Data request are being issued to SCE, PG&E, and SDG&E, and follows up on the previous requests. Response time specified in WSD-01 is three business days, with exceptions requiring notification of the Wildfire Safety Division director.

Unless otherwise indicated, incident data is being requested for 2020, 2019, and prior years. If any of this data was disclosed in previous data requests by MGRA and other parties, please provide a link to it.[2]

QUESTION 01

Please provide the most recent available geodatabase comprised of the nonconfidential portion of the GIS data uploaded to the WSD website containing **PSPS Event records including specifically all perimeter, timing, and damage data** that is reported to WSD and to the Safety Enforcement Division as part of PSPS event reporting. Damage records should include at the least location, type of damage, any photos, and date and time of report. Customer meter records may be omitted from the data response.

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2 Note, SDG&E has provided outage and ignition data for 2020 and does not have to re-supply this data or any link to it.

ANSWER 01

On January 27, 2021, PG&E met with MGRA to discuss this request. The parties agreed that PG&E would provide non-confidential GIS data relating to PSPS events from our February 5, 2021 submission. PG&E asked the Wildfire Safety Division ("WSD") for an extension to respond to the request in a letter dated January 28, 2021. The WSD approved the extension on January 29, 2021. PG&E and MGRA spoke again on February 2, 2021 and agreed that PG&E would produce the agreed-upon, non-confidential GIS data on or before February 12, 2021. PG&E produces the agreed-upon, non-confidential GIS data in *WildfireMitigationPlans_DR_MGRA_007-Q02Rev01-Atch01.*

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_008-Q02		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_008-Q02		
Request Date:	1/25/2021	Requester DR No.:	WMP-2021 MGRA DR-2
Date Sent:	February 12, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Utilities are required to provide data upon request to stakeholders under WSD-001. At the request of the Wildfire Safety Division, utilities have begun to provide GIS data to WSD in geodatabase format via a secure Commission website, with updates provided as part of quarterly reports. As per WSD-011, utility data is provided in quarterly reports so that analysis can be "frontloaded" prior to the issuance of the Wildfire Mitigation Plans.[1] IOUs provided GIS data to WSD in September and December 2020.

Data request are being issued to SCE, PG&E, and SDG&E, and follows up on the previous requests. Response time specified in WSD-01 is three business days, with exceptions requiring notification of the Wildfire Safety Division director.

Unless otherwise indicated, incident data is being requested for 2020, 2019, and prior years. If any of this data was disclosed in previous data requests by MGRA and other parties, please provide a link to it.[2]

QUESTION 02

Please provide the most recent available geodatabase comprised of the nonconfidential portion of the GIS data uploaded to the WSD website containing **ignition data** that is reported to WSD as part of risk event reporting. Please provide entire the historical data set available within the database.

ANSWER 02

On January 27, 2021, PG&E met with MGRA to discuss this request. The parties agreed that PG&E would provide non-confidential GIS data relating to ignitions from our February 5, 2021 submission. PG&E asked the WSD for an extension to respond to the

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1 WSD-011; Attachment 2.1; p. 1 – "Accordingly, the WSD will consider these four key elements for the 2021 WMP Update submission and review process: 1. Frontload data collection. This would extend the timeframe for WSD and stakeholder review of relevant utility data in advance of the WMP submission and review period, in addition to reducing the need for follow-up data requests. This means some data is collected prior to the annual WMP through Quarterly Reports..."

2 Note, SDG&E has provided outage and ignition data for 2020 and does not have to re-supply this data or any link to it.

request in a letter dated January 28, 2021. The WSD approved the extension on January 29, 2021. PG&E and MGRA spoke again on February 2, 2021 and agreed that PG&E would produce the agreed-upon, non-confidential GIS data on or before February 12, 2021. PG&E produces the agreed-upon, non-confidential GIS data in *WildfireMitigationPlans_DR_MGRA_007-Q02Rev01-Atch01*.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_008-Q03		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_008-Q03		
Request Date:	1/25/2021	Requester DR No.:	WMP-2021 MGRA DR-2
Date Sent:	February 12, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Utilities are required to provide data upon request to stakeholders under WSD-001. At the request of the Wildfire Safety Division, utilities have begun to provide GIS data to WSD in geodatabase format via a secure Commission website, with updates provided as part of quarterly reports. As per WSD-011, utility data is provided in quarterly reports so that analysis can be "frontloaded" prior to the issuance of the Wildfire Mitigation Plans.[1] IOUs provided GIS data to WSD in September and December 2020.

Data request are being issued to SCE, PG&E, and SDG&E, and follows up on the previous requests. Response time specified in WSD-01 is three business days, with exceptions requiring notification of the Wildfire Safety Division director.

Unless otherwise indicated, incident data is being requested for 2020, 2019, and prior years. If any of this data was disclosed in previous data requests by MGRA and other parties, please provide a link to it.[2]

QUESTION 03

Please provide the most recent available geodatabase comprised of the nonconfidential portion of the GIS data uploaded to the WSD website containing **outage data** that is reported to WSD as part of risk event reporting. Please provide entire the historical data set available within the database.

ANSWER 03

On January 27, 2021, PG&E met with MGRA to discuss this request. The parties agreed that PG&E would provide non-confidential GIS data relating to outages from our February 5, 2021 submission. PG&E asked the Wildfire Safety Division ("WSD") for an

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1 WSD-011; Attachment 2.1; p. 1 – "Accordingly, the WSD will consider these four key elements for the 2021 WMP Update submission and review process: 1. Frontload data collection. This would extend the timeframe for WSD and stakeholder review of relevant utility data in advance of the WMP submission and review period, in addition to reducing the need for follow-up data requests. This means some data is collected prior to the annual WMP through Quarterly Reports..."

2 Note, SDG&E has provided outage and ignition data for 2020 and does not have to re-supply this data or any link to it.

extension to respond to the request in a letter dated January 28, 2021. The WSD approved the extension on January 29, 2021. PG&E and MGRA spoke again on February 2, 2021 and agreed that PG&E would produce the agreed-upon, non-confidential GIS data on or before February 12, 2021. PG&E produces the agreed-upon, non-confidential GIS data in *WildfireMitigationPlans_DR_MGRA_007-Q02Rev01-Atch01.*

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_008-Q04		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_008-Q04		
Request Date:	1/25/2021	Requester DR No.:	WMP-2021 MGRA DR-2
Date Sent:	February 12, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Utilities are required to provide data upon request to stakeholders under WSD-001. At the request of the Wildfire Safety Division, utilities have begun to provide GIS data to WSD in geodatabase format via a secure Commission website, with updates provided as part of quarterly reports. As per WSD-011, utility data is provided in quarterly reports so that analysis can be "frontloaded" prior to the issuance of the Wildfire Mitigation Plans.[1] IOUs provided GIS data to WSD in September and December 2020.

Data request are being issued to SCE, PG&E, and SDG&E, and follows up on the previous requests. Response time specified in WSD-01 is three business days, with exceptions requiring notification of the Wildfire Safety Division director.

Unless otherwise indicated, incident data is being requested for 2020, 2019, and prior years. If any of this data was disclosed in previous data requests by MGRA and other parties, please provide a link to it.[2]

QUESTION 04

To the extent that there are any records or fields considered confidential in the above datasets, please provide a list of the type of record (for example, transmission with voltage above 200 kV) and specific fields that are considered confidential, including explanation and legal justification for why the particular type of record or field is considered confidential.

ANSWER 04

On January 27, 2021, PG&E met with MGRA to discuss this request. The parties agreed that PG&E would provide non-confidential GIS data relating to PSPS events,

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2 Note, SDG&E has provided outage and ignition data for 2020 and does not have to re-supply this data or any link to it.

outages, and ignitions from our February 5, 2021 submission. PG&E asked the Wildfire Safety Division ("WSD") for an extension to respond to the request in a letter dated January 28, 2021. The WSD approved the extension on January 29, 2021. PG&E and MGRA spoke again on February 2, 2021 and agreed that PG&E would produce the agreed-upon, non-confidential GIS data provided herewith in *WildfireMitigationPlans_DR_MGRA_007-Q02Rev01-Atch01*, as well as the list below identifying the confidential basis for withholding data, on or before February 12, 2021.

Feature Class	Field Name	Basis for Confidentiality
3.3.2 PSPS Event Log	Substation ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.2 PSPS Event Log	Substation Name	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.2 PSPS Event Log	Isolation Device	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.2 PSPS Event Log	Isolation Device Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.2 PSPS Event Log	Isolation Device ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.2 PSPS Event Log	Total Customers	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)

Feature Class	Field Name	Basis for Confidentiality
3.3.2 PSPS Event Log	Residential Customers	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.2 PSPS Event Log	Medical Baseline Customers	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.2 PSPS Event Log	Commercial Industrial Customers	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.2 PSPS Event Log	Other Customers	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.2 PSPS Event Log	Critical Infrastructure	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)

Feature Class	Field Name	Basis for Confidentiality
3.3.2 PSPS Event Log	Critical Infrastructure Duration	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.2 PSPS Event Log	Critical Infrastructure Impact	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.5 PSPS Event Customer Meter	PSPS Event Meter ID	Contains specific customer service point information that should not be disclosed in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.5 PSPS Event Customer Meter	Event ID	This information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.5 PSPS Event Customer Meter	Asset ID	Contains specific customer service point information that should not be disclosed in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)

Feature Class	Field Name	Basis for Confidentiality
3.3.5 PSPS Event Customer Meter	Utility ID	This information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.5 PSPS Event Customer Meter	HFTD Class	This information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.5 PSPS Event Customer Meter	County	This information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.3.6 PSPS Asset Damage Point	Damage Event ID	This contains confidential PG&E employee information. Acts of hostility against PG&E employees show that the public interest in protecting this information outweighs the public interest in disclosure. (See Govt. Code § 6255(a).)
3.3.6 PSPS Asset Damage Conductor	Damage Event ID	This contains confidential PG&E employee information. Acts of hostility against PG&E employees show that the public interest in protecting this information outweighs the public interest in disclosure. (See Govt. Code § 6255(a).)
3.3.6 PSPS Asset Damage Conductor	Asset ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Asset Damage Conductor	Operating Voltage kV	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)

Feature Class	Field Name	Basis for Confidentiality
3.3.6 PSPS Asset Damage Conductor	Substation Name	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Asset Damage Conductor	Substation ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Asset Damage Conductor	Substation Type	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Asset Damage Conductor	Manufacturer Model ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Support Structure Damage Detail	Useful Lifespan	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Support Structure Damage Detail	PSPS Ssd ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Support Structure Damage Detail	Damage Event ID	This contains confidential PG&E employee information. Acts of hostility against PG&E employees show that the public interest in protecting this information outweighs the public interest in disclosure. (See Govt. Code § 6255(a).)

Feature Class	Field Name	Basis for Confidentiality
3.3.6 PSPS Event Support Structure Damage Detail	Asset ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Support Structure Damage Detail	Operating Voltage kV	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Support Structure Damage Detail	Manufacturer Model ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Support Structure Damage Detail	Useful Lifespan	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Other Asset Damage	PSPS Oad ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Other Asset Damage	Damage Event ID	This contains confidential PG&E employee information. Acts of hostility against PG&E employees show that the public interest in protecting this information outweighs the public interest in disclosure. (See Govt. Code § 6255(a).)
3.3.6 PSPS Event Other Asset Damage	Asset ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)

Feature Class	Field Name	Basis for Confidentiality
3.3.6 PSPS Event Other Asset Damage	Operating Voltage kV	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Other Asset Damage	Manufacturer Model ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.3.6 PSPS Event Other Asset Damage	Useful Lifespan	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.4.3 Ignition	Fire Detection Method	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *se seq*.)
3.4.3 Ignition	Fire Detection Method Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.3 Ignition	Suspected Initiating Cause	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Suspected Initiating Cause Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Object Contact	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.3 Ignition	Equipment Failure	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Associated Operating Voltage kV	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Substation ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.4.3 Ignition	Substation Name	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.).

Feature Class	Field Name	Basis for Confidentiality
3.4.3 Ignition	Other Companies	This information may provide customer information in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Equipment Type	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Determination	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.3 Ignition	Determination Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Facility Contacted	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Contributing Factor	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.3 Ignition	Contributing Factor Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Outage Status	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.3 Ignition	Toutage ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.4.3 Ignition	Ignition Notes	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.). May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Outage End Date	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Outage End Time	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Outage Duration	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	CMI	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.) Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.4.4 Transmission Outages	Customers Out Momentary	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.) Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Customers Out Sustained	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *se seq*.) Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)
3.4.4 Transmission Outages	Customer Count	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *se seq*.) Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Associated Operating Voltage kV	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Other Companies	This information may provide customer information in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Substation ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.4.4 Transmission Outages	Recloser Setting	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Isolation Device Type	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Isolation Device Type Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Basic Cause	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Basic Cause Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Basic Cause Object	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Basic Cause Object Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Damaged Device	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Damaged Device Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Expulsion Fuse Operation	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Outage Description	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Supplemental Cause	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.4 Transmission Outages	Supplemental Cause Description	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.4 Transmission Outages	Location Or Address	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.5 Transmission VM Outage	Substation ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.4.5 Transmission VM Outage	Associated Operating Voltage kV	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.5 Transmission VM Outage	Tree Species	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.5 Transmission VM Outage	Tree Height	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.5 Transmission VM Outage	Tree DBH	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.5 Transmission VM Outage	Tree Trunk Distance	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.5 Transmission VM Outage	Vm Outage Description	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.5 Transmission VM Outage	Location Or Address	Physical facility, cyber-security sensitive, or critical energy infrastructure data protected from disclosure. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	CMI	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.6 Distribution Outages	Customers Out Momentary	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Customers Out Sustained	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Customer Count	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Associated Operating Voltage kV	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.6 Distribution Outages	Other Companies	Customer outage information combined with GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Substation ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.4.6 Distribution Outages	Recloser Setting	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Isolation Device Type	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.6 Distribution Outages	Isolation Device Type Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Basic Cause	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Basic Cause Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Basic Cause Object	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.6 Distribution Outages	Basic Cause Object Comment	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Damaged Device	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Damaged Device Comment	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Expulsion Fuse Operation	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.6 Distribution Outages	Outage Description	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Supplemental Cause	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.6 Distribution Outages	Supplemental Cause Description	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.6 Distribution Outages	Location Or Address	This GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.7 Distribution VM Outage	Substation ID	Physical facility, cyber-security sensitive, or critical energy infrastructure data. (See 18 C.F.R. § 388.113, see also Govt. Code § 6254(k), (ab); 6 U.S.C. § 131; 6 CFR § 29.2.)
3.4.7 Distribution VM Outage	Associated Operating Voltage kV	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.7 Distribution VM Outage	Tree Species	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.7 Distribution VM Outage	Tree Height	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

Feature Class	Field Name	Basis for Confidentiality
3.4.7 Distribution VM Outage	Tree DBH	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.7 Distribution VM Outage	Tree Trunk Distance	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.7 Distribution VM Outage	Vm Outage Description	May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)
3.4.7 Distribution VM Outage	Location Or Address	This GIS data may facilitate customer identification in violation of privacy rules. (See PUC § 8380; Civ. Code §§ 1798 *et seq.*; Govt. Code § 6254; D.14-05-016.) May contain information subject to the attorney client privilege or the work product doctrine or may be subject to ongoing investigation and analysis. (See e.g., Evid. Code § 954; Code Civ. Proc., § 2018.010 *et seq*.)

PG&E – MGRA – Data Request Response 3

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q01		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q01		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

QUESTION 01 (7)

Provide the “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”, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

ANSWER 01 (7)

PG&E objects to this request on the grounds that it is overbroad and unduly burdensome because PG&E is required to respond within three business days pursuant to WSD-001. PG&E also objects on the grounds that responding to this request would require PG&E to perform a novel analysis not performed previously.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q02		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q02		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

QUESTION 02 (8)

Provide the number of wires down, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

ANSWER 02 (8)

PG&E objects to this request on the grounds that it is overbroad and unduly burdensome because PG&E is required to respond within three business days pursuant to WSD-001. PG&E also objects on the grounds that responding to this request would require PG&E to perform a novel analysis not performed previously.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q03		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q03		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

QUESTION 03 (9)

Provide the number of outages caused by vegetation, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

ANSWER 03 (9)

PG&E objects to this request on the grounds that it is overbroad and unduly burdensome because PG&E is required to respond within three business days pursuant to WSD-001. PG&E also objects on the grounds that responding to this request would require PG&E to perform a novel analysis not performed previously.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q04		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q04		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

QUESTION 04 (10)

Provide the number of outages not caused by vegetation, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

ANSWER 04 (10)

PG&E objects to this request on the grounds that it is overbroad and unduly burdensome because PG&E is required to respond within three business days pursuant to WSD-001. PG&E also objects on the grounds that responding to this request would require PG&E to perform a novel analysis not performed previously.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q05		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q05		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

QUESTION 05 (11)

Provide the number of ignitions, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

ANSWER 05 (11)

PG&E objects to this request on the grounds that it is overbroad and unduly burdensome because PG&E is required to respond within three business days pursuant to WSD-001. PG&E also objects on the grounds that responding to this request would require PG&E to perform a novel analysis not performed previously.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q06		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q06		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

QUESTION 06 (12)

What is the maximum duration in hours simulated used to model maximal losses using the Technosylva model?

ANSWER 06 (12)

The maximum duration in hours that can be simulated using the Technosylva fire spread model is currently 84 hours. PG&E's default forecast duration is 8 hours.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q07		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q07		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

QUESTION 07 (13)

What is the average size of "maximal" wildfire spread in acres when the Technosylva model is run to its maximum duration?

ANSWER 07 (13)

The Technosylva fire spread model domain is capped at a 40 x 40 mile square. Without context regarding a specific time and place constraints, this question is not able to be further answered, as modeled fire size is highly dependent upon the underlying conditions in the area of concern, including variables such as live and dead fuel moisture, weather conditions, fuel loading and terrain.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q08		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q08		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

QUESTION 08 (14)

What is the typical computational time for a Technosylva run of “maximum” duration? Include assumptions regarding CPU type, speed and memory consumed.

ANSWER 08 (14)

An 84-hour simulation would take approximately 30 seconds to 2 minutes to compute, dependent on the size of the simulated fire. All simulations are done server side at Technosylva and speed of computation is independent of the PG&E end users’ computer hardware.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_009-Q09		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_009-Q09		
Request Date:	February 17, 2021	Requester DR No.:	WMP-2021 MGRA DR-3
Date Sent:	February 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

QUESTION 09 (15)

Have Technosylva fire spread simulations been run for 24 and 48 hour propagation times? If yes, how do the results compare to the results of 8 hour simulations in terms of average acres impacted and in terms of computing resources? If not, why has this not been performed?

ANSWER 09 (15)

We have run on-demand simulations longer than the default time extent of 8 hours, including both 24 and 48-hour propagation times. A 24 hour simulation increases the computing time by roughly 4x compared to the 8 hour default, according to Technosylva.

Without specific time and location constraints, the average acreage component of this question cannot be answered, as acreage depends significantly based on the underlying conditions in the area of concern, including variables such as live and dead fuel moisture, weather conditions, fuel loading and terrain.

PG&E – MGRA – Data Request Response 4

Wildfire Mitigation Plans - 2021
MGRA Data Request No. 4
February 25, 2021

The following data requests are being issued to PG&E.

MGRA-16 On page 64 of its WMP, PG&E states that "during RFW conditions, there is approximately a 70 percent chance that a large wildfire (i.e., 300 acres or greater) started with an ignition involving PG&E's electric equipments [sic] in an HFTD area results in destroying 100 or more structures." Please provide the calculation justifying this assertion.

MGRA-17 "FIGURE PG&E-4.2-6: AGENCY TRAINING MATERIALS AND PG&E VALIDATION" is not legible. Please provide a legible version of this figure or a valid and accessible citation.

MGRA-18 "FIGURE PG&E-4.2-8: SNAPSHOT OF OPW DASHBOARD" is not legible. Please provide a legible version of this figure or a valid and accessible citation.

MGRA-19 On page 116 of its WMP, PG&E presents data from a research report that "found that PG&E's fire risk ranking per species uses a sound methodology. The engaged researchers agreed that we should focus on tree species that have been observed to have a higher branch failure rate as part of our continuous improvement efforts." Please provide a copy of this research report.

MGRA-20 On p. 203 of its WMP, PG&E states that: "When developing the 2021 Wildfire Distribution Risk Model, wind speed was considered as a variable impacting ignition, and it was determined, as can be seen in the output below, that average wind speed (the last row in Figure PG&E-4.6-4 below) has a marginal effect on the probability of ignition." The wind speed variable shown in Figure PG&E-4.6-4 is called "wind-avg". Additionally, this is accompanied by variables "specific-humidity-avg" and "precipitation-avg". Confirm whether the "-avg" designation represents an annual average or an average over another period.

MGRA-21 Regarding the 2021 Wildfire Distribution Risk Model, explain why weather variables averaged over a period (annually?) were used rather than peak values or values measured or predicted at the time of historical ignition events.

MGRA-22 On p. 281 of its WMP, PG&E states that it is developing "weather-station specific wind gust model based on machine-learning or statistical techniques." What characteristics is this model designed to predict, and based upon what input data? Will this model be used to predict wind gusts only or will it also be used to predict outage rates?

MGRA-23 "FIGURE PG&E-7.3.1-2: EXAMPLE OUTPUT FROM THE FIRE SPREAD MODEL APPLICATION" is not legible. Please provide a legible version of this figure or a valid and accessible citation.

MGRA-24 On p. 416 of its WMP, PG&E discusses its satellite monitoring program. With regard to this program:

a. What fraction of the alerts are "false alarms" that do not correspond to wildfires, and how has this changed as the project has matured?

b. What fraction of alerts are "first alerts" that are received prior to wildfires being reported by other means?

c. What is the mean time between the point at which a wildfire becomes visible on a wildfire camera and the time that an alert is received from satellite monitoring?

d. What is the mean time between updates for a typical location in the PG&E service area from any satellite with a polar orbit?

MGRA-25 Regarding PG&E POMMS model output presented on pp. 431-433: In its comments on the 2020 WMPs, MGRA noted that there were significant differences between the 99^{th} percentile results from PG&E and SCE meteorology models in areas where model predictions overlapped.[1] Did PG&E and SCE consult on weather model differences in 2020 and if so what was their conclusion regarding differences between their models, particularly with regard to 99^{th} percentile wind discrepencies?

MGRA-26 On p. 666-667 of its WMP, PG&E lists highest risk tree species per region. For the purposes of this ranking, did PG&E normalize by the number of trees adjacent to PG&E equipment in the given region? Or is the risk ranking solely a function of the number of outages associated with that species?

MGRA-27 With regard to "Table 12: Mitigation initiative financials": Why is the RSE for Rapid Earth Current Fault Limiter (REFCL) 0.06? What assumptions lead to this low value, and how will these change if the pilot is successful?

[1] MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2020 WILDFIRE MITIGATION PLANS OF SDG&E, PG&E, SCE; April 7, 2020; pp. 53-55.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_010-Q01		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q01		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 01 (16)

On page 64 of its WMP, PG&E states that "during RFW conditions, there is approximately a 70 percent chance that a large wildfire (i.e., 300 acres or greater) started with an ignition involving PG&E's electric equipments [sic] in an HFTD area results in destroying 100 or more structures." Please provide the calculation justifying this assertion.

ANSWER 01 (16)

This is based off reviewing PG&E's ignition tracking data and large fires in PG&E territory. In looking at attachment 'WildfireMitigationPlans_DR_MGRA_010-Q16_Atch01.xlsx', PG&E separates each ignition by HFTD, RFW, and fire size, shown in 'All Ignition Data set'. That then is matched against CALFIRE's reporting on structures, and fatalities, shown in 'Large Fires (PGETerritory)'. Based on matching of the two data sets, there was 7 ignitions identified. Of those 5 were attributed to meet the greater than 300 acre + 100 or more structures threshold.

In 'All Ignition Data Set', filter '0_RFW Applicable' for 'Fire Weather RFW Applicable', and '0_Fire Greater than 300 Acres' for 'Fire Greater than 300 Acres'. You will find seven unique entries. These represent large fires during RFW.

In 'Large Fires (PGETerritory)', filter '0_RFW Applicable' for 'Red Flag Warning Applicable', filter 'Cause' for ' Electrical Power', there are 6 unique line items, with 5 fires greater than 100 structures under column '0_Buildings Destroyed Modified'. These represent catastrophic/destructive fires during RFW.

When you combine these two data sets, out of the 7 ignitions that meet large fires, 5 led to catastrophic/destructive fires during RFW. Five out of seven is approximately 71.4%, rounded to 70%.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_010-Q17		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q17		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 17

"FIGURE PG&E-4.2-6: AGENCY TRAINING MATERIALS AND PG&E VALIDATION" is not legible. Please provide a legible version of this figure or a valid and accessible citation.

ANSWER 17

Please see : WildfireMitigationPlans_DR_MGRA_010-Q17_Atch01

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_010-Q03		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q03		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 03 (18)

"FIGURE PG&E-4.2-8: SNAPSHOT OF OPW DASHBOARD" is not legible. Please provide a legible version of this figure or a valid and accessible citation.

ANSWER 03 (18)

Please see : WildfireMitigationPlans_DR_MGRA_010-Q18_Atch01

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_010-Q04		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q04		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 04 (19)

On page 116 of its WMP, PG&E presents data from a research report that "found that PG&E's fire risk ranking per species uses a sound methodology. The engaged researchers agreed that we should focus on tree species that have been observed to have a higher branch failure rate as part of our continuous improvement efforts." Please provide a copy of this research report.

ANSWER 04 (19)

PG&E's engagement with researchers at University of California Cooperative Extension and the University of California Berkeley to evaluate our EVM procedural requirements for work execution did not result in a formal research report. It was an initial discussion regarding the methodology of PG&E's fire risk rankings per species and possible adjustments to minimum radial clearance requirements for trees with trunks within the defined minimum clearance zone. As indicated on page 116 of the 2021 WMP, "results of this research may not result in any changes in 2021 but are part of long-term analysis for performing EVM in the most effective way possible."

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_010-Q05		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q05		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 05 (20)

On p. 203 of its WMP, PG&E states that:

> “When developing the 2021 Wildfire Distribution Risk Model, wind speed was considered as a variable impacting ignition, and it was determined, as can be seen in the output below, that average wind speed (the last row in Figure PG&E-4.6-4 below) has a marginal effect on the probability of ignition.”

The wind speed variable shown in Figure PG&E-4.6-4 is called “wind-avg”. Additionally, this is accompanied by variables “specifichumidity-avg” and “precipitation-avg”. Confirm whether the “-avg” designation represents an annual average or an average over another period.

ANSWER 05 (20)

Yes, the average meteorology values are annual averages.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_010-Q06		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q06		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 06 (21)

Regarding the 2021 Wildfire Distribution Risk Model, explain why weather variables averaged over a period (annually?) were used rather than peak values or values measured or predicted at the time of historical ignition events.

ANSWER 06 (21)

As a planning model, the 2021 Wildfire Distribution Risk Model provides insights used to develop annual mitigation plans. It is a model trained to predict where ignitions are more likely to occur over the next year and not when they will occur. This is different than an operational model that would be used for a PSPS event where the likelihood of ignition for a forecasted weather pattern is the objective. For an operational model, peak weather values play a significant role in developing predictions. However, when modeling all ignitions over longer periods of time, prevailing wind speeds and directions play a different role. As long as there are a similar number of wind events in similar locations over time, the model is already accounting for wind impacts on annual ignitions. However, the majority of ignitions are not caused by wind as 95% of outages do not occur during NE wind days.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_010-Q07		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q07		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 07 (22)

On p. 281 of its WMP, PG&E states that it is developing “weather-station specific wind gust model based on machine-learning or statistical techniques.” What characteristics is this model designed to predict, and based upon what input data? Will this model be used to predict wind gusts only or will it also be used to predict outage rates?

ANSWER 07 (22)

The model will be used for forecasting wind gusts specifically for point weather station locations. The specific input data for the machine learning models has not been determined at this time (as they are still in development); however, in general, the machine learning model will be fed with various forecasted weather parameters from the surrounding environment and then trained to predict the wind gusts for the given location. These models will be tested against historical weather observations during the model training phase.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_010-Q08		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q08		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 08 (23)

"FIGURE PG&E-7.3.1-2: EXAMPLE OUTPUT FROM THE FIRE SPREAD MODEL APPLICATION" is not legible. Please provide a legible version of this figure or a valid and accessible citation.

ANSWER 08 (23)

Please see: WildfireMitigationPlans_DR_MGRA_010-Q23_Atch01

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_010-Q09		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q09		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 09 (24)

On p. 416 of its WMP, PG&E discusses its satellite monitoring program. With regard to this program:

a. What fraction of the alerts are "false alarms" that do not correspond to wildfires, and how has this changed as the project has matured?

b. What fraction of alerts are "first alerts" that are received prior to wildfires being reported by other means?

c. What is the mean time between the point at which a wildfire becomes visible on a wildfire camera and the time that an alert is received from satellite monitoring?

d. What is the mean time between updates for a typical location in the PG&E service area from any satellite with a polar orbit?

ANSWER 09 (24)

a. PG&E is unable to provide a fraction of alerts that are "false alarms". PG&E does not track the number of alerts which turn up to be false. PG&E has worked to limit the number of false alarms, mainly by masking out locations that more frequently provide false alarms, such as solar panels, bodies of water, and agricultural areas where agricultural burns are frequent. These locations occasionally cause false alarms by confusing the satellite detection system imager. . The system also cannot differentiate between prescribed burns and wildfires, nor can it differentiate between some larger structural and industrial fires and a wildfire.

b. PG&E is unable to answer this question with a fraction. Satellite detections are invaluable for "first alert" detections in areas with limited populations and internet/mobile connections for reporting. For other areas, satellite detections can serve as first alerts or help corroborate other intelligence sources. In practice, given the many other sources that are brought together to verify ignitions, PG&E is unable to precisely calculate which alerts which "first alerts" of an ignition.

c. PG&E cannot answer this question with certainty because there are too many variables involved. Every fire is different, and the location, size, and temperature of a fire can all impact satellite detection times. The satellite must complete its scan before sending the ignition data to SSEC for processing. The data is then sent to PG&E for additional processing Accordingly, PG&E does not track “mean” alert times in this manner.

d. The polar orbiting satellites PG&E pulls into the MODIS portion of the satellite fire detection system are the MODIS imager carrying Aqua and Terra satellites. These satellites collect images of the same area of earth approximately 3 hours apart. At a minimum, the PG&E territory is passed over twice per day by each of these satellites.

e. The polar orbiting satellites PG&E pulls into the VIIRS portions of the satellite fire detection system are the VIIRS imager carrying SUOMI-NPP and NOAA-20 satellites. These satellites are designed to capture the earth’s surface twice a day, and passes are separated by approximately 50 minutes. At a minimum, the PG&E territory is passed over twice per day by these satellites.

PACIFIC GAS AND ELECTRIC COMPANY
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Data Response

PG&E Data Request No.:	MGRA_010-Q10		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q10		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 10 (25)

Regarding PG&E POMMS model output presented on pp. 431-433: In its comments on the 2020 WMPs, MGRA noted that there were significant differences between the 99th percentile results from PG&E and SCE meteorology models in areas where model predictions overlapped.[1] Did PG&E and SCE consult on weather model differences in 2020 and if so what was their conclusion regarding differences between their models, particularly with regard to 99th percentile wind discrepencies?

ANSWER 10 (25)

PG&E did not consult with SCE on weather model differences in 2020. We also do not know how SCE computed their 99 percentile winds and if they are based on hourly or daily data. PG&E and SCE have developed their weather models independently from one another, although both models are variations of the Weather Research and Forecasting (WRF) Model. Model domain overlap occurs because the domain of a weather model must extend beyond the area of concern due to a phenomenon known as edge effects, where model accuracy is lower at the edges of the weather model field. If the area of discrepancy is located near the edge of one of the weather models, edge effects could be partially responsible for this discrepancy. Also, while the same base model is utilized by both utilities, the WRF Model contains a significant number of parameter and physics options and variables which are determined by the end user. PG&E leveraged the expertise of two external numerical weather prediction expert companies to configure and validate its version of the WRF Model to perform best within the boundaries of the PG&E service territory. This was done by validating several recent historical storms against weather stations in the PG&E territory Also, PG&E calibrated the 2km version of the WRF Model primarily against offshore wind event days in order to maximize model performance on days that would potentially require PSPS to be enacted as the POMMS model is the basis of PG&E meteorology's forecast scoping process.

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1 MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2020 WILDFIRE MITIGATION PLANS OF SDG&E, PG&E, SCE; April 7, 2020; pp. 53-55.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_010-Q11		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q11		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 11 (26)

On p. 666-667 of its WMP, PG&E lists highest risk tree species per region. For the purposes of this ranking, did PG&E normalize by the number of trees adjacent to PG&E equipment in the given region? Or is the risk ranking solely a function of the number of outages associated with that species?

ANSWER 11 (26)

PG&E normalized this data based on the species data available. PG&E does not have an exact count as this was extrapolated from our existing data.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_010-Q12		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_010-Q12		
Request Date:	February 25, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 4
Date Sent:	March 2, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 12 (27)

With regard to "Table 12: Mitigation initiative financials": Why is the RSE for Rapid Earth Current Fault Limiter (REFCL) 0.06? What assumptions lead to this low value, and how will these change if the pilot is successful?

ANSWER 12 (27)

Table 12 inadvertently includes an erroneous RSE value for Rapid Earth Current Fault Limited (REFCL). This will be corrected in PG&E's errata filing of the 2021 WMP. The error resulted from a mis-entry, where the sub-driver column was erroneously populated with 'Fuse'. However, REFCL, as explained in the 'Justification of Effectiveness %' column, mitigates various types of line to ground and line to line faults, regardless of equipment failure type. The program exposure was also erroneously populated and has been adjusted to reflect estimated total line miles upon which REFCL is expected to provide coverage for each year. The correct RSE is 104. Please refer to the attachment named WildfireMitigationPlans_DR_MGRA_010-Q27_Atch01.xlsm
.

Pilot results will adjust effectiveness values based on results specific to our system.

PG&E – MGRA – Data Request Response 5

Wildfire Mitigation Plans - 2021
MGRA Data Request PG&E No. 5
March 4, 2021

The following data requests are being issued to PG&E.

MGRA-28 Please provide a table of all trees removed in 2018-2020, including columns for year, species type, species (if available), distance from SCE equipment (if available), and reason for removal (if available).

MGRA-29 Regarding the 2021 Utility Maturity Survey, the attached PDF output is incomplete and not possible to track against the 2020 Utility Maturity Survey.
Please provide a table of all Utility Maturity Survey responses that have changed since 2020, how they have changed, and a description of why.

Regarding PG&E's Outage Producing Wind (OPW) model:

MGRA-30 Regarding "FIGURE PG&E-4.2-8: SNAPSHOT OF OPW DASHBOARD", please provide the data used for this figure in tabular format.

MGRA-31 Is the OPW model described on page 75 of the 2021 WMPs using the same algorithm and methods described in PG&E's 2020 release "PACIFIC GAS AND ELECTRIC COMPANY; CALCULATING METEOROLOGICAL AND PG&E FIRE RISK; PG&E PSPS DECISION-MAKING; May 15,2020; REV.1; PG&E Emergency Preparedness & Response (EP&R) / PG&E Meteorology and Fire Science."? If the calculation methods have changed, please describe how.

