State of California – A Natural Resources Agency
Gavin Newsom, Governor

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Caroline Thomas Jacobs, Director

August 9, 2021

To: Stakeholders to Pacific Gas and Electric's 2021 Wildfire Mitigation Plan Update

Enclosed is the Draft Action Statement of the Office of Energy Infrastructure Safety (Energy Safety) presenting its evaluation of Pacific Gas and Electric Company's (PG&E) 2021 Wildfire Mitigation Plan (WMP) Update.

On August 9, 2021, this Draft Action Statement is published for public review and comment. Comments shall be submitted no later than August 30, 2021. Reply comments will not be accepted.

The California Public Utilities Commission (CPUC) will publish Draft Resolution WSD-021, which includes this Draft Action Statement as an attachment. Stakeholder may submit a single set of comments addressing both the Draft Resolution, issued by the CPUC, and the Draft Action Statement, issued by Energy Safety. Comments shall be limited to fifteen (15) pages in length and focus on the factual, legal, or technical errors in the Draft Resolution and associated Draft Action Statement. Comments not meeting all submission requirements may not be considered.

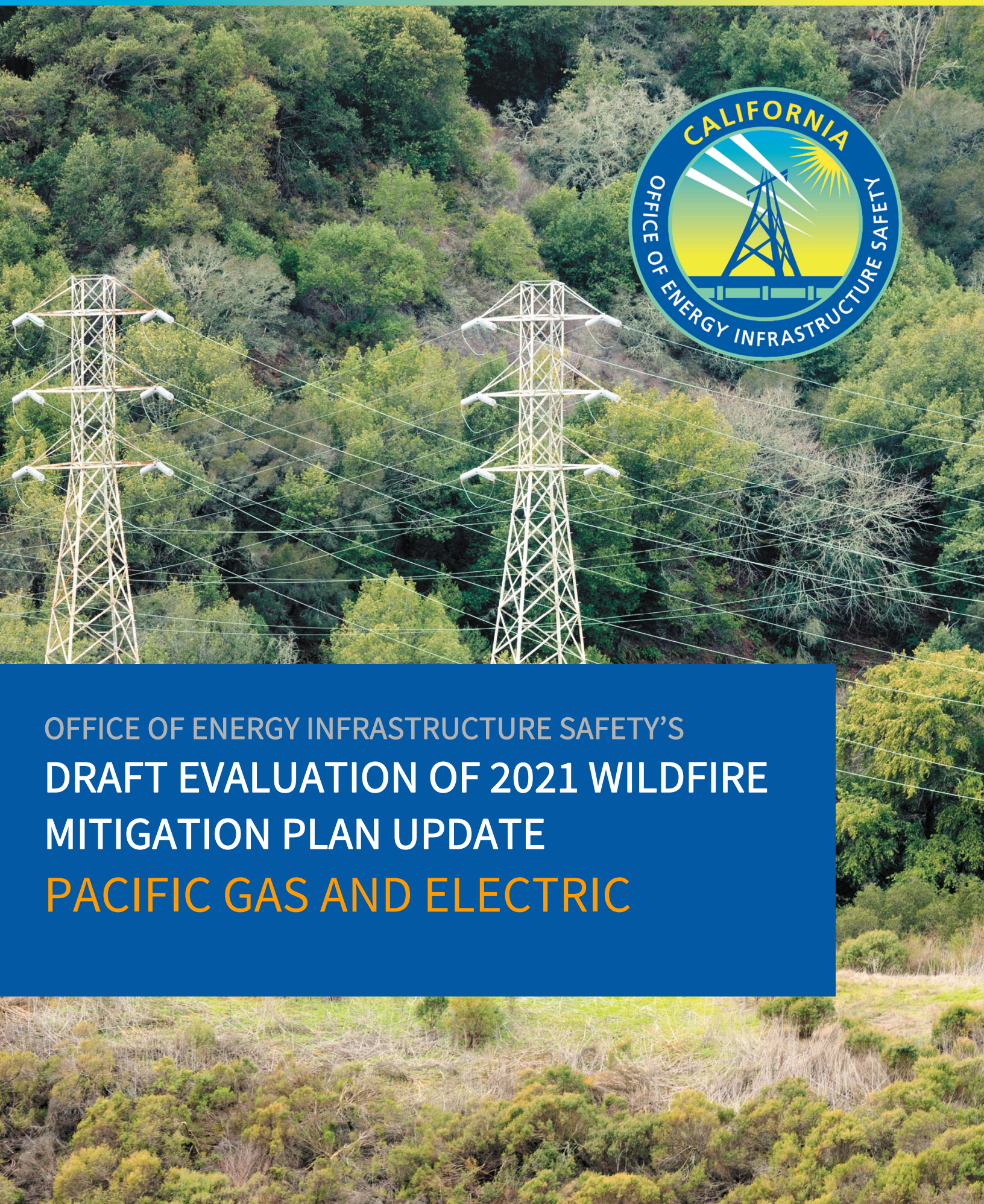
Comments must be submitted to Energy Safety's e-filing system in the 2021 Wildfire Mitigation Plans docket (#2021-WMPs). Comments must also be submitted via email on the service list of the CPUC's Rulemaking 18-10-007 with a copy to wildfiresafety@cpuc.ca.gov.

The Action Statement is binding upon Energy Safety's publication of the Final Action Statement.

Sincerely,

Lucy Morgans

Lucy Morgans
Action Program Manager, Safety Policy Division
Office of Energy Infrastructure Safety



OFFICE OF ENERGY INFRASTRUCTURE SAFETY'S

DRAFT EVALUATION OF 2021 WILDFIRE MITIGATION PLAN UPDATE

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Contents

INTRODUCTION AND BACKGROUND

This Action Statement represents the assessment of the Office of Energy Infrastructure Safety (Energy Safety)[1] on the 2021 Wildfire Mitigation Plan Update (WMP or Plan) of Pacific Gas and Electric Corporation (PG&E or the utility). This Plan is an update for the comprehensive 2020-2022 plan submitted by PG&E in 2020. PG&E submitted its 2021 WMP Update on February 5, 2021, in response to guidelines provided by the California Public Utilities Commission's (CPUC) Wildfire Safety Division (WSD).[2] Assembly Bill (AB) 1054[3] mandates that Energy Safety complete its evaluation of WMPs within three months of submission, unless Energy Safety issues an extension.[4] On May 4, 2021, WSD issued a Revision Notice to PG&E to address critical issues within its WMP Update. That notice also contained a notice of extension for the review timeline. PG&E responded on June 3, 2021. For additional information see below in Section 1.2.

PG&E's 2021 WMP Update is approved.

In its 2021 WMP Update, PG&E demonstrates an improved understanding of the underlying risks it faces, a more targeted approach to addressing those risks, and a foundational change in its organization structure and systems, including data governance, that will better position it to improve over time.

Notwithstanding these improvements, Energy Safety finds that PG&E is spending more money per mitigation initiative and yet making less progress than its peer utilities. Energy Safety expects PG&E to demonstrate that it is reducing the risk of wildfire in line with its peers. PG&E must provide an update to Energy Safety on the 29 key areas of improvement outlined in this Action Statement in its November 1, 2021, Progress Report.

1. Legal Authority

In 2018, following the devastating wildfires in 2016 and 2017, the California Legislature passed several bills increasing oversight of the electrical corporations' efforts to reduce utility-related

[1] Pursuant to Public Utilities Code Section 326(b), on July 1, 2021, the Wildfire Safety Division (WSD) transitioned from the Commission into the Office of Energy Infrastructure Safety (Energy Safety) under the California Natural Resources Agency. Energy Safety "is the successor to" and "is vested with all of the duties, powers, and responsibilities of the Wildfire Safety Division" (Government Code Section 15475), including, but not limited to, jurisdiction for evaluating and approving or denying electrical corporations' WMPs and evaluating compliance with regulations related to the WMPs. The Commission and the newly formed Energy Safety will adhere to all statutory requirements pertaining to the WMP process. WSD is used to describe the work of the WSD prior to July 1, 2021. Energy Safety is used to describe the work of Energy Safety beginning on July 1, 2021. Any references to WSD action post July 1, 2021, or to Energy Safety action prior to July 1, 2021, are inadvertent and should be interpreted as the actions of WSD or Energy Safety as appropriate.

[2] The Commission approved 2021 WMP guidelines in Resolution WSD-011.

[3] Stats. of 2019, Ch. 79.

[4] Pub. Util. Code Section 8386.3(a).

wildfires.[5] AB 1054 created the WSD at the CPUC and tasked it with reviewing annual WMPs submitted by electrical corporations under the CPUC's jurisdiction.

As of July 1, 2021, the WSD transitioned into the Office of Energy Infrastructure Safety (Energy Safety) under the California Natural Resources Agency (CNRA) vested with all the powers, duties, and responsibilities of the WSD established pursuant to Section 15475 of the Government Code.[6] Section 10 of the associated Resolution provides further detail on the transition of the WSD to Energy Safety. In this Action Statement, "WSD" is used to describe the work of the WSD prior to July 1, 2021, and "Energy Safety" is used to describe the work of Energy Safety beginning on July 1, 2021. Any references to WSD action post July 1, 2021, or to Energy Safety action prior to July 1, 2021, are inadvertent and should be interpreted as the actions of WSD or Energy Safety as appropriate. Any references herein to WSD actions that post-date this transition should be interpreted as actions taken by Energy Safety or for which Energy Safety will take responsibility.

The main regulatory vehicle for Energy Safety to evaluate electrical corporations' wildfire risk reduction efforts is the WMP, which was first introduced in Senate Bill (SB) 1028[7] and further defined in SB 901,[8] AB 1054, and AB 111. Investor-owned electrical corporations (hereafter referred to as "utilities") are required to submit WMPs assessing their level of wildfire risk and providing plans for wildfire risk reduction. The CPUC evaluated the utilities' first WMPs under the SB 901 framework in 2019.[9]

AB 1054 and AB 111 transferred responsibility for evaluation and approval or denial of WMPs to Energy Safety; AB 1054 provides, "After approval by the division, the commission shall ratify the action of the division." Energy Safety must ensure utility wildfire mitigation efforts sufficiently address increasing utility wildfire risk. To support its efforts, Energy Safety developed a long-term strategic roadmap, Reducing Utility-Related Wildfire Risk (2020).[10] This strategic roadmap informs Energy Safety's work in updating the WMP process and guidelines and Energy Safety's evaluation of the WMPs.