MGRA-32 Please provide details of and justification for the use of a genetic growth algorithm for the OPW model (PG&E WMP p. 75)

Regarding PG&E's ignition probability model:

MGRA-33 On page 98 of its WMP, PG&E lists "wind max" as the annual 99th percentile hourly wind speed at 10 m. However, "wind max" is not listed as a variable used in either the equipment probability of ignition model (pp. 102). Did PG&E conduct an analysis of equipment ignition probability using this variable? And if so please present the results.

MGRA-34 By "gusty summer days" (p. 98), what is the "summer" definition used for the purposes of this calculation? What was the justification for restricting this variable to summer?

MGRA-35 Please present the "buy down" risk curves showing both equipment ignition probability and vegetation ignition probability showing circuit risk rankings and relative risk, both with the old regression ignition model and the new machine learning ignition model.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q28		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q28		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 28

Please provide a table of all trees removed in 2018-2020, including columns for year, species type, species (if available), distance from SCE equipment (if available), and reason for removal (if available).

ANSWER 28

PG&E interprets this request to be referring to PG&E rather than SCE. Subject to that interpretation, please see attachment 'WildfireMitigationPlans_DR_MGRA_011-Q28-Atch01.xlsx' listing available tree removal data for Work year, Tree species, Species type, Program, and Volume. Species type is not captured in EVM.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q29		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q29		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

The following data requests are being issued to PG&E.

QUESTION 29

Regarding the 2021 Utility Maturity Survey, the attached PDF output is incomplete and not possible to track against the 2020 Utility Maturity Survey. Please provide a table of all Utility Maturity Survey responses that have changed since 2020, how they have changed, and a description of why.

ANSWER 29

PG&E objects to the characterization that the 2021 Utility Maturity Survey is incomplete. PG&E provided all requested information for the 2021 survey within the requested deadline. Subject to and without waiving its objection, PG&E is providing the list of questions where a survey response changed from the 2020 submission to the 2021 submission with an explanation of why in attachment "WildfireMitigationPlans_DR_MGRA_011-Q29-Atch01".

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
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Data Response

PG&E Data Request No.:	MGRA_011-Q30		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q30		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding PG&E's Outage Producing Wind (OPW) model:

QUESTION 30

Regarding "FIGURE PG&E-4.2-8: SNAPSHOT OF OPW DASHBOARD", please provide the data used for this figure in tabular format.

ANSWER 30

See the attachment titled "WildfireMitigationPlans_DR_MGRA_011-Q30-Atch01". The spreadsheet includes the data used for this figure except for the outage cause/PSPS damage information which have been redacted for confidentiality.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q31		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q31		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding PG&E's Outage Producing Wind (OPW) model:

QUESTION 31

Is the OPW model described on page 75 of the 2021 WMPs using the same algorithm and methods described in PG&E's 2020 release "PACIFIC GAS AND ELECTRIC COMPANY; CALCULATING METEOROLOGICAL AND PG&E FIRE RISK; PG&E PSPS DECISION-MAKING; May 15,2020; REV.1; PG&E Emergency Preparedness & Response (EP&R)/PG&E Meteorology and Fire Science."? If the calculation methods have changed, please describe how.

ANSWER 31

The OPW Model was enhanced in 2020 and is not the same version that was cited in the referenced document. The current OPW Model methodology is described in detail in the 2021 WMP on pages 75-77.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q32		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q32		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding PG&E's Outage Producing Wind (OPW) model:

QUESTION 32

Please provide details of and justification for the use of a genetic growth algorithm for the OPW model (PG&E WMP p. 75).

ANSWER 32

Outage nodes are created to relate historical outages to nodes and then the nodes to POMMS grid cells. The geographic area of a node is a function of distribution line mile density, with approximately 50 overhead line miles per node. Spatially contiguous nodes of similar line miles per node were created by PG&E Data Scientists and PG&E GIS analysts using a genetic growth algorithm. Further background information on the algorithm is available at the following link: https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-statistics/learnmore-buildbalancedzones.htm . Alternative OPW Model formulations were evaluated, including circuit level models and circuit-cell level models. Due to the high variability of lengths of PG&E's approximately 3,300 circuits, the circuit models were found to be less granular compared to the node-cell model approach for the longer circuits which are spreading the weather information over too large of an area, and too small for the shorter circuits, with insufficient observation of outages to train the model. In other words, the justification for the nodes is to allow OPW to be trained with sufficient outages in each node, allow OPW to be compared across the territory, and to attain a more precise spatial relation of the weather and outage information.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q35		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q35		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding PG&E's ignition probability model:

QUESTION 35

Please present the "buy down" risk curves showing both equipment ignition probability and vegetation ignition probability showing circuit risk rankings and relative risk, both with the old regression ignition model and the new machine learning ignition model.

ANSWER 35

Wildfire risk by circuit is presented for the 2019-2020 Wildfire Risk Model and the 2021 Wildfire Distribution Risk Model for vegetation and equipment in WildfireMitigationPlans_DR_MGRA_011-Q35-Atch01.xls.

For the 2019-2020 Wildfire Risk Model the vegetation risk was produced at the circuit level and the System Hardening risk was produced as the circuit segment level. For the 2021 Wildfire Distribution Risk Model, both the Vegetation and Equipment Risk models are produced at the circuit segment level.

Risk reduction is represented as the risk that is addressed at each circuit segment. For each buy down curve, the total risk of all circuit segments is the value at the top left of the buy down curve. For each circuit segment along the x-axis the total risk for that circuit segment is removed from the total as a representation of the amount of wildfire risk addressed as mitigations are conducted.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q33		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q33		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding PG&E's ignition probability model:

QUESTION 33

On page 98 of its WMP, PG&E lists "wind max" as the annual 99th percentile hourly wind speed at 10 m. However, "wind max" is not listed as a variable used in either the equipment probability of ignition model (pp. 102). Did PG&E conduct an analysis of equipment ignition probability using this variable? And if so please present the results.

ANSWER 33

Yes, PG&E did use the "wind max" data set as part of the initial set of input variables to the Equipment Probability of Ignition Model. As part of the regularization model development step the "wind max" variable was removed from the input variables as it did not contribute performance gain during out of sample testing.

The fact that the 99th percentile hourly wind speed did not contribute performance gain for the Equipment Probability of Ignition Model was questioned by our modeling team. As seen in the jackknife results below, it was left in the vegetation ignition probability model which was developed before the Equipment Probability of Ignition Model. Similar to the Equipment Probability of Ignition Model jackknife result on page 203 of the 2021 WMP, for the Vegetation Probability of Ignition Model, the average wind and wind max have a marginal effect on the predictive power of the model. With further investigation the team arrived at the following understanding that supported removing the variable from the Equipment Probability of Ignition Model:

The ignition probability models are tuned to predict fire-season annual probabilities of reportable ignitions according to conditions at each grid location. Prevailing wind metrics over the course of the fire season are only weakly predictive of ignitions. This is because: (1) over 90% of reportable ignitions do not occur during unusual wind conditions; (2) prevailing winds shape vegetation settlement and structure - Red Flag Warning ignitions are due to anomalous conditions, not prevailing conditions and the low-risk coasts and low-veg high mountains see the highest prevailing winds; and (3) the danger associated with wind is most closely correlated with fire intensity and spread and therefore quantified by consequence data (as distinct from ignitions).

One way to interpret the annual models is that such conditions occur every year and what makes specific locations risky are variables that describe the presence of vegetation and dryness of fuels on top of the predictable occurrence of winds and, spatially speaking, gusty winds are less unusual than vegetation and fuels.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q34		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q34		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding PG&E's ignition probability model:

QUESTION 34

By "gusty summer days" (p. 98), what is the "summer" definition used for the purposes of this calculation? What was the justification for restricting this variable to summer?

ANSWER 34

The definition of summer for wildfire risk modeling is June 1st through November 30th. While equipment failures, and to a lesser extent, ignitions occur throughout the year, wildfire risk is highest when fuel and moisture levels reach critical stages during summer periods. As the 2021 Wildfire Distribution Risk Model is focused on quantifying wildfire risk as the product of ignition probability and wildfire consequence and wildfire consequence is tuned to peak wildfire conditions in the summer, the ignition probability also focused on the same time period.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_011-Q35		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_011-Q35		
Request Date:	March 4, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 5
Date Sent:	March 9, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding PG&E's ignition probability model:

QUESTION 35

Please present the "buy down" risk curves showing both equipment ignition probability and vegetation ignition probability showing circuit risk rankings and relative risk, both with the old regression ignition model and the new machine learning ignition model.

ANSWER 35

Wildfire risk by circuit is presented for the 2019-2020 Wildfire Risk Model and the 2021 Wildfire Distribution Risk Model for vegetation and equipment in WildfireMitigationPlans_DR_MGRA_011-Q35-Atch01.xls.

For the 2019-2020 Wildfire Risk Model the vegetation risk was produced at the circuit level and the System Hardening risk was produced as the circuit segment level. For the 2021 Wildfire Distribution Risk Model, both the Vegetation and Equipment Risk models are produced at the circuit segment level.

Risk reduction is represented as the risk that is addressed at each circuit segment. For each buy down curve, the total risk of all circuit segments is the value at the top left of the buy down curve. For each circuit segment along the x-axis the total risk for that circuit segment is removed from the total as a representation of the amount of wildfire risk addressed as mitigations are conducted.

PG&E – MGRA – Data Request Response 6

Wildfire Mitigation Plans - 2021
MGRA Data Request SCE No. 8 SDG&E No. 6 PG&E No. 6-amended
March 17, 2021

The following data requests are being issued to PG&E, SCE and SDG&E. Renumbering starts at MGRA-35.

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

MGRA-35 How is the duration of the simulation determined for risk calculations used to prioritize circuit risks for mitigation? Is there a maximum / default duration of simulation for this purpose and if so what is it?

MGRA-36 Is there a maximum wildfire size used for simulation determined for risk calculations used to prioritize circuit risks for mitigation and if so what is it?

MGRA-37 How are weather and fuel inputs determined for risk calculations used to prioritize circuit risks for mitigation?

MGRA-38 How is the duration of the simulation determined for risk calculations used to identify circuits for PSPS? Is there a maximum / default duration of simulation for this purpose and if so what is it? Or does the duration of the simulation extend to the projected length of the weather event?

MGRA-39 Is there a maximum wildfire size used in simulations to identify circuits for PSPS and if so what is it?

MGRA-40 Regarding the file 2021WMP_ClassB_Action-PGE-15_Atch01.xlsx, spreadsheet technosylva_fire_probability, columns C (acres_mean) and E (acres_max), what is the duration of the model run in hours used to obtain these figures?

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_012-Q36		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_012-Q36		
Request Date:	March 17, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 6
Date Sent:	March 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

QUESTION 36

How is the duration of the simulation determined for risk calculations used to prioritize circuit risks for mitigation? Is there a maximum / default duration of simulation for this purpose and if so what is it?

ANSWER 36

The wildfire consequence data is based on an 8-hour simulation provided by Technosylva. The wildfire consequence data used for all distribution locations are based on these 8-hour simulations.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_012-Q37		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_012-Q37		
Request Date:	March 17, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 6
Date Sent:	March 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

QUESTION 37

Is there a maximum wildfire size used for simulation determined for risk calculations used to prioritize circuit risks for mitigation and if so what is it?

ANSWER 37

PG&E interprets this question to be asking what the largest simulated fire in terms of acres is resulting from the Technosylva 8-hour fire spread simulations for modeled locations on the PG&E distribution system. For each location along the distribution grid, 452 simulations are performed across over 200,000 locations. From among these, the maximum 8-hour simulated wildfire size was 31,015 acres.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_012-Q38		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_012-Q38		
Request Date:	March 17, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 6
Date Sent:	March 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

QUESTION 38

How are weather and fuel inputs determined for risk calculations used to prioritize circuit risks for mitigation?

ANSWER 38

For details on the weather and fuels used in development of the 2021 Wildfire Distribution Risk Model, please see the ‘description’ column of Table PG&E-4.2-7: Meteorological Datasets used in 2021 Wildfire Distribution Risk Model on page 82 of the 2021 Wildfire Mitigation Plan.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_012-Q39		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_012-Q39		
Request Date:	March 17, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 6
Date Sent:	March 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

QUESTION 39

How is the duration of the simulation determined for risk calculations used to identify circuits for PSPS? Is there a maximum / default duration of simulation for this purpose and if so what is it? Or does the duration of the simulation extend to the projected length of the weather event?

ANSWER 39

Technosylva outputs are not currently utilized in PSPS decision making; however, we are currently evaluating incorporation of Technosylva outputs into the PSPS Black Swan criteria. The millions of fire spread simulations that are run automatically each day from Technosylva presently have a maximum burn duration of 8 hours. This was selected at the guidance of Technosylva to: 1) capture the initial burn period; 2) simulate all fires across an equivalent timeframe to allow for direct comparisons between circuits; and 3) balance costs, as computational costs scale with burn duration times.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_012-Q40		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_012-Q40		
Request Date:	March 17, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 6
Date Sent:	March 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

QUESTION 40

Is there a maximum wildfire size used in simulations to identify circuits for PSPS and if so what is it?

ANSWER 40

The Technosylva fire model is not currently being used for PSPS decision making. While PG&E does not have a programmed maximum wildfire size in simulation models, the Technosylva fire model domain is currently limited to 40 x 40 square miles.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_012-Q41		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_012-Q41		
Request Date:	March 17, 2021	Requester DR No.:	WMP-2021 MGRA PGE DataRequest 6
Date Sent:	March 22, 2021	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph Mitchell

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

QUESTION 41

Regarding the file 2021WMP_ClassB_Action-PGE-15_Atch01.xlsx, spreadsheet technosylva_fire_probability, columns C (acres_mean) and E (acres_max), what is the duration of the model run in hours used to obtain these figures?

ANSWER 41

The duration of the model run is 8 hours.

MGRA 2020 WMP Comments – Attachment A-2

SCE Data Request Responses

SCE – MGRA – Data Request Response 1

Southern California Edison
WSD-001 – 2020 WMP

DATA REQUEST SET M G R A - S C E - 0 0 1 W M P - 2 0 2 1

To: MGRA
Prepared by: Ryan Stevenson
Job Title: Senior Advisor
Received Date: 1/7/2021

Response Date: 1/12/2021

Question 001:
Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website. This should contain the least the version of GIS data provided to WSD in September pursuant to the Draft WSD GIS Data Reporting Requirements and Schema for California Electric Corporations (Draft GIS Data Schema) along with any updates provided in December. Where confidential data is intermixed in tables with non-confidential data, fields containing confidential data should be left blank or removed. Confidentiality should not be applied at the feature class level.

Response to Question 001:
As explained in its Quarterly Reports, SCE has reservations regarding confidentiality of data. Data is confidential when it is in the public interest that the information not be disseminated publicly. Release of the precise location, age, and other attributes of SCE's assets alongside the precise location of critical facilities may significantly increase safety risk to the public. For example, knowledge of underground line routes and electrical equipment serving a critical facility could facilitate an attack on that critical facility's power supply. Also, knowledge of the location of specific SCE assets in areas with historical high fire weather could make them vulnerable to attack during the worst possible time. Further, the precise locations of SCE's high voltage transmission lines and substations alongside the abovementioned confidential information, as well as the non-confidential information requested increases risk to the bulk power transmission system. The Commission recognizes the importance of safeguarding critical energy infrastructure information and although maps of varying age and detail of SCE's transmission system may be publicly available from other sources, SCE does not believe it is prudent to further propagate that information, in this level of detail, accompanying other information that, taken together, could prove to be useful to a bad actor. According to CAL FIRE, arson arrests through September/October 2020 are approximately 60% greater than the annual average over 2016 through 2019.[1] This is concerning to SCE and should be a concern to stakeholders and the Commission. For these reasons, SCE applied confidentiality at the feature class level for each provided dataset as opposed to the data field level. Notwithstanding these concerns, SCE is working towards identifying confidentiality at the field level for its next Quarterly Report submission. Given the constraints of the draft GIS Data Schema, it may not be possible to replicate the Geodatabase with

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[1] *See* https://www.fire.ca.gov/media/1bqlpsdu/arsonarrests.pdf.

just non-confidential data. Moreover, while a data element such as equipment age may be deemed non-confidential on a standalone basis, when that data is related to location and probability and consequence of ignition information, it could provide critical information to a bad actor putting SCE facilities and communities at grave risk. As such, even non-confidential data elements in a relational Geodatabase could pose a significant risk. Standard Commission confidential processes require stakeholders to enter into Non-disclosure Agreements (NDAs) to protect confidential information and SCE recommends these processes be used with stakeholders requesting the Geodatabase until the WSD creates its data portal with strict security protocols. To meet this request, SCE is providing four data layers that it determined are non-confidential. Also, SCE plans to identify confidentiality at the data element level with its next Quarterly Report submission and will assess if it is possible and in the public interest to recreate a non-confidential Geodatabase that could be provided. The four non-confidential data layers (Camera, Weather Station, OH Primary Distribution Line, and OH Secondary Distribution Line) are attached.

SCE – MGRA – Data Request Response 2

DATA REQUEST SET M G R A - S C E - 0 0 1 W M P - 2 0 2 1

To: MGRA
Prepared by: Ryan Stevenson
Job Title: Senior Advisor
Received Date: 1/7/2021

Response Date: 1/12/2021

Question 002:
If updates to the GIS database are to be released to WSD contemporaneously with the Wildfire Mitigation Plans, the IOUs shall make non-confidential versions of the GIS data available to MGRA and other interested stakeholders at the same time that they are released to WSD. Deadline for this request is therefore the same as that for GIS data release to WSD.

Response to Question 002:
Please see SCE's Response to Question No. 1.

Southern California Edison
WSD-011 – 2021 WMP

DATA REQUEST SET M G R A - S C E - 0 0 2

To: MGRA
Prepared by: Alexander Redd
Job Title: Advisor
Received Date: 1/25/2021

Response Date: 2/10/2021

Question 001:
Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website containing PSPS Event records including specifically all perimeter, timing, and damage data that is reported to WSD and to the Safety Enforcement Division as part of PSPS event reporting. Damage records should include at the least location, type of damage, any photos, and date and time of report. Customer meter records may be omitted from the data response.

Response to Question 001:
Please see the attached geodatabase.

Southern California Edison
WSD-011 – 2021 WMP

DATA REQUEST SET M G R A - S C E - 0 0 2

To: MGRA
Prepared by: Alexander Redd
Job Title: Advisor
Received Date: 1/25/2021

Response Date: 2/10/2021

Question 002:
Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website containing ignition data that is reported to WSD as part of risk event reporting. Please provide entire the historical data set available within the database.

Response to Question 002:
Please see the attached geodatabase.

Southern California Edison
WSD-011 –2021 WMP

DATA REQUEST SET M G R A - S C E - 0 0 2

To: MGRA
Prepared by: Alexander Redd
Job Title: Advisor
Received Date: 1/25/2021

Response Date: 2/10/2021

Question 003:
Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website containing outage data that is reported to WSD as part of risk event reporting. Please provide entire the historical data set available within the database.

Response to Question 003:
Please see the attached geodatabase.

Southern California Edison
WSD-011 – 2021 WMP

DATA REQUEST SET M G R A - S C E - 0 0 2

To: MGRA
Prepared by: Ryan Stevenson
Job Title: Senior Advisor
Received Date: 1/25/2021

Response Date: 2/10/2021

Question 004:
To the extent that there are any records or fields considered confidential in the above datasets, please provide a list of the type of record (for example, transmission with voltage above 200 kV) and specific fields that are considered confidential, including explanation and legal justification for why the particular type of record or field is considered confidential.

Response to Question 004:
Pursuant to the WSD's Draft GIS Schema requirements, SCE identified confidentiality at the data field level in its GIS Status Report. As such, the list of fields considered confidential are included in SCE's GIS Status Report. SCE's GIS Status Report can be found on its WMP webpage (www.sce.com\wmp). Pursuant to CPUC rules, SCE submitted a confidentiality declaration to the WSD regarding data it deems confidential. That declaration explains the confidentiality basis as follows:

The information meets the balancing test of California Government Code section 6255. It is in the public interest that the information not be disseminated publicly. Release of detailed asset and risk event information could make SCE's facilities vulnerable to attack and could be valuable information in planning an attack on critical infrastructure. Further, providing this information in addition to and in relation with Critical Facility information could further the consequences of such an attack.

There is little to no benefit to making this information publicly available. Third parties do not need this information to evaluate SCE's 2021 WMP Update. As such, the public interest in not disclosing this information far outweighs the public interest in disclosing it.

In addition, public disclosure of customer information could compromise privacy to the potential harm of customers. In addition, public disclosure of this information could identify the company, customer, or the location/site or other private information that could be advantageous to a competitor. Gov't Code § 6254(c); Gov't Code § 6254(k); Civil Code §§ 1798.3 & 1798.24 (the California Information Practices Act); Cal. Const., Art. I, § 1 (California constitutional right to privacy); Gov't Code §§6254(k), 6254.7(d); Evid. Code §1060; Civil Code §3426 et seq.; Competitive Data: Gov't Code §§ 6254(k), 6254.7(d); Evid. Code §1060; Civil Code §3426 et seq.

SCE – MGRA – Data Request Response 3

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

MGRA-7 Provide the "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", subdivided into the following categories:
Year from 2015 to 2020, further subdivided into:
High Fire Threat District Tier 2 and Tier 3, further subdivided into:
Total, HWW, RFW, HWW and RFW, and HWW without RFW.

MGRA-8 Provide the number of wires down, subdivided into the following categories:
Year from 2015 to 2020, further subdivided into:
High Fire Threat District Tier 2 and Tier 3, further subdivided into:
Total, HWW, RFW, HWW and RFW, and HWW without RFW.

MGRA-9 Provide the number of outages caused by vegetation, subdivided into the following categories:
Year from 2015 to 2020, further subdivided into:
High Fire Threat District Tier 2 and Tier 3, further subdivided into:
Total, HWW, RFW, HWW and RFW, and HWW without RFW.

MGRA-10 Provide the number of outages not caused by vegetation, subdivided into the following categories:
Year from 2015 to 2020, further subdivided into:
High Fire Threat District Tier 2 and Tier 3, further subdivided into:
Total, HWW, RFW, HWW and RFW, and HWW without RFW.

MGRA-11 Provide the number of ignitions, subdivided into the following categories:
Year from 2015 to 2020, further subdivided into:
High Fire Threat District Tier 2 and Tier 3, further subdivided into:
Total, HWW, RFW, HWW and RFW, and HWW without RFW.

Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

MGRA-12 What is the maximum duration in hours simulated used to model maximal losses using the Technosylva model?

MGRA-13 What is the average size of "maximal" wildfire spread in acres when the Technosylva model is run to its maximum duration?

MGRA-14 What is the typical computational time for a Technosylva run of "maximum" duration? Include assumptions regarding CPU type, speed and memory consumed.

MGRA-15 Have Technosylva fire spread simulations been run for 24 and 48 hour propagation times? If yes, how do the results compare to the results of 8 hour simulations in terms of average acres impacted and in terms of computing resources? If not, why has this not been performed?

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 3

To: Cal Advocates
Prepared by: Bryan Landry
Job Title: Senior Advisor – Strategic Planning
Received Date: 2/17/2021

Response Date: 2/19/2021

Question 006:
Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

What is the maximum duration in hours simulated used to model maximal losses using the Technosylva model?

Response to Question 006:
Wildfire consequences are calculated based on the spread of a fire over an eight (8) hour period for each ignition point. Fire spread predictions are run for each of the 41 weather scenarios extracted from the SCE 20-year climatology. This results in 41 different risk values for each variable (acres, structures, population) for each ignition point.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 3

To: Cal Advocates
Prepared by: Bryan Landry
Job Title: Senior Advisor – Strategic Planning
Received Date: 2/17/2021

Response Date: 2/19/2021

Question 007:
Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

What is the average size of "maximal" wildfire spread in acres when the Technosylva model is run to its maximum duration?

Response to Question 007:
The average maximum consequence value in terms of acres impacted for all facility locations (FLOCS) over an eight (8) hour simulation period is 540.496 acres.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 3

To: Cal Advocates
Prepared by: Bryan Landry
Job Title: Senior Advisor – Strategic Planning
Received Date: 2/17/2021

Response Date: 2/19/2021

Question 008:
Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

What is the typical computational time for a Technosylva run of "maximum" duration? Include assumptions regarding CPU type, speed and memory consumed

Response to Question 008:

Wildfire consequences are calculated based on the spread of a fire over an eight (8) hour period predicted for each ignition point. Fire spread predictions are run for each of the 41 weather scenarios extracted from the SCE 20-year climatology. This results in 41 different risk values for each variable (acres, structures, population) for each ignition point.

This results in approximately 29 million simulations. This data is computed in a cloud environment by SCE's vendor (Technosylva). A single simulation can be run on a typical laptop computer with eight (8) gigabytes of RAM from anywhere between approximately 30 seconds to 2 minutes.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 3

To: Cal Advocates
Prepared by: Bryan Landry
Job Title: Senior Advisor – Strategic Planning
Received Date: 2/17/2021

Response Date: 2/21/2021

Question 009:
Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

Have Technosylva fire spread simulations been run for 24 and 48 hour propagation times? If yes, how do the results compare to the results of 8 hour simulations in terms of average acres impacted and in terms of computing resources? If not, why has this not been performed?

Response to Question 009:
SCE does not possess fire spread simulations with 24- or 48-hour propagation times. A standard eight (8) hour duration is chosen as a consistent duration for each simulation to allow for comparison and interpretation of outputs when comparing all simulations.

SCE – MGRA – Data Request Response 4

Southern California Edison
WSD-011 – WSD-011

DATA REQUEST SET M G R A - S C E - 0 0 4

To: MGRA
Prepared by: Raymond Fugere
Job Title: Principal Manager
Received Date: 2/22/2021

Response Date: 2/25/2021

Question 001:
Provide all ignition data collected by SCE in the format provided in annual reports to the Safety Enforcement Division, for years 2015 to 2020. Confidential fields may be removed, for example if SCE considers location information confidential for transmission equipment it may omit necessary fields from transmission records. However, it should still provide location information for distribution data.

Response to Question 001:
The attached file titled "MGRA-SCE-004-Question-001" contains all CPUC reportable ignition events reported between 2015 and 2019. Please note, the file contains 2020 data that is to be reported to the CPUC on April 1, 2021, and that data is still being finalized and may have some fields that are blank and still being populated.

DATA REQUEST SET M G R A - S C E - 0 0 4

To: MGRA
Prepared by: Raymond Fugere
Job Title: Principal Manager
Received Date: 2/22/2021

Response Date: 2/25/2021

Question 002:
Has SCE omitted any wildfires from the list of ignitions for which it contests utility involvement, but which a public agency or SCE has publicly acknowledged is under investigation? If the answer to this question is "yes", then list the name and ignition date of the fire(s) under investigation.

Response to Question 002:
Yes. Below is a list of the fires, to the best of SCE's knowledge, that were excluded from SCE's annual ignition report because the fires were under active investigation at the time of reporting:

> VAN DYKE (2/6/2015), CABIN (8/14/2015), LINCOLN (8/16/2015), NICOLE (2/18/2016), EDISON (5/12/2016), ERSKINE (6/23/2016), MARINA (6/24/2016), BRAVO (5/12/2017), ELLIS (10/18/2017), THOMAS/KOENIGSTEIN (12/4/2017), MEYERS (12/5/2017), RYE (12/5/2017), LIBERTY (12/7/2017), HOLIDAY (7/6/2018), WOOLSEY (11/8/2018), PIRU (5/3/2019), STAR (7/28/2019), TENAJA (9/4/2019), SADDLE RIDGE (10/10/2019), OAK (10/28/2019), WALNUT (10/25/2019), EASY (10/30/2019), MUREAU (10/30/2019), MARIA (10/31/2019)

Please note, for years 2018 and prior, this was a manual search, and SCE made reasonable efforts to include all that it knew were not contained in the annual filing within the limits of the 3-day response period. Additionally, in 2019, four smaller events (10/5/2019, 10/21/2019, 11/27/2019, 11/28/2019) that involved civil litigation were excluded. SCE is not producing events that may be excluded from its 2020 report, which will be submitted on April 1, 2021, because the filing is not finalized and is still under review.

Southern California Edison
WSD-011 – WSD-011

DATA REQUEST SET M G R A - S C E - 0 0 4

To: MGRA
Prepared by: Raymond Fugere
Job Title: Principal Manager
Received Date: 2/22/2021

Response Date: 2/25/2021

Question 003:
This request is based on Edison's assertion that it does not have outage data in GIS format, and that therefore that responding to MGRA Data Request No. 3 questions 7 through 11 would present an excessive burden.

Provide all wires down data from 2015 to 2020, including all non-confidential fields maintained in the SCE database. Position information should be in terms of latitude/longitude. If latitude/longitude is not available, then ID of nearest structure should be provided. If ID of nearest structure is not available provide circuit ID and feeder number. Additionally, data provided should include date/time of wire-down, cause of wire down, supplemental cause information on wire down, weather information, major event day information, event id, equipment involved, fault type, ignition involved, if ignition involved, cross reference to ignition ID in MGRA-16, if vegetation caused, diagnosis of tree failure.

Response to Question 003:
The attached spreadsheet titled "MGRA-SCE-004-Question-003.xlsx" contains all wire downs between 2015 to 2020. The data set contains all non-confidential fields in the database. The database does not track weather, tree health or whether an ignition occurred. However, SCE attempted to match vegetation and ignition records to the outage data by using circuit and date of the event although this may not always be correct. For example, there could be multiple events on the same day. Furthermore, given the limited time to respond to this data request, SCE is unable to provide weather data for the events listed in the Excel file.

Southern California Edison
WSD-011 – WSD-011

DATA REQUEST SET M G R A - S C E - 0 0 4

To: MGRA
Prepared by: Raymond Fugere
Job Title: Principal Manager
Received Date: 2/22/2021

Response Date: 2/25/2021

Question 004:
Provide all outage data from 2015 to 2020, including all non-confidential fields maintained in the SCE database. Position information should be in terms of latitude/longitude. If latitude/longitude is not available, then ID of nearest structure should be provided. If ID of nearest structure is not available provide circuit ID and feeder number. Additionally, data provided should include date/time of wire-down, cause of outage, supplemental cause information on outage, weather information, major event day information, event id, equipment involved, fault type, ignition involved, if ignition involved, cross reference to ignition ID in MGRA-16, if vegetation caused, diagnosis of tree failure.

Response to Question 004:
The attached spreadsheet entitled "MGRA-SCE-004-Question-004.xlsx" contains all outage data that was used to create SCE's WMP fault tables between 2015 to 2020. SCE has excluded all restoration steps, and outages that were not faults (i.e., crew caused). The database does not track weather, tree health or if an ignition occurred. However, SCE attempted to match vegetation and ignition records to the outage data. SCE attempted to match these records by using circuit and date of the event. However, this may not be always correct. For example, there could be multiple events on the same day. Furthermore, within the shortened response time, SCE is unable to provide weather data for the events listed in the Excel file.

SCE – MGRA – Data Request Response 5

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Andrea Elsdon
Job Title: Andrea Elsdon
Received Date: 2/25/2021

Response Date: 3/2/2021

Question 001:
The response to Data Request MGRA-3 (GIS PSPS damage data) was incomplete:
• The data lacks any "cause" information.
• SCE's PSPS reports list one instance of equipment damage in its November 24th Report, 9 instances of equipment damage in its November 29th report, and 8 instances of equipment damage in its December 4th report. This is a total of 18 instances of damage. Only 10 are listed in the GIS data provided to MGRA.

Repeating language from MGRA-3: "Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website containing PSPS Event records including specifically all perimeter, timing, and damage data that is reported to WSD and to the Safety Enforcement Division as part of PSPS event reporting. Damage records should include at the least location, type of damage, any photos, and date and time of report. Customer meter records may be omitted from the data response." (emphasis added) By "type of damage" MGRA is referring to the cause of the damage recorded by SCE. Provide data for all 18 events referred to in SCE's post-incident PSPS reports.

Response to Question 001:
The tables below provide the requested information. As MGRA states, 18 instances of damage were listed in the PSPS post-event reports, but only ten were in the data provided in SCE's response. The 18 instances referenced in the question do not include incidents for the 10.23.2020 and 12.16.2020 Post Event Reports, and the Q4 2020 Quarterly Data Report (QDR) did take all of them into account. The corrections are summarized below with details in the tables.

Post Event Report:

- Reported: 29 structures (reported in 21 line entries)
- Reported incorrectly: 12 structures (subtract) – details shown in Table 1 below
- Missed reporting: 1 structure (added) – detail shown in table 2 below
- Accurate count: 18 structures

Q4 2020 Quarterly Data Report:

- Reported: 10 structures
- Reported incorrectly: 0 structures (subtract)

- Missed reporting: 8 structures (added) – details shown in table 2 below
- Accurate number: 18 structures

The following items were included in the Post-Event Reports that after further review should have been excluded for the reasons noted:

Post Event Report:	Circuit	Structure(s)	Damage Indicated	Reason to Exclude
2020.10.23	Acosta	1499799E	Damaged Insulators	This was not located in area de-energized for PSPS.
2020.10.23	Acosta	1388833E	Damaged Insulators	This was not located in area de-energized for PSPS.
2020.10.23	Acosta	4234971E	Broken Pole	This was not located in area de-energized for PSPS.
2020.11.29	Taiwan	4319112E, 1810547E	Damaged circuit hardware	Found and corrected **prior to event**
2020.11.29	Lockner	1570494E	Damaged conductor	This was not located in area de-energized for PSPS beyond initial 20 minutes to open equipment and further isolate.
2020.11.29	Twin Lakes	1365090E, 1662572E	Damaged transformer lead and conductor	These were not located in area de-energized for PSPS.
2020.12.04	Matilija	108929E	Downed conductor	This was not located in area de-energized for PSPS.
2020.12.04	Sutt	1142S, 1499837E	Damaged conductor and crossarm	These were not located in area de-energized for PSPS.
2020.12.04	Timber Canyon	881218E	Downed conductor	This was not located in area de-energized for PSPS.

The following items were excluded from the Q4 2020 QDR in error. They have been updated in the report:

Post Event Report:	Circuit	Structure(s)	Damage Indicated	Cause
2020.11.24	Condor	2038752E	Service wire connectors damaged	Unknown, strong winds, possible veg contact
2020.11.29	Anton	1383492E	Damaged crossarm	Unknown, strong winds
2020.11.29	Balcom	901395E	Service wire neutral open in a few places going through a tree	Unknown, strong winds, possible veg contact
2020.11.29	Dysart	2092722E	Damaged crossarm	Unknown, strong winds
2020.11.29	Energy	1186927E	Broken transformer lead	Unknown, strong winds
2020.11.29	Energy	1647114E	Tracking on crossarm, over the arm taps	Unknown, strong winds
2020.11.29	Northpark	2121599E	Tree fell into secondary lines, splitting pole at top	Tree fell into line

2020.12.04	Thacher	474424E	Tree fell into communication line causing secondary pole to lean	Tree fell into line

SCE – MGRA – Data Request Response 6

Wildfire Mitigation Plans - 2021
MGRA Data Request SCE No. 6
March 3, 2021

The following data requests are being issued to SCE only.