2. Multi-Year Plan Process

In February of 2020, the utilities[11] submitted their three-year 2020-2022 WMPs. The WSD conducted its evaluation and either approved, conditionally approved, or denied the Plans. In

[5] In this document "utility" should be understood to mean "electrical corporation."
[6] See AB 111, Stats. of 2019, Ch. 81.
[7] Stats. of 2016, Ch. 598.
[8] Stats. of 2018, Ch. 626.
[9] See Rulemaking (R.) 18-10-007.
[10] The Office of Energy Infrastructure's strategic roadmap Reducing Utility-Related Wildfire Risk (2020) (accessed July 29, 2021): https://energysafety.ca.gov/who-we-are/strategic-roadmap/.
[11] Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas and Electric, Liberty Utilities, PacifiCorp, Bear Valley Electric Service, Trans Bay Cable, and Horizon West Transmission.

the case of conditional approval, the WSD identified items missing or incomplete in the Plans on a scale of severity, with Class A Deficiencies representing issues that required resolution through a Remedial Compliance Plan (RCP).[12] The 2020 Class B Deficiencies required resolution through Quarterly Reports,[13] and Class C Deficiencies were to be resolved in the 2021 WMP Update.

In 2020, the WSD issued a conditional approval of PG&E's WMP. PG&E submitted its RCP[14] to resolve Class A Deficiencies on July 27, 2020.[15] The WSD released its evaluation of PG&E's RCP on December 30, 2020, and provided direction to address "insufficient" responses in PG&E's updated 2021 Plan. PG&E submitted its first Quarterly Report on September 9, 2020, to resolve 2020 Class B Deficiencies.[16] The WSD released its evaluation of PG&E's Quarterly Report on January 8, 2021, and also issued direction to address "insufficient" responses in its 2021 WMP Update.[17] Appendix 10.2 of this report provides a list of the deficiencies found in the 2020 WMP and their current status.

3. 2021 Evaluation Process

On November 16, 2020, the CPUC adopted updated WMP requirements (Guidelines) and procedures for the 2021 WMP Plan Year pursuant to Public Utilities Code section 8389(d).[18] The updates to the 2021 WMP Guidelines are intended to streamline the reporting and evaluation process. Pursuant to the adopted Guidelines, large utilities submitted 2021 WMP Updates on February 5, 2021; small and multi-jurisdictional utilities (SMJUs) and independent transmission operators (ITOs) submitted 2021 WMP Updates on March 5, 2021.

The 2021 WMP submissions are updates of the 2020-2022 WMPs and are intended to show progress since 2020 and report changes from the 2020 WMP. Importantly for 2021, Energy Safety amended its review process and will no longer issue conditional approvals. Instead,

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[12] An RCP "must present all missing information and/or articulate the electrical corporation's plan, including proposed timeline, to bring the electrical corporation's WMP into compliance." See Resolution WSD-002 at 17.
[13] "Class B issues are of moderate concern and require reporting on a quarterly basis by the electrical corporation to provide missing data or update its progress in a quarterly report." See Resolution WSD-002 at 18.
[14] PG&E's 2020 RCP can be found here (accessed July 18, 2021): https://energysafety.ca.gov/what-we-do/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2020-wmp/.
[15] WSD's evaluation of PG&E's 2020 RCP can be found here (accessed July 18, 2021): https://energysafety.ca.gov/what-we-do/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2020-wmp/.
[16] PG&E's 2020 QR can be found here (accessed July 18, 2021): https://energysafety.ca.gov/what-we-do/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2020-wmp/. Subsequent Quarterly Reports addressing conditions requiring ongoing reporting will be evaluated as part of utilities' 2021 WMP Updates.
[17] WSD's Evaluation of PG&E's First Quarterly Report from January. 8, 2021 (accessed July 30, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2020/pge-qr-action-statement.pdf. The WSD issued an extension to the large investor-owned utilities to respond to insufficient Quarterly Reports until February 26, 2021.
[18] See https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf for adopted 2021 WMP Guidelines (accessed July 29, 2021).

where Energy Safety found critical issues with 2021 submissions, it issued a Revision Notice requiring the utility to remedy such issues prior to completion of the 2021 WMP Update evaluation. Upon receipt of the utility's response to the Revision Notice, Energy Safety could determine that the response was sufficient to warrant approval, although additional ongoing reporting or other conditions may be required, or the response was insufficient such that denial of the WMP is warranted due to the utility inadequately reducing wildfire risk and its potential impact to public safety.

Energy Safety evaluated 2021 WMP Updates according to the following factors:

- Completeness: The WMP is complete and comprehensively responds to the WMP statutory requirements and WMP Guidelines.
- Technical feasibility and effectiveness: Initiatives proposed in the WMP are technically feasible and are effective in addressing the risks that exist in the utility's service territory.
- Resource use efficiency: Initiatives are an efficient use of utility resources and focus on achieving the greatest risk reduction at the lowest cost.
- Demonstrated year-over-year progress: The utility has demonstrated sufficient progress on objectives and program targets reported in the prior annual WMP.
- Forward-looking growth: The utility demonstrates a clear action plan to continue reducing utility-related wildfires and the scale, scope, and frequency of Public Safety Power Shutoff (PSPS) events.[19] In addition, the utility is sufficiently focused on long-term strategies to build the overall maturity of its wildfire mitigation capabilities while reducing reliance on shorter-term strategies such as PSPS and vegetation management.

To conduct its assessment, Energy Safety relied upon PG&E's WMP submission and subsequent update, responses to Revision Notices, input from California Department of Forestry and Fire Protection (CAL FIRE), input from the Wildfire Safety Advisory Board (WSAB), public comments, responses to the WSD's data requests, utility-reported data, and utility responses to the Utility Maturity Survey.

Upon completion of its review, Energy Safety determined whether each utility's 2021 WMP Update should either be:

- Approved (approval may include the requirement to address certain issues in the utility's subsequent WMP and/or through existing ongoing reporting processes), or,
- Denied (the utility does not have an approved WMP for 2021 and must reapply for approval in 2022).

[19] A Public Safety Power Shutoff (PSPS) event, also called a de-energization event, is when a utility proactively and temporarily cuts power to electric lines that may fail in certain weather conditions in specific areas to reduce electric facility-caused fire risk.

4. Cost Recovery

This document does not approve costs attributable to WMPs, as statute requires electrical corporations to seek cost recovery and prove all expenditures are just and reasonable at a future time in their General Rate Cases (GRC) or an appropriate application. Nothing in this Action Statement nor CPUC's Resolution should be construed as approval of any WMP-related costs.[20]

1. SUMMARY OF KEY FINDINGS

Pursuant to Public Utilities Code (Pub. Util. Code) Section 8386.3(a), this Action Statement is the totality of Energy Safety's review of PG&E's 2021 WMP Update. PG&E's 2021 WMP Update is approved.

1.1 Areas of Significant Progress

Energy Safety finds that PG&E has made significant progress over the past year and/or has matured in its mitigation strategies for future years in the following areas:

- PG&E redesigned its 2021 Wildfire Distribution Risk Model that includes vegetation probability of ignition, equipment probability of ignition, and fire consequence models. The updated model informs which circuit segments PG&E considers highest risk and enables PG&E to prioritize circuit segments for mitigation based on risk.
- PG&E has updated its Vegetation Risk Model for 2021 in a manner it claims allows it to prioritize work with more granularity at the level of circuit protection zones (CPZs).[21] The model's outputs are used to prioritize work for PG&E's EVM program.
- PG&E established a new system hardening program decision-making framework. The new decision-making framework provides a consistent approach for evaluating the optimal mitigation measure for each circuit segment that PG&E selects for mitigation, with a focus on reducing catastrophic wildfire risk. The new decision-making framework provides a more comprehensive and targeted approach than PG&E presented in its

[20] Energy Safety's approval and the Commission's ratification do not relieve the electrical corporation from any and all otherwise applicable permitting, ratemaking, or other legal and regulatory obligations.
[21] CPZs are portions of a circuit that can be isolated from the rest of the system. https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/vegetation-management.page (accessed July 12, 2021).

2020 WMP and represents a significant improvement to PG&E's initiative selection process.[22, 23]

- PG&E provided 10 times more risk-spend efficiency (RSE) estimates for mitigation initiatives than it did in its 2020 WMP, helping remedy a concern raised in connection with the 2020 WMP that PG&E was combining initiatives for its RSE calculations. These combinations made the RSEs less valuable because they did not allow comparison across initiatives to determine whether certain initiatives had a more favorable RSE than others.
- PG&E improved its inspection process to identify particular issues based on its Failure Modes and Effects Analysis and ignition risk analysis to move away from its previous "run to failure" methodology. This process targets known failures that present higher ignition risk and aims to repair or mitigate them prior to failure occurring.
- PG&E improved its capability to analyze circuit segments across multiple initiatives, including vegetation management and system hardening, and developed plans to avoid conducting vegetation management where system hardening is occurring and vice versa. PG&E is working to tailor its initiative selections to the optimal solution for each CPZ instead of choosing overarching initiatives that may overlap in benefits and therefore not provide the most efficient use of resources.
- PG&E has been working toward consolidating the data collection tools for various vegetation management (VM) activities into a new geographic information system (GIS)-based vegetation management system it calls "One Vegetation Management."[24] A consolidated system will enable PG&E to improve planning, scheduling, and reporting and improve coordination between its numerous VM programs. It is important that PG&E keep track of its various VM programs in a consolidated manner to avoid situations where work done as part of one of its programs is not available to workers handling other VM programs. Anytime VM personnel – regardless of the program on which they work – needs data about a particular tree or trees, the data should be available regardless of which VM resulted in the gathering of the data.

1.2 Revision Notices

A Revision Notice was issued to PG&E on May 4, 2021, to resolve six critical issues in its 2021 WMP Update. PG&E responded to the Revision Notice on June 3, 2021. Table 1 below lists the critical issues contained in the Revision Notice, a brief overview of PG&E's response, and whether Energy Safety deems the response to be sufficient to support approval of the 2021

[22] While these processes were not developed at the time of PG&E's initial submission of its 2021 WMP Update, PG&E presented the changes made to its decision-making process in a presentation given to Wildfire Safety Division on May 21, 2021. Given that this process is now in-place and was developed by the time PG&E refiled its 2021 WMP Update as part of the Revision Notice Response, Energy Safety is including the updates as part of its overall 2021 WMP review.

[23] Energy Safety is seeking more information from PG&E regarding its July 21, 2021, announcement of its plans to underground 10,000 miles of power lines to determine if that plan will impact the decision-making framework presented in PG&E's 2021 WMP Update.

[24] PG&E 2021 WMP Update Revision - Clean, p. 807.

WMP Update. All critical issues were addressed by PG&E in its Revision Notice Response. However, in some instances residual issues remain, and Energy Safety includes new remedies in the relevant sections of this Action Statement, as indicated in Table 1 below.

Table 1: Critical issues.