The following requests are issued with regard to SCE's Probability of Ignition (POI) model used as an input to its WRRM.

According to the row describing "POI - Component of WRRM" in the table on page 85 of SCE's WMP, SCE uses "Historical Weather Data" consisting of hourly ADS weather model data with a 2X2 km resolution as an input to its POI machine learning model.

MGRA-21 What are the variables from the historical weather data that are used by POI?

MGRA-22 What kind of wind data is utilized as an input to the machine learning model? Gust or average wind speeds? And are averages used (if so over what time period), peak values (if so over what time period), or value at point of failure using Historical Failure Data?

MGRA-23 Describe the algorithm(s) used by the POI model. "Machine learning" is not sufficient detail.

MGRA-24 When making predictions for an ignition to be used as input for consequence modeling, what assumptions are input to the POI model regarding weather conditions? Is the probability of ignition averaged over all historic weather conditions? Or is POI based on a specific weather scenario also used for Technosylva fire spread modeling?

MGRA-25 During the February 22nd technical workshop, Joe Goizueta of SCE commented that SCE had not observed correlation between wind speeds and outage rates. Please confirm whether this is an accurate statement and if so provide data and analysis supporting it.

MGRA-26 SDG&E observes the following probabilities for ignitions arising from outages:

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%

SCE's POI model uses only outages, not ignitions, as input. What assumptions does it make about probability of ignition from any given outage?

MGRA-27 In its response to Cal Advocates Data Request CalAdvocates-SCE-2021WMP-01, SCE states that "SCE plans to assess the feasibility of replacing the current methodology for setting PSPS thresholds and triggers with a dynamic, machine-

learning model that derives circuit thresholds and triggers. SCE began the development of this model in 2020 and will perform rigorous analysis and validation in 2021."
How does this machine learning model differ from POI? What algorithms will it use and what specific data will it analyze (in particular weather data)?

General questions

MGRA-28 Please provide a table of all trees removed in 2018-2020, including columns for year, species type, species (if available), distance from SCE equipment (if available), and reason for removal (if available).

MGRA-29 Please provide details of the consequence modeling portion of the WRRM component that calculates the risk of PSPS de-energization based on the probability of de-energization and consequence of those de-energizations (safety, reliability and financial) at the circuit level.

MGRA-30 Please provide data and/or calculation showing the dependency of FPI 2.0 on wind speed.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Matthew Mendoza
Job Title: Predictive Analytics/Data Science, Advisor
Received Date: 3/3/2021

Response Date: 3/8/2021

Question 001:
What are the variables from the historical weather data that are used by POI?

Response to Question 001:
The POI model uses solar radiation, humidity, precipitation, temperature, dew point temperature, wet bulb temperature, atmospheric pressure, and wind speed, direction, and frequency of oscillation, from SCE weather stations and WRF climatology model data generated by Atmospheric Data Solutions (ADS).

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Matthew Mendoza
Job Title: Predictive Analytics/Data Science, Advisor
Received Date: 3/3/2021

Response Date: 3/8/2021

Question 002:
What kind of wind data is utilized as an input to the machine learning model? Gust or average wind speeds? And are averages used (if so over what time period), peak values (if so over what time period), or value at point of failure using Historical Failure Data?

Response to Question 002: Ten years (2009-2019) of hourly wind data including the peak (gusts), average, and standard deviation of observed wind distribution are used in the models.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Matthew Mendoza
Job Title: Predictive Analytics/Data Science, Advisor
Received Date: 3/3/2021

Response Date: 3/8/2021

Question 003:
Describe the algorithm(s) used by the POI model. "Machine learning" is not sufficient detail.

Response to Question 003:
The POI model uses a form of ensemble model called a "Random Forest Classifier." Ensemble models use a group or "ensemble" of decision trees to make classifications. The Random Forest Classifier takes subsets of random samples of the training data set and fits a decision tree on the independent variables that best discriminates between the classes of interest. The order with which the algorithm chooses variables to build out the decision trees is also randomized. Future data is classified based on the consensus of "votes" of the ensemble of decision trees.

Classifications in the context of POI models determine whether an asset experienced a failure given its physical features and the environmental and electrical stresses, and other data that the asset may experience. The Random Forest Classifier, therefore, creates a congress of logic trees that determine the likelihood of an asset failure.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Matthew Mendoza
Job Title: Predictive Analytics/Data Science, Advisor
Received Date: 3/3/2021

Response Date: 3/8/2021

Question 004:
When making predictions for an ignition to be used as input for consequence modeling, what assumptions are input to the POI model regarding weather conditions? Is the probability of ignition averaged over all historic weather conditions? Or is POI based on a specific weather scenario also used for Technosylva fire spread modeling?

Response to Question 004:
Hourly weather features are aggregated to their mean, max, and standard deviation over 10 years to capture the cumulative, average, and extreme impacts from weather conditions on equipment failures that are likely to cause ignitions. Therefore, the POI model was not based on the specific weather scenario used for Technosylva fire spread modeling but was built using all outages capable of generating a spark regardless of the weather condition at the time of the outage.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Eric X Wang
Job Title: Senior Advisor - Predictive Analytics/Data Science
Received Date: 3/3/2021

Response Date: 3/8/2021

Question 005:
During the February 22nd technical workshop, Joe Goizueta of SCE commented that SCE had not observed correlation between wind speeds and outage rates. Please confirm whether this is an accurate statement and if so provide data and analysis supporting it.

Response to Question 005:
Mr. Goizueta's statement was referring to circuit level correlations and was based on a limited sample of data and Mr. Goizueta's expert judgment. SCE has observed correlations for 10% of circuits for which there was available data. For most circuits, SCE does not have enough-wind driven outage data at the circuit level to make determinations about correlations between wind speeds and outage rates.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Eric X Wang
Job Title: Senior Advisor - Predictive Analytics/Data Science
Received Date: 3/3/2021

Response Date: 3/8/2021

Question 006:
SDG&E observes the following probabilities for ignitions arising from outages:

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%

SCE's POI model uses only outages, not ignitions, as input. What assumptions does it make about probability of ignition from any given outage?

Response to Question 006:
SCE's POI model was developed in two steps. The first step is to output the probability of spark-causing outages at sub driver level (e.g., CFO, EFF). Not all sparks-causing outages lead to ignitions, as ignitions may depend on the presence of other factors such as weather and fuels. The second step is to calibrate the output to POI by calibrating against historical fires. The calibration is performed at the sub driver level so that the results reflect the outage to ignition potential. This calibration gives us greater granularity than applying a probability across the entire area. For example, we can estimate total ignitions across a territory as well as estimate ignitions from an equipment failure versus a vegetation contact at a segment or circuit level.

Southern California Edison
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

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/3/2021

Response Date: 3/8/2021

Question 010:
Please provide data and/or calculation showing the dependency of FPI 2.0 on wind speed.

Response to Question 010:
The current FPI references a matrix to calculate the weather score which is based on wind speed (miles per hour at 20 feet) and dew point depression (degrees F). Dew point depression is a way to measure how dry the air is near the ground.

FPI Weather Component (Wx)

		Wind Speed (mph)					
		<=5	6-10	11-16	17-22	23-28	>=29
Dew Point Depression	>=50	2	3	3	4	5	6
	40-49	2	2	3	3	4	5
	30-39	1	2	2	3	3	4
	20-29	1	1	2	2	3	3
	10-19	0	0	1	1	1	1
	<10	0	0	0	0	0	0

The limitation to the current FPI is that it does not account for wind speeds that are greater than 29 mph and dew point depressions that are greater than 50 since anything above these values would be assigned a "6" no matter the level of exceedance in both variables.

FPI 2.0 will have no upper boundaries because it will not be utilizing a matrix. The weather score in FPI 2.0 will be calculated using one of the following formulas:

FPI 2.0weather = (WindSpeed^2)*(Dew Point Depression) or (WindSpeed^2)*(Vapor Pressure Deficit)

Testing and evaluating these formulas over both a historical period and in real time will determine which performs better. Both versions of the equation put the same emphasis on the wind speed which is why that variable is squared. It has been observed that stronger winds can overcome fire mitigating factors such as moisture in the air or in the vegetation, so it is important that wind speeds be the dominant factor in the FPI 2.0 formula. In addition, this new formula will account for winds at any strength with no upper boundary limitations.

SCE – MGRA – Data Request Response 7

The following data requests are being issued to SCE only.

On p. 47 of its WMP, SCE states that: "To account for a wide range of historical climate scenarios, SCE uses 41 weather scenarios across a 20-year historical climatology in its WRRM consequence model. By using a wide range of models, SCE can determine the relative risk of wildfire consequence for each location under the maximum likely weather conditions, based on a historic climatology for any given location."

MGRA-31 Are the same "maximum likely weather conditions" used for modeling fire spread identical to those that are used by the Probability of Ignition (POI) model? In other words, are the same weather condition assumptions used to feed both POI and consequence models?

MGRA-32 Are the ignition probability and consequence probability treated as completely independent distributions? Aside from location, are there any input parameters common between the two calculations (such as weather)?

General questions:

MGRA-33 In its comments on the 2020 WMPs, MGRA noted that there were significant differences between the 99th percentile results from PG&E and SCE meteorology models in areas where model predictions overlapped. Did SCE consult with PG&E on weather model differences in 2020 and if so what was their conclusion regarding differences between their models, particularly with regard to 99th percentile wind discrepancies?

MGRA-34 Please provide a table of all Utility Maturity Survey responses that have changed since 2020, how they have changed, and a description of why.

Southern California Edison

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DATA REQUEST SET M G R A - S C E - 0 0 7

To: MGRA
Prepared by: Bryan Landry
Job Title: Senior Advisor – Strategic Planning
Received Date: 3/16/2021

Response Date: 3/19/2021

Question 001:

On p. 47 of its WMP, SCE states that: "To account for a wide range of historical climate scenarios, SCE uses 41 weather scenarios across a 20-year historical climatology in its WRRM consequence model. By using a wide range of models, SCE can determine the relative risk of wildfire consequence for each location under the maximum likely weather conditions, based on a historic climatology for any given location."

Are the same "maximum likely weather conditions" used for modeling fire spread identical to those that are used by the Probability of Ignition (POI) model? In other words, are the same weather condition assumptions used to feed both POI and consequence models?

Response to Question 001:

No, the weather conditions parameters used in the POI and in the consequence components of the Wildfire Risk Reduction Model are different. While the consequence modeling targets specific days, the POI model uses all faults regardless of weather conditions. Future updates to the consequence model will include larger data sets with more days to further refine the consequence values.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 7

To: MGRA
Prepared by: Bryan Landry
Job Title: Senior Advisor – Strategic
Received Date: 3/16/2021

Response Date: 3/19/2021

Question 002:
On p. 47 of its WMP, SCE states that: "To account for a wide range of historical climate scenarios, SCE uses 41 weather scenarios across a 20-year historical climatology in its WRRM consequence model. By using a wide range of models, SCE can determine the relative risk of wildfire consequence for each location under the maximum likely weather conditions, based on a historic climatology for any given location."
Are the ignition probability and consequence probability treated as completely independent distributions? Aside from location, are there any input parameters common between the two calculations (such as weather)?

Response to Question 002:
Yes. The probability of ignition (POI) component and the consequence component of the Wildfire Risk Reduction Model are distinct and separate models. By "parameters," SCE interprets the question to mean – what are some common "features" used in the machine learning models which comprise the various POI sub-components, and what "variables" comprise the weather scenarios for ignition simulations. Some of the features and variables that are common across these components are: wind, wind speed, wind direction, humidity, and temperature.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 7

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/16/2021

Response Date: 3/19/2021

Question 003:
In its comments on the 2020 WMPs, MGRA noted that there were significant differences between the 99th percentile results from PG&E and SCE meteorology models in areas where model predictions overlapped. Did SCE consult with PG&E on weather model differences in 2020 and if so what was their conclusion regarding differences between their models, particularly with regard to 99th percentile wind discrepancies?

Response to Question 003:
SCE is unaware of the 99^{th} percentile results from PG&E.

DATA REQUEST SET M G R A - S C E - 0 0 7

To: MGRA
Prepared by: Devin Rauss
Job Title: Sr. Manager
Received Date: 3/16/2021

Response Date: 3/18/2021

Question 004:
Please provide a table of all Utility Maturity Survey responses that have changed since 2020, how they have changed, and a description of why.

Response to Question 004:
The table below provides an explanation regarding differences in the 2021 and 2020 starting points, or differences in our anticipated end point for 2022. The table only includes questions that reflect such changes.

SCE included an identification of key initiatives and associated progress in sections 7.1 and 7.2 of our WMP. The table below does not repeat this information, but instead offers a summary representation of how and why our responses evolved. In many cases, the response changes are a reflection of the successful execution of WMP activities in the time intervals between the two survey responses. SCE had significant focus on our WMP activities throughout 2020 and as a result made a significant amount of progress on many of our capabilities. The time elapsed since the last survey and progress made are reflected in the difference in starting point between 2020 and 2021, denoted by "achieved capabilities through activities completed in 2020". We also updated our expected maturity level in 2022 based on the progress made from 2020 to 2021 as denoted by statements including "… than originally anticipated…".

Cap.	Sub-Question	Maturity Level by Year: 2020 WMP 2020	2020 WMP 2022	2021 Update 2021	2021 Update 2022	How	Why
A.I	a. How sophisticated is utility's ability to estimate the risk of weather scenarios?	ii	iv	iv	iv	Improvements in weather modeling and risk understanding	Achieved capabilities through activities completed in 2020
	d. How automated is the tool?	i	ii	ii	ii	Improvements in automation	Achieved capabilities through activities completed in 2020
	a. How is ignition risk calculated	ii	iii	iv	iv	Improvements in risk tool inputs and granularity	Achieved more risk modeling enhancements than originally anticipated through activities completed in 2020
A.II	b. How automated is the ignition risk calculation tool?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
	d. How automated is the ignition risk estimation process?	i	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
	f. How are the outputs of the ignition risk impact assessment tool evaluated?	iii	iv	iii	iii	N/A	Do not expect machine learning will be achieved in this timeframe
A.III	g. What other inputs are used to estimate impact?	i	iii	iii	iii	Additional inputs incorporated	Achieved capabilities through activities completed in 2020
	a. How is risk reduction impact estimated?	ii	iv	iv	iv	Achieved interval scale for risk estimation	Achieved capabilities through activities completed in 2020
	b. How automated is ignition risk reduction impact assessment tool?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
A.IV	c. How granular is the ignition risk reduction impact assessment tool?	ii	v	v	v	Achieved greater granularity	Achieved capabilities through activities completed in 2020
	b. How automated is the mechanism to determine whether to update algorithms based on deviations?	i	i	i	ii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
A.V	c. How are deviations from risk model to ignitions and propagation detected?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated

	e. What other data is used to make decisions on whether to update algorithms?	iii	iv	iv	iv	Additional inputs incorporated	Achieved capabilities through activities completed in 2020
B.I	b. How are measurements validated?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
	a. How granular is the weather data that is collected?	ii	ii	iv	iv	Improvements in weather data collection	Achieved greater degree of weather collection than originally anticipated through activities completed in 2020
B.II	c. How granular is the tool?	iii	iii	iii	iv	Improvements in granularity	Expect to achieve greater degree of granularity than originally anticipated
	c. At what level of granularity can forecasts be prepared?	iii	iii	iii	iv	Improvements in granularity	Expect to achieve greater degree of granularity than originally anticipated
B.III	e. How automated is the forecast process?	iii	iii	iv	iv	Improvements in automation	Achieved greater degree of automation than originally anticipated through activities completed in 2020
	b. What equipment is used to detect ignitions?	iii	iii	iv	iv	Additional equipment used for detecting ignitions	Incorporated equipment beyond what was originally anticipated through activities completed in 2020
	c. How is information on detected ignitions reported?	iii	iii	iii	iv	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
B.V	d. What role does ignition detection software play in wildfire detection?	i	i	i	ii	Use of cameras in detection	Expect to incorporate cameras to a greater extent than was originally anticipated
	a. Does grid design meet minimum G095 requirements and loading standards in HFTD areas?	ii	ii	iii	iii	Grid design standards updated	Achieved greater degree of improvement to grid designs than originally anticipated through activities completed in 2020
	b. Does the utility provide micro grids or islanding where traditional grid infrastructure is impracticable and wildfire risk is high?	i	ii	ii	ii	Incorporation of additional grid designs	Achieved capabilities through activities completed in 2020
C.II	c. Does routing of new portions of the grid take wildfire risk into account?	ii	ii	i	i	Incorporation of wildfire risk into routing considerations	SCE better understands this question to mean wildfire risk is a consideration, but not the sole

							consideration, changing our response from last time.
	b. What level of redundancy does the utility's distribution architecture have?	ii	ii	iii	iii	Improvements in distribution architecture redundancy	Achieved greater degree of redundancy than originally anticipated through activities completed in 2020
C.III	d. How does the utility consider egress points in its grid topology?	i	i	i	ii	Incorporation of additional factors into grid topology	Expect to incorporate egress points to a greater degree than originally anticipated
	a. Does the utility have an understanding of the risk spend efficiency of hardening initiatives?	ii	iii	iii	iii	Improvements in risk modeling (relative vs quantitative)	Achieved capabilities through activities completed in 2020
C.IV	b. At what level can estimates be prepared?	ii	v	iii	v	Improvements in risk modeling granularity	Progressing to target expected for 2022 through activities completed in 2020
C.V	b. Are results of pilot and commercial deployments, including project performance, project cost, geography, climate, vegetation etc. shared in sufficient detail to inform decision making at other utilities?	ii	ii	iii	iii	Greater information sharing	Sharing with stakeholders beyond what was originally anticipated
	b. How are patrol inspections scheduled?	i	i	ii	iii	Improvements to updates and risk incorporation of inspection schedules	Achieved, and expect to continue to achieve, greater improvements in scheduling through activities completed in 2020 and planned for 2021/22
	c. What are the inputs to scheduling patrol inspections?	i	i	i	ii	Incorporation of predictive modeling	Expect to incorporate predictive modeling into inspections more than originally anticipated
D.II	i. What are the inputs to scheduling other inspections?	i	i	ii	ii	Incorporation of predictive modeling	Expect to incorporate predictive modeling into inspections more than originally anticipated
D.III	c. At what level of granularity are the depth of checklists, training, and procedures customized?	i	i	v	v	Improvements in granularity	Achieved greater degree of granularity than originally expected through activities completed in 2020

D.IV	b. How are service intervals set?	i	ii	ii	ii	Improvements in granularity	Achieved capabilities through activities completed in 2020
E.III	c. At what level of granularity are the depth of checklists, training, and procedures customized?	ii	ii	v	v	Improvements in granularity	Achieved greater degree of granularity than originally expected through activities completed in 2020
E.IV	h. Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?	i	i	ii	ii	Greater collaboration with customers	SCE better understands this question to mean this option is available to customers, not necessarily utilized, changing our response from last time.
E.IV	i. Does the utility work with partners to identify new cost-effective uses for vegetation taking into consideration environmental impacts and emissions of vegetation waste?	i	i	ii	ii	Greater collaboration with partners	SCE better understands this question to mean this option is available to partners, not necessarily utilized, changing our response from last time.
E.V	f. Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?	i	i	ii	ii	Greater collaboration with customers	SCE better understands this question to mean this option is available to customers, not necessarily utilized, changing our response from last time.
E.V	g. Does the utility work with partners to identify new cost-effective uses for vegetation, taking into consideration environmental impacts and emissions of vegetation waste?	i	i	ii	ii	Greater collaboration with partners	SCE better understands this question to mean this option is available to partners, not necessarily utilized, changing our response from last time.
E.VI	a. How is contractor and employee activity audited?	ii	ii	ii	iii	Demonstrable functioning of audit process	Expect to be able to demonstrate this functionality by end of 2022 more than originally anticipated
F.V	a. Is there a process for inspecting de-energized sections of the grid prior to re-energization?	ii	iii	ii	ii	N/A	Do not believe augmentation with sensors and aerial tools will be accomplished in this timeframe
F.V	c. What is the average amount of time that it takes you to re-energize your grid from a PSPS once weather has subsided to below your de-energization threshold?	iv	v	v	v	Increase in re-energization time	Achieved capabilities through activities completed in 2020

	d. Is there a system for sharing data in real time across multiple levels of permissions?	i	i	i	iii	Increased levels of permission for data sharing	Expect to have permission sharing across a greater degree of levels than originally anticipated
G.II	e. Are the most relevant wildfire related data algorithms disclosed?	ii	ii	iii	iii	Disclosure of wildfire data algorithms	Experience with WMP disclosures led us to a higher capability than originally expected
	b. Based on near miss data captured, is the utility able to simulate wildfire potential given an ignition based on event characteristics, fuel loads, and moisture?	i	ii	ii	ii	Wildfire ignition modeling improvements	Achieved capabilities through activities completed in 2020
	c. Does the utility capture data related to the specific mode of failure when capturing near miss data?	i	ii	ii	ii	Mode of failure data capture	Achieved capabilities through activities completed in 2020
G.III	d. Is the utility able to predict the probability of a near miss in causing an ignition based on a set of event characteristics?	i	ii	ii	ii	Wildfire ignition modeling improvements	Achieved capabilities through activities completed in 2020
H.I	b. For what level of granularity is the utility able to provide projections for each scenario?	ii	v	iv	v	Improvements in granularity	Progressing to target expected for 2022 through activities completed in 2020
H.II	e. At what level of granularity is the utility able to provide risk efficiency figures?	ii	v	iv	iv	Improvements in granularity	Do not believe asset level is possible during this timeframe, but have already advanced to span level through activities completed in 2020
	b. At what level can estimates be prepared?	ii	iii	iii	iii	Improvements in granularity	Achieved capabilities through activities completed in 2020
	d. What vegetation management initiatives does the utility include within its evaluation?	ii	iii	iii	iii	Incorporation of more initiatives into evaluation	Achieved capabilities through activities completed in 2020
H.III	e. Can the utility evaluate risk reduction synergies from combination of various initiatives?	i	ii	ii	ii	Ability to evaluate risk reduction of various initiatives	Achieved capabilities through activities completed in 2020
	a. How accurate of a risk spend efficiency calculation can the utility provide?	ii	iii	iii	iii	Risk spend efficiency accuracy improvements	Achieved capabilities through activities completed in 2020
H.IV	b. At what level can estimates be prepared?	ii	v	v	v	Improvements in granularity	Achieved capabilities through activities completed in 2020

H.V	a. To what extent does the utility allocate capital to initiatives based on risk-spend efficiency (RSE)?	ii	iii	iii	iv	Expanded use of risk spend efficiency in capital allocation	Achieved capabilities through activities completed in 2020, and expect to improve beyond original anticipated level of maturity
	b. What information does the utility take into account when generating RSE estimates?	i	iii	iii	iii	Improvements in granularity	Achieved capabilities through activities completed in 2020
	c. How does the utility verify RSE estimates?	ii	ii	ii	iii	Additional data used for verification	Increasing historical data facilitates a greater level of maturity for 2022 than originally anticipated
I.III	a. Does the utility provide clear and substantially complete communication of available information relevant to affected customers?	ii	iii	iii	iii	Incorporated referrals to other agencies	Achieved capabilities through activities completed in 2020
J.I	f. Has the utility implemented a defined process for testing lessons learned from utilities to other ensure local applicability?	i	i	ii	ii	Established process	Process established in 2020 to share lessons learned
J.III	d. Does the utility have a specific annually-updated action plan further reduce wildfire and PSPS risk to LEP & AFN communities?	i	ii	ii	ii	Incorporation of LEP & AFN communities into plan	Achieved capabilities through activities completed in 2020
J.IV	c. Does the utility accurately predict and communicate the forecasted fire propagation path using available analytics resources and weather data?	i	i	ii	ii	Communication of fire forecasts	Achieved capabilities through activities completed in 2020

SCE – MGRA – Data Request Response 8

Wildfire Mitigation Plans - 2021
MGRA Data Request SCE No. 8 SDG&E No. 6 PG&E No. 6-amended
March 17, 2021

The following data requests are being issued to PG&E, SCE and SDG&E. Renumbering starts at MGRA-35.

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

MGRA-35 How is the duration of the simulation determined for risk calculations used to prioritize circuit risks for mitigation? Is there a maximum / default duration of simulation for this purpose and if so what is it?

MGRA-36 Is there a maximum wildfire size used for simulation determined for risk calculations used to prioritize circuit risks for mitigation and if so what is it?

MGRA-37 How are weather and fuel inputs determined for risk calculations used to prioritize circuit risks for mitigation?

MGRA-38 How is the duration of the simulation determined for risk calculations used to identify circuits for PSPS? Is there a maximum / default duration of simulation for this purpose and if so what is it? Or does the duration of the simulation extend to the projected length of the weather event?

MGRA-39 Is there a maximum wildfire size used in simulations to identify circuits for PSPS and if so what is it?

MGRA-40 Regarding the file 2021WMP_ClassB_Action-PGE-15_Atch01.xlsx, spreadsheet technosylva_fire_probability, columns C (acres_mean) and E (acres_max), what is the duration of the model run in hours used to obtain these figures?

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 8

To: MGRA
Prepared by: Bryan Landry
Job Title: Senior Advisor – Strategic Planning
Received Date: 3/17/2021

Response Date: 3/22/2021

Question 001:
Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:
How is the duration of the simulation determined for risk calculations used to prioritize circuit risks for mitigation? Is there a maximum / default duration of simulation for this purpose and if so what is it?

Response to Question 001:

For wildfire mitigation planning, SCE uses the maximum modeled consequences across 41 weather scenarios for ignition simulations with an eight (8) hour propagation period. A standard eight (8) hour duration was chosen to allow for comparison of relative consequences across all assets. These consequence scores are, in turn, used to prioritize the deployment of mitigations.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 8

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/17/2021

Response Date: 3/22/2021

Question 002:
Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:
Is there a maximum wildfire size used for simulation determined for risk calculations used to prioritize circuit risks for mitigation and if so what is it?

Response to Question 002:
No, there is no maximum fire size used for simulations that determine risk calculations.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 8

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/17/2021

Response Date: 3/22/2021

Question 003:
Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:
How are weather and fuel inputs determined for risk calculations used to prioritize circuit risks for mitigation?

Response to Question 003:
SCE has chosen 41 historical weather events to represent fire consequence across the SCE service area. These scenarios are used to inform the prioritization of wildfire mitigation efforts for circuits. These weather events were chosen based on the magnitude and duration of each weather event over the past 20 years. Technosylva uses the following weather and fuels inputs for fire spread modeling:

Wind speed
Relative humidity
Temperature
Dead fuel moisture
Live fuel moisture

The above weather and fuel variables were used to calculate fire spread and consequence for each of the weather events which were then aggregated to provide a risk single score along each circuit.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 8

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/17/2021

Response Date: 3/22/2021

Question 004:
Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:
How is the duration of the simulation determined for risk calculations used to identify circuits for PSPS? Is there a maximum / default duration of simulation for this purpose and if so what is it? Or does the duration of the simulation extend to the projected length of the weather event?

Response to Question 004:
SCE does not use Technosylva to identify circuits for PSPS.

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 8

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/17/2021

Response Date: 3/22/2021

Question 005:
Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:
Is there a maximum wildfire size used in simulations to identify circuits for PSPS and if so what is it?

Response to Question 005:
SCE does not use Technosylva to identify circuits for PSPS.

MGRA 2020 WMP Comments – Attachment A-3

SDG&E Data Requests

SDG&E – MGRA – Data Request Response 1

Date Received: January 7, 2021
Date Submitted: January 12, 2021

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

Utilities are required to provide data upon request to stakeholders under WSD-001. At the request of the Wildfire Safety Division, utilities have begun to provide GIS data to WSD in geodatabase format via a secure Commission website, with updates provided as part of quarterly reports. As per WSD-011, utility data is provided in quarterly reports so that analysis can be "frontloaded" prior to the issuance of the Wildfire Mitigation Plans.[1] IOUs provided GIS data to WSD in September and December 2020.

This data request is being issued to SCE, PG&E, and SDG&E. Response time specified in WSD-01 is three business days, with exceptions requiring notification of the Wildfire Safety Division director.

III. RESPONSES

QUESTION 1:

Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website. This should contain the least the version of GIS data provided to WSD in September pursuant to the Draft WSD GIS Data Reporting Requirements and Schema for California Electric Corporations (Draft GIS Data Schema) along with any updates provided in December. Where confidential data is intermixed in tables with non-confidential data, fields containing confidential data should be left blank or removed. Confidentiality should not be applied at the feature class level.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

SDG&E is required to submit spatial data related to its Wildfire Mitigation Plan (WMP) consistent with the Wildfire Safety Division's *Geographic Information System (GIS) Data Reporting Requirements and Schema for California Electrical Corporations* issued on August 5, 2020 (WSD schema). Due to the design limitations of the WSD's current schema, there is no process to separate confidential and non-confidential data within attributes of certain feature classes. Additional attributes stored within SDG&E's GIS data which allow for identification of confidential information (i.e., voltages of 230kV and above) are not tracked in all feature classes where transmission equipment information is tracked within the WSD schema. In these cases, once the data is loaded into the WSD schema, SDG&E can no longer distinguish between

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1 WSD-011; Attachment 2.1; p. 1 – "Accordingly, the WSD will consider these four key elements for the 2021 WMP Update submission and review process: 1. Frontload data collection. This would extend the timeframe for WSD and stakeholder review of relevant utility data in advance of the WMP submission and review period, in addition to reducing the need for follow-up data requests. This means some data is collected prior to the annual WMP through Quarterly Reports..."

confidential and non-confidential data. The WSD has requested that utilities track confidentiality in a separate excel status report, which does not connect back to the geodatabase submission and therefore does not allow for filtering of confidential data within the geodatabase submission. To respond to this data request and as discussed with MGRA on January 11, 2021, SDG&E has removed all feature classes that contain confidential data, which is not able to be separated from non-confidential data.

SDG&E plans to work with the WSD on a solution to this constraint. SDG&E recommends that a confidentiality attribute be added to each feature class to allow for future filtering of confidential data from non-confidential data. This will allow the utilities to filter out confidential data without affecting non-confidential data.

Please see the attached document: MusseyGradeGIS.gdb, which is being sent via SDG&E's electronic data transfer system.

QUESTION 2:

If updates to the GIS database are to be released to WSD contemporaneously with the Wildfire Mitigation Plans, the IOUs shall make non-confidential versions of the GIS data available to MGRA and other interested stakeholders at the same time that they are released to WSD. Deadline for this request is therefore the same as that for GIS data release to WSD.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

Please see the response to Question 1 above. SDG&E will work with MGRA and other parties to provide non-confidential versions of its geodatabase files.

SDG&E – MGRA – Data Request Response 2

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2021 WILDFIRE MITIGATION PLAN UPDATE
SDG&E RESPONSE

Date Received: January 25, 2021
Date Submitted: February 10, 2021

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

Date Received: January 25, 2021
Date Submitted: February 10, 2021

Utilities are required to provide data upon request to stakeholders under WSD-001. At the request of the Wildfire Safety Division, utilities have begun to provide GIS data to WSD in geodatabase format via a secure Commission website, with updates provided as part of quarterly reports.

As per WSD-011, utility data is provided in quarterly reports so that analysis can be "frontloaded" prior to the issuance of the Wildfire Mitigation Plans.[1] IOUs provided GIS data to WSD in September and December 2020.

Data request are being issued to SCE, PG&E, and SDG&E, and follows up on the previous requests. Response time specified in WSD-01 is three business days, with exceptions requiring notification of the Wildfire Safety Division director.

Unless otherwise indicated, incident data is being requested for 2020, 2019, and prior years. If any of this data was disclosed in previous data requests by MGRA and other parties, please provide a link to it.[2]

III. RESPONSES

QUESTION 1:

Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website containing **PSPS Event records including specifically all perimeter, timing, and damage data** that is reported to WSD and to the Safety Enforcement Division as part of PSPS event reporting. Damage records should include at the least location, type of damage, any photos, and date and time of report. Customer meter records may be omitted from the data response.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

Please refer to "MGRA_SDGE_DR2.gdb" and "MGRA_SDGE_DR2_PSPS_damage_photos.zip."

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[1] WSD-011; Attachment 2.1; p. 1 – "Accordingly, the WSD will consider these four key elements for the 2021 WMP Update submission and review process: 1. Frontload data collection. This would extend the timeframe for WSD and stakeholder review of relevant utility data in advance of the WMP submission and review period, in addition to reducing the need for follow-up data requests. This means some data is collected prior to the annual WMP through Quarterly Reports..."

[2] Note, SDG&E has provided outage and ignition data for 2020 and does not have to re-supply this data or any link to it.

Date Received: January 25, 2021
Date Submitted: February 10, 2021

QUESTION 2:

Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website containing **ignition data** that is reported to WSD as part of *risk* event reporting. Please provide entire the historical data set available within the database.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

Please refer to "MGRA_SDGE_DR2.gdb."

QUESTION 3:

Please provide the most recent available geodatabase comprised of the non-confidential portion of the GIS data uploaded to the WSD website containing **outage data** that is reported to WSD as part of *risk* event reporting. Please provide entire the historical data set available within the database.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

Please refer to "MGRA_SDGE_DR2.gdb."

QUESTION 4:

To the extent that there are any records or fields considered confidential in the above datasets, please provide a list of the type of record (for example, transmission with voltage above 200 kV) and specific fields that are considered confidential, including explanation and legal justification for why the particular type of record or field is considered confidential.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

No confidential information is provided in "MGRA_SDGE_DR2.gdb" or "MGRA_SDGE_DR2_PSPS_damage_photos.zip."

SDG&E – MGRA – Data Request Response 3

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-03
2021 WILDFIRE MITIGATION PLAN UPDATE
SDG&E RESPONSE

Date Received: February 17, 2021
Date Submitted: February 22, 2021

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

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10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

Date Received: February 17, 2021
Date Submitted: February 22, 2021

III. RESPONSES

The following data requests are being issued to PG&E, SCE, and SDG&E.

The first set of data requests refer to the outage, risk event, and ignition data presented in Tables 2, 7.1, and 7.2 of the standard data tables, as well as the weather metrics for high wind warning (HWW) and Red Flag Warnings (RFW) found in Table 6.

IOUs are requested to provide an additional table using these data for the years 2015 through 2020. The following table provides a visual guide as to the format (for 2015 only – other years to be included in equivalent columnar format).

#	Outcome metric name	2015									
		HFTD Tier 2					HFTD Tier 3				
		Total	RFW	HWW	HWW&RFW	HWW&^RFW	Total	RFW	HWW	RFW&HWW	HWW&^RFW
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										
1.b.	Number of wires down (total)										
1.c.	Number of outage events not caused by contact with vegetation (total)										
1.d.	Number of outage events caused by contact with vegetation (total)										
7.c.ii.	Number of ignitions										

Events are to be classified in the following manner:

RFW: the event occurs within a National Weather Service Red Flag Warning perimeter during the time that the Red Flag Warning is active.

HWW: the event occurs within a National Weather Service High Wind Warning perimeter during the time that the High Wind Warning is active.

HWW&RFW: the event occurs in an area with simultaneously active High Wind Warning and Red Flag Warning.