Critical issue	Description	Utility response	Energy Safety evaluation
RN-PG&E-01 Omission of Quantitative Targets for Reduction in PSPS Scale, Scope, and Frequency	PG&E omitted inclusion of quantitative targets for reducing the scale, scope, and frequency of PSPS events; it does not fully explain how its programmatic commitments over the next WMP cycle will reduce PSPS events; and it projects an increase in customer planned outage hours for 2021 and 2022 despite the implementation of mitigation measures over this time period.	PG&E responded to each required remedy, including: 1) description of changes to its PSPS protocols, 2) quantitative targets for reducing scale, scope, and frequency of PSPS, 3) description of PSPS target methodology, 4) expected quantitative reduction of PSPS scale, scope, and/or frequency from programmatic commitments, 5) detail of how major programs are factored into PSPS projections, and 6) explanation of why its projected customer outage hours for 2021 and 2022 are an increase over recorded customer outage hours in 2020.	PG&E's response sufficiently addresses each required remedy; however, PG&E states that its PSPS approach will likely change in August 2021 and the new approach may be "substantially"[25] different than PG&E's current approach.[26] Energy Safety recognizes the need to continually refine and improve PSPS protocols, but significant changes to PSPS protocols could result in significant changes to PSPS commitments. As soon as practicable, PG&E must provide an update, including showing how its new PSPS protocols affect targets. See key area for improvement PG&E-21-29 below.
RN-PG&E-02 Inadequate Justification of Significant Changes to High Priority Circuit Segments	PG&E does not adequately justify its significant re-prioritization of circuit segments targeted for mitigation. PG&E relies on the results of its 2021 Wildfire Distribution Risk Model ("2021 Risk Model") to justify these changes. However, PG&E does not provide adequate validation of its 2021 Risk Model.	PG&E provided its internal validation report, its third-party review and validation, and other available supporting materials that reviewed and/or validated its 2021 Risk Model. PG&E provided an explanation and timeline for how and when it intends to address all recommendations provided by these reports, reviews, and validations. PG&E provided detailed descriptions of and	PG&E provided the required information. However, additional remedies are required. Third-party evaluation findings provided recommendations for improving PG&E's risk models, including further integration between PG&E's risk model and PSPS model, a need for a stronger connection between SMEs and the model, and the need for a roadmap for further development of the models. To provide transparency, as well as ensure that PG&E is addressing the third-party's findings, PG&E must provide updates on its progress for

[25] PG&E Revision Notice response, section 2 "2021 PSPS Protocols," page 983.
[26] In its Revision Notice response, PG&E labels its current PSPS protocols, in effect from May 2021 through August 2021, as "2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags."

Critical issue	Description	Utility response	Energy Safety evaluation
		justification for modeling assumptions, choice of inputs, and accuracy of outputs.	implementing the recommended changes. This issue is addressed in key area for improvement PG&E-21-06. See Section 5.1 for additional details.
RN-PG&E-03 Unacceptable Aggregation of System Hardening Risk-Spend Efficiencies (RSEs)	PG&E does not provide individual RSE estimates for its system hardening initiatives and instead provides one RSE for distribution system hardening.	PG&E provided the detailed costs, miles treated, RSE estimates, and other relevant information and data for each of the following mitigations: covered conductor installation, undergrounding, and remote grid. PG&E submitted this information as a revised Table 12.	PG&E addressed the critical issue by providing the costs, miles treated, and RSE estimates for covered conductor installation, undergrounding, and remote grid. Additional discussion on RSEs can be found in Section 5.8. Related issues and key areas for improvement regarding RSEs include PG&E-21-26 through 28.
RN-PG&E-04 Equivocating Language in Asset Inspection QA/QC Process Descriptions	PG&E continues to use vague, noncommittal, and equivocating language to describe its processes for quality assurance and quality control (QA/QC) of distribution and transmission asset inspections.	PG&E revised its 2021 WMP Update to describe its QA/QC processes for its asset inspections using specific, measurable, quantifiable, and verifiable language and described its internal plans to address QA/QC issues related to asset inspections.	PG&E's response was complete and this issue is resolved. See additional discussion in Section 5.4 on key areas of improvement for QA/QC in PG&E-21-17.
RN-PG&E-05 Unresolved Discrepancies in Vegetation Management Expenditure Data and Their Effect on the WMP	PG&E continues to provide inconsistent data for its vegetation management program since 2019.	PG&E submitted a revised Table 12 and explained in full and complete detail why spend information was so drastically different from previous submissions and what quality controls it has in place.	PG&E provided the required information, including a revised Table 12. However, Energy Safety remains concerned about the inconsistency of data and supports PG&E's proposal to hire a "business liaison" for each major WMP initiative category."[27] See additional discussion in Section 5.5.
RN-PG&E-06 Contradictory Reduction in Expenditure Allocation for Critical Vegetation Management Initiatives	PG&E significantly reduces budget allocations for initiatives considered critical to effective execution of its vegetation management programs.	PG&E explained how it is ensuring it is still meeting its risk reduction targets from vegetation contact considering its modified percentage allocation and expenditure reduction, as compared to the 2020 WMP. PG&E also provided requested details on its	PG&E's response was complete. However, the details PG&E provided regarding initiatives 7.3.5.13, QA/QC of vegetation inspections, and 7.3.5.14, recruiting and training of vegetation management personnel, raise additional concerns. See Section 5.5 for additional discussion on future

[27] PG&E 2021 WMP Update Revision – Clean, p. 417.

Critical issue	Description	Utility response	Energy Safety evaluation
		vegetation management program.	remedies required in the 2022 WMP Update.

Additional discussion of Energy Safety's evaluation of PG&E's Revision Notice Response can be found in the following sections:

- On Revision Notice Issue RN-PG&E-01: Section 6.0
- On Revision Notice Issue RN-PG&E-02: Section 5.1
- On Revision Notice Issue RN-PG&E-03: Section 5.8
- On Revision Notice Issue RN-PG&E-04: Section 5.4
- On Revision Notice Issue RN-PG&E-05: Section 5.5
- On Revision Notice Issue RN-PG&E-06: Section 5.5

1.3 Key Areas for Improvement and Remedies

Energy Safety evaluated the 2021 WMP Updates with a particular focus on how the utility's chosen mitigations and strategies will drive down the risk of utility-related wildfires as well as the scale, scope, and frequency of PSPS events. Energy Safety approves PG&E's 2021 WMP Update; however, Energy Safety finds that PG&E must focus over the next year on the areas summarized in Table 2 below. While continued progress toward maturity is important in all areas of a utility's WMP, Energy Safety finds these areas to be key for PG&E to continue to drive down utility-related wildfire risk. Energy Safety expects PG&E to take action to address these key areas[28] and report on progress made over the year in a Progress Report due by 5:00 p.m. on November 1, 2021, and in its 2022 WMP Update. Energy Safety will closely monitor progress in each of these areas over the coming year.

Table 2 provides a summary of the key areas for improvement and remedies and has been edited for length. A version of this table containing the full text of the key areas for improvement and remedies is contained in Appendix 10.1.

In addition to the table below summarizing key areas for improvement, each key focus area and any required follow-up are denoted by a table in the respective detailed evaluation section.

[28] PG&E must address the complete key areas for improvement and associated remedies which can be found in the corresponding initiative section and Appendix 10.1 of this Action Statement.

Table 2: Summary of key areas for improvement and remedies.

Risk Assessment and Mapping (Section 5.1)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-01 Unclear inclusion of future climate data into planning	PG&E's 2021 WMP Update does not include PG&E's climate resilience team's evaluation of High Fire Risk Areas (HFRA)[29] map initiatives in order to validate that the maps are consistent with climate projections.	PG&E must explain how it incorporates components of its climate resilience team's report into its own risk assessment.
PG&E-21-02 Lack of consistency in approach to wildfire risk modeling across utilities	The utilities do not have a consistent approach to wildfire risk modeling. They face similar enough circumstances that there should be some level of consistency in statewide approaches to wildfire risk modeling.	The utilities[30] must collaborate through a working group facilitated by Energy Safety to develop a more consistent statewide approach to wildfire risk modeling. A working group will allow for collaboration among the utilities, stakeholder and academic expert input, and increased transparency.
PG&E-21-03 Inadequate speed of improvements made to risk modeling	PG&E self-reported a low risk assessment score in the Maturity Model with slower growth in comparison to the other two large investor-owned utilities (IOUs). Thus, PG&E fails to demonstrate growth at an adequate speed in regard to its risk assessment.	PG&E must demonstrate that it is applying automation as quickly as possible, explaining any constraints on progress, and supply its workplan to enhance its modeling efforts.
PG&E-21-04 PG&E does not adequately justify the wind speed inputs it uses in its Probability of Ignition Models.	PG&E's Outage Producing Winds (OPW) Model finds a correlation between equipment failure and high wind speed. Despite the correlation, PG&E does not use peak wind speed as part of its input data set for its Equipment Probability of Ignition Model.	PG&E must demonstrate that it appropriately accounts for wind speed in its Probability of Ignition Models' input data sets and addresses discrepancies between its input data sets and those of its peer utilities.
PG&E-21-05 Lack of PSPS consequence model at a circuit-segment level	PG&E does not describe any specific efforts or progress regarding the development of the PSPS risk model. The incorporation of PSPS consequence risk into the total risk reduction of a mitigation initiative is crucial to the selection process.	PG&E must provide a detailed update on the functionality of its PSPS consequence model at a circuit-segment level; and quantitative targets for any remaining work or future developments.

[29] PG&E 2021 WMP Update at p. 85. PG&E identified areas of increased fire risk that are not currently included in the CPUC-designated HFTD and defined these as High Fire Risk Areas.

[30] Here "utilities" refers to SDG&E and Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), PacifiCorp, Bear Valley Electric Service, Inc. (BVES), and Liberty Utilities; although this may not be the case every time "utilities" is used through the document.