HWW&^RFW: the event occurs in an area with an active High Wind Warning and NO simultaneous Red Flag Warning

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QUESTION 1:

Provide the "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", subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

Please refer to the attachment "2021 WMP MGRA-SDGE DR3 Q1-Q5.xlsx." SDG&E only provided transmission data within the total columns because transmission point of risk event is not tracked in the transmission outage database. Due to this gap in the data, SDG&E is unable to align with transmission risk event locations with the locations of HWW and RFW events.

Date Received: February 17, 2021
Date Submitted: February 22, 2021

QUESTION 2:

Provide the number of wires down, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

Please refer to the attachment "2021 WMP MGRA-SDGE DR3 Q1-Q5.xlsx." SDG&E only provided transmission data within the total columns because transmission point of risk event is not tracked in the transmission outage database. Due to this gap in the data, SDG&E is unable to align with transmission risk event locations with the locations of HWW and RFW events.

Date Received: February 17, 2021
Date Submitted: February 22, 2021

QUESTION 3:

Provide the number of outages caused by vegetation, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

Please refer to the attachment "2021 WMP MGRA-SDGE DR3 Q1-Q5.xlsx." SDG&E only provided transmission data within the total columns because transmission point of risk event is not tracked in the transmission outage database. Due to this gap in the data, SDG&E is unable to align with transmission risk event locations with the locations of HWW and RFW events.

QUESTION 4:

Provide the number of outages not caused by vegetation, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

Please refer to the attachment "2021 WMP MGRA-SDGE DR3 Q1-Q5.xlsx." SDG&E only provided transmission data within the total columns because transmission point of risk event is not tracked in the transmission outage database. Due to this gap in the data, SDG&E is unable to align with transmission risk event locations with the locations of HWW and RFW events.

QUESTION 5:

Provide the number of ignitions, subdivided into the following categories: Year from 2015 to 2020, further subdivided into: High Fire Threat District Tier 2 and Tier 3, further subdivided into: Total, HWW, RFW, HWW and RFW, and HWW without RFW.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 5:

Please refer to the attachment "2021 WMP MGRA-SDGE DR3 Q1-Q5.xlsx."

Regarding the use of the Technosylva fire spread model and its used to calculate wildfire consequences:

QUESTION 6:

What is the maximum duration in hours simulated used to model maximal losses using the Technosylva model?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 6:

The maximum duration of a simulation using the Technosylva model is 24 hours.

Date Received: February 17, 2021
Date Submitted: February 22, 2021

QUESTION 7:

What is the average size of "maximal" wildfire spread in acres when the Technosylva model is run to its maximum duration?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 7:

The model is run daily, and the size of simulated incidents are always variable and are highly dependent upon the weather at the exact location of the ignition. Simulations are run throughout the service territory and those simulation are compiled to inform decisions on fire potential. No average maximum size is created.

Date Received: February 17, 2021
Date Submitted: February 22, 2021

QUESTION 8:

What is the typical computational time for a Technosylva run of "maximum" duration? Include assumptions regarding CPU type, speed and memory consumed.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 8:

Typically, the model is run on either a Panasonic Toughbook or a mobile device. The computational time varies depending on the length of the model run and the severity of the burning conditions at the time of ignition. That said, typically the model run time does not exceed 1-2 minutes and usually the model results are available in under a minute. The model also has a feature that utilized the IRWIN database and simulates a fires from the coordinates of a wildland dispatch (this is not always the actual ignition point). These simulations are run for 2 hours and are available in a matter of seconds.

QUESTION 9:

Have Technosylva fire spread simulations been run for 24 and 48 hour propagation times? If yes, how do the results compare to the results of 8 hour simulations in terms of average acres impacted and in terms of computing resources? If not, why has this not been performed?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 9:

Through the testing and development of the program, fires were run for all available durations. However, 24 hour simulations are rarely performed as it would be extremely unusual for a fire to burn for 24 hours without some amount of suppressive action. In the instances that SDG&E has run the model for 24 hours, the acres impacted are highly dependent upon the weather conditions.

During SDG&E's normal operational application of the model, the exact length of single model runs is based on expected burning conditions and suppressive resources available at the time of ignition. For general simulation and/or training a 2, 4, or 8 hour simulation is used.

SDG&E – MGRA – Data Request Response 4

Date Received: March 2, 2021
Date Submitted: March 5, 2021

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

III. RESPONSES

The following data requests are being issued to SDG&E only.

On p. ix of its WMP, SDG&E states: "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."

QUESTION 1:

Provide documentation and description of the AI forecasting system in use by SDG&E, including algorithm, training and testing methodology, and variables used for observations and predictions.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

Please refer to "MGRA-SDGE DR4 Q1.zip," which contains three progress reports on the status and implementation of SDG&E's AI-based forecasting system through 2020. Specifically, SDG&E provides documentation on the Machine Learning Model leveraged, which demonstrates the training and testing methodology as well as the variables studied (also copied and pasted below).

- 1) temp_grad_surf: Vertical temperature gradient near the surface, which is defined as the ratio of the difference in potential temperature between 2 and 100m to the distance between 2 and 100m (i.e., 98m). Unit: K m-1.
- 2) wind_spd_grad_surf: Vertical gradient of wind speed near the surface, which is defined as the ratio of the difference in wind speed between 10 and 100m to the distance between 10 and 100m (i.e., 90m). Unit: s-1.
- 3) Ri_surf: Richardson number near the surface, as defined by eq. (2) in Rob's paper. It is basically a function of temp_grad_surf and wind_spd_grad_surf.
- 4) wind_dir_500mb: Wind direction at 500 mb. Unit: degree.
- 5) u_500m, u_1000m, u_1500m, u_2000m, u_2500m, u_3000m: zonal wind at different heights above ground.
- 6) v_500m, v_1000m, v_1500m, v_2000m, v_2500m, v_3000m: meridional wind at different heights above ground. Unit: m s-1.
- 7) temp_500m, temp_1000m, temp_1500m, temp_2000m, temp_2500m, temp_3000m: temperature at different heights above ground. Unit: K

Date Received: March 2, 2021
Date Submitted: March 5, 2021

QUESTION 2:

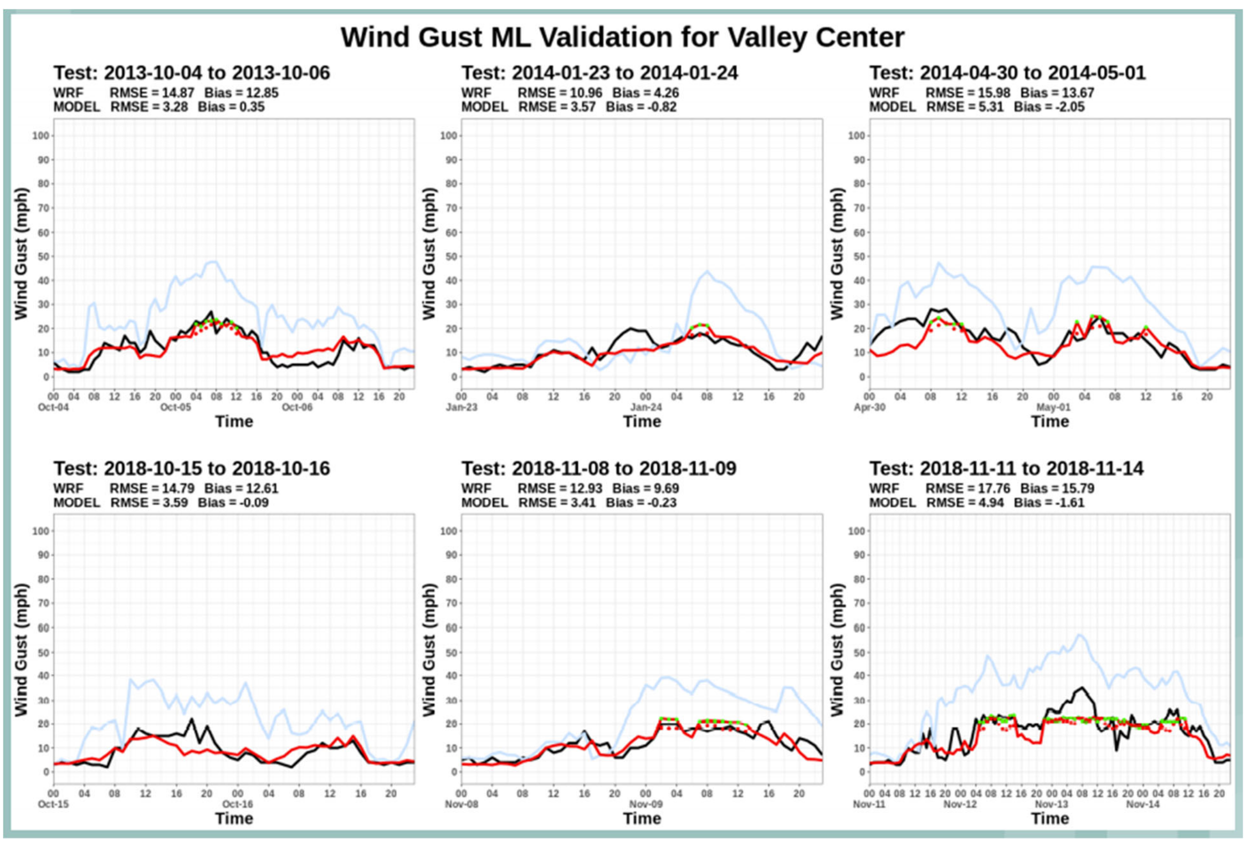
Provide benchmarking and testing data that demonstrate any benefits of the AI forecasting system over the previous forecasting system.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

The benchmark and testing data is included in the supported documentation provided in response to Question 1 above. Below is a validation plot for the Valley Center Weather Station demonstrating a significant improvement in forecast accuracy over the previous forecasting system, which is the blue line. The new AI forecast is the red line and the actual wind speed is the black line.



Date Received: March 2, 2021
Date Submitted: March 5, 2021

QUESTION 3:

Describe how the AI forecasting system is currently used, and whether it has completely replaced the previous forecasting system.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

The AI forecasting system has not completely replaced the previous forecasting system, although it has already proven to significantly improve forecasting capability. As of the end of 2020, 59 weather stations have had AI forecast models developed, leaving approximately 160 remaining to be built. The forecasts from the 59 weather stations were directly integrated into the forecasting system that our meteorology team uses to finalize the wind gust forecasts that support PSPS operations.

Date Received: March 2, 2021
Date Submitted: March 5, 2021

QUESTION 4:

How does SDG&E account for a 13% increase in accounts opened in HFTD areas in one year? Do these newly opened accounts correspond to closed accounts elsewhere in SDG&E's service area?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

The 13% increase did not include accounts closed in the HFTD during the same time period. After taking into account both "opened" and "closed" accounts, SDG&E saw a net increase of 2% in number of accounts that opened in HFTD areas.

Date Received: March 2, 2021
Date Submitted: March 5, 2021

QUESTION 5:

How does SDG&E account for a 39% increase in AFN customers in one year?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 5:

The 39% increase did not include AFN accounts closed in the HFTD during the same time period. Upon further review, the 39% increase in AFN customers inadvertently included customer accounts that fell into multiple AFN categories (e.g., an account on both the CARE and FERA programs was counted twice).

After taking into account both "opened" and "closed" accounts, and removing customers that fall into multiple AFN categories, the number of **unique** customers increased by approximately 1%.

On p. 80 of its WMP, SDG&E states 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.

QUESTION 6:

How does SDG&E model the relationship between failure rate and wind speed? How is wind speed determined for the purposes of this modeling?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 6:

SDG&E leverages the extensive data collected from its weather network when determining relationships between failure rate and wind speed. From this data, subject matter experts devised a simple wind factor that attempted to apply considerations for different speeds of wind. SDG&E used these wind factors to adjust the likelihood of ignitions. Since the time of the first WRRM model, more weather data and wind modeling efforts have been undertaken. Future models will utilize an updated method of applying wind factors that will likely focus on specific relationships of failure rates and wind with various asset classes.

Date Received: March 2, 2021
Date Submitted: March 5, 2021

On p. 89 of its WMP, SDG&E states that WiNGS weights for PSPS "are determined by analyzing the safety, financial, reliability impact of a 12-hour power shutoff event to these customers using industry research."

QUESTION 7:

Please provide details describing what "industry research" is being utilized for determining safety, reliability, and financial impacts of PSPS and how this research is being used to determine weights.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 7:

Industry research refers to studies of blackouts such as the northeast blackout. In order to estimate customer impact values, proxy customer types are utilized to leverage industry research resources. The proxy customer types selected are assumed to be representative of an average customer within a particular customer category. In the case of the critical customer category, a communications tower is used as a proxy customer type to research the impact of a power shutoff. SDG&E leveraged reports on historical extended power outages and power shutoff events for the identified proxy customer types to estimate the expected natural unit consequences per impact category.

QUESTION 8:

Please show weight calculations for the safety, reliability, and financial PSPS impacts.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 8:

For each impact category, the expected consequence value is estimated, in natural units, for a worst-case scenario. After the expected value of each impact type has been determined in natural units, the following scoring system is used to convert natural unit impacts to a PSPS impact score. These individual attribute scores are then weighted according per the multi-attribute value function (MAVF) guidelines to arrive at a total PSPS impact value per customer type.

Safety	
Score	Metrics (SIFs)*
30	5+
20	3-5
10	0.25-2
0	0

Reliability	
Score	Metrics (Directly Impacted Customers)*
30	1000+
20	501-1000
10	101-500
0	0-100

Financial	
Score	Metrics ($)
30	1M+
20	100K-1M
10	10K-100K
0	<10K

QUESTION 9:

Describe uncertainties in the assumptions used in the weight calculations and give ranges for what SDG&E considers reasonable values and justifications for these ranges.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 9:

Please refer to the response to Question 8 above for the range of natural unit values that SDG&E considers when determining the scoring parameters for PSPS impact. These ranges were estimated by using non-critical customers as a baseline PSPS impact of 1, whereas a non-critical customer is defined as all customers that do not fall in either the critical or medical baseline categories. The initial scoring ranges are estimated using historical extended power shutoff events; however, an impact multiplier can be used where the expected consequence of a worst-case scenario exceeds the bounds of the scoring table. At the current moment, SDG&E is focusing these efforts to generate an expected value, or average, impact for each of the parameters described. In future improvements to the risk models, it is likely that the notion of uncertainty of assumptions will be utilized in some fashion – whether that be in stochastic methods or in the usage of ranges.

Regarding SDG&E's Vegetation Risk Index (VRI):

QUESTION 10:

Provide the scoring method that VRI uses to incorporate at-risk species, and give the relative weights or scores used for each at-risk species.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 10:

The tree species component (Ts) is developed by creating four "buckets" which represent the presence of a tree species in a given area that has a history of causing outages. To do this, we first had to rank each tree species with respect to outages. To rank each species, we took the total number of outages attributed to each species (excluding tree trimming) and divided by the total number of trees of that species. For example, there were 11,007 Palm-Fan trees in our database and 260 outages attributed to Palm-Fan trees. 260/11,007 = 2.36%. Based on the entire results of all species, we then placed each tree species into one of the four buckets based on where their final calculation fell in the entire range of data… < 30th percentile (S_1), 30th - 75th percentile (S_2), 75th – 95th percentile (S_3), and > 95th percentile (S_4). ADS has a more complete list of tree species, so the numbers below may need to be adjusted after ADS has re-calculated the percent of trees in a given species that is responsible for outages. Below are the buckets currently being used:

- Ts bucket 1 (S_1) = Percentage of low risk trees (Species outage percent < 0.12%)
- Ts bucket 2 (S_2) = Percentage of medium risk trees (Species outage percent 0.12% - 0.47%)
- Ts bucket 3 (S_3) = Percentage of high risk trees (Species outage percent 0.47% - 2.29%)
- Ts Bucket 4 (S_4) = Percentage of extreme risk trees (Species outage percent > 2.29%)

Example: If along Circuit XYZ, 20% of the trees were in bucket 1, 50% were in bucket 2, 30% were in bucket 3, and 0% were in bucket 4, then…

Ts = 1(.20)+2(.50)+3(.30)+4(.00) = 2.10

Date Received: March 2, 2021
Date Submitted: March 5, 2021

QUESTION 11:

Provide a table for all trees removed by SDG&E from 2018 to 2020, including:
- Year
- Tree Species
- Subspecies / Variety (if available)
- Reason for removal (using SDG&E category classification)
- Distance from tree to SDG&E equipment

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 11:

Please refer to "MGRA-SDGE DR4 Q11.xlsx."

- Tree species – SDG&E records tree species using the common name, not the taxonomic genus and species.

- Reason for removal – SDG&E does not use a categorical classification for trees that are removed. Trees that are removed are recorded in the database by the tree contractor using a condition code. A condition code of "*Completed Removal*" would denote that the tree was live and healthy. A condition code of "*Completed, Green, Reliability Removal*" and "*Completed, Dead or Dying, Reliability Removal*" would denote a tree that was live and had structural deficiencies, and a tree that was dead/dying respectively.

- Distance from tree to SDG&E equipment – SDG&E records tree distance (clearance) as a value in a range of feet. The value represents the estimated distance between the closest portion of the tree canopy and the powerline at the time of inspection prior to the tree's removal.

On page 185 of its WMP, SDG&E states that: "all FPI information has been made available to researchers through an API web portal".

QUESTION 12:

What data is available through SDG&E's API web portal?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 12:

The following SDG&E data is made available through the web portal:

- **GOES Fire Detections**: Fire detections from GOES16 and GOES17 satellites.
- **SDG&E Operational Ensemble NAM 001 Dead Fuel Moisture NFDRS**: Dead fuel moisture and related variables derived from the National Fire Danger Rating System (NFDRS) algorithms using the SDG&E Operational Ensemble NAM 001 WRF model.
- **HPWREN Cameras**: Imagery from HPWREN cameras.
- **HPWREN Weather Station Measurements**: Archive of HPWREN weather station measurements from 2007-present. Also includes SDG&E weather station measurements until July 2018.
- **SDG&E Fire Potential Index**: The Fire Potential Index (FPI) assists in making operational decisions that will reduce fire threats and risks. This tool converts environmental, statistical, and scientific data to local fire potential.
- **SDG&E Historical Ensemble GFS 003 WRF**: A 2 km historical dataset produced with downscaled reanalysis data across far Southern California. This dataset was optimized for atmospheric river events and winter storms.
- **SDG&E Historical Ensemble NAM 001 WRF**: A 3 km historical dataset produced with downscaled reanalysis data across Southern California. This dataset was optimized for Santa Ana winds and was generated in collaboration with the USFS and UCLA.
- **SDG&E Operational Ensemble GFS 003 WRF**: WRF model initialized with GFS boundary conditions and optimized for atmospheric river events and winter storms. This model is run at a 2 km horizontal resolution with 51 verticle levels.

- **SDG&E Operational Ensemble NAM 001 WRF**: WRF model initialized with NAM boundary conditions and optimized for Santa Ana wind conditions. This model is run at a 2 km horizontal resolution with 52 vertical levels.

- **SDG&E Operational Ensemble GFS 001 WRF**: WRF model initialized with GFS boundary conditions and optimized for Santa Ana wind conditions. This model has a 6 km horizontal resolution with 46 vertical levels up to 100 mb.

- **SDG&E Operational Ensemble GFS 002 WRF**: WRF model initialized with GFS boundary conditions and optimized for summer monsoon/hot and humid events. This model is run at a 2 km horizontal resolution with 51 vertical levels.

QUESTION 13:

What research institutions are currently able to access SDG&E's API web portal?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 13:

This data is available to any, and all research institutions that have interest in using the data.

QUESTION 14:

What is the process by which researchers can gain access to the SDG&E web portal? What are requirements for access?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 14:

The SDG&E Meteorology Data Catalog is now publicly hosted at the San Diego Super Computing Center (SDSC): https://wifire-data.sdsc.edu/dataset

Date Received: March 2, 2021
Date Submitted: March 5, 2021

On p. 192 of its WMP, SDG&E states that "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%

QUESTION 15:

How is the estimate of 90% for animal and balloon contact determined?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 15:

As reported in the SDG&E Quarterly Report on 2020 WMP dated September 9, 2020 at Appendix A Guidance 5, the 90% effectiveness of covered conductor relates to animal, balloon and vegetation contacts. The effectiveness was determined by looking at all ignition causes and assuming covered conductor would mitigate all foreign object faults with the exception of large vegetation or vehicle contacts.

Once SDG&E installs more covered conductor, effectiveness will be measured by comparing faults on the distribution lines before and after covered conductor installations.

QUESTION 16:

How is the estimate of 0% for vehicle contact determined?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 16:

The estimate was determined from subject matter expertise, and the assumption that a vehicle contact would cause the pole to fail and wire to fall to the ground. The insulation for covered conductor is rated for incidental contacts; it is not rated to withstand continuous contact with the ground.

Once SDG&E installs more covered conductor, effectiveness will be measured by comparing faults on the distribution lines before and after covered conductor installations.

Date Received: March 2, 2021
Date Submitted: March 5, 2021

QUESTION 17:

Please provide reasonable scenarios under which animals and balloons can cause ignitions on covered conductor, and any justification that these scenarios make up 10% of animal and balloon contacts.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 17:

As reported in the SDG&E Quarterly Report on 2020 WMP dated September 9, 2020 at Appendix A Guidance 5, the 90% effectiveness of covered conductor relates to animal, balloon and vegetation contacts. The effectiveness was determined by looking at all ignition causes and assuming covered conductor would mitigate all foreign object faults with the exception of large vegetation or vehicle contacts.

Date Received: March 2, 2021
Date Submitted: March 5, 2021

QUESTION 18:

Please provide justification for the claim that an ignition caused by a vehicle collision will never be mitigated by covered conductor.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 18:

The estimate was determined from subject matter expertise, and the assumption that a vehicle contact would cause the pole to fail and wire to fall to the ground. The insulation for covered conductor is rated for incidental contacts; it is not rated to withstand continuous contact with the ground.

SDG&E – MGRA – Data Request Response 5

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-05
2021 WILDFIRE MITIGATION PLAN UPDATE
SDG&E RESPONSE

Date Received: March 12, 2021
Date Submitted: March 17, 2021

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

III. RESPONSES

QUESTION 1:

Please provide a table of all Utility Maturity Survey responses that have changed since 2020, how they have changed, and a description of why.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

Please see refer to the file titled: "MGRA DR 5 - SDGE UWMMA Survey 2021.pdf"

QUESTION 2:

Regarding Table 6 – Weather Patterns: Please add further rows to Item 2 – Wind conditions to classify wind conditions into subcategories in the same manner as Red Flag Warnings in Item 1. In other words, add further subcategories for HFTD Zone 1, Zone 2, Zone 3, and Non-HFTD for High Wind Warning Overhead circuit-mile days.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

Please refer to the attachment titled: "2021 WMP MGRA-SDGE-DR5 Table Q2.xlsx"

Date Received: March 12, 2021
Date Submitted: March 17, 2021

<u>QUESTION 3</u>:

Is the Technosylva suite used in any way for calculating consequences of wildfire for the purposes of MAVF/RSE calculations? If so how, and what assumptions regarding weather, fuel, or burn duration are used? If not, are there plans to use it in this fashion?

<u>OBJECTION</u>:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

<u>RESPONSE 3</u>:

For the 2021 WMP filing, data from Technosylva is used to estimate consequences of wildfire at different regions (non HFTD, Tier 2 and Tier 3) based on the location of assets and their assessed conditional impacts from the WRRM model. It is also used to estimate RSEs for a subset of system hardening projects. The WiNGS model currently uses a consequence value from the Wildfire Risk Reduction Model (WRRM) which is built using Technosylva information. The consequence information in WiNGS focused on the maximum consequence for each distribution segment, which represents the worst case weather and vegetation. The WiNGS model will evolve as new information and data become available and as modeling techniques become more mature.

QUESTION 4:

If only historical data is used for Monte Carlo modeling, then is the distribution based on wildfire size or financial loss? What assumptions are made regarding the relationship between wildfire size and financial losses?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

For overall wildfire risk modeling, SDG&E focused on the natural units that are represented in its Risk Quantification Framework, namely safety, reliability, and financial. The most recent Risk Quantification Framework includes Acres Burned as a part of the safety attribute.

The general process for the top-down wildfire risk modeling was to consider the financial damage from large fires, using a) historical fires associated to SDG&E equipment, and b) adjustments to the likelihood that attempt to take into account differences and uncertainties between the present time frame and the time period of the historical fire data. Both a) and b) above contain uncertainty. Monte Carlo modeling was them performed to understand the range (or probability distribution) of the likelihood of a large fire. For the purposes of the RAMP and WMP RSE calculations, the expected value of likelihood obtained from the Monte Carlo modeling was used. This expected value is the one applied to the CoRE function for the risk score.

SDG&E makes no assumptions regarding a relationship between wildfire size and financial losses.

Date Received: March 12, 2021
Date Submitted: March 17, 2021

QUESTION 5:

If the historical data for wildfire sizes or losses is modelled by a function, please provide that function, its parameters, and description. Is there a maximum size / loss used for the function?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 5:

Based on historical data, and attempts to quantify risks, SDG&E currently uses a decision-tree logic for its wildfire modeling. SDG&E believes there is no perfect single probability distribution to capture the large number of ultra-low-impact wildfires while containing wildfires that can exceed $5 Billion in damages. Statistical "fitting" techniques do not resolve well for SDG&E's wildfire dataset. The majority of SDG&E's reportable wildfires have not resulted in significant financial, safety, or reliability impacts. Of note, since January 2008, with an average of 20-30 reportable wildfires per year, only one non-utility structure has been partially damaged. The decision-tree technique allows SDG&E to focus on the potential damage from large, destructive wildfires while being realistic regarding the number of non-damaging fires. For wildfires that do have significant damage, the probability distribution for financial impact used in the Monte Carlo model was gamma(3, 0.8). The current model assumes that approximately 1 in every 220 reportable wildfires will have significant damage. Both the decision-tree logic and the probability distributions used are subject to annual reviews of their efficacy, and SDG&E is willing to work with outside entities to discuss improvements to the model.

QUESTION 6:

Regarding the Ignition Rate table on page 53 that indicates that ignition rate substantially increases during Extreme weather conditions, has SDG&E studied whether this is due to the kind of fault that occurs during elevated and extreme conditions or whether it is because of increased likelihood of any fault becoming an ignition? If both of these factors contribute what is the estimated contribution of both?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 6:

When SDG&E investigated the types of faults that become ignitions during extreme conditions, it was not able to identify a specific type of fault that is causing increased ignitions during elevated conditions. Instead, most fault drivers show an increased likelihood of becoming an ignition during elevated conditions. Due to the small number of extreme days in a given year, the dataset of risk events and resultant ignitions is much smaller. Looking at the historical dataset, the ignition rate does not increase for all drivers on extreme days since SDG&E has not recorded risk events for all drivers. However, when comparing the ignition rates of faults across all drivers on extreme days, a pattern of increased likelihood is apparent.

Date Received: March 12, 2021
Date Submitted: March 17, 2021

Regarding the file MGRA-SDGE DR4 Q1.zip, provided in response to MGRA-SDGE-04 RESPONSE 1:

QUESTION 7:

One of the enclosed presentations states that: "As indicated in Rob's paper, extreme wind event always happens when RN is around zero". Please provide a copy of or public reference to Rob's paper.

OBJECTION:

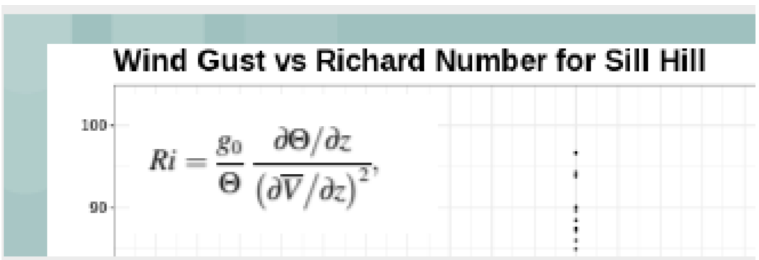
SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 7:

The paper referenced, written in part by Dr. Robert Fovell, can be found at http://www.atmos.albany.edu/facstaff/rfovell/papers/2018-gutierriez-fovell.pdf.

<u>QUESTION 8</u>:

The following relationship is shown on one of the graphs:



Please provide definitions of and the method for obtaining the values for the Richard Number Ri, g0, Theta, V-bar, and z. If these are fully described in "Rob's paper", that will be adequate.

<u>OBJECTION</u>:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

<u>RESPONSE 8</u>:

The definitions and methodologies are fully described in the paper referenced in Q7.

QUESTION 9:

In the file provided to MGRA as part 2021 WMP MGRA-SDGE DR3 Q1-Q5 - jwm.xlsx, the line 8, "Number of ignitions", appears to have calculation errors. The columns HWW&RFW and HWW&^RFW (high wind warning without red flag warning) should add up to the number in the column HWW. There are inconsistencies between these numbers. The other rows tally correctly. Please send a corrected version of this row.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 9:

Please refer to the updated file titled "2021 WMP – MGRA DR 5 – Q9.xlsx" with the corrected row 8 data.

SDG&E – MGRA – Data Request Response 6

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-06
2021 WILDFIRE MITIGATION PLAN UPDATE
SDG&E RESPONSE

Date Received: March 17, 2021
Date Submitted: March 22, 2021

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

III. RESPONSES

Regarding the use of the Technosylva fire spread model and its use to calculate wildfire consequences:

QUESTION 1:

How is the duration of the simulation determined for risk calculations used to prioritize circuit risks for mitigation? Is there a maximum / default duration of simulation for this purpose and if so what is it?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 6, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

The duration of all wildfire simulations performed by Technosylva and used in WiNGS was 8 hours, in all situations. Future models may have different applications of duration.

Date Received: March 17, 2021
Date Submitted: March 22, 2021

QUESTION 2:

Is there a maximum wildfire size used for simulation determined for risk calculations used to prioritize circuit risks for mitigation and if so what is it?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 6 and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

No, there is no maximum wildfire size used.

QUESTION 3:

How are weather and fuel inputs determined for risk calculations used to prioritize circuit risks for mitigation?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 6, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

The current version of WiNGS, which is used for prioritizing and scoping projects, considers weather and fuel in two places:

(1) The consequence values of potential wildfires that were calculated by Technosylva contained weather and fuel scenarios. The worst case of fire spread that was derived from those scenarios was used as an input in WiNGS.

(2) The likelihood of a wildfire was modified to account for the highest recent wind gust measured on each segment. Together, these inputs help shape the overall wildfire risk calculations on each segment.

QUESTION 4:

How is the duration of the simulation determined for risk calculations used to identify circuits for PSPS? Is there a maximum / default duration of simulation for this purpose and if so what is it? Or does the duration of the simulation extend to the projected length of the weather event?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 6, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

The duration of all wildfire simulations performed by Technosylva and used in WiNGS was 8 hours, in all situations. Future models may have different applications of duration.

QUESTION 5:

Is there a maximum wildfire size used in simulations to identify circuits for PSPS and if so what is it?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 6, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 5:

No, there is no maximum wildfire size used.

MGRA 2020 WMP Comments – Attachment A-4

Utility Wildfire Mitigation Maturity Model – Changes from 2020 to 2021

PG&E – UWMMS Differences 2020/21

Category Name	Capability Name	Question Name	Question	Current State Score (2020)	Future State Score (2020)	Current State Score (2021)	Future State Score (2021)	Change Justification (Current State)	Change Justification (Future State)
Risk Mapping and Simulation	Climate scenario modeling and sensitivities	A.I.e	What additional information is used to estimate model weather scenarios and their risk?	i	iii	ii	iv	Updated interpretation of the options for weather scenario as it applies to historical weather	Updated interpretation of the options for weather scenario as it applies to historical weather
Risk Mapping and Simulation	Estimation of wildfire consequences for communities	A.III.a	How is estimated consequence of ignition relayed?	ii	ii	iv	iv	Use of Technosyvla wildfire spread modeling has provided the output details necessary for this improvement	Use Technosyvla wildfire spread modeling has provided the output details necessary for this improvement
Risk Mapping and Simulation	Estimation of wildfire consequences for communities	A.III.f	How are the outputs of the ignition risk impact assessment tool evaluated?	i	iii	ii	iii	Introduced precision metrics for risk models and review	
Risk Mapping and Simulation	Estimation of wildfire and PSPS risk-reduction impact	A.IV.c	How granular is the ignition risk reduction impact assessment tool?	i	iii	iii	iii	In 2020, PG&E substantially updated a number of its risk models. The updates to PG&E's risk models are described in Sections 4.2, 4.3, 4.5.1, and 7.3.1 of the 2021 WMP. Models addressing ignition risk reduction are addressed specifically in Section 4.3.	
Risk Mapping and Simulation	Estimation of wildfire and PSPS risk-reduction impact	A.IV.d	How are ignition risk reduction impact assessment tool estimates assessed?	i	iii	ii	iii	In 2020, PG&E substantially updated a number of its risk models. The updates to PG&E's risk models are described in Sections 4.2, 4.3, 4.5.1, and 7.3.1 of the 2021 WMP. Models addressing ignition risk consequences are addressed specifically in Section 4.5.1(b).	
Risk Mapping and Simulation	Estimation of wildfire and PSPS risk-reduction impact	A.IV.e	What additional information is used to estimate risk reduction impact?	ii	iii	iv	v	In 2020, PG&E substantially updated a number of its risk models. The updates to PG&E's risk models are described in Sections 4.2, 4.3, 4.5.1, and 7.3.1 of the 2021 WMP. Model inputs are described specifically in Sections 4.3, 4.5.1 and 7.3.1.5-7.3.1.6.	Our next iteration of the risk model will align with level 5 - including vegetation and weather risk. Upgrades to PG&E's risk modeling are described in Sections 4.5.1 and 7.3.1 and Actions PGE-20 (Class A) and PGE-53 (Class B) of the 2021 WMP.
Risk Mapping and Simulation	Risk maps and simulation algorithms	A.V.a	What is the protocol to update risk mapping algorithms?	i	ii	ii	ii	Our Technosylva data gets updated on a periodic basis, especially for large scale events.	

Risk Mapping and Simulation	Risk maps and simulation algorithms	A.V.d	How are decisions to update algorithms evaluated?	i	iii	ii	iii	The internal and external validfation of PG&E's risk models is described in Section 4.5.1(g) of the 2021 WMP.	
Situational awareness and forecasting	Weather variables collected	B.I.a	What weather data is currently collected?	ii	iii	iii	iii	PG&E installed many more weather stations in 2020 and now operates and maintains approximately 1000 weather stations. These data provide reliable measurements of multiple fire weather variables.	
Grid design and system hardening	Grid design for resiliency and minimizing PSPS	C.III.d	How does the utility consider egress points in its grid topology?	ii	ii	i	ii	PG&E has temporarily removed egress modeling from our current risk model and prioritization, but we plan to incorporate it again in the long-term. We still leverage egress in our asset replacement and grid design activities.	
Asset management and inspections	Asset inventory and condition assessments	D.I.b	How frequently is the condition assessment updated?	ii	iii	ii	ii		Upon further review of this question in 2021, detailed inspections are planned for no more frequently than an annual cadence. Condition assessments are synomounous with inspections and thus updated at the same frequency.
Asset management and inspections	QA/QC for asset management	D.V.c	How frequently is QA/QC information used to identify deficiencies in quality of work performance and inspections performance?	iii	iv	iv	iv	In 2021, the inspection team plans to release new tools and dashboards that provide weekly tracking of inspector throughput, quality and other KPIs under development. This is new in 2021, and reflects an improvement in the timeliness and communications from 2020 practice	
Vegetation management and inspections	Vegetation grow-in mitigation	E.IV.d	What biological modeling is used to guide clearance around lines and equipment	iii	i	iii	iii		PG&E will continue to evaluate the possibility of utilizing biological modeling to guide clearances, but it has been illustrated that yearly in-person evaluations by trained staff provide best results. As part of PG&E's routine Vegetation Management program, we inspect all conductor line miles at a minimum of once a year.
Grid operations and protocols	Incorporating ignition risk factors in grid control	F.II.b	Does the utility have systems in place to automatically track operation history including current, loads, and voltage throughout the grid at the circuit level?	i	i	ii	ii	Usage of the PI-Historian software system allows for real-time data capture from the Energy Management System.	Usage of the PI-Historian software system allows for real-time data capture from the Energy Management System.

Grid operations and protocols	Incorporating ignition risk factors in grid control	F.II.c	Does the utility use predictive modeling to estimate the expected life and make equipment maintenance, rebuild, or replacement decisions based on grid operating history, and is that model reviewed?	ii	iii	i	i	Upon further review of this question in 2021, voltage and loading information is used to drive capacity upgrades, but complete, operational predictive modeling is not used to estimate expected life.	Upon further review of this question in 2021, voltage and loading information is used to drive capacity upgrades, but complete, operational predictive modeling is not used to estimate expected life.
Grid operations and protocols	Incorporating ignition risk factors in grid control	F.II.d	When does the utility operate the grid above rated voltage and current load?	ii	ii	i	i	During any condition, but contingent on real-time conditions. Note that we are operating the system with wildfire mitigations (per PG&E's internal guidance) during high risk wildfire conditions.	During any condition, but contingent on real-time conditions. Note that we are operating the system with wildfire mitigations (per PG&E's internal guidance) during high risk wildfire conditions.
Grid operations and protocols	PSPS op. model and consequence mitigation	F.III.b	What share of customers are communicated to regarding forecasted PSPS events?	ii	iv	iv	iv	The effectiveness of accurate customer notifications before and during a PSPS event depends principally upon when and how the patterns of critical fire weather change. Changes in the timing and location of critical fire weather can change the timing and magnitude of catastrophic fire risk, and can sometimes move a circuit into scope, delay the timing of de-energization by Time and Place (TP), or remove a TP from de-energization scope entirely. Being able to forecast these changes leads to more effective customer communications.	
Grid operations and protocols	PSPS op. model and consequence mitigation	F.III.d	During PSPS events, does the utility's website go down?	ii	i	i	i	PG&E launched a standalone cloud-based website to handle traffic spikes during high volume events. During 2020, PG&E did not experience any availability issues with its website.	

Grid operations and protocols	Protocols for PSPS re-energization	F.V.c	What is the average amount of time that it takes you to re-energize your grid from a PSPS once weather has subsided to below your de-energization threshold?	ii	iv	iv	iv	During the weather event, the PG&E Incident Command and meteorology teams monitor real-time and forecasted weather conditions based on weather models, weather station data, and field observations while patrol crews and helicopters are pre-positioned in anticipation of the Weather All Clear to begin patrols. Using this incoming information, Weather All Clears are generally issued by fire index area (FIA) in a phased approach to restore customers as soon as possible. In some cases, Weather All Clears are issued for portions of FIAs to further increase granularity and allow for earlier customer restoration	
Grid operations and protocols	Protocols for PSPS re-energization	F.V.d	What level of understanding of probability of ignitions after PSPS events does the utility have across the grid?	ii	iii	iii	iii	In 2021, this information is tracked and modeled by Meteorology to inform potential consequence of PSPS damages and hazards found during an event. This information is also used by Meteorology to inform the Outage Producing Wind Model.	
Grid operations and protocols	Ignition prevention and suppression	F.VI.b	What training and tools are provided to field workers?	iii	iii	v	v	There has been a new training developed for contact crews based on the PG&E employee training of fire mitigation	Training is now provided to employees and contractors for fire mitigation and supression
Data governance	Data collection and curation	G.I.f	Does the utility share best practices for database management and use with other utilities in California and beyond?	i	i	i	ii		The California IOUs have named representatives for each company and agreed to begin discussions in 2021 to share learnings with one another regarding data management.
Data governance	Data transparency and analytics	G.II.a	Is there a single document cataloguing all fire-related data and algorithms, analyses, and data processes?	i	i	i	ii		PG&E has reframed its perspective to align that a suite of categorized documents appears to meet the intent of this survey question.

Data governance	Data transparency and analytics	G.II.b	Is there an explanation of the sources, cleaning processes, and assumptions made in the single document catalog?	i	i	i	ii		Similar to G.II.a above, PG&E has reframed its perspective to align that a suite of categorized documents appears to meet the intent of this survey question, and it should include these aspects.
Data governance	Near-miss tracking	G.III.a	Does the utility track near miss data for all near misses with wildfire ignition potential?	i	ii	ii	ii	The WSD redfined "near miss" data as "risk events" in the Glossary provided by WSD for the 2021 WMP. PG&E has created a focused team to collect risk event data across our service territory.	
Data governance	Near-miss tracking	G.III.b	Based on near miss data captured, is the utility able to simulate wildfire potential given an ignition based on event characteristics, fuel loads, and moisture?	i	ii	ii	ii	The WSD redfined "near miss" data as "risk events" in the Glossary provided by WSD for the 2021 WMP. PG&E has created a focused team to collect risk event data across our service territory. Now models can be applied to the risk event data to simulate events.	
Data governance	Near-miss tracking	G.III.c	Does the utility capture data related to the specific mode of failure when capturing near miss data?	i	ii	ii	ii	The WSD redfined "near miss" data as "risk events" in the Glossary provided by WSD for the 2021 WMP. PG&E has created a focused team to collect risk event data across our service territory. Now that there is a process for capturing risk event data and reporting it, PG&E is able to speak in more detail to failures.	
Data governance	Data sharing with the research community	G.IV.b	Does the utility in engage in research?	iii	iii	iv	iv	PG&E participates in the following, some of which include studies funded and shared across multiple utilities: - Investor Owned Utility meetings - Western Under Ground committee meetings - Dig-Safe board meetings where utilities share research information - CEATI, NATF and other industry organizations - Benchmarking and sharing project information - IEEE committees for breakers and transformers	PG&E participates in the following, some of which include studies funded and shared across multiple utilities: - Investor Owned Utility meetings - Western Under Ground committee meetings - Dig-Safe board meetings where utilities share research information - CEATI, NATF and other industry organizations - Benchmarking and sharing project information - IEEE committees for breakers and transformers

Data governance	Data sharing with the research community	G.IV.d	Does the utility promote best practices based on latest independent scientific and operational research?	i	ii	ii	ii	PG&E has enhanced our innovation review processes in 2020 and leverages the IWRMC as one venue to review scientific and operational research that may benefit wildfire risk mitigation activities.	
Resource allocation methodology	Presentation of relative risk spend efficiency for portfolio of initiatives	H.II.b	What initiatives are captured in the ranking of risk spend efficiency?	i	ii	i	iii		PG&E expects to estimate RSEs for emerging technologies as well to help inform investments. If no pilot data is available, we will use industry estimations to create preliminary RSEs to project effectiveness.
Resource allocation methodology	Presentation of relative risk spend efficiency for portfolio of initiatives	H.II.c	Does the utility include figures for present value cost and project risk reduction impact of each initiative, clearly documenting all assumptions (e.g. useful life, discount rate, etc.)?	i	i	i	ii		As PG&E matures in risk reduction analysis, PG&E utiltizes the concept of SMAP/RAMP, which includes the usage of present value and useful life. This is expected to continue to translate to further granularity at project level analysis.
Resource allocation methodology	Presentation of relative risk spend efficiency for portfolio of initiatives	H.II.e	At what level of granularity is the utility able to provide risk efficiency figures?	i	iii	iii	iii	PG&E developed an updated Vegetation Risk Model and Conductor Risk Model at the Circuit Protection Zone level, which measure risk consistent with SMAP and MAVF principles as defined by CPUC. This allows PG&E to produce risk scores at the CPZ level and measure risk. Application of SMAP and MAVF is described in Section 4.2 of the 2021 WMP and the granularity of risk models is described in Sections 4.3 and 4.5.1(e) of the 2021 WMP.	
Resource allocation methodology	Process for determining risk spend efficiency of vegetation management initiatives	H.III.a	How accurate of a risk spend efficiency calculation can the utility provide?	i	ii	ii	iii	Since the 2020 WMP, PG&E has submitted a series of additional RSEs through 2020 RAMP Report and Class B Guidance-1 Submission to begin the assessment of programs.	As PG&E matures on the understanding of RSEs and continues improvement in the granularity of risk models and costs associated with programs, RSEs are accurately quantified to inform decision making.

Resource allocation methodology	Process for determining risk spend efficiency of vegetation management initiatives	H.III.b	At what level can estimates be prepared?	i	iii	iii	iii	PG&E developed an updated Vegetation Risk Model and Conductor Risk Model at the Circuit Protection Zone level, which measure risk consistent with SMAP and MAVF principles as defined by CPUC. This allows PG&E to produce risk scores at the CPZ level and measure risk. Application of SMAP and MAVF is described in Section 4.2 of the 2021 WMP and the granularity of risk models is described in Sections 4.3 and 4.5.1(e) of the 2021 WMP.	
Resource allocation methodology	Process for determining risk spend efficiency of system hardening initiatives	H.IV.a	How accurate of a risk spend efficiency calculation can the utility provide?	ii	ii	ii	iii		PG&E uses a consistent quantification of MAVF risk scores and risk reduction. As PG&E continues its development, PG&E expects to have quantified RSEs that help inform initiatives at targeted locations, which currently is still at a portfolio level.
Resource allocation methodology	Process for determining risk spend efficiency of system hardening initiatives	H.IV.b	At what level can estimates be prepared?	i	iii	iii	iii	PG&E developed an updated Vegetation Risk Model and Conductor Risk Model at the Circuit Protection Zone level, which measure risk consistent with SMAP and MAVF principles as defined by CPUC. This allows PG&E to produce risk scores at the CPZ level and measure risk. Application of SMAP and MAVF is described in Section 4.2 of the 2021 WMP and the granularity of risk models is described in Sections 4.3 and 4.5.1(e) of the 2021 WMP.	
Emergency planning and preparedness	Plan to restore service after wildfire related outage	I.II.c	To what level are procedures to restore service after a wildfire-related outage customized?	i	i	v	v	PG&E develops and executes fire rebuild plans down to the asset level, incorporating circuit hardening opportunies into the restoration planning process	PG&E develops and executes fire rebuild plans down to the asset level, incorporating circuit hardening opportunies into the restoration planning process

Emergency planning and preparedness	Emergency community engagement during and after wildfire	I.III.a	Does the utility provide clear and substantially complete communication of available information relevant to affected customers?	ii	ii	iii	iii	In 2020, PG&E expanded partnerships with CBOs and included information about the resources of these organizations in its medical baseline communications and on its website. PG&E plans to continue to build on its progress throughout 2021.	In 2020, PG&E expanded partnerships with CBOs and included information about the resources of these organizations in its medical baseline communications and on its website. PG&E plans to continue to build on its progress throughout 2021.
Emergency planning and preparedness	Emergency community engagement during and after wildfire	I.III.b	What percent of affected customers receive complete details of available information?	ii	iv	iii	iv	PG&E's PSPS data supports the current state score.	
Emergency planning and preparedness	Emergency community engagement during and after wildfire	I.III.c	What percent of affected medical baseline customers receive complete details of available information?	i	iii	iii	iii	PG&E's PSPS data supports the current state score.	
Emergency planning and preparedness	Emergency community engagement during and after wildfire	I.III.d	How does the utility assist where helpful with communication of information related to power outages to customers?	iii	ii	ii	ii	PG&E has a webpage dedicated to evacuation.	
Emergency planning and preparedness	Protocols in place to learn from wildfire events	I.IV.b	Is there a defined process and staff responsible for incorporating learnings into emergency plan?	i	ii	ii	ii	PG&E developed and executed an After Action Standard.	
Emergency planning and preparedness	Protocols in place to learn from wildfire events	I.IV.c	Once updated based on learnings and improvements, is the updated plan tested using "dry runs" to confirm its effectiveness?	i	ii	ii	ii	PG&E has developed a 2021-2023 Multi Year Training and Exercise Plan	
Emergency planning and preparedness	Protocols in place to learn from wildfire events	I.IV.d	Is there a defined process to solicit input from a variety of other stakeholders and incorporate learnings from other stakeholders into the emergency plan?	i	ii	ii	ii	PG&E developed and executed After Action Standard and Procedure	
Emergency planning and preparedness	Processes for continuous improvement after wildfire and PSPS	I.V.b	Does the utility conduct a customer survey and utilize partners to disseminate requests for stakeholder engagement?	i	iii	iii	iii	Going into the 2020 wildfire season, PG&E established formal stakeholder groups, advisory boards, and collaboratives that helped to disseminate requests for stakeholder engagement. In addition, in 2020, PG&E solicited stakeholder feedback specifically on its customer survey.	

Emergency planning and preparedness	Processes for continuous improvement after wildfire and PSPS	I.V.c	In what other activities does the utility engage?	iii	iv	iv	iv	Over the course of 2020, we improved customer engagement and communication regarding our PSPS program. We have established various venues and mediums to assess and obtain feedback from the public and our public safety partners including public listening sessions (i.e. PSPS listening sessions) and direct	
Emergency planning and preparedness	Processes for continuous improvement after wildfire and PSPS	I.V.d	Does the utility share with partners findings about what can be improved?	i	ii	ii	ii	Over the course of 2020, we improved customer engagement and communication regarding our PSPS program. We have established various venues and mediums to assess and obtain feedback from the public and our public safety partners including public listening sessions (i.e. PSPS listening sessions) and direct	
Emergency planning and preparedness	Processes for continuous improvement after wildfire and PSPS	I.V.e	Are feedback and recommendations on potential improvements made public?	i	ii	ii	ii	Over the course of 2020, we improved customer engagement and communication regarding our PSPS program. We have established various venues and mediums to assess and obtain feedback from the public and our public safety partners including public listening sessions (i.e. PSPS listening sessions) and direct debriefs. The materials and meeting minutes from these meetings are posted to our external website.	
Emergency planning and preparedness	Processes for continuous improvement after wildfire and PSPS	I.V.f	Does the utility conduct proactive outreach to local agencies and organizations to solicit additional feedback on what can be improved?	i	ii	ii	ii	Over the course of 2020, we improved customer engagement and communication regarding our PSPS program. We have established various venues and mediums to assess and obtain feedback from the public and our public safety partners including public listening sessions (i.e. PSPS listening sessions) and direct	

Emergency planning and preparedness	Processes for continuous improvement after wildfire and PSPS	I.V.g	Does the utility have a clear plan for post-event listening and incorporating lessons learned from all stakeholders?	i	ii	ii	ii	Over the course of 2020, we improved customer engagement and communication regarding our PSPS program. We have established various venues and mediums to assess and obtain feedback from the public and our public safety partners including public listening sessions (i.e. PSPS listening sessions) and direct	
Emergency planning and preparedness	Processes for continuous improvement after wildfire and PSPS	I.V.i	Does the utility have a process to conduct reviews after wildfires in other the territory of other utilities and states to identify and address areas of improvement?	i	ii	ii	ii	PG&E began participating in the IWRMC in 2020 (see J.I.a)	
Stakeholder cooperation and community engagement	Cooperation and best practice sharing with other utilities	J.I.a	Does the utility actively work to identify best practices from other utilities through a clearly defined operational process?	i	iii	iii	iii	In 2020, PG&E participated in the start-up of the International Wildfire Risk Mitigation Consortium (IWRMC) with a global group of utilities to share and identify best practices through a facilitated, defined process.	
Stakeholder cooperation and community engagement	Engagement with LEP and AFN populations	J.III.c	Can the utility point to clear examples of how those relationships have driven the utility's ability to interact with and prepare LEP & AFN communities for wildfire mitigation activities?	i	ii	ii	ii	PG&E formed the People with Disabilities and Aging Advisory Council and the Statewide IOU AFN Advisory Council in early 2020. Once these groups were established, PG&E was able to leverage these organizations to provide direct feedback on our programs, resources and services.	
Stakeholder cooperation and community engagement	Engagement with LEP and AFN populations	J.III.d	Does the utility have a specific annually-updated action plan further reduce wildfire and PSPS risk to LEP & AFN communities?	i	ii	ii	ii	PG&E filed its first annual AFN plan in 2020 and the associated Progress Reports in 2020.	
Stakeholder cooperation and community engagement	Collaboration with emergency response agencies	J.IV.a	What is the cooperative model between the utility and suppression agencies?	ii	iii	iii	iii	The continued collaboration with fire suppression agencies and the monitoring and subsequent sharing of fire detection satellite information has improved the current state when compared to 2020.	

SCE – UWMMS Differences 2020/21

Southern California Edison

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

DATA REQUEST SET M G R A - S C E - 0 0 7

To: MGRA
Prepared by: Devin Rauss
Job Title: Sr. Manager
Received Date: 3/16/2021

Response Date: 3/18/2021

Question 004:
Please provide a table of all Utility Maturity Survey responses that have changed since 2020, how they have changed, and a description of why.

Response to Question 004:
The table below provides an explanation regarding differences in the 2021 and 2020 starting points, or differences in our anticipated end point for 2022. The table only includes questions that reflect such changes.

SCE included an identification of key initiatives and associated progress in sections 7.1 and 7.2 of our WMP. The table below does not repeat this information, but instead offers a summary representation of how and why our responses evolved. In many cases, the response changes are a reflection of the successful execution of WMP activities in the time intervals between the two survey responses. SCE had significant focus on our WMP activities throughout 2020 and as a result made a significant amount of progress on many of our capabilities. The time elapsed since the last survey and progress made are reflected in the difference in starting point between 2020 and 2021, denoted by "achieved capabilities through activities completed in 2020". We also updated our expected maturity level in 2022 based on the progress made from 2020 to 2021 as denoted by statements including "… than originally anticipated…".

		Maturity Level by Year					
		2020 WMP		2021 Update			
Cap.	Sub-Question	2020	2022	2021	2022	How	Why
A.I	a. How sophisticated is utility's ability to estimate the risk of weather scenarios?	ii	iv	iv	iv	Improvements in weather modeling and risk understanding	Achieved capabilities through activities completed in 2020
	d. How automated is the tool?	i	ii	ii	ii	Improvements in automation	Achieved capabilities through activities completed in 2020
	a. How is ignition risk calculated	ii	iii	iv	iv	Improvements in risk tool inputs and granularity	Achieved more risk modeling enhancements than originally anticipated through activities completed in 2020
A.II	b. How automated is the ignition risk calculation tool?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
	d. How automated is the ignition risk estimation process?	i	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
	f. How are the outputs of the ignition risk impact assessment tool evaluated?	iii	iv	iii	iii	N/A	Do not expect machine learning will be achieved in this timeframe
A.III	g. What other inputs are used to estimate impact?	i	iii	iii	iii	Additional inputs incorporated	Achieved capabilities through activities completed in 2020
	a. How is risk reduction impact estimated?	ii	iv	iv	iv	Achieved interval scale for risk estimation	Achieved capabilities through activities completed in 2020
	b. How automated is ignition risk reduction impact assessment tool?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
A.IV	c. How granular is the ignition risk reduction impact assessment tool?	ii	v	v	v	Achieved greater granularity	Achieved capabilities through activities completed in 2020
	b. How automated is the mechanism to determine whether to update algorithms based on deviations?	i	i	i	ii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
A.V	c. How are deviations from risk model to ignitions and propagation detected?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated

	e. What other data is used to make decisions on whether to update algorithms?	iii	iv	iv	iv	Additional inputs incorporated	Achieved capabilities through activities completed in 2020
B.I	b. How are measurements validated?	ii	ii	ii	iii	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
	a. How granular is the weather data that is collected?	ii	ii	iv	iv	Improvements in weather data collection	Achieved greater degree of weather collection than originally anticipated through activities completed in 2020
B.II	c. How granular is the tool?	iii	iii	iii	iv	Improvements in granularity	Expect to achieve greater degree of granularity than originally anticipated
	c. At what level of granularity can forecasts be prepared?	iii	iii	iii	iv	Improvements in granularity	Expect to achieve greater degree of granularity than originally anticipated
B.III	e. How automated is the forecast process?	iii	iii	iv	iv	Improvements in automation	Achieved greater degree of automation than originally anticipated through activities completed in 2020
	b. What equipment is used to detect ignitions?	iii	iii	iv	iv	Additional equipment used for detecting ignitions	Incorporated equipment beyond what was originally anticipated through activities completed in 2020
	c. How is information on detected ignitions reported?	iii	iii	iii	iv	Improvements in automation	Expect to achieve higher degree of automation than originally anticipated
B.V	d. What role does ignition detection software play in wildfire detection?	i	i	i	ii	Use of cameras in detection	Expect to incorporate cameras to a greater extent than was originally anticipated
	a. Does grid design meet minimum G095 requirements and loading standards in HFTD areas?	ii	ii	iii	iii	Grid design standards updated	Achieved greater degree of improvement to grid designs than originally anticipated through activities completed in 2020
	b. Does the utility provide micro grids or islanding where traditional grid infrastructure is impracticable and wildfire risk is high?	i	ii	ii	ii	Incorporation of additional grid designs	Achieved capabilities through activities completed in 2020
C.II	c. Does routing of new portions of the grid take wildfire risk into account?	ii	ii	i	i	Incorporation of wildfire risk into routing considerations	SCE better understands this question to mean wildfire risk is a consideration, but not the sole

							consideration, changing our response from last time.
	b. What level of redundancy does the utility's distribution architecture have?	ii	ii	iii	iii	Improvements in distribution architecture redundancy	Achieved greater degree of redundancy than originally anticipated through activities completed in 2020
C.III	d. How does the utility consider egress points in its grid topology?	i	i	i	ii	Incorporation of additional factors into grid topology	Expect to incorporate egress points to a greater degree than originally anticipated
	a. Does the utility have an understanding of the risk spend efficiency of hardening initiatives?	ii	iii	iii	iii	Improvements in risk modeling (relative vs quantitative)	Achieved capabilities through activities completed in 2020
C.IV	b. At what level can estimates be prepared?	ii	v	iii	v	Improvements in risk modeling granularity	Progressing to target expected for 2022 through activities completed in 2020
C.V	b. Are results of pilot and commercial deployments, including project performance, project cost, geography, climate, vegetation etc. shared in sufficient detail to inform decision making at other utilities?	ii	ii	iii	iii	Greater information sharing	Sharing with stakeholders beyond what was originally anticipated
	b. How are patrol inspections scheduled?	i	i	ii	iii	Improvements to updates and risk incorporation of inspection schedules	Achieved, and expect to continue to achieve, greater improvements in scheduling through activities completed in 2020 and planned for 2021/22
	c. What are the inputs to scheduling patrol inspections?	i	i	i	ii	Incorporation of predictive modeling	Expect to incorporate predictive modeling into inspections more than originally anticipated
D.II	i. What are the inputs to scheduling other inspections?	i	i	ii	ii	Incorporation of predictive modeling	Expect to incorporate predictive modeling into inspections more than originally anticipated
D.III	c. At what level of granularity are the depth of checklists, training, and procedures customized?	i	i	v	v	Improvements in granularity	Achieved greater degree of granularity than originally expected through activities completed in 2020

D.IV	b. How are service intervals set?	i	ii	ii	ii	Improvements in granularity	Achieved capabilities through activities completed in 2020
E.III	c. At what level of granularity are the depth of checklists, training, and procedures customized?	ii	ii	v	v	Improvements in granularity	Achieved greater degree of granularity than originally expected through activities completed in 2020
	h. Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?	i	i	ii	ii	Greater collaboration with customers	SCE better understands this question to mean this option is available to customers, not necessarily utilized, changing our response from last time.
E.IV	i. Does the utility work with partners to identify new cost-effective uses for vegetation taking into consideration environmental impacts and emissions of vegetation waste?	i	i	ii	ii	Greater collaboration with partners	SCE better understands this question to mean this option is available to partners, not necessarily utilized, changing our response from last time.
	f. Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?	i	i	ii	ii	Greater collaboration with customers	SCE better understands this question to mean this option is available to customers, not necessarily utilized, changing our response from last time.
E.V	g. Does the utility work with partners to identify new cost-effective uses for vegetation, taking into consideration environmental impacts and emissions of vegetation waste?	i	i	ii	ii	Greater collaboration with partners	SCE better understands this question to mean this option is available to partners, not necessarily utilized, changing our response from last time.
E.VI	a. How is contractor and employee activity audited?	ii	ii	ii	iii	Demonstrable functioning of audit process	Expect to be able to demonstrate this functionality by end of 2022 more than originally anticipated
	a. Is there a process for inspecting de-energized sections of the grid prior to re-energization?	ii	iii	ii	ii	N/A	Do not believe augmentation with sensors and aerial tools will be accomplished in this timeframe
F.V	c. What is the average amount of time that it takes you to re-energize your grid from a PSPS once weather has subsided to below your de-energization threshold?	iv	v	v	v	Increase in re-energization time	Achieved capabilities through activities completed in 2020

	d. Is there a system for sharing data in real time across multiple levels of permissions?	i	i	i	iii	Increased levels of permission for data sharing	Expect to have permission sharing across a greater degree of levels than originally anticipated
G.II	e. Are the most relevant wildfire related data algorithms disclosed?	ii	ii	iii	iii	Disclosure of wildfire data algorithms	Experience with WMP disclosures led us to a higher capability than originally expected
	b. Based on near miss data captured, is the utility able to simulate wildfire potential given an ignition based on event characteristics, fuel loads, and moisture?	i	ii	ii	ii	Wildfire ignition modeling improvements	Achieved capabilities through activities completed in 2020
	c. Does the utility capture data related to the specific mode of failure when capturing near miss data?	i	ii	ii	ii	Mode of failure data capture	Achieved capabilities through activities completed in 2020
G.III	d. Is the utility able to predict the probability of a near miss in causing an ignition based on a set of event characteristics?	i	ii	ii	ii	Wildfire ignition modeling improvements	Achieved capabilities through activities completed in 2020
H.I	b. For what level of granularity is the utility able to provide projections for each scenario?	ii	v	iv	v	Improvements in granularity	Progressing to target expected for 2022 through activities completed in 2020
H.II	e. At what level of granularity is the utility able to provide risk efficiency figures?	ii	v	iv	iv	Improvements in granularity	Do not believe asset level is possible during this timeframe, but have already advanced to span level through activities completed in 2020
	b. At what level can estimates be prepared?	ii	iii	iii	iii	Improvements in granularity	Achieved capabilities through activities completed in 2020
	d. What vegetation management initiatives does the utility include within its evaluation?	ii	iii	iii	iii	Incorporation of more initiatives into evaluation	Achieved capabilities through activities completed in 2020
H.III	e. Can the utility evaluate risk reduction synergies from combination of various initiatives?	i	ii	ii	ii	Ability to evaluate risk reduction of various initiatives	Achieved capabilities through activities completed in 2020
	a. How accurate of a risk spend efficiency calculation can the utility provide?	ii	iii	iii	iii	Risk spend efficiency accuracy improvements	Achieved capabilities through activities completed in 2020
H.IV	b. At what level can estimates be prepared?	ii	v	v	v	Improvements in granularity	Achieved capabilities through activities completed in 2020

	a. To what extent does the utility allocate capital to initiatives based on risk-spend efficiency (RSE)?	ii	iii	iii	iv	Expanded use of risk spend efficiency in capital allocation	Achieved capabilities through activities completed in 2020, and expect to improve beyond original anticipated level of maturity
	b. What information does the utility take into account when generating RSE estimates?	i	iii	iii	iii	Improvements in granularity	Achieved capabilities through activities completed in 2020
H.V	c. How does the utility verify RSE estimates?	ii	ii	ii	iii	Additional data used for verification	Increasing historical data facilitates a greater level of maturity for 2022 than originally anticipated
I.III	a. Does the utility provide clear and substantially complete communication of available information relevant to affected customers?	ii	iii	iii	iii	Incorporated referrals to other agencies	Achieved capabilities through activities completed in 2020
J.I	f. Has the utility implemented a defined process for testing lessons learned from utilities to other ensure local applicability?	i	i	ii	ii	Established process	Process established in 2020 to share lessons learned
J.III	d. Does the utility have a specific annually-updated action plan further reduce wildfire and PSPS risk to LEP & AFN communities?	i	ii	ii	ii	Incorporation of LEP & AFN communities into plan	Achieved capabilities through activities completed in 2020
J.IV	c. Does the utility accurately predict and communicate the forecasted fire propagation path using available analytics resources and weather data?	i	i	ii	ii	Communication of fire forecasts	Achieved capabilities through activities completed in 2020

SDG&E – UWMMS Differences 2020/21

Capability Name	Question Name	Question	2021 Responses (Current)	2021 Responses (Future)	Changed Current State from 2020?	Change Justification (Current State)	Changed Future State from 2020?	Change Justification (Future State)
2. Ignition risk estimation	A.II.b	How automated is the ignition risk calculation tool?	ii	iii	Downgrade	SDG&E's reason for de-maturation from "Mostly (<50%)" to "Partially (<50%)" in the current year was due to our interpretation of the question rather than a change in process of ignition risk estimation. SDG&E's interpretation of automation is when data is automatically pulled from different sources and databases, it automatically flows through different models to automatically simulate results without any involvement and interpretation from the Subject Matter Experts. Based on our understanding of this definition, questions related to Capability 2, 4 and 3 fall in different categories. Capability 2 (A.II.b) is focused on the likelihood of an ignition. SDG&E uses a combination of tools to assess ignition risk based on data, Subject Matter Expert input, and ignition history. The tools used for assessment are automated, however, there is a need for manual effort upfront to gather the data, run it through the model and lastly, it requires a Subject Matter Expert for analysis of the outputs to make them meaningful. Based on this reasoning, the ignition risk estimation tool is partially automated.	No Change	N/A
3. Estimation of wildfire consequences for communities	A.III.f	How are the outputs of the ignition risk impact assessment tool evaluated?	iv	iv	Upgrade	SDG&E subject matter experts assess the output of the wildfire modeling and have the ability to make real-time changes and updates based upon experiences and conditions measured or observed. Additionally, SDG&E plans to work with Technosylva and others to implement innovative approaches to enhance and leverage Wildfire Risk Reduction Model (WRRM) with real time learning	No Change	N/A
4. Estimation of wildfire and PSPS risk-reduction impact	A.IV.b	How automated is your ignition risk reduction impact assessment tool?	ii	iii	Downgrade	SDG&E's reason for de-maturation from "Mostly (<50%)" to "Partially (<50%)" in the current year was due to our interpretation of the question rather than a change in process of ignition risk estimation. SDG&E's interpretation of automation is when data is automatically pulled from different sources and databases, it automatically flows through different models to automatically simulate results without any involvement and interpretation from the Subject Matter Experts. Based on our understanding of this definition, questions related to Capability 2, 4 and 3 fall in different categories. Capability 2 (A.II.b) is focused on the likelihood of an ignition. SDG&E uses a combination of tools to assess ignition risk based on data, Subject Matter Expert input, and ignition history. The tools used for assessment are automated, however, there is a need for manual effort upfront to gather the data, run it through the model and lastly, it requires a Subject Matter Expert for analysis of the outputs to make them meaningful. Based on this reasoning, the ignition risk estimation tool is partially automated. Capability 4 (A.IV.b) has a new element of risk modeling for PSPS risk reduction. However, very similar to capability 2 - the tools are partially automated due to the manual process of gathering and interpreting the results.	No Change	N/A
7. Weather data resolution	B.II.a	How granular is the weather data that is collected?	iv	iv	Upgrade	SDG&E's response upgraded for the current year as SDG&E's weather data remains sufficiently granular to monitor current conditions and validate model performance. In addition, SDG&E forecast model provides wind estimation at about 50 atmospheric altitudes, with those closest to the surface being most relevant to ignition risk.	Upgrade	SDG&E's response upgraded for the current year as SDG&E's weather data remains sufficiently granular to monitor current conditions and validate model performance. In addition, SDG&E forecast model is developed wind estimation over 50 atmospheric altitudes.
7. Weather data resolution	B.II.b	How frequently is data gathered	v	v	Upgrade	SDG&E's response upgraded for the current year because the weather stations that did report every 10 minutes now have the capability to report every 30 second on demand.	Upgrade	SDG&E's response upgraded for the current year since the Weather stations at SDG&E report every 10 minutes and up to every 30 second on demand. Over 200 SDG&E weather stations are equipped with 30 seconds capability.
9. External sources used in weather forecasting	B.IV.c	For what is weather data used?	iii	iii	Upgrade	SDG&E continues to leverage and enhance live map platforms to create a single visual map to support real-time operation with the weather data. SDG&E has operationalized a new internal PSPS dashboard, resulting in the increased rating.	No Change	N/A
10. Wildfire detection processes and capabilities	B.V.c	How is information on detected ignitions reported?	iii	iii	Upgrade	SDG&E continues to work and build relationships with emergency response agencies, strategic partner organizations and fire suppression agencies. SDG&E upgraded the response this year, with the assumption that the stakeholders that we continue to build and expand and improve collaboration with are CAL OES and the CPUC.	Upgrade	SDG&E continues to work and build relationships with emergency response agencies, strategic partner organizations and fire suppression agencies. SDG&E upgraded the response this year, with the assumption that the stakeholders that we continue to build and expand and improve collaboration with are CAL OES and the CPUC.
13. Grid design for resiliency and minimizing PSPS	C.III.b	What level of redundancy does the utility's distribution architecture have?	ii	ii	No Change	N/A	Downgrade	SDG&E is a normally radial system and majority of the circuits within HFTD have ties, sectionalizing devices to minimize customer impact during failures/outages. With the system being normally radial, SDG&E currently is not actively looking at ways to create a redundant system (i.e. a network) for n-1 within the HFTD to achieve much lower impact.
13. Grid design for resiliency and minimizing PSPS	C.III.d	How does the utility consider egress points in its grid topology?	ii	ii	No Change	N/A	Downgrade	SDG&E implicitly considers egress risk in grid topology based on circuits and communities but not in a formalized or quantitative way for each customer at the moment. However, the timelines to get this in an application are still unclear and are being worked on. The future maturity was updated in the 2021 assessment due to uncertainties about that timeline.