PG&E-21-06 Insufficient transparency for modifications to Wildfire Risk Models and circuit segment prioritization	In response to RN-PG&E-02, PG&E provided justification for its reprioritization of circuit segments and also provided the third-party review of its 2021 Wildfire Distribution Risk Model. The third-party's analysis included recommendations for PG&E to improve its Wildfire Risk Models. PG&E must continue to update its models and report its progress in implementing the third-party's evaluation recommendations.	PG&E must provide an update on progress made on each of the third-party's recommendations and an updated timeline for addressing the recommendations. PG&E must detail what changes have been made to its 2021 risk models since the submission of its 2021 WMP Update and describe changes it has made to its circuit segment prioritization since the submission of its 2021 WMP Update.
Situational Awareness and Forecasting (Section 5.2)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-07 PG&E's DFA and EFD technology pilot outcome is lacking justification for the scope of installment	Following PG&E's 2020 pilot project for Distribution Fault Anticipation (DFA) and Early Fault Detection (EFD) technology, PG&E determined to ramp up deployment to 600-800 circuits. However, PG&E lacks details and performance metrics on the pilot outcome and how PG&E made the decision to ramp up deployment.	PG&E must provide details and performance metrics on the outcome of the 2020 DFA and EFD technology pilot program and explain how the determination was made to increase deployments of DFA/EFD technology across its service territory.
PG&E-21-08 Weather station program target not met	PG&E's 2021 WMP Update originally reported installation of 404 weather stations in 2020, surpassing its program target of 400. However, in PG&E's revised 2021 WMP Update the weather station installations changed to 378 in 2020, falling short of its target without explanation.	PG&E must provide details on why PG&E did not meet the targeted 400 weather station installs in 2020 and explain why weather station installation totals in the original 2021 WMP Update differ from the revised 2021 WMP Update.
Grid Design and System Hardening (Section 5.3)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-09 Limited evidence to support the effectiveness of covered conductor	The rationale to support the selection of covered conductor as a preferred initiative to mitigate wildfire risk lacks consistency among the utilities. The utilities have not demonstrated a full understanding of the long-term risk reduction, cost-effectiveness, and field performance of covered conductor, and fail to provide adequate comparison to other initiatives' ability to reduce PSPS risk.	The utilities must coordinate to develop a consistent approach to evaluating the long-term risk reduction and cost-effectiveness of covered conductor deployment (including the effectiveness of covered conductor in the field in comparison to alternative initiatives) and to determining how covered conductor installation compares to other initiatives in its potential to reduce PSPS risk.
PG&E-21-10	The pace of PG&E's current program for expulsion fuse replacements is not	PG&E must demonstrate that it is replacing expulsion fuses with fuses that reduce wildfire risk at a speed that adequately addresses risk;

Insufficient pace of expulsion fuse replacement plan	proportional to those of SDG&E and SCE.[31] The slower pace is especially problematic given PG&E's larger service territory.	explain current limits or constraints on the scope of PG&E's expulsion fuse replacement program; and increase the pace of its expulsion fuse replacement program, provided reasonable constraints do not limit such expansion.
PG&E-21-11 Insufficient detail regarding installation of expulsion fuses in HFTD areas	PG&E continues to install non-exempt expulsion fuses, which are considered to be fire hazards, in HFTD areas. PG&E does not detail whether the non-exempt expulsion fuses it installed in the HFTD in 2019 and 2020 were installed under allowable circumstances.	PG&E must explain the circumstances under which it installed non-exempt expulsion fuses in HFTD areas; and clarify if any of the new expulsion fuses it is installing in the HFTD in 2021 and beyond are non-exempt fuses.
PG&E-21-12 Failure to adequately track copper conductor replacements and insufficient detail regarding targeting replacements to highest risk areas	PG&E identified that copper conductor poses a high risk due to its high incidence of failure yet does not currently track completed copper reconductoring projects nor provide sufficient evidence that its copper reconductoring plan targets the highest risk circuits.	PG&E must develop a workplan to target and track copper reconductoring projects; and demonstrate that it is targeting its copper reconductoring projects to its highest risk circuits, including justification for any projects outside of the HFTD.
PG&E-21-13 Failure to demonstrate that system hardening plan targets highest risk circuit segments	A small percentage of circuit-segments in PG&E's distribution system pose a high percentage of PG&E's wildfire risk.[32] However, PG&E does not clearly demonstrate that its system hardening plan targets these segments.	PG&E must fully demonstrate that its system hardening mitigation efforts efficiently target reducing wildfire risk and PSPS events, including a description of how PG&E determines the order in which circuit segments are scheduled for mitigation.
PG&E-21-14 Inadequate transparency of	PG&E provides limited detail regarding its short-term system hardening plan and does not include its long-term system hardening plan. Additionally, PG&E's July 21, 2021, press release[33] regarding its intention to	PG&E must provide additional detail on its short-term system hardening plans; provide its long-term system hardening plan; explain how, if at all, PG&E's recently announced undergrounding plan changes its decision-

[31] Cal Advocates' Comments state at p. 36: "PG&E has approximately 22,000 expulsion fuses in HFTDs and forecasts replacing about five percent of them in 2021" which is approximately 1,100 fuses. At this rate, it will take PG&E nearly two decades to remove all the expulsion fuses from the HFTD. By comparison, BVES replaced 2,200 in 2020, which is more expulsion fuses than PG&E in 2020, although PG&E's service territory is two thousand times larger than BVES. In 2021, SDG&E replaced "3,179 (with a focus in Tiers 3 and 2 of the HFTD), bringing the total replaced to 5,669 out of the 11,000 total populations of such fuses in the HFTD" (according to SDG&E's 2021 WMP Update, p. 197). SCE is replacing "13,000 locations by the end of 2022 (cumulative from the inception of the program in 2018)" (according to SCE's 2021 WMP Update, p. 216).

[32] "2021 Wildfire Mitigation Plan Workshop Grid Design and System Hardening" presented February 23, 2021, p. 4.

[33] "PG&E Announces Major New Electric Infrastructure Safety Initiative to Protect Communities From Wildfire Threat," July 21, 2021: https://investor.pgecorp.com/news-events/press-releases/press-release-details/2021/PGE-Announces-Major-New-Electric-Infrastructure-Safety-Initiative-to-Protect-Communities-From-Wildfire-Threat/default.aspx (accessed July 28, 2021).

system hardening plan	underground 10,000 miles of power lines indicates that PG&E may change the system hardening plan and initiative selection process presented in PG&E's 2021 WMP Update.	making framework for initiative selection; and provide an update on its system hardening efforts.
Asset Management and Inspections (Section 5.4)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-15 Insufficient detail regarding covered conductor maintenance	PG&E does not provide sufficient detail on its covered conductor maintenance requirements. PG&E does not explain or justify its spend projections for covered conductor maintenance, which decrease from 2021 to 2022 despite the constant projected line miles.	PG&E must provide its procedures for determining when covered conductor maintenance is required and explain why PG&E's cost projections decrease from 2021 to 2022 despite line mile projections remaining the same.
PG&E-21-16 Insufficient evidence of effective covered conductor maintenance program	PG&E does not have a separate covered conductor maintenance program.	PG&E must either provide all supporting material to demonstrate that its maintenance programs effectively maintain its covered conductor or enhance its current operations and explain how the enhancements will effectively maintain its covered conductor.
PG&E-21-17 Insufficient evidence of QA/QC for work performed by contractors	Several PG&E internal audits revealed contractors that failed to follow procedures. PG&E's response to these issues was insufficient.	PG&E must demonstrate that it is tracking the quality of contractor work; describe how it is addressing underperforming contractors; and describe how it is expanding quality control of work performed by contractors.
Vegetation Management and Inspections (Section 5.5)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-18 Minimally planned maturity of VM program	PG&E has increased the scale of its VM program but does not foresee maturing five of six VM Maturity Model capabilities. PG&E must create a long-term VM maturation strategy and establish clear goals and targets to prioritize work and monitor progress toward its risk-reduction goals.	PG&E must clearly define goals and targets to reach each level of maturity for Maturity Model capabilities 21-26 and include a timeline for completion of the goals and targets from. PG&E must also provide a long-term vision for each VM initiative in Subsection 5 "Future improvements to the initiative" (or similar) including any relevant timelines.
PG&E-21-19 Delays in achieving mutually agreeable	PG&E cites delays in reaching mutually agreeable environmental and community impact mitigation efforts that result in	PG&E must show progress on achieving environmental and community impact mitigation agreements with agencies, local governments, and tribal governments. PG&E

environmental mitigation	PG&E seeking court orders.[34] These delays, judicial or otherwise, can compromise working relationships between the community and state and local environmental agencies and cause further delays to WMP initiatives.	must consider the development of Operations and Maintenance Plans and Memorandums of Understandings with relevant federal, state,[35] and local land managing agencies to facilitate agreed-upon review times of permits and/or vegetation management activities. PG&E must document the outcomes of these efforts and any lessons learned.
PG&E-21-20 Non-inclusion of fire damage attributes in hazard tree assessments	It is unclear whether PG&E uses its Tree Assessment Tool (TAT) to perform hazard tree assessments in post-wildfire response circumstances or uses no tool or standard for this purpose.	PG&E must clarify what tool or standard it and its contractors use in post-wildfire response circumstances for hazard tree assessments for post-fire specifics. If PG&E does not currently use any such tool (including TAT), PG&E must develop a tool or standard for this purpose.
PG&E-21-21 Unknown environmental impact of fire retardant used on a planned basis	PG&E plans to undertake an environmental review of fire-retardant chemicals ahead of the 2021 wildfire season to pilot under its Utility Defensible Space (UDS) program "pre-treat[ing] Right of Ways (ROWs) and around equipment in select locations to limit a spark from causing an ignition." However, long-term, repeated applications of fire retardant in the same area will likely have negative environmental impacts.	PG&E must provide the environmental review report to Energy Safety and its fire retardant application regime including but not limited to the frequency of applications, timing of applications, amount and type of retardant, and locations of applications to the circuit name and CPZ; quarterly reports regarding the deployment of fire retardant to the Compliance Division of Energy Safety per CPUC-approved Compliance Operational Protocols;[36] and an RSE value for its fire retardant application regime.
PG&E-21-22 Incomplete identification of vegetation species and record keeping	PG&E must ensure proper identification of species so that the "regional species risk values" [37] put into the TAT are updated and accurate. While PG&E does not currently prescribe tree work based on specific species, it may choose to do so in the future; in this case, accurate species recordkeeping is essential.	PG&E must use scientific names in its reporting, add genus and species designation input capabilities into its systems that track vegetation, and identify the genus and species of any tree that has caused an outage[38] or ignition[39] in the Quarterly Data Reports (QDRs).
PG&E-21-23	RCP Action-PGE-35[40] (Class A) required PG&E, SCE, and SDG&E to "submit a joint, unified plan" to begin a study of the	PG&E, SCE, and SDG&E will participate in a multi-year vegetation clearance study. Energy Safety will confirm the details of this study in

[34] PG&E Revised 2021 WMP Update p. 691.
[35] This does not include the CPUC nor any environmental review processes already required by the CPUC.
[36] Wildfire Safety Division – Compliance Operational Protocols, issued February 16, 2021, p. 5-7.
[37] PG&E 2021 WMP Update, p. 667.
[38] WSD GIS Data Reporting Standard Version 2, Transmission Vegetation Caused Unplanned Outage (Feature Class), Section 3.4.5 & Distribution Vegetation Caused Unplanned Outage (Feature Class), Section 3.4.7.
[39] WSD GIS Data Reporting Standard Version 2, Ignition (Feature Class), Section 3.4.3
[40] Wildfire Safety Division Evaluation of Pacific Gas and Electric Company's Remedial Compliance Plan can be found here (accessed August 2, 2021):
https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2020/pge-rcp-action-statement-20201230.pdf