14. Risk-based grid hardening and cost efficiency	**C.IV.b**	**At what level can estimates be prepared?**	iii	iii	Upgrade	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 worked on developing its Wildfire Next Generation System (WiNGS) model; a. 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. SDG&E is continuing to improve the model to get a granular assessment of risk across the system	No Change	N/A
14. Risk-based grid hardening and cost efficiency	**C.IV.e**	**Can the utility evaluate risk reduction synergies from combination of various initiatives?**	ii	ii	Upgrade	While SDG&E continues to expand and further improve on the evaluation of risk reduction synergies, SDG&E is able to evaluate combinations of grid hardening solutions manually on a case-by-cases basis but plans to continue to enhance this effort.	Upgrade	While SDG&E continues to expand and further improve on the evaluation of risk reduction synergies, SDG&E is able to evaluate combinations of grid hardening solutions manually on a case-by-cases basis but plans to continue to enhance this effort.
16. Asset inventory and condition assessments	**D.I.a**	**What information is captured in the equipment inventory database?**	iv	iv	No Change	N/A	Downgrade	SDG&E notes that there is an accurate inventory of equipment that may contribute to wildfire risk, including age, state of wear, and expected lifecycle, including records of all inspections and repairs and up-to-date work plans on expected future repairs and replacements. SDG&E is developing, adding and learning more about the data and it isn't mature enough to seek independent auditing of this data. Meanwhile, SDG&E stores ISO and PUC audited information for maintenance records, but it isn't seeking independent auditing of sensor outputs (Condition Based Maintenance, SCADA, Relay, Sectionalizing Recloser) for everything under Distribution, Transmission and Substation currently, however, may consider it for future.
21. Vegetation inventory and condition assessments	**E.I.a**	**What information is captured in the inventory?**	iv	iv	No Change	N/A	Downgrade	In capability 21, the highest level of maturity involves up-to-date tree health and moisture content to determine the risk of ignition and propagation. SDG&E currently has a comprehensive and detailed tree inventory database. Each inventory tree record is updated during the inspection activity and captures information such as species, clearance, tree condition, work status, customer and location information, activity history, etc. SDG&E doesn't intend to take into consideration the fuel moisture content by tree to determine risk of ignition and propagation by end of 2022.
27. Protective equipment and device settings	**F.I.b**	**Is there an automated process for adjusting sensitivity of grid elements and evaluating effectiveness?**	ii	ii	No Change	N/A	Downgrade	SDG&E tracks setting changes via manually created workflows, which is reviewed to ensure accuracy. Automated scripts are initiated by operations to change field settings. SDG&E plans on full automation into risk profiles by device for the future, however, this is something that will go beyond 2022.
28. Incorporating ignition risk factors in grid control	**F.II.d**	**When does the utility operate the grid above rated voltage and current load?**	i	iii	No Change	N/A	Upgrade	SDG&E's goal is to never operate the grid above rated voltage and current load. SDG&E has system restrictions to identify all voltage and current limits for individual circuit segments. In addition, SDG&E plans on further improving and developing on those systems, partnering with internal System Planning team to identify potential overload locations on the system which will allow quick identification and response to mitigate any system overload conditions.
29. PSPS op. model and consequence mitigation	**F.III.b**	**What share of customers are communicated to regarding forecasted PSPS events?**	ii	iii	Downgrade	There were multiple factors that contributed to the decrease in our customer communication rate, though we are very focused on continuously improvement moving forward. Fire season 2020 posed several forecasting challenges for the meteorology team to anticipate every circuit that may experience critical fire weather conditions. To not over-communicate, over-warn or "cry wolf" to our customers, we strive to be very precise and targeted with our notifications, and this has led to isolated instances where extreme fire weather conditions have materialized in unanticipated areas causing de-energization without pre-notification. Additionally, we leverage remotely controlled sectionalizing devices to isolate the impacts of our PSPS efforts. There were multiple instances in 2020 in which the communications with these devices were not successful, requiring our system operators to leverage the next available switch, impacting customers that we did not expect to be impacted by the outage. In both of these instances, our team is focused on mitigating these unanticipated impacts moving forward.	No Change	N/A

29. PSPS op. model and consequence mitigation	**F.III.e**	**During PSPS events, what is the average downtime per customer?**	v	v	Upgrade	SDG&E's response was upgraded from 2020, due to a change in interpretation of "downtime". The initial response in 2020 was based on interpreting downtime as outage duration and was answered based on looking at system SAIDI. In 2021, SDG&E's interpretation based on the line of questions in this capability changed to interpreting "downtime" as website downtime rather than power outage. During 2020, SDG&E did not experience any website downtime throughout the wildfire season. SDGE.com is hosted on the Amazon Web Services (AWS) "Cloud" infrastructure (we started this in 2011). During an active PSPS event, SDG&E utilizes 24/7 monitoring tools and staff to check not only up-time, but performance, as well. If SDG&E detects degradation of SDGE.com performance, they add AWS web servers (AWS' Elastic Web-Computing) to increase capacity to handle the load. SDG&E has built a highly-scalable website infrastructure, including: · Using CloudFlare as our Content Delivery Network (CDN) · Fine-tuned load balancing and proxy caching · A multi-tier stack, that separates the web servers from the file/database servers · Upgraded disaster recovery system (in different parts of the country)	Upgrade	SDG&E's response was upgraded from 2020, due to a change in interpretation of "downtime". The initial response in 2020 was based on interpreting downtime as outage duration and was answered based on looking at system SAIDI. In 2021, SDG&E's interpretation based on the line of questions in this capability changed to interpreting "downtime" as website downtime rather than power outage. During 2020, SDG&E did not experience any website downtime throughout the wildfire season. SDGE.com is hosted on the Amazon Web Services (AWS) "Cloud" infrastructure (we started this in 2011). During an active PSPS event, SDG&E utilizes 24/7 monitoring tools and staff to check not only up-time, but performance, as well. If SDG&E detects degradation of SDGE.com performance, they add AWS web servers (AWS' Elastic Web-Computing) to increase capacity to handle the load. SDG&E has built a highly-scalable website infrastructure, including: · Using CloudFlare as our Content Delivery Network (CDN) · Fine-tuned load balancing and proxy caching · A multi-tier stack, that separates the web servers from the file/database servers · Upgraded disaster recovery system (in different parts of the country)
31. Protocols for PSPS re-energization	**F.V.c**	**What is the average amount of time that it takes you to re-energize your grid from a PSPS once weather has subsided to below your de-energization threshold?**	iv	v	No Change	N/A	Upgrade	After the SDG&E weather network shows that wind speeds have reduced and the forecast doesn't indicate that the wind speeds will re-accelerate above certain thresholds, the process of re-energization can take place. The goal for each re-energized circuit is to complete the patrols with 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. In some cases patrols can be completed faster with air traffic permits, longer daylight hours, etc. However, there are conditions that are outside of SDGE control, such as the weather may have subsided, but the wind speeds need to be below a certain threshold for helicopter to fly safely to conduct patrols.
33. Data collection and curation	**G.I.f**	**Does the utility share best practices for database management and use with other utilities in California and beyond?**	iii	iii	Upgrade	SDG&E prioritizes cooperation and sharing of best practices as an important component of our fire mitigation activities. SDG&E is currently working with the other IOU's within California to share best practices for WMP database development and management. It does so through periodic joint meetings on both the programming and structure required to create a searchable database for WMP matters. We are also sharing best practices with the other IOU's on the structure and formatting of the governing documents needed to support the overall database as well as how a glossary comes to play. For example, 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 IWRMC is made up of multiple utilities from the United States, Australia, South America, and other areas. 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 accelerates learnings and development of new solutions, helping to lead industry direction, and innovative approaches to risk mitigation.	Upgrade	SDG&E prioritizes cooperation and sharing of best practices as an important component of our fire mitigation activities. SDG&E is currently working with the other IOU's within California to share best practices for WMP database development and management. It does so through periodic joint meetings on both the programming and structure required to create a searchable database for WMP matters. We are also sharing best practices with the other IOU's on the structure and formatting of the governing documents needed to support the overall database as well as how a glossary comes to play. For example, 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 IWRMC is made up of multiple utilities from the United States, Australia, South America, and other areas. 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 accelerates learnings and development of new solutions, helping to lead industry direction, and innovative approaches to risk mitigation.
34. Data transparency and analytics	**G.II.e**	**Are the most relevant wildfire related data algorithms disclosed?**	iv	iv	Upgrade	SDG&E continues to publicly share relevant wildfire related data algorithms, regardless of regulatory request. Relevant wildfire related data includes scientific publications such as Santa Ana Wildfire Threat Index (SAWTI) which 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, Fire Potential Index, etc. SDG&E continue to focus on enhancing academic partnerships through broader data sharing. Additionally, SDG&E put more effort into providing more detail around its risk modeling algorithms in the 2021 WMP update.	Upgrade	SDG&E continues to publicly share relevant wildfire related data algorithms, regardless of regulatory request. Relevant wildfire related data includes scientific publications such as Santa Ana Wildfire Threat Index (SAWTI) which 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, Fire Potential Index, etc. SDG&E continue to focus on enhancing academic partnerships through broader data sharing. Additionally, SDG&E put more effort into providing more detail around its risk modeling algorithms in the 2021 WMP update.
37. Scenario analysis across different risk levels	**H.I.a**	**For what risk scenarios is the utility able to provide projected cost and total risk reduction potential?**	iii	iii	Upgrade	Assuming different scenarios in this context are interpreted as scenarios for risk mitigations; upon further review of this capability, SDG&E responded based on the how Risk Spend Efficiencies (RSEs) were presented in the RAMP. The assessments in the RAMP include range of high, low and mid-points for both the risk calculations as well as the RSE analysis which includes risk reduction and costs. The current template structure for the WMP asks for a single point in which case SDG&E provides one score for the RSEs but can provide ranges where necessary.	Upgrade	Assuming different scenarios in this context are interpreted as scenarios for risk mitigations; upon further review of this capability, SDG&E responded based on the how Risk Spend Efficiencies (RSEs) were presented in the RAMP. The assessments in the RAMP include range of high, low and mid-points for both the risk calculations as well as the RSE analysis which includes risk reduction and costs. The current template structure for the WMP asks for a single point in which case SDG&E provides one score for the RSEs but can provide ranges where necessary.

39. Process for determining risk spend efficiency of vegetation management initiatives	**H.III.e**	**Can the utility evaluate risk reduction synergies from combination of various initiatives?**	i	ii	No Change	N/A	Upgrade	SDG&E has been able to evaluate combined risk reductions in RAMP by grouping vegetation management initiatives to calculate RSEs but recognizes the need to improve methods to do so in the future and will be working on exploring those by end of 2022.
40. Process for determining risk spend efficiency of system hardening initiatives	**H.IV.b**	**At what level can estimates be prepared?**	iii	iv	Upgrade	SDG&E developed the Wildfire Next Generation System model (WiNGS) in 2020 and is continuing to improve the model this year to provide granular estimates. WiNGS is built upon the Risk Spend Efficiency (RSE) methodology in RAMP, evaluates both wildfire and PSPS risks 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. WiNGS analysis can be done at a segment and circuit-level for grid hardening initiatives.	Upgrade	While SDG&E continues to improve and enhance the RSEs at the circuit level, SDG&E is doing further analysis and conducting studies to gather data at the span level, which will be ingested by the Wildfire Next Generation System model with the goal of providing more granular assessments.
40. Process for determining risk spend efficiency of system hardening initiatives	**H.IV.d**	**What grid hardening initiatives are included in the utility risk spend efficiency analysis?**	v	v	Upgrade	All grid hardening initiatives are included in the utility risk spend efficiency analysis. Initiatives that are lab-tested such as Falling Conductor Protection are also included in the risk spend efficiency analysis. The FCP program detects changes in phasor measurements to de-energize broken conductor before they fall to the ground	No Change	N/A
40. Process for determining risk spend efficiency of system hardening initiatives	**H.IV.e**	**Can the utility evaluate risk reduction effects from the combination of various initiatives?**	i	ii	No Change	N/A	Upgrade	While SDG&E continues to expand and further improve on the evaluation of risk reduction synergies, SDG&E is able to evaluate combinations of grid hardening solutions manually on a case-by-cases basis but plans to continue to enhance this effort.
51. Collaboration with emergency response agencies	**J.IV.a**	**What is the cooperative model between the utility and suppression agencies?**	iii	iii	Upgrade	SDG&E's continues to cooperate with suppression agencies by ensuring good communication and regularly strengthening relationships before, during, and after incidents. Alert Wildfire is used by the suppression agencies to confirm fires. SDG&E also works cooperatively with these agencies when ignitions occur and the reporting paths for ignitions are part of our standard operating procedures.	Upgrade	SDG&E's continues to cooperate with suppression agencies by ensuring good communication and regularly strengthening relationships before, during, and after incidents. Alert Wildfire is used by the suppression agencies to confirm fires. SDG&E also works cooperatively with these agencies when ignitions occur and the reporting paths for ignitions are part of our standard operating procedures.

MGRA 2020 WMP Comments – Attachment B

APPENDIX B – CPUC DOCUMENTS

APPENDIX B-1 WILDFIRE STATISTICS AND THE USE OF POWER LAWS

Joseph W. Mitchell, M-bar Technologies and Consulting, LLC.

Prepared for the Mussey Grade Road Alliance

Proceeding R.20-07-013

February 11, 2021

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company (U 39 M) to Submit Its 2020 Risk Assessment and Mitigation Phase Report	Application A.20-06-012 (Filed June 30, 2020)

WILDFIRE STATISTICS AND THE USE OF POWER LAWS

FOR POWER LINE FIRE PREVENTION

FINAL: FEBRUARY 11, 2021

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Dated: February 11, 2021

Table of Contents

1. INTRODUCTION

This whitepaper has been prepared by Mussey Grade Road Alliance (MGRA) expert Joseph Mitchell, Ph.D. at the request of the Safety Policy Division (SPD) to provide a technical proposal for the use of power laws for utility risk calculations in the S-MAP proceeding R.20-07-013.

The goal of this whitepaper is to provide a starting point for practical and accurate wildfire risk calculations that can be incorporated into utility Risk Assessment Mitigation Plan (RAMP) proceedings and used to prioritize utility mitigation strategies. To do this this paper will first to lay out the basic principles of wildfire statistics based on current scientific measurements and estimates. It will then attempt to lay out possible methods by which these principles can be incorporated into the multi-attribute value function (MAVF) as required by the S-MAP Settlement Agreement. The aim of any such effort should be useability and not scientific elegance. While precision is nice, due to the nature of extreme event statistics it is possible to be very precise over certain ranges and to miss the big picture entirely.

Utility wildfire ignitions are driven primarily by extreme weather events, both in their frequency and consequences. While wildfire size is driven by the severity of weather events, utility wildfire frequency is driven both by the frequency of extreme weather events and their severity. This is because extreme weather events, and specifically extreme winds, cause non-linear increases in infrastructure damage, both direct and from flying debris and falling trees. Correct utility wildfire statistics therefore requires correct weather statistics, and there is considerable uncertainty regarding these. There is also still a good degree of uncertainty in the California wildfire size distribution statistics themselves, if not in their overall behavior then in the extreme tail ends of the distributions – which is where they really count. This will have big implications for some more extreme forms of mitigation – undergrounding of distribution lines, for instance, but not much so for other forms of mitigation such as hardening and EVM. This is because the utility go-to mitigation for extreme events (and not so extreme) has become de-energization, or “public safety power shutoff” (PSPS). If correctly applied (timing and extent), de-energization can be effective in stopping utility ignition of wildfires, and more certain in its outcome than other mitigation measures. However, as has been raised in numerous Commission proceedings, de-energization comes with a slew of public harms and increased risks, including some risks that also scale with weather event severity (such as the potential for ignitions from generators and cooking fires escaping into the wildland urban interface). PSPS is both a risk and a mitigation, and its harms need to be quantified as well as its benefits. Hence, risk-spend efficiencies for most mitigations are not so much to balance their costs against potential avoided wildfire harm as they are to balance their costs against PSPS harm. This can all be summarized in the following principle:

The purpose of utility wildfire mitigation is to raise the fire weather severity limits at which utility equipment can be safely operated.

In other words, PSPS can save Californians from harm due to catastrophic wildfire. Mitigation can save Californians from harm due to PSPS.

2. POWER LAWS AND WILDFIRE

Power laws are a class of statistical distributions that follow "scaling" or "self-similar" distributions over many orders of magnitude. If two variables are related by a power law, then the increase or decrease of the magnitude of one variable will be proportional to the increase or decrease in the magnitude of the other variable. Mathematically this is shown as:

$$y = Cx^{-\alpha}$$

These are often plotted on log-log plots, since this demonstrates the linear relationship between the scales:

$$\log y = -\alpha \log x + \log C$$

Power laws are observed in numerous disciplines: physics, economics, information technology, sociology, biology, ecology, urban planning, to name some. While some power laws are direct manifestations of physical laws (for instance Kepler's Law in astronomy), some power law relationships arise spontaneously from interrelationships between system components, or are "self-organized". This has led to an entire discipline of "complexity science" that attempts to explain phenomena as a result of universal scaling laws. The literature on this topic is extensive, including not only academic articles but numerous books, including popular treatments.[1] Per Bak, one of its founders explained that "complex behavior in nature reflects the tendency of large systems with many components to evolve into a poised, 'critical' state, way out of balance, where minor disturbances may lead to events, called avalanches, of all sizes. Most of the changes take place through catastrophic events rather than by following a smooth gradual path."[2]

2.1. Fat-Tailed Distributions

Power laws are an example of "fat-tailed" distributions, in which the overall weight of the distribution is dominated by rare or even extreme events. In fact, for certain values of the exponent ($\alpha < 2$) the integral of the power law (used for weighting probabilities) does not converge, which means that the contributions from extreme events will always dominate the results.[3] The mean, if calculated, becomes larger the more events are included in the distribution, so it is impossible to predict the mean accurately based on any amount of past data. Contributions from future events will always be larger (in the long run) than those from past events.

Another important consideration with fat-tailed distributions is uncertainty. Out on the tail of the distribution the statistical uncertainty is larger, as well as the potential for systematic uncertainties, such as effects driven by rare and as yet unmeasured phenomena. Because of the overweighted contribution of the extreme tail to the overall result, these uncertainties can have a significant or even dominant effect. You know the least about what you need to know the most.

There are "fat-tailed" distributions other than power laws, such as lognormal and related distributions. In fact, in many cases these distributions fit data traditionally associated with power laws better than a power law distribution.[4] Which are more appropriate for wildfire size distributions is discussed below.

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[1] For example, "Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies", by Geoffrey West; 2017; Penguin Press.
[2] Bak, P., 1999. How Nature Works: the science of self-organized criticality, First Softcover edition. ed. Copernicus, New York.
[3] Newman, M.E.J., 2005. Power laws, Pareto distributions and Zipf's law. Contemporary Physics 46, 323–351. https://doi.org/10.1080/00107510500052444
[4] Benguigui, L., Marinov, M., 2015. A classification of natural and social distributions Part one: the descriptions. arXiv preprint arXiv:1507.03408.

2.2. Wildfire Size Distributions and Power Laws

Wildfire sizes are among the first natural hazard phenomena to be characterized as power law distributions. Malamud, Morein and Turcotte's pioneering work in 1998[5] found scaling behavior when looking at a variety of data sets. This work and others[6] also demonstrate that the power law behavior can be generated by simple toy models of wildfire ignition, such as cellular automata.

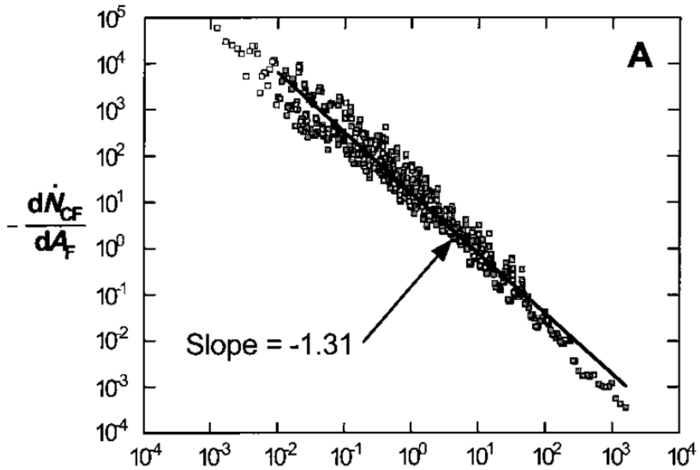

Figure 1 - Example wildfire size distribution from Malamud, et. al. (Reference 5). This distribution shows wildfire sizes in km^2 (horizontal axis) from US Fish and Wildlife Service lands from 1986 to 1995. The data are plotted as a non-cumulative distribution, in which the y axis value represents the total number of fires within a particular size bin. Power laws show a linear distribution when plotted on a log-log plot.

This relationship was studied by other authors as well. Some authors such as Beguini and Marinov[7] confirmed the direct power law relationship. Others, using different reference data, such as Newman,[8] which uses a larger data set, shows an apparent truncation in the data, which he asserts "could follow a power law but with an exponential cutoff".

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[5] Malamud, B.D., Morein, G., Turcotte, D.L., 1998. Forest Fires: An Example of Self-Organized Critical Behavior. Science 281, 1840–1842. https://doi.org/10.1126/science.281.5384.1840
[6] Turcotte, D.L., Malamud, B.D., Guzzetti, F., Reichenbach, P., 2002. Self-organization, the cascade model, and natural hazards. PNAS 99, 2530–2537. https://doi.org/10.1073/pnas.012582199 https://www.pnas.org/content/99/suppl_1/2530
Drossel, B., Schwabl, F., 1992. Self-organized critical forest-fire model. Phys. Rev. Lett. 69, 1629–1632. https://doi.org/10.1103/PhysRevLett.69.1629
[7] Benguini and Marinov, 2015; Reference 4.
[8] Newman, M.E.J., 2005. Power laws, Pareto distributions and Zipf's law. Contemporary Physics 46, 323–351. https://doi.org/10.1080/00107510500052444

2.3. Wildfire sizes in California

We are naturally most concerned with wildfire sizes in California. Several authors have looked at this question. Moritz et. al. examined data from the Los Padres National Forest and found that scaling of wildfire sizes followed a power law with exponent of α = 0.5. They used a "highly optimized tolerance" (HOT) probability loss resource (PLR) model to fit the data, which incorporates deviation from power law behavior at both low and high size limits:

$$y = C[(a + x)^{-\alpha} - (a + L)^{-\alpha}]$$

where a is the small size cutoff and L is the large size cutoff.[9]

In Mitchell 2009,[10] the following distribution for all fires in Southern California between 1960 and was shown:

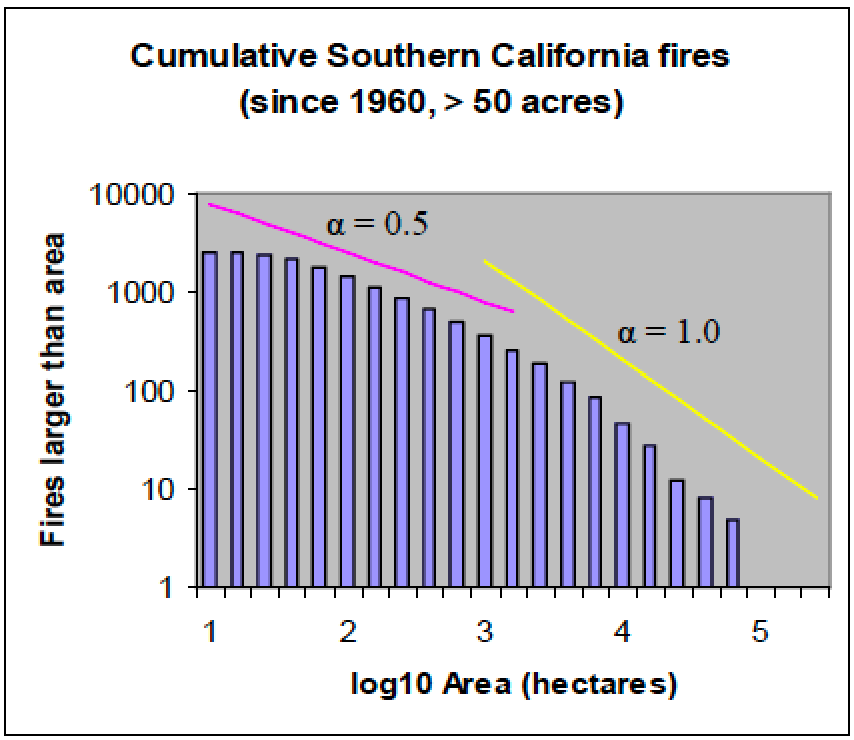

Figure 2 - Reproduced from Mitchell 2009, Fire and Materials. Different power law slopes are seen over different size domains. Unlike Malamud, et al., this plot uses a cumulative distribution, in which the vertical axis shows the total

[9] Moritz, M.A., Morais, M.E., Summerell, L.A., Carlson, J.M., Doyle, J., 2005. Wildfires, complexity, and highly optimized tolerance. Proceedings of the National Academy of Sciences 102, 17912–17917. https://doi.org/10.1073/pnas.0508985102
[10] Mitchell, J.W., 2009. Power lines and catastrophic wildland fire in southern California, in: Proceedings of the 11th International Conference on Fire and Materials, pp. 225–238.

number of wildfires larger than the value on the horizontal axis. The exponent for a cumulative distribution is one less than the exponent for a non-cumulative distribution.

Rather than a cutoff, this figure shows a steadily increasing slope as fire size increases.

Clauset, et. al.[11] looked at all fires in California and determined that the behavior could be described by a power law with an exponential cutoff. This would be of the mathematical form:

$$y = Cx^{-\alpha}e^{-\lambda x}$$

In summary, there is general agreement that power law distributions can be used to describe wildfire sizes in California over a certain range of scales. Behavior of wildfire statistics for the largest events, which are extremely important for risk estimation, shows a good deal of variation from study to study and should be regarded as an open question.

2.4. Fire Weather Severity and Wildfire Size Distributions

Fire weather conditions are known to be a driver of the ultimate size of wildfires, but this topic has received less study than geographic variations. One exception is the work of Boer, et. al.,[12] who examined wildfires in Australia and determined that "fire sizes and fire weather events were found to have matching scaling behaviour over a considerable, yet restricted, range of fire sizes, corresponding to roughly 50–60% of the recorded fires. Thus, other fire-controlling factors than weather including fuel patterns may still determine the distribution of a significant proportion of the (smaller) fires but, as our findings suggest, they do not explain the spatial scale invariance of the fires in our study areas." In other words, extremely large fires are more probable during extreme fire weather. More recently, Abatzoglu, et. al. showed that human-related ignitions concurrent with high winds lead to larger fires.[13]

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[11] Clauset, A., Shalizi, C.R., Newman, M.E.J., 2009. Power-Law Distributions in Empirical Data. SIAM Rev. 51, 661–703. https://doi.org/10.1137/070710111

[12] Boer, M.M., Sadler, R.J., Bradstock, R.A., Gill, A.M., Grierson, P.F., 2008. Spatial scale invariance of southern Australian forest fires mirrors the scaling behaviour of fire-driving weather events. Landscape Ecol 23, 899–913. https://doi.org/10.1007/s10980-008-9260-5 https://research-repository.uwa.edu.au/files/1480533/11732_PID11732.pdf

[13] Abatzoglou, J.T., Balch, J.K., Bradley, B.A., Kolden, C.A., 2018. Human-related ignitions concurrent with high winds promote large wildfires across the USA. International Journal of Wildland Fire. https://doi.org/10.1071/WF17149 http://www.pyrogeographer.com/uploads/1/6/4/8/16481944/abatzoglou_etal_2018_ijwf.pdf

2.5. Utility Wildfires are Larger

The factor makes utility wildfires unique is that one of the drivers that leads to larger wildfires – extreme weather – also makes ignition more probable. This changes the shape of the fire size distribution, as I observed in Mitchell 2009's plot of utility wildfire sizes.[14]

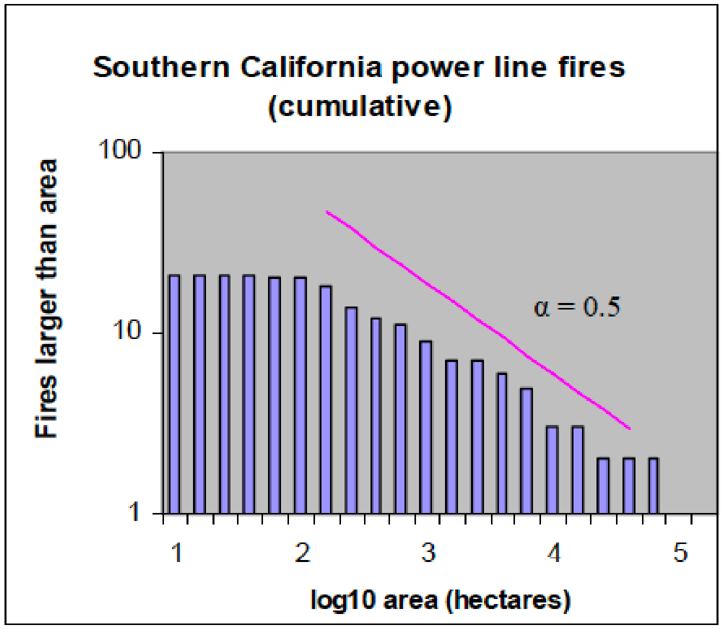

Figure 3 - Reproduced from Mitchell 2009. This figure, a cumulative distribution, shows that the tail of extreme power line events is broad, based on the shallow slope in the log/log plot.

While the sample size was small for this plot, it shows that the slope of the log-log plot is shallow, indicating an inordinate contribution from very large events. As Mitchell 2009 also noted, sampling fire events that start during extreme fire weather also produces a distribution that is skewed to large fires, and power line fires tend to start during extreme weather events. That is the fundamental reason for over-representation of utility fires as catastrophic events: Fires are more likely to be ignited at the very times when fire growth is likely to be largest.

The 2009 data set was small, and below we review the same approach using CAL FIRE's perimeter data set updated to the end of 2019. The cause attribution in the data set is sometimes incorrect or ambiguous ("unknown") in the case of disputed catastrophic fires. These were corrected

[14] Mitchell 2009; Footnote 10.

with attributions later found in CAL FIRE incident reports and SED CPUC reviews. Two subsets of the data are shown: without power line fires and power line fires only.

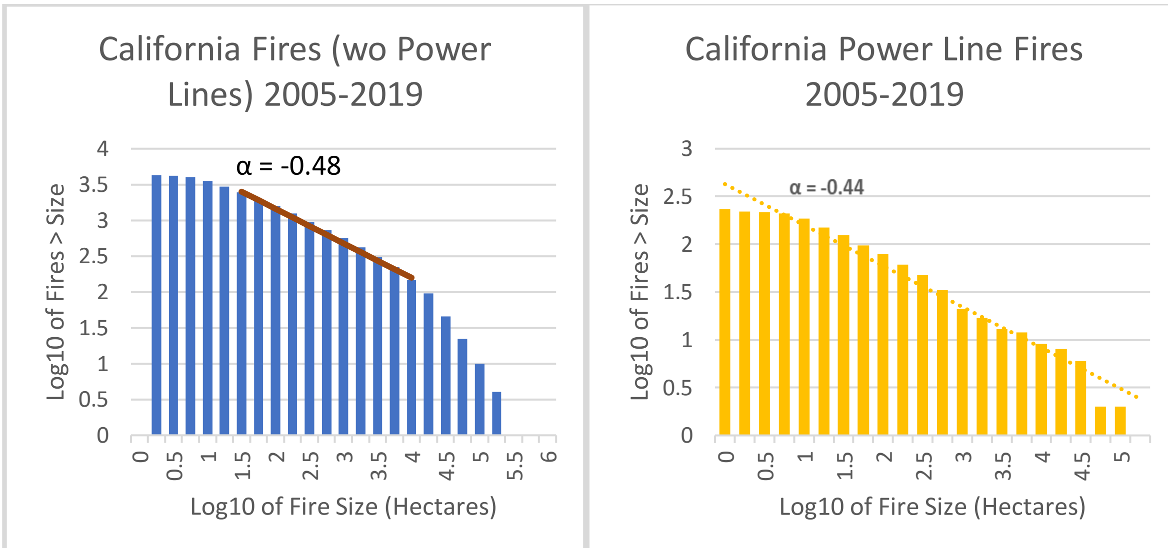

Figure 4 - CAL FIRE perimeter data for wildfires attributed to power line ignitions, shown as cumulative distributions plotted on log-log axes. 2007 and 2017 fire attributions are corrected with CAL FIRE and CPUC assessments. The trendlines are a guide to the eye, rather than a best fit and shows how power line exponents would appear. These are extreme fat-tailed distributions. Deviations from power law behavior appear above 30,000 acres (without power lines) and 80,000 acres for power line fires. Maximum scale may be 500,000 acres, with large uncertainty.

Trendlines are plotted and serves as a guide to the eye.[15] For wildfires with power line fires excluded a power law with exponent of -0.48 would describe the data over 3 orders of magnitude. For power line fires, a power law with exponent of -0.44 would fit the data over 3.5 orders of magnitude. Both distributions show a drop off, with non-power line fires deviating from power law above 30,000 acres and power line fires deviating over 80,000 acres. Statistics are poor and uncertainties large for the largest fires, but data would be consistent with a maximum size scale on the order of 500,000 acres for California fires. The exponent is very small (much less than 1.0) indicating that California wildfires exhibit extreme fat-tailed behavior.

[15] As per Clausset 2009 (Footnote 11), least squares methods are prone to bias by tail statistics and a maximum likelihood method should be employed to obtain accurate power law exponents.

What are the implications of this fat-tailed behavior for risk management? We can reformulate the above plots to show total loss (hectares burned) for each of the size bins. This is done by multiplying the number of events in each bin by mean size of each (logarithmic) bin.

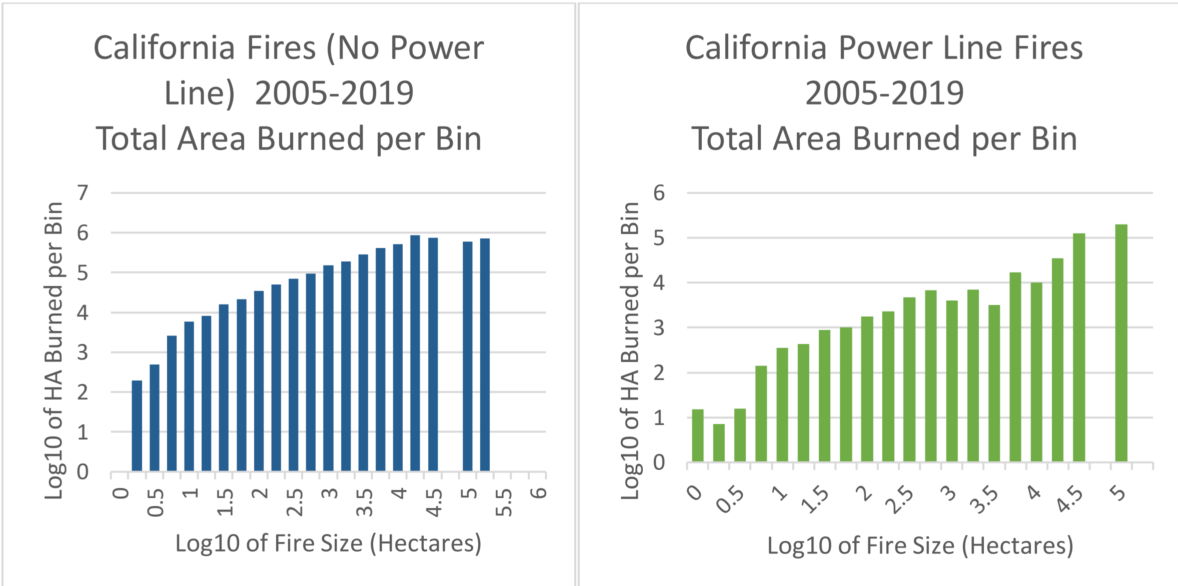

Figure 5 - Total area burned per logarithmic bin for California wildfires 2005 to 2019, calculated by multiplying logarithmic mean of bin by number of wildfires in the bin. Power line related wildfires are compared against full sample with wildfires removed. It is important to note that these are not cumulative plots.

The results of this formulation are a striking demonstration of the implications of power law statistics. It should be emphasized that the vertical axis of these plots is logarithmic. They show that the vast majority of loss potential comes from the most extreme events. For the wildfire sample with power line attribution removed, a plateau is observed at a value of 4 on the horizontal axis (30,000 acres). Losses at or above this level combined exceed all contributions from smaller wildfires. For power line fires the effect is even more dramatic. The two highest contributing bins (above 90,000 acres) contributed more acres burned than all smaller power line wildfires combined. As I observed in a 2004 wildland firefighter trade magazine article, "***the catastrophic is typical***".[16] Typical events are small. Typical losses are from catastrophic events.

These plots also demonstrate the amplified, even dominant, effect of uncertainty. The fact that there are empty bins for larger fires indicates that the contribution of extreme value fires is

[16] https://www.mbartek.com/weeds-info/5-wildfire-magazine-article
JosephW. Mitchell; WEEDS: Firebrand Defense for the "Typical Catastrophe"; Brand Dilution (Cover article); Wildfire Magazine; Mar. 2005.

strongly affected by statistical fluctuations. ***The largest contributions come from the portion of the distribution with highest uncertainty.*** Likewise, while we expect that there is a cutoff in the power law behavior, the exact point of cutoff is not well known, but the value of this cutoff will have dramatic effects on the results of risk calculations. Consequently, any risk calculation based on our knowledge of wildfire statistics needs to be accompanied by a great deal of humility – there is a significant likelihood that estimates can be off by quite a lot.

While the methodology proposed in this paper will be robust against these uncertainties, risk estimates used to set thresholds will still be subject to these effects, and should always be checked against model assumptions.

2.6. Utility Wildfire Ignition Probability Dramatically Increases During Extreme Weather Events

The other side of the utility wildfire risk equation is frequency of ignitions. While some ignitions occur throughout the year in response to various drivers, period of extreme stress due to wind can cause dramatically increased outage rates due to wind damage and vegetation contact. Along with this damage, if the winds occur during periods of low relative humidity and dry vegetation, energy released from the fault is quite likely to ignite a wildfire.

The extreme dependence of outage rates on local wind speeds was shown Mitchell 2012.[17] This work studied SDG&E outage data and measured the relative probability of outages on circuits based on the peak wind gust speed at the nearest weather station.

[17] Mitchell, J.W., 2013. Power line failures and catastrophic wildfires under extreme weather conditions. Engineering Failure Analysis, Special issue on ICEFA V- Part 1 35, 726–735. https://doi.org/10.1016/j.engfailanal.2013.07.006

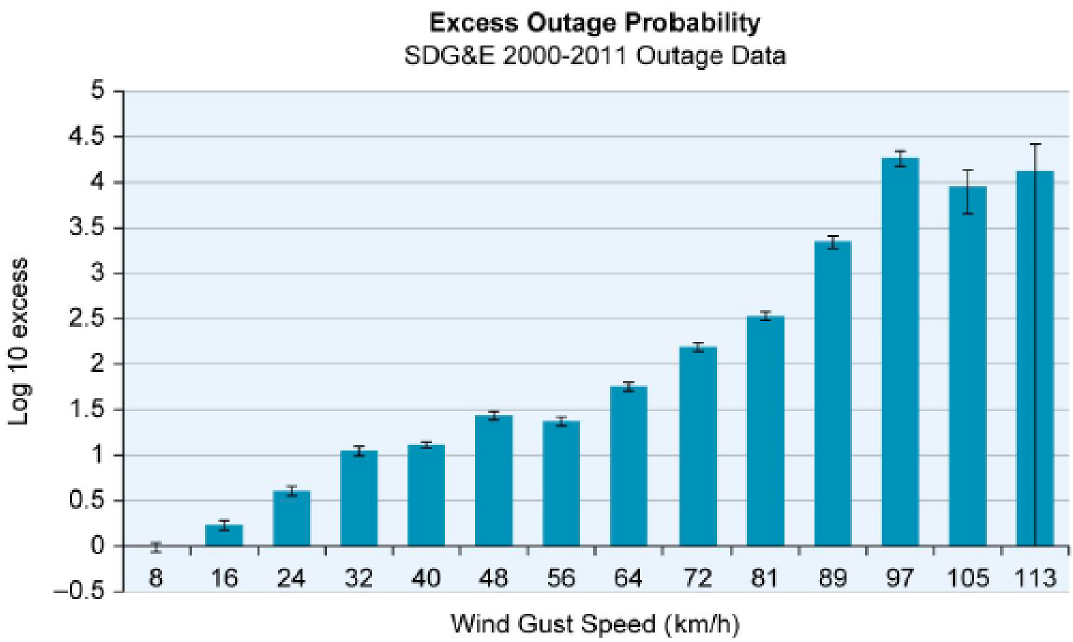

Figure 6 - Excess outage probability as a function of wind speed obtained by normalizing SDG&E outage data with historical Mesowest weather station data. For each outage, a wind speed was determined at the nearest appropriate weather station for the circuit having the outage. Historical data for each of these weather stations was analyzed to determine what fraction of time the wind speed exceeded the speed at which the outage occurred. Data were then normalized against a baseline wind speed of 8 km/hr, giving the number of outages per unit time at a particular wind speed at that location compared to number of outages that would be expected during calm weather. The vertical scale is logarithmic. Data show a ten-fold increase in outage rate for every 15-20 mph increase in wind gust speed. Reproduced from Mitchell 2012, Footnote 17.

Syphard and Keeley 2015 analyzed fires in San Diego County and the Santa Monica Mountains, and found that powerline-related fires, moreso than any other fire ignition type, were correlated with the "southwestness" of the ignition point. In other words, infrastructure that ignited had more exposure to northeasterly Santa Ana winds.[18]

Other studies have verified that power line fires are more frequent during fire weather and cause greater damage, such as Miller et. al., who verified this effect in Australia.[19]

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[18] Keeley, J.E., Syphard, A.D., 2018. Historical patterns of wildfire ignition sources in California ecosystems. Int. J. Wildland Fire 27, 781–799. https://doi.org/10.1071/WF18026 https://www.academia.edu/download/41195924/54d3a7b00cf2b0c6146deaae.pdf20160115-19908-1ft4a7s.pdf

[19] Miller, C., Plucinski, M., Sullivan, A., Stephenson, A., Huston, C., Charman, K., Prakash, M., Dunstall, S., 2017. Electrically caused wildfires in Victoria, Australia are over-represented when fire danger is elevated. Landscape and Urban Planning 167, 267–274. https://doi.org/10.1016/j.landurbplan.2017.06.016

2.7. Summary and Implications of Power Line Wildfire Characteristics

Wildfires sparked by electric utilities tend to be larger and more destructive because external drivers such as high winds significantly increase the frequency of ignitions, and the very same drivers are a component of extreme fire weather, which causes rapid growth of wildfires and is linked to greater wildfire sizes and impacts. The statistical distribution of power line wildfires has consequences for risk estimation.

The power law exponent for power line wildfires is small, less than 0.5. This throws a monkey wrench into standard statistical treatments, which are based on projections from historical data. What an exponent this small implies is that one cannot derive an accurate mean using past history. Future events will always be larger, and throw off any mean based on backwards-looking data. This is true for any exponent less than 1.0. As Taleb writes about this type of power law, "…there is no mean. We call it the Fuhgetaboudit. If you see something in that category, you go home and you don't talk about it."[20] Those of us who have homes in the wildland urban interface do not have the luxury of fuhgettingaboudit. If we ever do, we will be reminded sooner or later by the smoke and red glow over the next hill. Fortunately, we have better options, for two reasons.

- As noted by several authors and shown in the most recent California power line fire statistics, there should be a cutoff at a maximum scale. This should allow a statistical treatment.
- Even though uncertainties in the cutoff value could have dramatic effects, we can avoid this problem by placing extreme events into a class handled by a heuristic approach.

The "heuristic approach" discussed in this paper is power shutoff, and it is already in practice, but is currently not quantitatively balanced against other risks. The framework laid out in this paper is designed to incorporate the extreme event statistics into the MAVF framework and lay out how both harm and benefit from "PSPS" can be balanced to optimize utility mitigation spending for the public benefit.

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[20] Taleb, N.N., 2020. Statistical Consequences of Fat Tails: Real World Preasymptotics, Epistemology, and Applications. STEM Academic Press. https://arxiv.org/abs/2001.10488; pp. 27-28.

3. PROPOSED MECHANISM TO COUPLE WILDFIRE RISK TO DRIVER EVENTS

As should be evident, the utility wildfire problem is complex, and finding a mechanism to address it correctly is difficult, particularly within the MAVF framework. The following proposal makes a number of simplifications and assumptions, but should nevertheless capture the most important characteristic of power line wildfire risk while still making use of the existing MAVF framework. The outline for this proposal is:

- Determine the maximum scale cutoff for wildfire events.
- Create a library of historical fire weather events classified in order of fire weather severity, and specifying extent and duration.
- Separate out "baseline" and "weather-driven" ignition risks into two tranches.
- Subdivide weather driven ignition risks into weather severity tranches.
- For each weather severity tranche,
    - determine a power law slope, and corresponding mean consequence,
    - determine a PSPS impact multiplier (geographic area X time), and from this a corresponding PSPS risk,
    - determine a characteristic wind speed, and from this,
        - a risk event frequency multiplier, and
        - specific mitigation effectiveness for each mitigation (such as hardening)

The MAVF should not have a cap in consequences to ensure that extreme events have an adequate contribution, and ideally should be a linear function.

The advantages of this approach are:

- It is consistent with the MAVF model.
- It allows the incorporation of new climate data as it becomes available.
- It allows PSPS harm to be directly compared to averted wildfire costs.

- It allows the specification and optimization of PSPS thresholds and mitigations in terms of weather severity. The goal of mitigations would be to replace PSPS within a specific weather severity tranche.

3.1. Maximum Scale for Wildfire Sizes

To the extent that wildfire sizes follow a power law, trying to define a maximum scale is a fool's errand. However, trees do not grow to the sky, and wildfires do not burn into the sea. There is a maximum size that a fire can reach before it encounters non-flammable area, devoid of vegetation, or composed of fire-resistant human developments. These limitations will cause deviations from power law behavior.

As Moritz, et. al. 2005 notes: "A large size cutoff…. should therefore be fit to the cumulative distribution to reflect the maximum fire sizes, resulting in a truncated model that captures changes in the large event tails and avoids artifacts of bin width selection in the noncumulative probability density. Without this specification, relatively large errors will occur in predicting large event probabilities."[21]

The fact that we don't have definitive evidence for these limits in California wildfire data should be a matter for grave consideration and concern. We should expect to continue to have record-breaking wildfires. Exactly what this scale is should be based on should be a matter for expert review, but an approach similar to that of Clauset, Shalizi, and Newman[22] but incorporating fire size data from 2012-2020 should be undertaken. Whether to use a cutoff similar to the HOT model or the exponential cutoff suggested by Clauset, Shalizi, and Newman should be looked at as well.

3.2. Identify and Classify Historical Fire Weather Events

Identifying and classifying fire weather events independent of wildfire ignitions is important for risk analysis for several reasons:

- Multiple wildfires are often ignited during the same severe weather event.

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[21] See Footnote 9.
[22] Clauset 2009.

- The extent and duration of utility de-energization (and associated customer harm) will be a function of weather event severity.
- Determining the distribution and severity of wildfire weather events will allow climate models to be incorporated into the risk calculations in a straightforward way.

For example, a severe fire weather event might cause an extended power shutoff over a widespread area. Even if this event does not result in any major wildfires or utility ignitions, it still should be characterized as a risk event in the MAVF framework because it does harm.

The metric used to determine event extremity could be a standard fire weather severity index, such as Fosberg Fire Weather Index, utility-determined Fire Potential Index (FPI), Santa Ana Weather Threat Index (SAWTI), or a wind-dependent metric. Studies such as Abatzoglou, et.al. (Footnote 13) have performed this kind of analysis, so it should be straightforward to select and incorporate an appropriate model that will allow us to classify past fire weather event severities and extents.

3.3. Baseline and Weather-Driven Wildfire Events

To some extent all wildfires have weather-dependent characteristics, since they presuppose the existence of dry vegetation. However, utility wildfires should be subdivided into weather-driven and baseline tranches because certain drivers are weather-related and others are not. Wildfire ignition drivers such as animal contact, vehicle collisions, and human error have no relationship to weather, whereas others such as equipment damage and vegetation contact may or may not be weather related. Creating a “baseline” tranche allows utilities to use a Poisson distribution to model the frequency, since the probability of a risk event is constant over time, and the consequence can be modelled by a power law with cutoff that is characteristic of low-wind events.

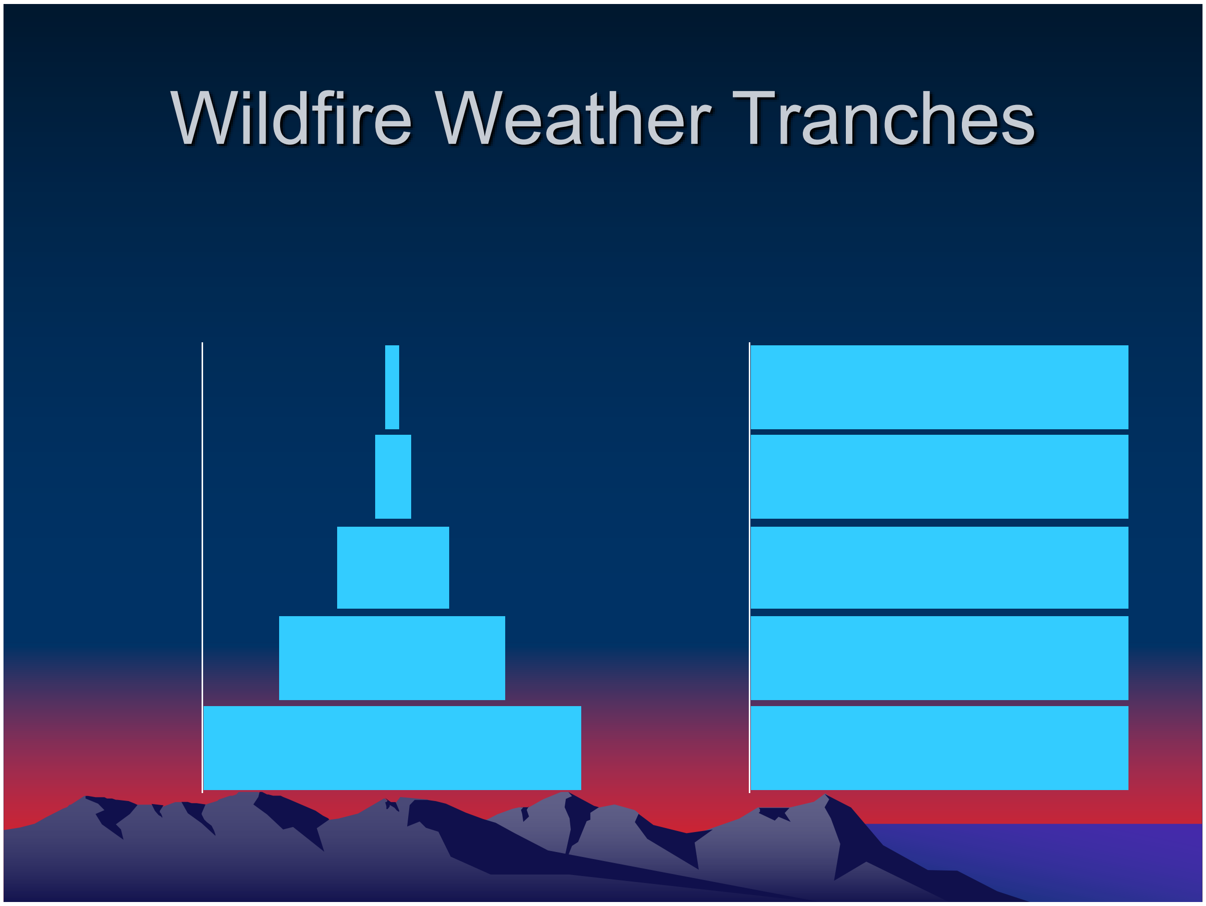

Figure 7 - Division of wildfire data into fire weather severity tranches. Tranches representing higher severity fire weather will be less frequent, but tranches should have equivalent risk because the wildfire consequences will be higher during more extreme weather events.

3.4. Weather-Driven Event Tranches

The remainder of wildfire events should be divided into tranches related to weather severity. The number of tranches should cover the range from moderate (but still above baseline) to extreme.

The Settlement Agreement foresees that tranches should be roughly equivalent in contributed risk.

3.4.1. Fire weather event frequency

Once the definition of the fire weather metric used to classify events has been identified, it can be determined how frequently events of each class occur. Because a large contribution from rare, extreme events is expected, the overall frequency for higher weather severity tranches will be expected to be much lower than those of lower weather severity tranches.

To examine fire weather history, the entire dataset of California wildfire data should be used to the extent that it is possible to construct an accurate history of the fire weather severity metric.

3.4.2. Fire weather severity tranche impacts.

Consequences from a fire weather severity tranche can be estimated from the wildfire size distribution of historical wildfires in that tranche. Essentially what is needed is an equivalent of the work done by Boer, et. al.[23] for Australia, except for California fires. It should be expected that each of these tranches of increasing fire weather severity would have an exponent that decreases correspondingly.

An example of how this might qualitatively look is shown in below.

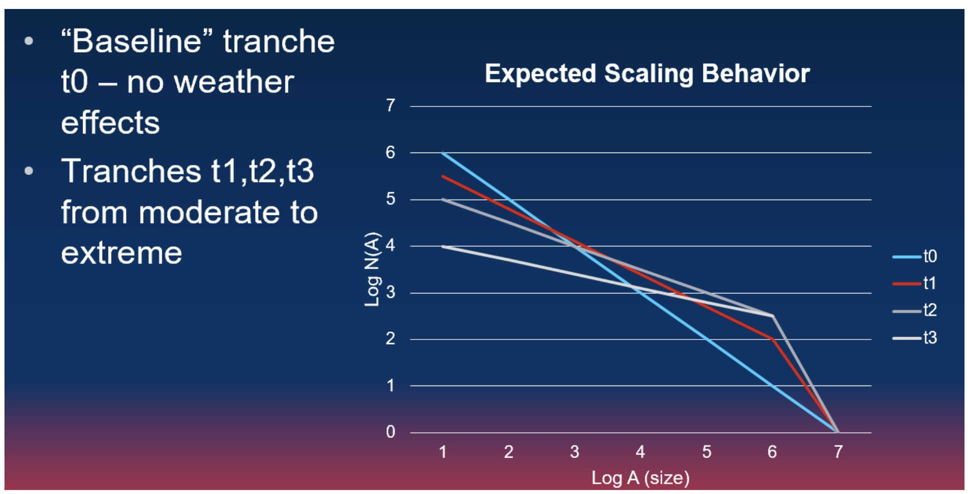

Figure 8 - Hypothesized scaling behavior for fire weather severity tranches t0, t1, t2, t3 of increasing wildfire severity. Expected behavior is power law with cutoff. Lesser slope (smaller exponent) is expected as wildfire weather event severity increases. The largest fires are expected to generally be during the most severe weather, as per Boer, et. al. Slope differences are amplified to demonstrate this effect. This plot assumes a common cutoff for all weather conditions, but it is likely that maximum possible wildfire size will be lesser for less extreme weather severity.

In Figure 8, we assume that there is a common cutoff size for all weather tranches, equivalent to the maximum size of a fire that the landscape can support. Data should be examined, however, to ascertain whether there is a lower cutoff for the baseline tranche or less severe fire weather.

[23] Boer, et. al.; Footnote 12.

It may also be possible to use wind speed as a differentiator between tranches. There will be a relationship between fire weather severity and wind speed. Mitchell 2009 plots fire sizes versus maximum gust speed at nearest weather station, with relative humidity less than 20%.

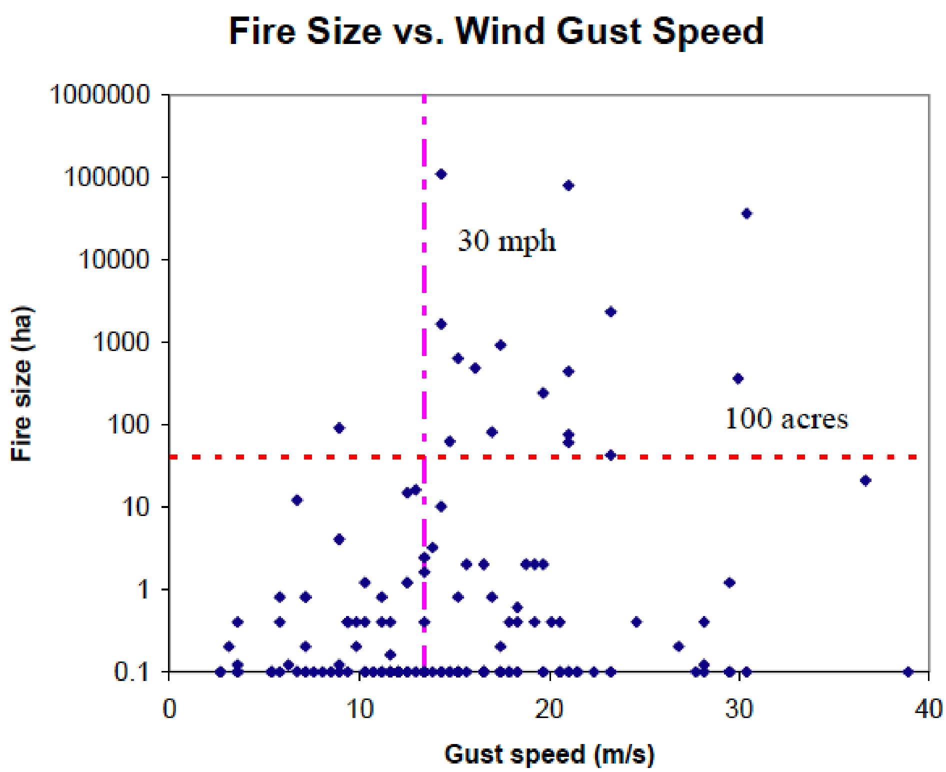

Figure 9 - Reproduced from Mitchell 2009. This plot shows fire sizes as a function of wind gust speed at the nearest weather station within 12 hours.

Based on more recent research by Coen, et. al., using the single nearest weather station is not likely to provide an accurate wind speed result at the point of ignition.[24] An upcoming paper by Prein et. al. will classify fire weather into "Extreme Weather Types" (XWT),[25] and determine frequencies for the occurrence of these XWTs. A similar effort, with a metric for intensity of the weather event could be used as a tranche designator.

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[24] Coen, J.L., Schroeder, W., Conway, S., Tarnay, L., 2020. Computational modeling of extreme wildland fire events: A synthesis of scientific understanding with applications to forecasting, land management, and firefighter safety. Journal of Computational Science 45, 101152. https://doi.org/10.1016/j.jocs.2020.101152

[25] Prein, A., J. Coen, A. Jaye, 2021: The Character and Changing Frequency in Extreme California Fire Weather. Nature Climate Change. Submitted.

To summarize: the goal of the division of wildfire data into tranches is to determine a frequency and consequence for each tranche, and to provide a distribution for each tranche that can be used in a later Monte Carlo analysis. Once this is obtained it can then be used to assess power line wildfire risks.

3.5. Determining a power line ignition frequency multiplier

Each fire weather severity tranche will be associated with elevated wind levels, and these will in turn be associated with higher outage rates and power line fire ignition rates. The next step in the analysis is to determine the power line ignition frequency multiplier for each tranche. This multiplier measures how much more likely a power line fire is to occur in the elevated tranche than it is during the baseline tranche. There are several possible ways to obtain this number:

- A straightforward way to obtain a multiplier is to compare the relative fraction of power line initiated wildfires to the total number of wildfires in each tranche, using CAL FIRE data.
- Utility ignition data can also be analyzed after ensuring that all contested major events are included. Fire weather severity would need to be estimated for each ignition point. This method is not accurate for data after 2018, when power shutoff-became a common practice. Furthermore, ignition data was not collected by PG&E or SCE prior to 2016, leaving a very limited set of data to extrapolate from.
- Utility outage or ignition data can also be used to estimate the frequency multiplier. As an intermediate step, a typical wind gust speed would need to be estimated for each tranche. Outage data can be analyzed to find a multiplier associated with that particular wind speed, such as done in Figure 6. An ignition fraction would need to also be determined for outages. The advantage to using outages is that there are abundant statistics to capture more extreme wind events, and also sensitivity to wind outside of fire danger periods is captured.
- A supplemental metric that could help to supplement ignition data are damage incidents reported by utilities for each de-energization event.

It might be beneficial to cross check these techniques against each other to validate the frequency multiplier.

3.6. PSPS Risk

The previous section laid out how to estimate the risk of wildfire ignition in different fire weather severity tranches. In order to construct a complete risk profile it is necessary to take into account de-energization not only as a mitigation but as a source of risk, and also to predict how these risks will scale as a function of fire weather severity.

Many different potential PSPS risks have been highlighted by stakeholders and intervenors over the years. One list provided by MGRA in R.18-12-005 is illustrative:

- *Risk of loss of communication*
  - *Risk that fires are not reported*
  - *Risk that people are not informed regarding approaching fires*
- *Risk of improper resident mitigations causing house fires that turn into interface fires*
  - *Risk of candle ignited fires*
  - *Risk of improperly maintained generators causing fires*
  - *Risk of barbeque or fire-pit ignited fires*
  - *Risk that a house fire in a WUI area progresses to an interface fire*
- *Delays in evacuation putting residents at risk*
  - *Nighttime evacuation hampered by lack of home power*
  - *Failure of traffic signals causing traffic backups*
- *Danger to vulnerable residents*
  - *Medical baseline customers requiring power*
  - *Financial harm to marginal residents living paycheck to paycheck*[26]

As California gains more experience from power shutoff events, some of these risks which were hypothetical when proposed are now being observed, anecdotally at least. For instance, the Tick fire, in SCE territory, was alleged to have been started as a cooking fire, while the Thief fire has been alleged to have been a generator fire.

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[26] R.18-12-005; MUSSEY GRADE ROAD ALLIANCE PHASE 2 TRACK 1 DE-ENERGIZATION PROPOSALS; September 16, 2019; p. 3.

Coupled to the risk of de-energizing is the risk of *not* de-energizing, or de-energizing in the wrong places or at the wrong times. A number of wildfires have been reported that occurred proximate to PSPS events, geographically or in time, in areas that were not de-energized:

Fire	Date	Utility
Camp	November 8, 2018	PG&E
Kincade	October 23, 2019	PG&E
Zogg	September 27, 2020	PG&E
Silverado	October 26, 2020	SCE
Cornell	December 7, 2020	SCE

Table 1 – Wildfires with alleged utility involvement that were started near PSPS events geographically and in time.

This S-MAP proceeding will deal with quantification of PSPS risks as a separate issue. How to incorporate PSPS risks (and benefits) into a MAVF framework, though, is critical for a complete characterization of electrical utility risk, and so we include an outline of how to incorporate PSPS risks and benefits into this proposal.

3.6.1. PSPS Impact Multiplier

More severe fire weather events have generally resulted in longer and more geographically widespread PSPS events. The relationship between fire weather severity and PSPS impacts needs to be quantified for each fire weather severity tranche. The harm and cost from PSPS events will approximately scale with the number of people and businesses affected. Efforts to determine PSPS costs/harm should result in a per/person-hour quantity. This would be used in conjunction with the impact multiplier to provide a PSPS risk distribution (and mean value) per tranche.

The base risk from PSPS should be determined by a dedicated effort by utilities and stakeholders and led by the Commission or WSD. Previous PSPS experience and domain expertise in conjunction with weather data can be used to estimate the fire weather severity multiplier.

There will be no PSPS risk for the baseline tranche, and for no tranches of greater fire weather severity that have been "cleared" for safe operation.

3.6.2. PSPS-Related Ignitions, PSPS Inefficiencies, and Increased Consequences

Some PSPS-related risks will scale with factors other than just the extent and duration of a a shutoff event. For instance, the consequences of PSPS-related wildfire ignitions (cooking, candles, generators, delayed reporting) would be expected to scale with the fire weather severity.

Likewise, fires ignited due to the failure to de-energize a circuit that was operating beyond its maximum safe level of fire weather severity would also potentially contribute to a fire ignition rate.

Both of these risks would be handled in the same way in the MAVF: The wildfire risk in a tranche protected by PSPS would not be zero but instead be a small residual value that also scales with the PSPS impact multiplier. These residual risks – for both PSPS-related ignitions and PSPS inefficiencies, should be calculated from what we've learned from PSPS experience in the two years it has been operational statewide, in conjunction with domain expert input and larger ignition datasets from outside of California.

De-energization will also increase risks for people in the path of a wildfire that is not related to PSPS or to utility ignition. It will make it more difficult to evacuate, especially for the elderly or people with special needs. It will also hamper communication. This risk is harder to quantify. It would affect the consequences of external wildfires, and would not have a frequency component. For simplicity's sake, it could also be treated in the same manner as PSPS inefficiencies. It will need to be estimated with input from stakeholders and subject matter experts, and informed by anecdotal PSPS data, as part of a Commission effort to quantify PSPS harm.

3.7. Optimized Mitigation with a Heuristic Kill-Switch

The form of wildfire mitigation that has evolved since D.09-09-030 (and ESRB-8 thereafter) consists of general hardening of utility infrastructure against ignition events (including increased vegetation management), with the option to shut off power if there is a present danger of equipment damage. To date this has mostly been a decentralized process left to the prioritization of IOU transmission and distribution groups. So far, there have been no utility hardening goals specifically targeted to safe operation above a certain threshold, at least insofar as appearing in CPUC proceedings. The goal of this paper is to lay out a simple conceptual framework using fire weather severity tranches to identify specific target levels for mitigation. This can be thought of as optimized mitigation with a heuristic kill switch. Standard cost/benefit or RSE techniques can be used to optimize mitigations to "clear" lower fire weather severity tranches for safe operation. Fire weather severity above a certain tranche level triggers the "kill switch", or PSPS. Like a circuit breaker, PSPS helps to protect against extreme tail event risks. It essentially trades a known (and very substantial) harm against a rare but possibly catastrophic potential harm.

The purpose of mitigation is to reduce risk, either by reducing the frequency or reducing the consequences of the risk events. This can take three forms in the current model:

1. Mitigation to reduce wildfire risk. This should be estimated per tranche, since effectiveness of a mitigation may vary with fire weather severity. Undergrounding, for instance, would be effective in all tranches. Hardening of a certain type may only be good up to a corresponding wind speed – hence the effectiveness would be lower in the higher tranches.
2. Mitigation to reduce PSPS impacts. Specific mitigations will reduce PSPS impacts by a certain fraction. The effectiveness of this mitigation would be expected to be independent of fire weather severity.
3. Mitigation to reduce the frequency of PSPS events by making the system safe to operate in a higher fire weather severity tranche. Hardening a circuit so that it can operate under conditions of "moderate" fire weather severity would be an example of this kind of mitigation. This class of mitigation reduces both wildfire risk and PSPS risk.

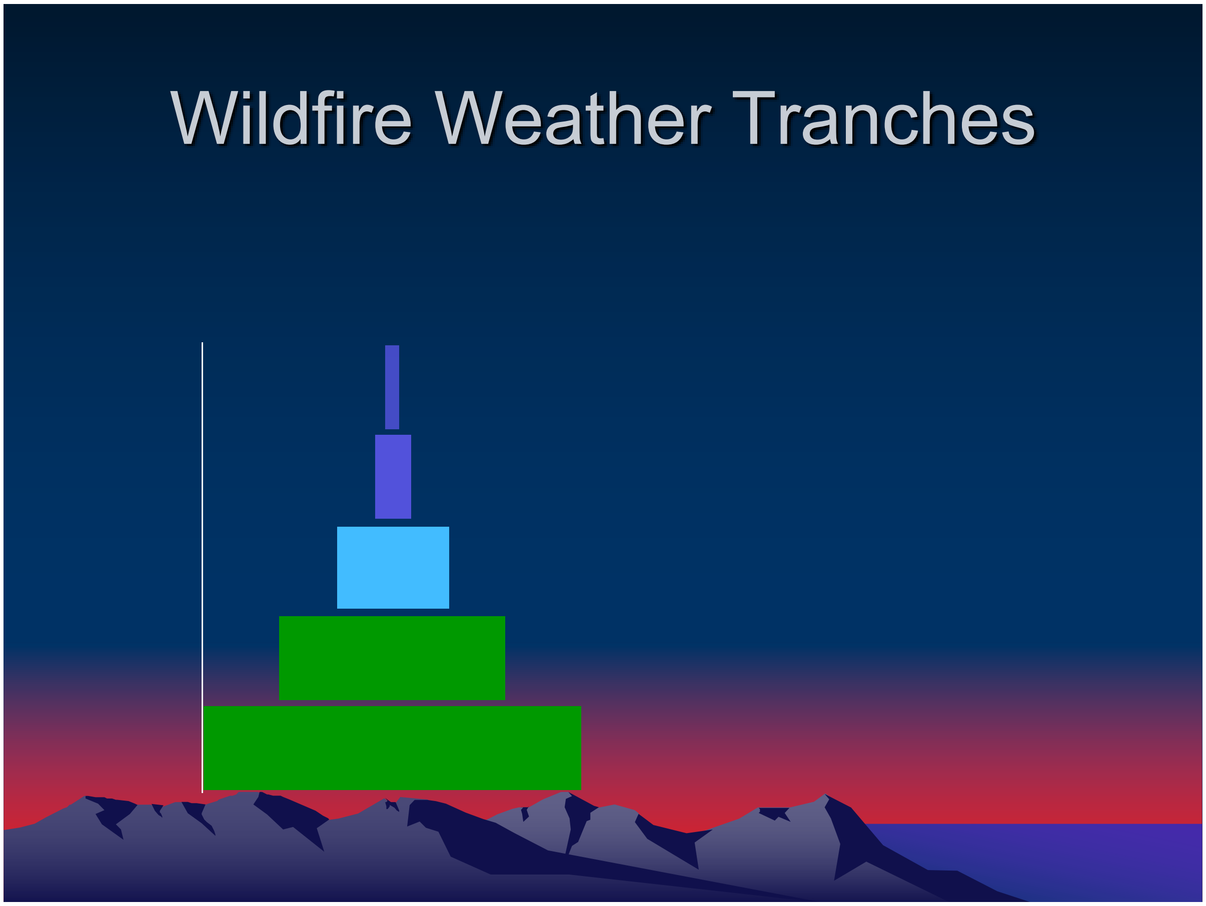

Figure 10 - Example of a risk analysis for a utility that is able to operate safely under moderate fire weather conditions. It evaluates and undertakes mitigations that would let it operate under elevated fire weather conditions. PSPS remains a last resort for severe and extreme fire weather conditions.