Inadequate joint plan to study the effectiveness of enhanced clearances	effectiveness of extended vegetation clearances. PG&E, SCE, and SDG&E presented the "joint, unified" plan to WSD on February 18, 2021. While it was apparent the three large utilities had discussed a unified approach, each utility presented differing analyses that would be performed to measure the effectiveness of enhanced clearances.	due course. The objectives of this study are to: establish uniform data collection standards create a cross-utility database of tree-caused risk events (i.e., outages and ignitions caused by vegetation contact); incorporate biotic and abiotic factors into the determination of outage and ignition risk caused by vegetation contact; and assess the effectiveness of enhanced clearances
PG&E-21-24 Need for quantified vegetation management compliance targets	In Table 12, PG&E only defines quantitative targets for six of 20 VM initiatives. Energy Safety will audit PG&E when a "substantial portion" of PG&E's VM work is complete and needs quantification in this task.	PG&E must define quantitative targets for all VM initiatives. If PG&E contends quantitative targets are not applicable to an initiative, PG&E must fully justify its position, define goals within that initiative, and include a timeline in which it expects to achieve those goals.
Grid Operations and Operating Protocols, Including PSPS (Section 5.6)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-25 Lack of specificity regarding how increased grid hardening will change system operations, change PSPS thresholds, and reduce PSPS events	PG&E does not commit to changes in its PSPS thresholds for increased grid hardening. PG&E does not specify how increased grid hardening will change system operations.	For each mitigation alternative, including pilot program initiatives, PG&E must provide quantitative analysis on: changes in system operations; changes in PSPS thresholds; and estimated changes in the frequency, duration, and number of customers impacted by PSPS events.
Resource Allocation Methodology (Section 5.8)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-26 Inadequate discussion on impact of Risk Spend Efficiencies (RSE) in initiative selection	PG&E does not clearly explain how RSE estimates impact its initiative selection process. RSE estimates provide a pathway to assess the relative benefit provided by the mitigation initiatives and must play an integral role in the selection process. Energy Safety understands the dynamic nature of initiative selection due to work management efficiencies, operational realities, resource constraints, and other factors. However, a clear description of how RSE estimates impact the selection	PG&E must provide an overview of its decision-making framework to include a clear explanation of how RSE estimates impact decision making for initiative selection. The overview must show the rankings of the relative decision-making factors (e.g., planning and execution lead times, resource constraints, etc.) and pinpoint where quantifiable risk reductions and RSE estimates are considered in the initiative selection process. Energy Safety recommends a cascading, dynamic "if-then" style flowchart

	process must be provided to ensure consistency across initiatives.	to effectively demonstrate this prioritization process and satisfy this requirement.
PG&E-21-27 Lack of methodology to verify RSE estimates	PG&E's response to capability 41c of the 2021 Maturity Survey showed that there is no RSE verification process in place. In order to rely on RSEs to select mitigation initiatives, PG&E must have high confidence that the calculated RSEs are accurate. PG&E must develop a methodology to assess the accuracy of its RSE estimates.	PG&E must provide a detailed RSE verification plan with attainable benchmarks and timeline.
PG&E-21-28 RSE values vary across utilities	Energy Safety raises a concern that there are stark variances in RSE estimates, sometimes on several orders of magnitude, for the same initiatives calculated by different utilities. There are also significant discrepancies between the utilities' inputs and assumptions, which further support the need for exploration and alignment of these calculations.	The utilities must collaborate through a working group facilitated by Energy Safety to develop a more standardized approach to the inputs and assumptions used for RSE calculations. After Energy Safety completes its evaluation of the 2021 WMP Updates, it will provide additional detail on the specifics of this working group.
Public Safety Power Shutoff (PSPS), Including Directional Vision for PSPS (Section 6)		
Utility-# and title	**Summary of issue description**	**Summary of remedies required and alternative timeline if applicable**
PG&E-21-29 PSPS targets and projections set to expire	PG&E will update its PSPS approach and the PSPS targets and projections presented in its WMP Update and Revision Notice response will become obsolete.	After PG&E updates its PSPS approach, PG&E must submit a Change Order Report describing its updated PSPS protocols and show how its new PSPS protocols affect PSPS projections and targets.

In addition to the key areas for improvement listed in Table 2 above, Energy Safety lists additional issues for continued improvement to increase the maturity of PG&E's wildfire mitigation capabilities in the evaluation sections below. These additional issues are denoted by bullet points. Energy Safety expects PG&E to take action to address these issues and report on progress made over the year in its 2022 WMP Update.

1.4 Maturity Model Evaluation

The WSD introduced a maturity model (the Utility Wildfire Mitigation Maturity Model) in 2020, providing a method to assess utility wildfire risk reduction capabilities and examine the relative maturity of individual wildfire mitigation programs. In 2020, the utilities completed a survey setting a baseline for maturity as well as anticipated progress over the three-year plan period. In 2021, the utilities again completed the survey, enabling Energy Safety to monitor progress and ascertain potential improvements to maturity based on progress to date.

The ten maturity and mitigation initiative categories are listed below in Section 5. Each capability within a category was assigned a level, from 0 – 4 range, with 0 being the lowest and 4 the highest. The levels were calculated using an "all or nothing" binary approach. Thus, to reach a specific maturity level, an electrical corporation would have to meet 100 percent of the threshold requirements for that level. Refer to Attachment 11.1 of this Action Statement for more details.

Energy Safety makes the following key findings regarding PG&E's maturity progress in 2021:

- PG&E currently rates its own highest maturity in the areas of
  - Situational Awareness & Forecasting (1.4)
  - Grid Operations & Protocols (1.3)
  - Stakeholder Cooperation & Community Engagement (1.4)
- The two areas where PG&E anticipates the most maturity growth by the end of the 2020-22 WMP cycle are:
  - Data Governance (from 0.3 to 2.8)
  - Emergency Planning & Preparedness (from 0.4 to 3.6)
- PG&E's overall maturity ranks considerably behind both SCE and SDG&E in several significant categories:
  - Grid Design & System Hardening (0.8)
  - Asset Management & Inspections (0.8)
  - Vegetation Management & Inspections (0.7)
  - Data Governance (0.8)
  - Resource Allocation Methodology (0.8)
  - Emergency Planning & Preparedness (2.0)
- PG&E does not foresee maturing five of six VM Maturity Model capabilities.[41]
- PG&E rates its current Vegetation Management & Inspections maturity at only 0.7 and only foresees improvement to 1.0. By comparison, SCE foresees improving from 2.0 to 3.0 across the WMP cycle, and SDG&E foresees improvement from 2.7 to 3.3.
  - PG&E reported maturity thresholds of zero for both current and cycle-end estimates for capability 24 (Vegetation Grow-In Mitigation) and capability 25 (Vegetation Fall-In Mitigation). These scores reflect PG&E's reported length of time in removing vegetation from rights of way.
- PG&E estimates that its resource allocation methodology maturity will increase from 0.2 to 1.5 across the WMP cycle. By comparison, SCE anticipates improvement from 0.8 to 2.7; SDG&E from 1.0 to 2.5. Much of this disparity appears to stem from PG&E's lack of methodology for verifying its risk-spend estimates.

[41] PG&E does not foresee maturing in the following VM related capabilities: vegetation inspection cycle (capability 22), vegetation inspection effectiveness (capability 23), vegetation grow-in mitigation (capability 24), vegetation fall-in mitigation (capability 25), and QA/QC for vegetation management (capability 26). See PG&E's 2021 response to the Maturity Survey (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/pge-2021-survey.pdf

- For capability 40a of the 2021 Maturity Survey PG&E selected "Utility has accurate relative understanding of cost and effectiveness to produce a reliable risk spend efficiency estimate." This selection is at odds with capability 41c, for which PG&E selected "Utility does not verify RSE estimates" for the WMP cycle 2020 – 2023.
- PG&E self-reported a low score in risk modeling automation, with slower growth than its peer utilities.[42] PG&E overhauled its modeling efforts between the 2020 and 2021 WMP submissions. However, PG&E fails to demonstrate growth at a rate comparable to its peers in its risk modeling automation. (For additional information on this issue see Section 5.1 "Risk Assessment and Mapping.")

2. WILDFIRE SAFETY ADVISORY BOARD INPUT

The Wildfire Safety Advisory Board (WSAB) provided recommendations on the WMP Updates of PG&E, Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E) on April 16, 2021. Energy Safety has considered the WSAB's recommendations and incorporates its input throughout this Action Statement. The WSAB's recommendations focused on the following areas:

Risk Assessment, Mapping and Resource Allocation

- All three utilities are now creating their own in-house models and using models created by other vendors. The WSAB is concerned that the assumptions, algorithms, and outcomes of the models are not being closely and transparently reviewed by independent experts to ensure they meet scientific standards.
- The WSAB is concerned that while PG&E does appear to be making great progress in developing its risk models its WMP Update does not report outcomes or how the outcomes have influenced decision-making and prioritization.
- The WMP Updates of all three utilities would benefit from specific examples of how mitigation measures were prioritized based on these models.[43]
- Without undergoing a transparent peer review process, neither Energy Safety nor the public can verify the accuracy of these models. Verifying the accuracy of the models is an essential step in reviewing the rationale for determining priorities. Further, these models must be vetted to ensure the prudent use of ratepayer funds.

[42] Within the responses to the Maturity Survey, for capabilities 1 and 2, PG&E rated itself as not automated for its climate scenario modeling for both current and end of 2023 and ranked its ignition risk automation as currently not automated, expecting to move to partially automated (<50 percent) in 2023. In comparison, SCE rated itself as partially automated for climate scenario modeling for both current and end of 2023 and expects to move from partially automated to mostly automated (>50 percent) for ignition risk. SDG&E rated itself as mostly automated for climate scenario modeling for both current and end of 2023 and expects to move from partially automated to mostly automated for ignition risk.

[43] SCE's 2021 WMP Update, pp. 83-86.

- The utilities should not maintain confidential modeling methods or implementation because the public safety of Californians depends upon our ability to reduce or eliminate utility-caused ignitions and wildfires.
- While the WSAB appreciates the sensitive and confidential nature of the data collected, there are ways to anonymize data so that it may be shared with the scientific community for peer review.