Different mitigations, therefore, are targeted to different fire weather severity tranches, and as a utility's wildfire prevention program matures its goal should be to operate safely under conditions of greater and greater fire weather severity. In the long run, there may be technical breakthroughs (such as the combination of REFCL and covered conductor) that would allow safe operation under all foreseeable weather conditions. Until and unless such solutions are deployed, however, de-energization remains a last resort option for the most extreme events. How robust utility systems must be to fire weather can be determined by a cost benefit analysis via the risk-spend efficiency of the MAVF.

3.8. Assembling the MAVF

This section proposes an approach to assembling a multi-attribute value function that incorporates power law dependencies, weather severity tranches, risks from both wildfire and power shutoff, and mitigations.

3.8.1. Components of the MAVF

Tranches: $t_i \ldots t_N$

There are N fire weather severity tranches, each designated by t_i.

Baseline Tranche: t_0

The baseline tranche contains all risk events that do not occur during times of fire weather.

Baseline Wildfire Rate: F_0

The wildfire fire frequency in the baseline tranche.

Fire Weather Event Frequency: f_i

The fire weather event frequency is the number of weather events of tranche *i* occurring annually.

Fire Multiplier: π_i

The fire multiplier is the mean increase in the number of significant wildfires in tranche *i* over the baseline wildfire rate. This will lead to a number of fires per risk event.

Note: The problem of fire complexes, in which wildfires merge, or wildfires with several contributing ignitions (i.e. Tubbs) will need to be addressed so as not to cause double counting of fire starts.

Tranche Wind Speed: v_i

The typical maximum wind speeds during a wildfire weather event in tranche *i*. This may be used to obtain a power line fire frequency multiplier from outage rates. It may also be used for engineering requirements for mitigations in tranche *i*.

Power Line Frequency Multiplier: P_i

The power line frequency multiplier characterizes how much the probability of a wildfire ignition event is increased in fire weather severity tranche *i*. As discussed above, it can be derived from 1) observed ratio of recorded power line fires per tranche 2) increase in ignition frequency from utility data as a function of weather severity tranche or wind speed 3) increase in outage rate as a function of wind speed.

Wildfire Consequence Distribution: dW_i/dA_i
Wildfire Consequence Mean: $\overline{W}_i$
Cutoff Size: A_{max}
Minimum Reliable Size: A_{min}
Power Law Exponent: α_i

The wildfire consequence distribution in a tranche is the cumulative number of wildfires above a certain area, plotted as a function of area. This value can also be weighted with a value quantifying mean customer harm per unit size of the wildfire. Alternatively, the size can be dispensed with and a plot of wildfire costs can be used, but this would take considerably more work because the problem has not been approached this way before.

A mean of the distribution may also be used, obtained by

$$\overline{W} = \int_{Amin}^{Amax} \frac{dW(A)}{d(A)}\, dA$$

It is recommended, however, to use Monte Carlo methods instead because the distribution, characterized by a power law over several orders of magnitude, and therefore the probability of outlier events of much greater consequence in any given weather tranche is significant.

The distribution will be characterized by a power law. An example function that can be used to fit the form to enable a parameterized Monte Carlo is the HOT/PLR formulation of Moritz, et. al.:

$$dW_i(A)/dA = C[(A_{min} + A)^{-\alpha_i} - (A_{min} + A_{max})^{-\alpha_i}]$$

De-energization Severity: d_i, $i > 0$

De-energization Consequences: $D_i = Sd_i$

The severity of de-energization is a value that expresses the extent of a shutoff event (possibly in customer-hours). This can be multiplied by a consequence multiplier $\boldsymbol{S}$ to create a consequence value $\boldsymbol{D_i}$ in units equivalent to the attribute (safety, financial, reliability). Each fire weather severity bin which uses PSPS as a mitigation will have a characteristic de-energization severity.

De-energization Inefficiency: ε

Even when lines are de-energized, there is a residual component of fire risk. This has three subcomponents:

- Utility-related ignition due to inefficiency and error in estimating the correct PSPS boundaries and timing.
- Increased fire risk from sources related to PSPS, such as cooking, generators, and delays in reporting.
- Increased risk to residents from wildfires that are not related to PSPS due lack of communication, traffic signaling, and inefficiencies from evacuating in the dark.

These could be individually addressed but for simplicity these are combined into a single parameter ε. Residual wildfire risk will be the inefficiency parameter multiplied by the wildfire risk and PSPS severity.

Wildfire Mitigation Efficiency: w_i^j

De-energization Mitigation Efficiency: q_i^j

MAVF allows the incorporation of mitigation measures. If there are W uncorrelated wildfire mitigation measures, then the residual wildfire risk for a specific fire weather severity tranche would be

$$r_i = \prod_{j=1}^{W} (1 - w_i^j) R_i$$

where R_i is the unmitigated risk in tranche *i.*

3.8.2. Wildfire risk calculation in the baseline tranche

The baseline risk due to wildfire ignition will take the following form:

$$\boldsymbol{R_0} = \boldsymbol{F_0 P_0 \overline{W}}_0$$

This is the simplest formulation, and represents the ambient risk of power line wildfire ignition in the absence of weather drivers. As a Monte Carlo, it can be represented as a Poisson distribution of events with consequences drawn from the wildfire consequence distribution $\mathbf{d}\boldsymbol{W_0}/\mathbf{dA_0}$, which can be represented by a power law with minimum and maximum cutoffs A_{min} and A_{max} and exponent α_0.

3.8.3. Wildfire risk calculation in tranches without PSPS

For tranches associated with fire weather events, the formulation takes into account the both the frequency and the amplification effects of these events.

$$\boldsymbol{R_i} = \boldsymbol{f_i \pi_i P_i \overline{W}}_{\mathrm{i}}$$

This includes a multiplier, $\boldsymbol{\pi_i}$, that represents how many fires, on average, occur during a fire weather event in severity tranche *i*. As a Monte Carlo, the weather event would be treated as a Poisson distribution, as would the number of fires generated from the event. The consequence distribution would be drawn from $\mathbf{d}\boldsymbol{W_i}/\mathbf{dA_i}$, which can be represented by a power law with minimum and maximum cutoffs A_{min} and A_{max} and exponent α_i.

3.8.4. PSPS and wildfire risk calculation in tranches with PSPS

In the case where PSPS is used to mitigate wildfire risk in a fire weather severity tranche, the risk from PSPS can be given as

$$\boldsymbol{R_i^{PSPS} = f_i D_i}$$

where P_i are the PSPS consequences calculated for a fire weather event in fire weather severity tranche *i*.

There are also potential inefficiencies in PSPS, as described above. These leave residual wildfire risks associated with weather severity tranche *i*.

$$\boldsymbol{R_i^{WF} = f_i \pi_i \varepsilon_i P_i \overline{W}_i}$$

The total tranche PSPS risk is the combination of the PSPS harm and residual wildfire risk.

$$\boldsymbol{R_i = R_i^{PSPS} + R_i^{WF} = f_i(D_i + \pi_i \varepsilon_i P_i \overline{W}_i)}$$

3.8.5. Wildfire risk vs. PSPS

The decision whether to apply PSPS as mitigation to a fire weather severity tranche or to leave it energized during an event of that severity then comes down to the following relation:

If this wildfire risk > PSPS risk, de-energize in the event of a weather event.

De-energization criterion for fire weather severity tranch *i*:

$$\boldsymbol{\pi_i \overline{W}_i > D_i + \pi_i \varepsilon_i P_i \overline{W}_i}$$

or

$$\boldsymbol{\pi_i (1 - \varepsilon_i) P_i \overline{W}_i > D_i}$$

The meaning of this criterion is that: "In order to shut off power, risk from wildfire needs to be greater than the risk from de-energization, including any wildfire risks that are caused or increased by PSPS".

Mitigations can be applied to both reduce wildfire risk and PSPS risk.

As shown in Section 3.8.1 the residual wildfire risk for a specific fire weather severity tranche is

$$r_i = \prod_{j=1}^{W} (1 - w_i^j) R_i$$

where R_i is the unmitigated risk in tranche i and a series of wildfire mitigations with efficiency w_i^j are applied. The equivalent value for PSPS mitigations would be:

$$r = \prod_{j=1}^{Q} (1 - q^j) R_i$$

In this case, PSPS mitigations, such as generators or microgrids, will have an effectiveness that is independent of fire weather severity, so there is no i tranche subscript.

Say that a utility sets a goal of upgrading a subset of its infrastructure so that it can safely operate under fire weather severity tranche t_2. It proposes a portfolio of W wildfire mitigations and Q PSPS mitigations. In order for it to meet the criteria for safe operation, it would need to meet the criterion:

$$\prod_{j=1}^{W} (1 - w_2^j)(1 - \varepsilon_2)\pi_2 P_2 \overline{W}_2 < \prod_{j=1}^{Q} (1 - q^j) D_2$$

These mitigations would come at a certain cost, and would reduce risk by an amount:

$$R_2^{PSPS\ unmitigated} - R_2^{WF\ mitigated}$$

This allows a risk/spend efficiency to be calculated. This calculation is equivalent to the cost-benefit analysis for de-energization first foreseen in D.09-09-030.[27]

[27] p. 2.

4. OTHER CONSIDERATIONS

4.1. MAVF Attributes

The MAVF is a "multi-attribute" value function, and is designed to incorporate specified "values" into the risk function as separate entities. MAVF functions that have been used so far by utilities at the CPUC include attributes of "safety", "reliability", and "financial", each with certain weights. The wildfire risk, comprised both of harm from wildfires and harm from PSPS, has components of all of these attributes. This paper does not treat how the method above would be decomposed into safety (deaths, injuries, illness from smoke, PSPS safety risks), reliability (loss of customer power during PSPS), and financial (property destroyed). However the treatment should be similar to that already performed by IOUs in preparation of their RAMP risk analyses.

4.2. Other Tranches

IOUs, the Commission, and intervenors have suggested a number of other possible decompositions of risk into tranches. MGRA's position is that ideally tranches should be *actionable* – amenable to treatment by specific mitigations or providing specific risk information. The wildfire weather risk tranches meet this requirement, but other tranche definitions may be very useful as well. We recommend using fire weather severity tranches in combination with other valid tranches applicable to wildfire risk, which would multiply the number of overall tranches by the number of fire weather severity tranches.

4.3. Fitting with Other Distribution Types

A standard procedure used by both PG&E and SDG&E is to use a Monte Carlo based wildfire risk model based on utility ignition data and wildfire simulations. The wildfire losses are then fit with an extreme value distribution. In PG&E's case this is a lognormal and in SDG&E's case this is a gamma function. In both cases these are empirical fits to the data: they fit the data with reasonable accuracy, even though there is no fundamental theory underlying this fit.

Is this okay? The answer is "it depends".

The lognormal and exponential are classed as "subexponential" functions, which means that they do not have as extreme fat-tailed behavior as a power law.[28] A power law with tail exponent less than one (which is our lot) has the worst possible statistical behavior, in that its mean does not even converge in the limit of large numbers. The problem would not be tractable at all were it not for a maximum size scale for wildfires, which we believe to be there both from fire size distributions and from physical principles.

So the question comes down to how well do the candidate distributions fit real and generated data? Taleb 2020 notes that for some problems, differences between Pareto (power law) and lognormal distributions may be moot.[29] What is particularly important is that the fit be good well out onto the tails of the distributions, and also that the cutoff be handled in a realistic way. Due to the outsized contribution of events far out on the statistical tail, and the relative uncertainty regarding the frequency of these events, any errors or uncertainty in the tail up to the cutoff will dominate the overall uncertainty of the entire calculation. Under these conditions, it is likely that a power law with cutoff will give a better fit than alternative distributions.

IOUs who wish to use alternative fit functions should compare them against power law for efficacy and robustness against error, and should compare how they work on the extreme tails of existing data sets such as California wildfires (both without power line and with power line only).

4.4. Wind Speed versus Fire Weather Severity

One approximation made in this model is to associate a wind speed variable with each fire weather severity tranche. Because fire weather severity has a number of components (humidity, fuel moisture, temperature), a fire weather severity tranche will contain a range of wind speeds. Generally there will be a correlation between the two variables with higher weather severity tranches containing higher wind speeds. Power line faults are dependent on wind speed, and not the other variables, so by using weather severity as a tranche identifier we are likely underestimating power line ignition rates, though we would expect consequences to track more closely with fire weather severity rather than with wind speeds. Sensitivity of power line fire ignitions on wind can be estimated from the wind dependence of utility fault rates and from damage reports that utilities

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[28] Taleb 2020; p. 89.
[29] Id.; p. 152.

provide in their post PSPS damage assessments. Use of ignition data itself is compromised after 2018 because of the use of PSPS, which suppresses ignition during extreme wind events.

Separating out these two effects would lead to greater accuracy and predictive capability. Ideally, a Monte Carlo treating these effects separately, with wind gust speed driving ignition frequency and fire severity driving consequences would likely lead to more accurate results.

4.5. Climate Change

One advantage of this approach is that it can readily incorporate input from climate models. Analysis of historical fire data indicate that the risk of wildfire is increasing throughout the Western United States in general and California in particular, and that this is due to anthropogenic climate change.[30,31] According to recent studies the climate variables driving the increase in fire risk appear to be related to higher temperatures and decreased humidity over a longer fire season.[32] Current climate models expect the intensity of Santa Ana winds to decrease over time, though this has not yet been observed in data.[33,34] This is surprising from a power line fire perspective, particularly with regard to Northern California. While power line fires have been known in Northern California, and have sometimes been catastrophic (for example, the Butte fire), the power line fire storm of 2017 followed the same pattern seen in Southern California in 2007, with near-simultaneous ignitions of multiple power line fires. The Camp fire followed in 2018, and had PG&E not implemented draconian power shutoff events, extensive damage to its infrastructure indicates that 2019 may have followed suite as a catastrophic fire loss year.

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30 Williams, A.P., Abatzoglou, J.T., Gershunov, A., Guzman-Morales, J., Bishop, D.A., Balch, J.K., Lettenmaier, D.P., 2019. Observed Impacts of Anthropogenic Climate Change on Wildfire in California. Earth's Future 7, 892–910. https://doi.org/10.1029/2019EF001210 https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019EF001210

31 Goss, M., Swain, D.L., Abatzoglou, J.T., Sarhadi, A., Kolden, C., Williams, A.P., Diffenbaugh, N.S., 2020. Climate change is increasing the risk of extreme autumn wildfire conditions across California. Environ. Res. Lett. https://doi.org/10.1088/1748-9326/ab83a7 http://iopscience.iop.org/10.1088/1748-9326/ab83a7

32 Op. Cit.

33 Hughes, M., Hall, A., 2010. Local and synoptic mechanisms causing Southern California's Santa Ana winds. Clim Dyn 34, 847–857. https://doi.org/10.1007/s00382-009-0650-4

34 Guzman-Morales, J., Gershunov, A., 2019. Climate Change Suppresses Santa Ana Winds of Southern California and Sharpens Their Seasonality. Geophysical Research Letters 46, 2772–2780. https://doi.org/10.1029/2018GL080261

Whatever the cause of this sudden change in Northern California power line fire danger, it will be necessary to incorporate climate change into long term utility risk modelling. The model proposed in this paper can incorporate changes in annual fire rates and fire weather severity determined by climate models through the base weather event frequency F_0 and the weather severity dependent frequency multiplier f_i. Calculations of frequency in a high / extreme bin (fire weather index > 95%) can be found in Goss, et. al:

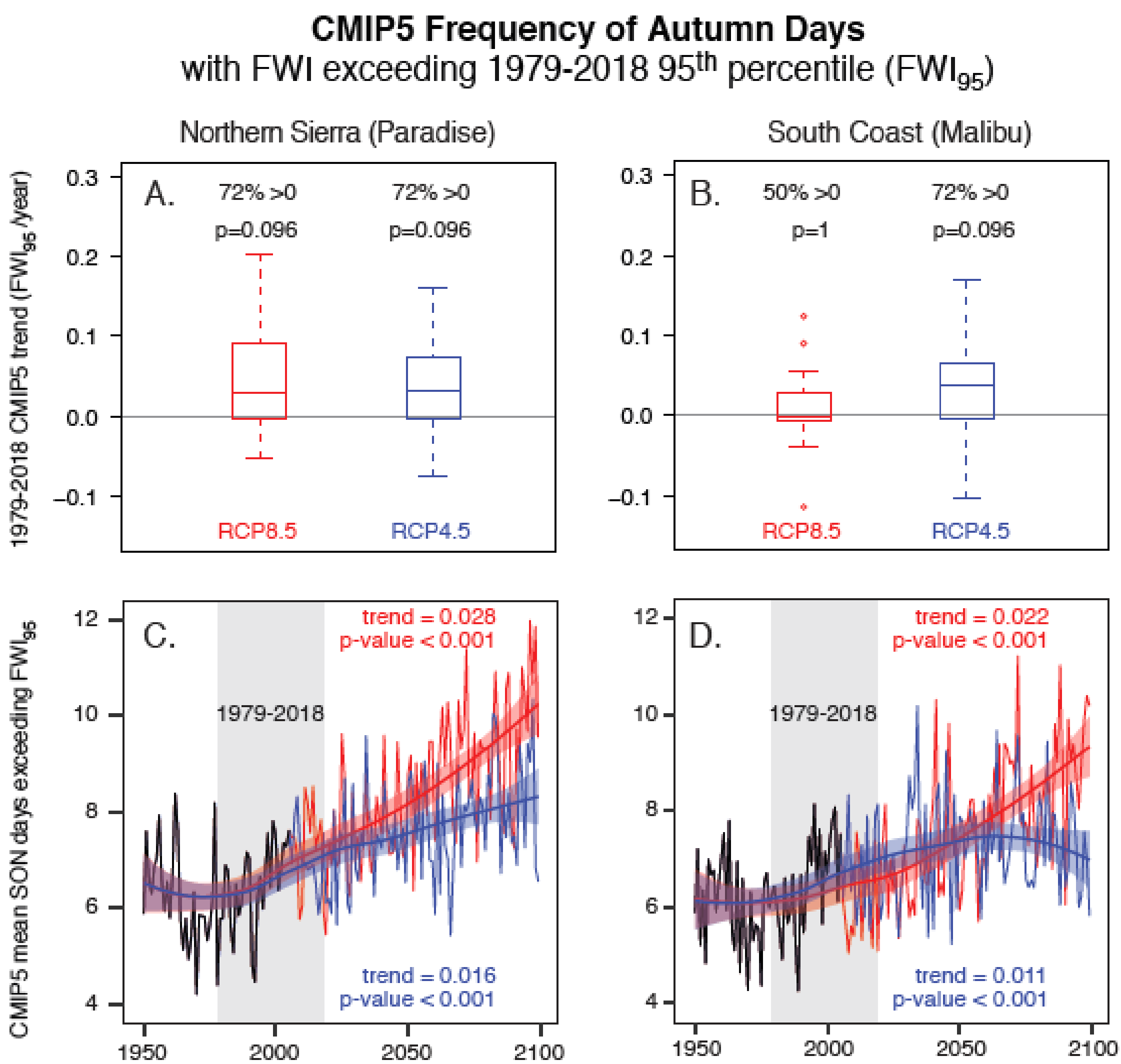

Figure 11 - Frequency of high/extreme fire weather days (FWI 95%) under climate change scenarios RCP 4.5 and RCP 8.5. The horizontal axis shows that data between 1979 and 2018 was included in the analysis, and the model projects changes out to the year 2100. Number of severe fire weather days per year is shown to substantially increase for more pessimistic climate scenarios. Reproduced from Goss, et. al. (Footnote 31).

5. NEXT STEPS

This section details what data would need to be assembled in order to apply power law fits to wildfire weather tranches and assemble a MAVF treatment based on fire weather tranches.

Component	Symbols	Difficulty	Source	Comments
Wildfire weather tranches and event rates.	t_i, F_0, f_i	Moderate	Academic, CA fires	Methodology for fire weather event severity has been developed by several groups.
Wildfire consequence distributions and means	dW_i/dA, α_i	Moderate	Academic, CA fires	Methodology for fire size distributions has already been developed by several groups.
Fires per event	π_i		Academic, CA fires	Will come out of tranche analysis.
Power line frequency multiplier	P_i	Moderate	Utility data, weather	Existing utility data is sufficient to show increase in outage/damage rates as a function of wind speed.
PSPS event severity	d_i	Easy	Utility SME, PSPS history	Once tranches & severity are established, extent of associated PSPS event can be calculated.
PSPS consequences and efficiency	S, Di, ε	Hard	Utilities, consultants, CPUC, intervenors	CPUC or WSD needs to develop methodology for quantifying customer harm.
Mitigations for wildfire and PSPS	w_i, q_i	Easy	Utilities	Utilities have mitigation estimates already, need to divide them into weather severity tranches if they depend on wind.

6. CONCLUSION

This whitepaper is intended to lay out a practical approach to incorporate the statistical properties of wildfires, which have consequences that follow power law statistics over several orders of magnitude, into the risk estimation framework adopted by the California Public Utilities Commission. It lays out the elements that need to be incorporated into the risk model, explains the rationale behind them, and discusses what pieces need to be created or assembled in order to create a proper risk model for utility wildfire losses. It is a framework more than it is a recipe: It is understood that IOUs may have or may obtain their own risk models and the S-MAP framework leaves a lot to utility discretion. A successful utility wildfire model, however, should have elements that can be mapped back to the principles laid out in this paper.

This paper also provides a technical framework for formalizing a requirement that the Commission and stakeholders have been attempting to enforce since the passage of ESRB-8: namely that utility power shutoff should be a "last resort" and that utilities should be trying to raise the thresholds at which they shut off power. It lays out a framework for implementing the cost-benefit analysis originally envisioned in D.09-09-030 within the auspices of the S-MAP Settlement Agreement using multi-attribute value function and its associated risk-spend efficiencies. The paper has tried to make clear the link between power law distributions and the dire risks of the most catastrophic wildfires and lays out a method by which these events can be isolated for treatment by power shutoff. At the other end of the risk spectrum, a process of continuous improvement should be undertaken that will raise utility shutoff thresholds and reduce the very significant risks and harms posed by PSPS.

Respectfully submitted this 1st day of February, 2020,

By: __/S/____***Joseph W. Mitchell***____________________

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Appendix B-2 RAMP Scenario Analysis Wind (MGRA)

Pacific Gas and Electric Company

Updated November 25, 2020

RAMP Scenario Analysis – Wind (MGRA)

11/25/2020 Updated

Scenario Description

MGRA suggested an alternative approach intended to demonstrate the sensitivity of PG&E's wildfire risk to extreme weather events. By this analysis MGRA suggests that PG&E will show that catastrophic fires are much more likely to occur due to ignitions under high wind and high fire danger conditions.

1. Identify eight additional tranches based on maximum wind gust speed within 3 miles of each ignition point and local red flag warning status.
2. Wind gust speed can be based on meteorological modeling or weather station data, though this should be done in a consistent way for the entire model run.
3. If meteorological analysis uses continuous rather than gust wind speed, use a gust factor of 1.6.
4. The tranches can be applied to the HFTD only
5. Each wind speed category should be separated into RFW / non-RFW tranches.
6. Sub-driver (cause) information should be recorded for each incident. It is expected that certain ignition causes will show wind dependency (equipment failure, vegetation contact) and some will not (3rd party contractor, animals).
7. Mitigation analyses should be done for each tranche.
8. The four wind speed categories that MGRA proposes are:
   - Maximum wind gusts (MWG) within 3 miles < 25 mph
   - 25 mph <= MWG < 40 mph
   - 40 mph <= MWG < 55 mph
   - MWG >= 55 mph

PG&E's Analysis

1. Local red flag warning analysis was already accounted for in the PG&E's RAMP Model.

2. Maximum wind gust speed around the ignition point were identified.

3. Every ignition was mapped to the climatology data via the POMMS* grid at 2km resolution. Weather data is available for each 2x2km POMMS grid cells for PG&E service territory.

4. For this analysis, a wind gust factor of 1.6 was used to convert sustained wind speed as provided by MGRA. But we note that PG&E's meteorology uses a factor of 1.7 for internal analysis.

5. Mapping was done for all ignitions.

6. PG&E already used sub-driver information for each incident in the WF risk model used in RAMP report.

7. PG&E did not perform tranche and mitigation analysis with this new data, but provides some data analysis in the following slides.

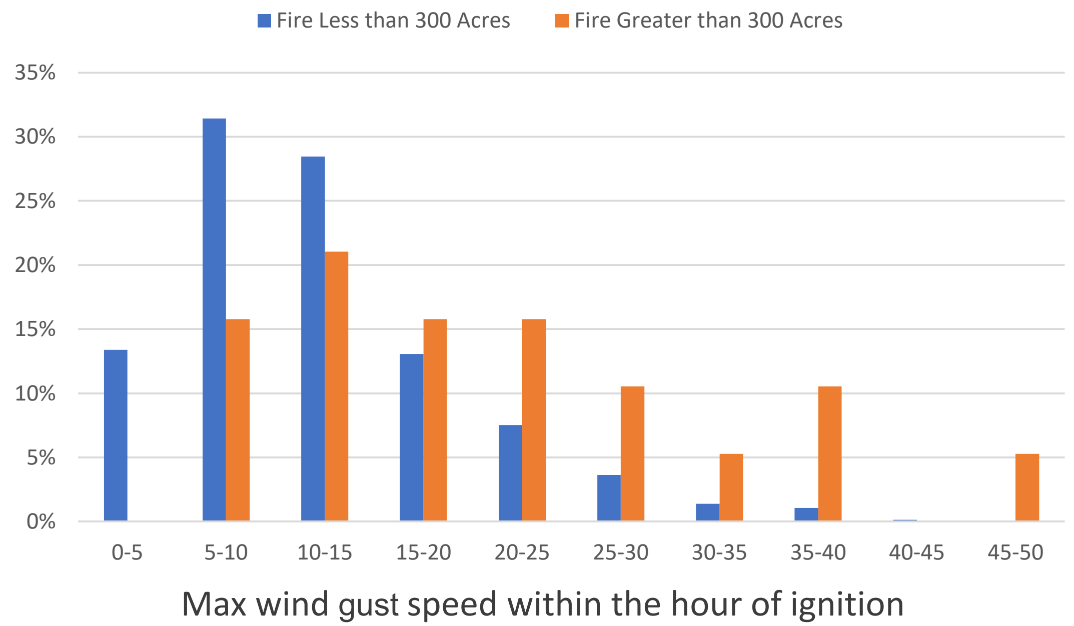
*POMMS is PG&E's Operational Mesoscale Modeling System, which is a high-resolution weather forecasting model that generates important fire weather parameters including wind speed, temperature, relative humidity and precipitation.

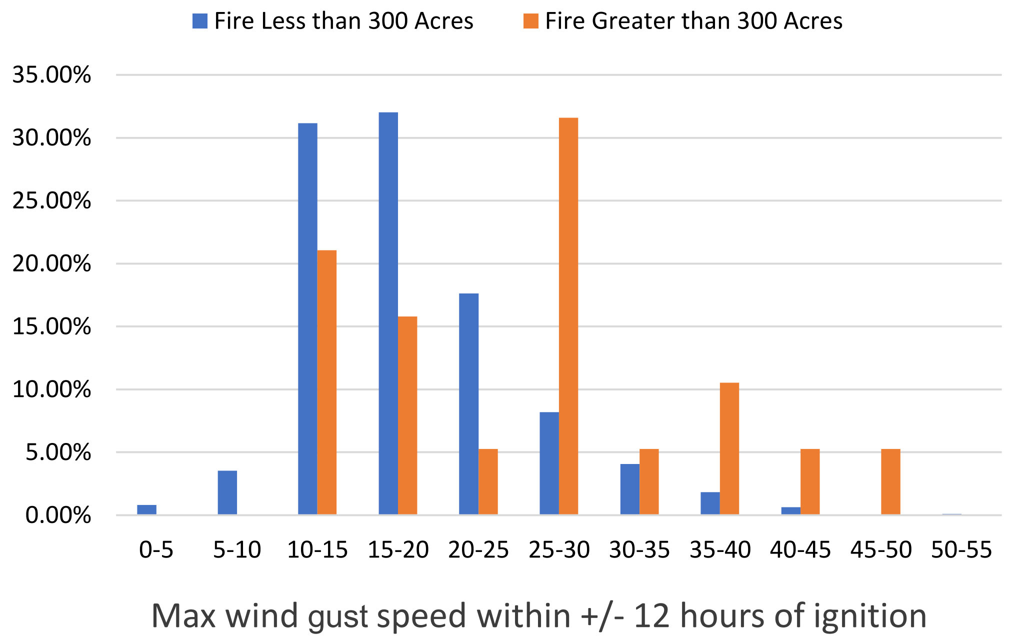
Wind Gust Speed Distribution by Large/Small Fire.

- Corrected wind gust speed data for ignitions show that higher proportion of ignitions with wind gust speed >25mph for large fires than that of small fires.

  - About 30% of 19 large fires (greater than 300 acres) and 6% of 2183 small fires (less than 300 acres) were when the maximum wind gust speed was greater than 25 mph *within the hour of ignition.*

  - About 60% of 19 large fires (greater than 300 acres) and 15% of 2183 small fires (less than 300 acres) were when the maximum wind gust speed was greater than 25 *mph within +/- 12 hours of ignition*





* Underlying data for this graph is provided in the "All Ignition Data Set" sheet of the attached workbook. (Last five columns)

of Large Fire Outcomes for Ignitions, By RFW and Wind Speed Category

- RFW status provides a clear difference in probability of an ignition resulting in large fire.
  - This is already accounted for in PG&E's wildfire risk model.

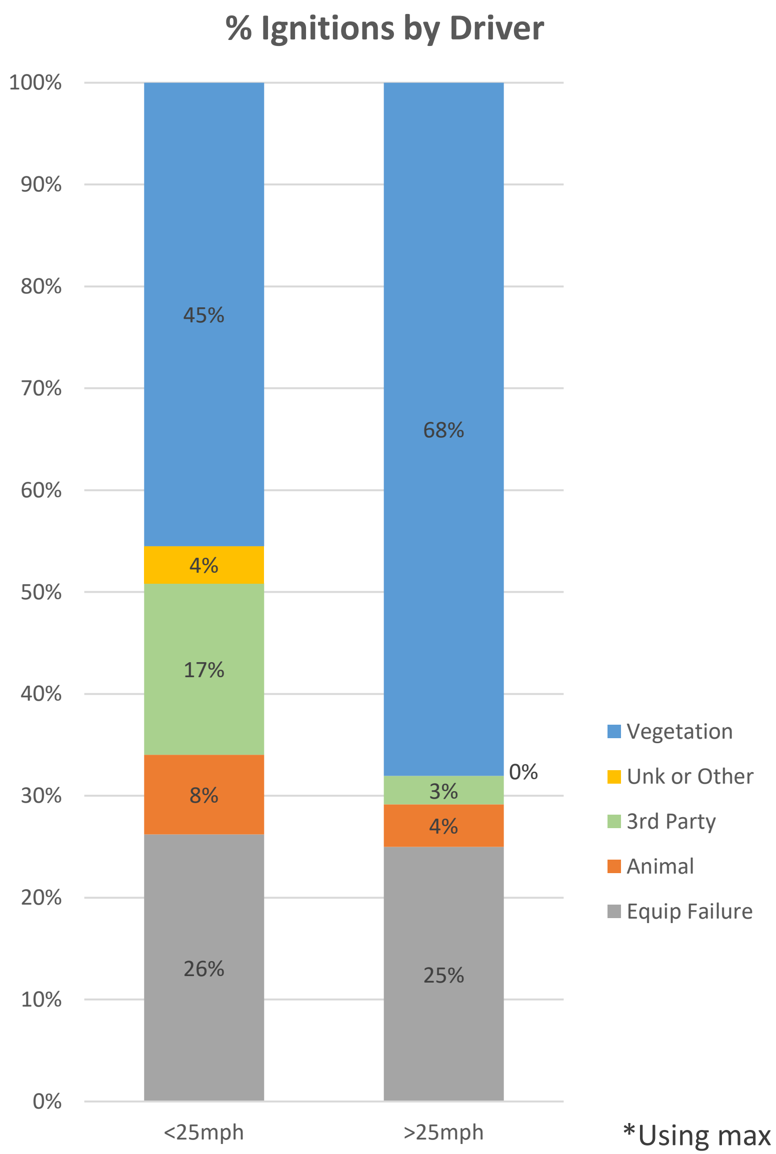
- Corrected wind gust speed data shows higher conditional probability that an ignition becomes a large fire when max wind gust speed > 25 mph.

Wind gust speed category		No RFW				RFW				Total			
		# Ignitions	% Ignitions	# Large	% Large	# Ignitions	% Ignitions	# Large	% Large	# Ignitions	% Ignitions	# Large	% Large
HFTD	<25mph	587	92%	4	1%	28	56%	0	0%	615	89%	4	1%
	25-40mph	51	8%	1	2%	20	40%	4	20%	71	10%	5	7%
	40-55mph	3	0%	0	0%	2	4%	2	100%	5	1%	2	40%
	All HFTD	641	100%	5	1%	50	100%	6	12%	691	100%	11	2%
Non-HFTD	<25mph	1214	85%	4	0%	38	47%	0	0%	1252	83%	4	0%
	25-40mph	210	15%	3	1%	36	44%	1	3%	246	16%	4	2%
	40-55mph	6	0%	0	0%	7	9%	0	0%	13	1%	0	0%
	All Non-HFTD	1430	100%	7	0%	81	100%	1	1%	1511	100%	8	1%

*Max wind gust speed within +/- 12 hours of ignition

* Underlying data for this table is provided in the "All Ignition Data Set" sheet of the attached workbook.

Wind Dependency for Ignition drivers.



- Vegetation drivers show higher wind dependency as expected.

  higher proportion of vegetation-driven ignitions when max wind gust speed is > 25mph.

- 3rd Party and animal drivers show low wind dependency as expected.

- The wind dependency of equipment failure driver is higher is lower than vegetation-driver.

  Prob(>25 mph| HFTD-Dist ignitions of Vegetation Driver) = 16%
  Prob(>25 mph| HFTD-Dist ignitions of Equipment Failure Driver) = 11%

*Using max wind gust speed within +/- 12 hours of ignition

Summary

- With the correction of the max wind gust speeds for PG&E's ignitions (2015-2019) obtained using the 2x2 km POMMS grid cell data, an estimated conditional probability that an ignition becomes a large fire is higher when max wind gust speed is higher than 25mph.

- PG&E's ignition data shows that catastrophic fires are much more likely to occur when ignitions occur under red flag warning conditions.

- All destructive/catastrophic fires (except Butte fire) have the max wind gust speed greater than 25mph, and two of them have max wind gust speed greater than 40mph.

1. Butte	<25mph
2. Cascade (Neu Wind Complex)	25-40mph
3. Redwood Valley (Mendocino Lake Complex)	25-40mph
4. Nuns (Central LNU Complex)	40-55mph
5. Atlas (Southern LNU Complex)	40-55mph
6. Sulphur (Mendocino Lake Complex)	25-40mph
7. Camp Fire	25-40mph