Vegetation Management: Inspections, Strategies, and Pilots

- Energy Safety should consider the impact of the utilities' vegetation management and tree removal practices on the environment, climate change, and wildfire risk. Energy Safety should consider whether the utilities have a tree replacement program and have consulted with ecologists regarding each tree removal.
- PG&E, SCE, and SDG&E should explore creating a statewide database so all incidents can be recorded, with the information to benefit all. This database could also track how species characteristics vary along different environmental gradients. Plants and trees are still being referred to by their genus, within which are hundreds of species. This database could serve as a repository to start narrowing the information and traits of these species.
- The WSAB is very concerned about the instances where PG&E has been cited in violation of environmental regulations by different State of California agencies.[44] The WSAB is troubled by the environmental impacts that are described therein such as discharges in waterways that are deleterious to fish and wildlife, and soil erosion from tree removal.

System Design and Management: Grid Hardening, Operations, Inspections, and Emerging Technology

- The WSAB is impressed with new technologies that are being piloted and deployed including PG&E's distribution fault anticipation and fault current limiting technology. This technology significantly reduces the size of the arcs in the event of a fault which increases worker safety and decreases the risk of ignition. If an ignition does occur, the risk of a high-consequence fire is reduced because the intensity of the arc is shorter, and the size of the arc is smaller.

[44] These violations include:

- Department of Forestry, and Fire Protection (CAL FIRE) Notices of Violation #1-5 between – CZU Lightning Fire Utility Work 1-20NON-00122-SCR October 30, 2020 and February 8, 2020;
- Central Coast Regional Water Quality Control Board December 15, 2020 Notice of Violation for Unauthorized Discharges No. 7019 0700 0001 7649 7673; and
- California Coastal Commission Notice of Violation v-3-20-0089 for Tree Removal in Santa Cruz Mountains.

- The WSAB is concerned about PG&E's reduced system hardening commitment from 342 line-miles in 2020 in HFTD to 180 line-miles in 2021.[45] PG&E has the largest service area of the three IOUs and has the greatest number of lines to harden.
- Energy Safety should request that the IOUs evaluate the risk involved in keeping idle lines or equipment energized versus disconnecting completely when not in use. Energy Safety should require the IOUs remove or de-energize lines and equipment that are not being used, which would lower the risk of those assets failing and causing a fire. PG&E indicates that it addresses idle lines and takes them out of service.[46] However, PG&E's WMP Update does not describe its protocols for the de-energization of idle lines and equipment.
- The WSAB is concerned that none of the utilities' WMP Updates describe their protocols to ensure the safety of their workforce when introducing new technologies or equipment, implementing new work practices, or during the removal, installation, and repair of equipment.

Public Safety Power Shutoffs: Reducing the Scale, Scope and Frequency

- During the WSD workshop held on August 11, 2020, the WSAB presented the System Hardening for Electric Utility Resiliency (SHEUR) threshold.[47] The utilities should develop a methodology (such as the SHEUR threshold) for reducing the risk of both wildfires and PSPS events, and systematically prioritizing grid hardening measures through risk spend efficiency calculations that treat wildfires and PSPS events as risks for the utilities to reduce the scale, scope, and frequency of PSPS.
- Both SCE and PG&E are in the process of developing more robust and adaptive predictive models in this area.

Emergency Planning and Communication: Emergency Preparedness, Stakeholder Cooperation, and Community Engagement

- The WSAB acknowledges the increased maturity level of the utilities in the capabilities of emergency planning and preparedness, stakeholder cooperation, and community engagement.

[45] PG&E 2021 WMP Update at 9.

[46] Board member Mader presented this idea at the August 11, 2020, WSD workshop.

[47] The WSAB presented recommendations to the WSD during the August 11, 2020, WSD Workshop. See also the WSAB Recommendations on the 2021 WMP Guidelines (June 24, 2020), available at the WSAB's website: https://energysafety.ca.gov/who-we-are/wildfire-safety-advisory-board/ (accessed July 30, 2021).

- Each utility offers data to quantify its outreach efforts and how it interacts with the affected populations (e.g., social media outreach, PSPS information workshops, specific customer contacts).[48]

3. PUBLIC AND STAKEHOLDER COMMENT

The following individuals and organizations submitted comments by March 29, 2021, and reply comments by April 13, 2021, on PG&E's 2021 WMP Update:

- Acton Town Council (ATC)
- California Farm Bureau Federation (CFBF)
- Green Power Institute (GPI)
- Joint Local Governments (JLG)
- Kevin Collins
- Mussey Grade Road Alliance (MGRA)
- Professor Catherine Sandoval, Santa Clara University School of Law (SCU Law)
- Protect Our Communities Foundation (PCF)
- Public Advocates Office at the California Public Utilities Commission (Cal Advocates)
- Rural County Representatives of California (RCRC)
- Santa Clara County (SCC)
- Small Business Utility Advocates (SBUA)
- The Utility Reform Network (TURN)
- Valley Women's Club for the San Lorenzo Valley
- Will Abrams

Comments were also provided on PG&E's response to its Revision Notice. The following individuals and organizations submitted comments by June 10, 2021, and reply comments by June 16, 2021, on PG&E's response to its 2021 Revision Notice:

- Green Power Institute (GPI)
- Mussey Grade Road Alliance (MGRA)
- Public Advocates Office at the California Public Utilities Commission (Cal Advocates)

Energy Safety has evaluated comments and concurs with the following stakeholder input on PG&E's 2021 WMP Update and PG&E's 2021 WMP Revision, as reflected in this Action Statement:

- There should be a coordinated approach to the calculation of risk-spend efficiency values across the utilities (MGRA, TURN, Cal Advocates). In particular, there should be a

[48] SCE's 2021 WMP Update describes its regional prioritization and its monthly survey to capture awareness and perception metrics across a sample of its customers. See SCE's 2021 WMP Update, pp. 326-327.

coordinated approach to looking at the costs and risk-spend efficiency of covered conductor installation across the utilities (MGRA, TURN, Cal Advocates).

- There should also be a coordinated approach to the utilities' risk modeling efforts, supported by an Energy Safety-led technical working group (Cal Advocates). The risk models should be subject to verification (MGRA).
- Utilities should explain how post PSPS inspection data informs lessons learned, with the goal for utilities to re-evaluate PSPS thresholds and/or explore alternative solutions (RCRC, GPI, ATC).
- Utilities provided limited analyses on the estimated impacts from pilot programs on PSPS thresholds (PCF, SBUA).
- The utilities need to make more progress on their joint plan to begin a study of the effectiveness of extended vegetation clearances (MGRA).
- The utilities should prioritize wildfire mitigation measures that address ignitions that have external drivers (like high wind) and are likely to occur under the worst possible conditions (i.e., likely to lead to catastrophic fires) (MGRA).
- Use of fire retardant on vegetation as a pre-emptive measure for wildfire prevention could have long-lasting environmental impacts and needs to be studied with rigorous peer and public review before expanding the pilot (RCRC, CFBF, JLG, Cal Advocates).
- The utilities should report in their WMPs every instance of catastrophic wildfire and the lessons they learned (ATC, Will Abrams, Cal Advocates).
- PG&E's enhanced vegetation management is producing large amounts of biomass residue at the clearance site which could serve as dry fuel for future fires (GPI, RCRC, Cal Advocates). Large biomass is also left behind in PG&E's post-fire restoration work (JLG).
- PG&E has poor record-keeping of its contractors which reduces vegetation and asset management quality assurance and quality control (Prof. Sandoval [SCU Law], Cal Advocates).
- PG&E has not addressed its shortcomings in training its personnel and contractors and in tracking ongoing mitigation implementation quality (Cal Advocates, TURN, JLG, Will Abrams, RCRC).
- Despite costly mitigations, PG&E forecasts equal or more frequent use of PSPS in the coming decade. Sectionalization and other grid hardening efforts appear to have had little effect on PSPS risk (MGRA, Valley Women's Club for the San Lorenzo Valley, TURN, Cal Advocates, GPI, SCC, Prof. Sandoval [SCU Law], Kevin Collins, ATC, RCRC).
- PG&E calls for a PSPS even when strong winds are not present – PG&E should explicitly call out PSPS events that are called as a result of poor asset and vegetation management (Will Abrams, ATC, MGRA).
- Weather forecasting and monitoring supports short-term PSPS reduction but does not address long-term grid issues (GPI, RCRC). PG&E's system hardening programs have not demonstrated a material impact on PSPS scale, scope, or frequency (Cal Advocates, MGRA).

- PG&E and SCE's pilots on Rapid Earth Fault Current Limiters (REFCLs) have shown promise as a potential low-cost alternative to address ignition risks such as vegetation contact and wire downs. (MGRA, TURN).
- A significant percent of PG&E's work verification inspections from 2019 and 2020 have findings that are still unaddressed and do not have a timeline to be addressed (Cal Advocates).
- PG&E needs to continue improving how it targets its system hardening and enhanced vegetation management initiatives to the areas that reduce the most risk (Cal Advocates, TURN).

4. DISCUSSION

The following sections discuss in detail PG&E's 2021 WMP Update, including progress over the past year, issues, and remedies to address by the next annual submission.

4.1 Introductory Sections of the WMP

The first two sections of the WMP Guidelines[49] require the utility to report basic information regarding persons responsible for executing the plan and adherence to statutory requirements. Section 1 requires contact information (telephone and email) for the executive with overall responsibility and the specific program owners. In addition, all experts consulted in preparation of the WMP must be cited by name and include their relevant background/credentials. Contact information and names may be submitted in a redacted file.

Section 2 requires the utility to specify where each of the 22 requirements from Pub. Util. Code section 8386(c) are satisfied. Each utility shall both affirm that the WMP addresses each requirement AND cite the section and page number where it is more fully described.

PG&E minimally satisfied all 22 requirements from Pub. Util. Code section 8386(c).

Issues and Remedies

While Energy Safety did not identify key areas for improvement in this competency, Energy Safety finds the following issues and directs associated remedies. Energy Safety expects PG&E to take action to address these issues and report on progress made over the year in its 2022 WMP Update.

- ISSUE: (All requirements.) The requested intent of Table 2-1 was to direct readers of the WMP to the section and page where the requirement was addressed. PG&E provided only the section reference.

[49] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 14-21 (accessed May 27, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

    - REMEDY: Provide section *and* page number(s) in this table.
- ISSUE: (Requirement 11) According to the WMP Guidelines, PG&E must provide a "list that identifies, describes, and prioritizes all wildfire risks, and drivers for those risks." PG&E did not provide this list and instead included a footnote that referenced a list. This list was later provided via a data request (see Appendix 10.2).
    - REMEDY: Provide a table with a prioritized list of wildfire risks and drivers and the rationale for prioritization.

4.2 Actuals and Planned Spending for Mitigation Plan

The WMP Guidelines[50] require utilities to report a summary of WMP expenditures, planned and actual, for the current WMP cycle.

This requirement also includes an estimated annual increase in costs to the ratepayer due to utility-related wildfires and wildfire mitigation activities. The WMP Guidelines require that ratepayer impact calculations are clearly shown to demonstrate how each value was derived. Nothing in the request for such information should be construed as approval of any such expenditure, which is left to the CPUC pursuant to Pub. Util. Code section 8386.4(b).

PG&E provided all required information regarding expenditures. However, PG&E's reported spend numbers differed with subsequent data request responses and phone conversations, making it difficult for Energy Safety to confirm the final expenditures. Further detail is explained in the "Issues and Remedies" section below.

See Figure 4.2.a for the comparison of the total WMP actual and planned spends of the three large electrical utilities.

- Comparing the planned spend of the three utilities, PG&E plans to spend the most in the WMP three-year cycle, but SDG&E plans to spend the most territory-wide per overhead circuit mile.
- Comparing the planned spend of the three utilities, PG&E plans to spend the most in the WMP three-year cycle in HFTDs, but SCE plans to spend the most per overhead HFTD circuit mile.
- Like the other utilities, PG&E plans to spend the most in 2022 within the WMP three-year cycle, including about 4.6% more than the projected spending for 2021 (or $5.117 billion).
- 56 percent of PG&E's total WMP cycle spend is on Grid Design and System Hardening.

[50] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 22-24 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

- PG&E's highest-spend initiative for the total WMP cycle is 7.3.5.2 "Detailed inspections of vegetation around distribution electric lines and equipment" ($3.186 billion total WMP cycle planned spend).
- PG&E shows an increase of 2 percent between its 2020 planned and 2020 actual spend ($4.725 billion to $4.821 billion).

PG&E's net changes in spend at the WMP Category level show that initiatives were added, removed or had expenditures reallocated. Planned total WMP cycle spend as reported 2020 WMP vs. 2021 WMP ($M) shows the following:

Spend increased in the following categories:

- Grid Design and System Hardening by $768.6M (+10.31%)
- Vegetation Management and Inspections by $103.7M (+2.41%)
- Data Governance by $229.7M (+124.63%)
- Situational Awareness and Forecasting by $22.1M (+17.46%)
- Stakeholder Cooperation and Community Engagement by $37.6M (+31.89%)
- Resource Allocation Methodology by $14.3M (+216.67%)
- Risk Assessment and Mapping by $2.8M (+16.09%)

Spend decreased in the following categories:

- Asset Management and Inspections by $413.9M (-33.89%)
- Grid Operations and Operating Protocols by $205.6M (-27.01%)
- Emergency Planning and Preparedness by $54.1M (-41.42%)

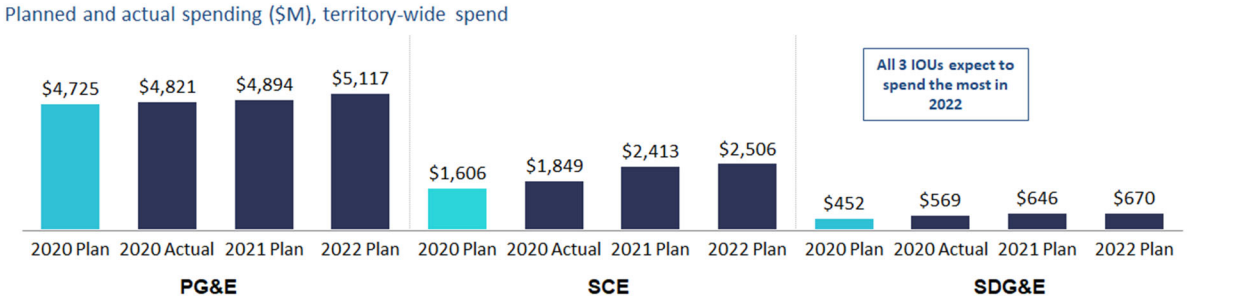
PG&E's planned total WMP three-year cycle expenditures allocation by category in the 2021 WMP Update are ($M and % of total):

- Grid Design and System Hardening $8,225M (56%)
- Vegetation Management and Inspections $4,409M (30%)
- Asset Management and Inspections $808M (5%)
- Grid Operations and Operating Protocols $556M (4%)
- Data Governance $414M (3%)
- Stakeholder Cooperation and Community Engagement $155M (1%)
- Situational Awareness and Forecasting $149M (1%)
- Emergency Planning and Preparedness $76M (0.5%)
- Resource Allocation Methodology $21M (0.1%)
- Risk Assessment and Mapping $20M (0.1%)

Energy Safety requested additional information and clarification from PG&E on their overall spend as described below, under "Issues and Remedies" for this section.

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:



	2020 Plan[1] ($M)	2020 Actual ($M)	2021 Plan ($M)	2022 Plan ($M)	Total WMP Cycle Planned Spend ($M)	Normalized WMP cycle spend per overhead circuit mile ($M)
PG&E	$4,725	$4,821	$4,894	$5,117	$14,832	$.150
SCE	$1,606[2]	$1,849	$2,413	$2,506	$6,768	$.131
SDG&E	$452[3]	$569	$646	$670	$1,886	$.232

SDG&E plans to spend the most per overhead circuit mile

Source: Tables8 and 12 of utility 2021 WMPs, Tables 21-30 of utility 2020 WMPs, subsequent data requests and SCE and PGE Revision Notices
1. SCE had initiatives that were reported in the 2020 WMP but not in the 2021 WMP; those initiatives are included in its 2020 plan totals.
2. In SCE's most recent data request response on 3/09/2021, SCE provided total territory spend but not annual territory-wide cycle spend as reported in 2020. The 2020 planned spend (1.6B) is calculated from SCE's 2020 WMP submission
3. SDG&E did not provide 2020-reported spend data for certain initiatives in their Feb 18 data request, as HFTD vs non HFTD split was not possible for those initiatives. Thus spend numbers from SDG&E's 2020 WMP were used for those specific initiatives.

Figure 4.2.a: Overview of total WMP spend across utilities, territory-wide spend.

As Figure 4.2.a shows, PG&E has the highest spend of the three large electrical utilities but is significantly lower than SDG&E in terms of spend per circuit mile.

	2020 Plan[1] ($M)	2020 Actual ($M)	2021 Plan ($M)	2022 Plan ($M)	Total WMP Cycle Planned Spend ($M)	Normalized WMP cycle spend per overhead HFTD circuit mile ($M)
PG&E	$3,224	$3,339	$3,334	$3,626	$10,299	$.334
SCE	$1,308	$1,357	$1,705	$1,783	$4,845	$.346
SDG&E	$340[2]	$464	$502	$521	$1,487	$.330

SCE plans to spend the most per overhead HFTD circuit mile

Source: Tables8 and 12 of utility 2021 WMPs, Tables 21-30 of utility 2020 WMPs, subsequent data requests, SCE and PGE Revision Notices
1. PG&E and SCE had initiatives that were reported in the 2020 WMP but not in the 2021 WMP; those initiatives are included in their 2020 plan totals.
2. SDG&E did not provide 2020-reported spend data for certain initiatives in their Feb 18 data request, as HFTD vs non HFTD split was not possible for those initiatives. Thus spend numbers from SDG&E's 2020 WMP were used for those specific initiatives.

Figure 4.2.b: Overview of total WMP spend across utilities, HFTD-only spend.

Figure 4.2.b provides a comparison of the high fire threat district actual and planned spends of the three large electrical utilities. As with total overhead circuits in Figure 4.2.a, PG&E's spend for HFTD circuit miles also falls between those of SCE and SDG&E.

Issues and Remedies

While Energy Safety did not identify key areas for improvement in this competency, Energy Safety finds the following issues and directs the associated remedies. Energy Safety expects PG&E to take action to address these issues and report on progress made over the year in its 2022 WMP Update.

- ISSUE: Explanations and amounts of large expenditure shifts in mitigation categories and individual initiatives (2020 actual vs. 2021 planned) were difficult to pin down across a number of phone conversations and data requests.

  PG&E initially showed a marked increase in its total WMP-cycle spend as reported in 2021, compared to that reported in 2020; this apparent increase was due to an inconsistency in reporting, whereby in 2020 PG&E had only reported its spend in the HFTD. In response to data request WSD-006, Q1,[51] PG&E amended its territory-wide cycle spend, anticipated as of 2020. Thus amended, PG&E's planned territory-wide WMP-cycle spend in 2020 was reported to be $15.160B. Territory-wide cycle spend as reported in 2021 was $15.015B, a decrease in planned cycle spend of approximately 1 percent from its 2020 plan to its 2021 plan. This change comprises decreased spend in Vegetation Management and Inspections initiatives and increases in Grid Design and System Hardening.

  Then, in response to a Revision Notice issued by WSD on May 4, 2021, PG&E again amended its planned WMP cycle spend as reported for 2020 to 14.3B, and its plan as of 2021 to $14.8B (see Appendix 10.3). These newer numbers included a range of estimates in spend on covered conductor and undergrounding, so the exact increase in planned spend will vary based on PG&E's covered conductor and undergrounding resource allocation. Issues in resource allocation are further discussed in the "Resource Allocation Methodology" mitigation initiatives and maturity evaluation.

    - REMEDY: PG&E must report all wildfire mitigation-related activity spend in its 2022 and subsequent WMP updates, using the Energy Safety classification scheme required in the upcoming 2022 WMP Update Guidelines. PG&E must

[51] Data request WSD-006, Question 1, can be found here (accessed July 22, 2021): https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page.

provide accurate spend information for its 2022 WMP Update upon initial submission. Any follow-up corrections must be fully explained and justified, with all calculations and underlying data reported to Energy Safety.

4.3 Lessons Learned and Risk Trends

This section of the WMP Guidelines[52] requires utilities to report how their plans have evolved since the 2020 WMP based on lessons learned, current risk trends, and research conducted. This section also requires utilities to report on potential future learnings through proposed and ongoing research.

Utilities must describe how the utility assesses wildfire risk in terms of ignition probability and estimated wildfire consequence using Commission adopted risk assessment requirements (for large electrical corporations) from the General Rate Case (GRC) Safety Model and Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Phase (RAMP) Proceeding at a minimum. The utility may additionally include other assessments of wildfire risk. The utility must:

1. Describe how it monitors and accounts for the contribution of weather and fuel to ignition probability and wildfire consequence.
2. Identify any areas where the Commission's HFTD should be modified.
3. Explain any "high fire threat" areas the utility considers that differ from Commission-adopted HFTD, and why such areas are so classified.
4. Rank trends anticipated to have the greatest impact on ignition probability and wildfire consequence.

PG&E provided all required information on lessons learned, current risk trends, and research conducted.

Energy Safety finds that PG&E has made the following progress over the past year:

- PG&E reports it is installing weather and fire monitoring devices across HFTD areas to provide early warning of high fire risk conditions and real-time identification of emerging wildfires, which enable faster action by first responders and more proactive system operations to avert fire ignition and spread. PG&E reports it is nearing the completion of long-term goals for the deployment of weather stations (1,300 by the end of 2021) and HD cameras (600 by the end of 2022).[53]
- PG&E reports it has established a 24/7 meteorology operations and a Wildfire Safety Operations Center (WSOC). These two entities work together to support day-to-day gas and electric system operations broadly as well as support emergency responses and preparation activities. Each has the technology and analytical capabilities to forecast

[52] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 24-29 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.
[53] PG&E 2021 WMP Update at p. 14.

wildfire threat conditions, identify and track actual fires, and support rapid fire response.[54]

- PG&E states that it has substantially updated its wildfire risk modeling and risk assessment tools for the 2021 WMP. PG&E's wildfire risk models produce a quantified risk value that is the product of two terms — the ignition probability and the wildfire consequence at each location. PG&E provides a summary of its models in Table PG&E-4.5-1, which includes the following:[55]
  - Enterprise Risk Model
  - 2021 Wildfire Distribution Risk Model
  - Vegetation Probability of Ignition Model
  - Equipment Probability of Ignition Model
  - Wildfire Consequence Model
  - Vegetation Risk Model
  - Conductor Risk Model
  - Large Fire Probability Model (Distribution) or LFPd Model
  - Large Fire Probability Model (Transmission) or LFPt Model
  - Dead Fuel Moisture Model
  - Live Fuel Moisture Model
  - Transmission Operability Assessment Model or OA Model
  - Outage Producing Wind Model or OPW Model
  - Fire Potential Index Model or FPI Model or Utility FPI Model
- PG&E explains that it uses two forms of models that can be used to address wildfire risk:[56]
  - Planning models which support annual workplans and are based on either worst-case conditions such as weather and fuels or cumulative probabilities of failure or ignition. The 2021 Wildfire Distribution Risk Model is a planning model for the Electric Distribution system.
  - Operational models, such as those used for PSPS events, use real-time weather, fuels data, and asset conditions as reflected by maintenance tags or recently completed asset hardening. The Large Fire Probability Model (Distribution) or LFPD Model is an example of an operational model.
- PG&E reports it has also modeled PSPS consequences to customers at a program level and is currently developing a more granular, circuit level model, to assess the impacts of PSPS de-energizations. PG&E indicates it currently plans to complete this analysis in collaboration with Energy Safety and the other California utilities by September 30, 2021.[57]
- In 2020, PG&E identified areas of increased fire risk that are not currently included in the CPUC-designated HFTD and defined these as High Fire Risk Areas (HFRA).[58] It also completed

[54] PG&E 2021 WMP Update at p. 15.
[55] PG&E 2021 WMP Update at p.121.
[56] PG&E 2021 WMP Update at p.130.
[57] PG&E 2021 WMP Update at p. 139.
[58] PG&E 2021 WMP Update at p. 85.

the first version of the HFRA map, which identified approximately 115 areas that are not included in HFTD areas to be included in its PSPS scope. These HFRA map areas vary from small boundary adjustments (i.e., 0.25 acres) to larger areas (i.e., hundreds of square miles) where ignitions could lead to catastrophic fires during offshore wind events. Many of the larger areas do not contain high numbers of customers or PG&E assets as they are in rural, hard to access locations where a fire could grow and spread rapidly. PG&E provided a map and a high-level summary table depicting the following information:[59]

  - Polygons[60] added: 115
  - Customers added to PSPS scope: 3,000
  - Distribution Circuit Miles within polygons: 620
  - Transmission Circuit Miles within polygons: 230

- PG&E provides detail in Table PG&E-4.2-9[61] identifying macro trends. It discusses change in ignition probability and estimated consequence due to:
  - climate change (warmer winters, extremely dry and wet years have become more common)
  - relevant species, such as bark beetles (invasive insect species can exacerbate forest health concerns and result in hazardous tree conditions that require repetitious monitoring and mitigation by utilities)
  - other drivers of change in fuel density and moisture (forests are becoming denser with decreased presence of large trees and significant tree mortality over the last decade)
  - population changes that could be impacted by utility ignition (with projection of upward population trends continuing, it is likely that populations in the Wildland Urban Interface (WUI) and/or the HFTD areas will relatedly increase)
  - population changes in HFTD that could be impacted by utility ignition (population growth in HFTD areas may exceed, at least in some areas, population growth in non-HFTD areas)
  - population changes in the WUI that could be impacted by utility ignition (given the overall area of the WUI as a percentage of PG&E's service territory, it is likely that population growth in WUI will not be an exception to anticipated trends)
  - Utility infrastructure location in HFTD vs non-HFTD (PG&E anticipates limited net-addition of utility assets in the near future)
  - utility infrastructure location in urban vs rural vs highly rural areas (trends impacting urban vs. rural are largely similar to those impacting HFTD vs non-HFTD)
- PG&E describes how the utility's plan has evolved since 2020, focusing on the primary gaps identified and lessons learned from 2020 and 2019, including risk prioritization of Enhanced

[59] PG&E 2021 WMP Update at p. 86 TABLE PG&E-4.2-8: HIGH LEVEL SUMMARY OF ADDITIONS TO HFTD AREAS.
[60] https://desktop.arcgis.com/en/arcmap/latest/analyze/arcpy-classes/polygon.htm A Polygon object is a closed shape defined by a connected sequence of x, y coordinate pairs.
[61] PG&E 2021 WMP Update at p. 90 TABLE PG&E-4.2-9: MACRO TRENDS IGNITION PROBABILITY AND/OR WILDFIRE CONSEQUENCE.

Vegetation Management (EVM) work, prioritizing the scheduling and execution of system inspections, and the quality of vegetation management activities.[62]

4.4 Inputs to the Plan and Directional Vision for WMP

This section of the WMP Guidelines[63] requires the utility to rank and discuss trends anticipated to exhibit the greatest impact on ignition probability and wildfire consequence within the utility's service territory over the next 10 years. First, utilities must set forth objectives over the following timeframes: before the upcoming wildfire season, before the next annual update, within the next 3 years, and within the next 10 years. Second and more practically, utilities must report the current and planned qualifications of their workforce they expect in order to meet these objectives.

Goal, objectives, and program targets:

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

The WMP Guidelines[64] require utilities to provide their objectives which are unique to each utility and reflect its 1, 3, and 10-year projections of progress toward the WMP goal. The WMP Guidelines also require utilities to report their unique program targets, which are quantifiable measurements of activity identified in WMPs and subsequent updates used to show progress toward reaching the objectives, such as number of trees trimmed or miles of power lines hardened.

PG&E provides all required information on its overall objectives and WMP program targets in Tables 5.3-1 and 5.2-1. PG&E referenced its objectives and program targets that were described extensively in its first quarterly report.

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[62] PG&E 2021 WMP Update pp. 46-50.
[63] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 29-31 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.
[64] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 29-30 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

Issues and remedies

While Energy Safety did not identify key areas for improvement in this competency, Energy Safety finds the following issue and directs the associated remedy. Energy Safety expects PG&E to take action to address this issue and report on progress made over the year in its 2022 WMP Update.

- ISSUE: PG&E does not have a sufficient methodology for establishing and committing to long-term plans in wildfire mitigation despite being able to in all other areas of planning and operations within their business.
  - REMEDY: PG&E must develop a robust methodology for planning out 10 years (or longer) within its Wildfire Mitigation Plan to reduce long-term risk and buy down the costs of mitigation efforts.

Workforce planning:

This subsection of the WMP Guidelines[65] requires utilities to report their worker qualifications and training practices regarding utility-related wildfire and PSPS mitigation for workers in mitigation-related roles including:

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

PG&E has met all the required elements of this subsection. For additional discussion on workforce issues specific to vegetation management, see section 5.5.

4.5 Metrics and Underlying Data

The WMP Guidelines[66] require utilities to report metrics and program targets as follows:

- *Progress metrics* that track how much utility wildfire mitigation activity has managed to change the conditions of a utility's wildfire risk exposure in terms of drivers of ignition probability.
- *Outcome metrics* that measure the performance of a utility and its service territory in terms of both leading and lagging indicators of wildfire risk, PSPS risk, and other direct and indirect consequences of wildfire and PSPS, including the potential unintended consequences of wildfire mitigation work.

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[65] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 30-31 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

[66] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 32-41 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

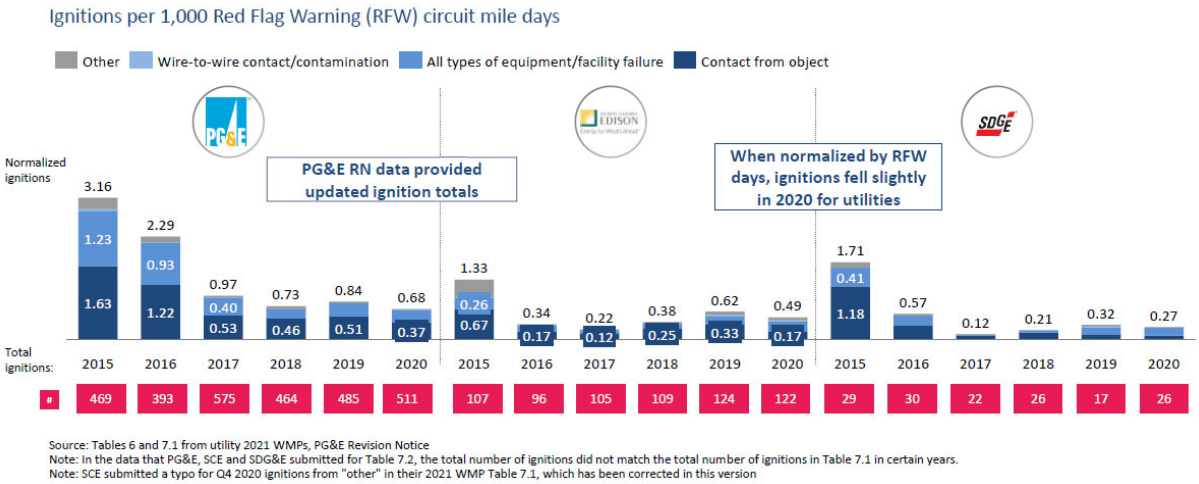
- *Program targets* measure tracking of proposed wildfire mitigation activities used to show progress toward a utility's specific objectives.[67] Program targets track the utility's pace of completing activities as laid out in the WMPs but do not track the efficacy of those activities. The primary use of these program targets in [year] will be to gauge utility follow-through on existing WMPs.

This section also requires utilities to provide several geographic information system (GIS) files detailing spatial information about their service territory and performance, including recent weather patterns, location of recent ignitions, area and duration of PSPS events, location of lines and assets, geographic and population characteristics, and location of planned initiatives.

See the Data Governance section for a review of the utility's progress and shortcomings in its Quarterly Data Reports.

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

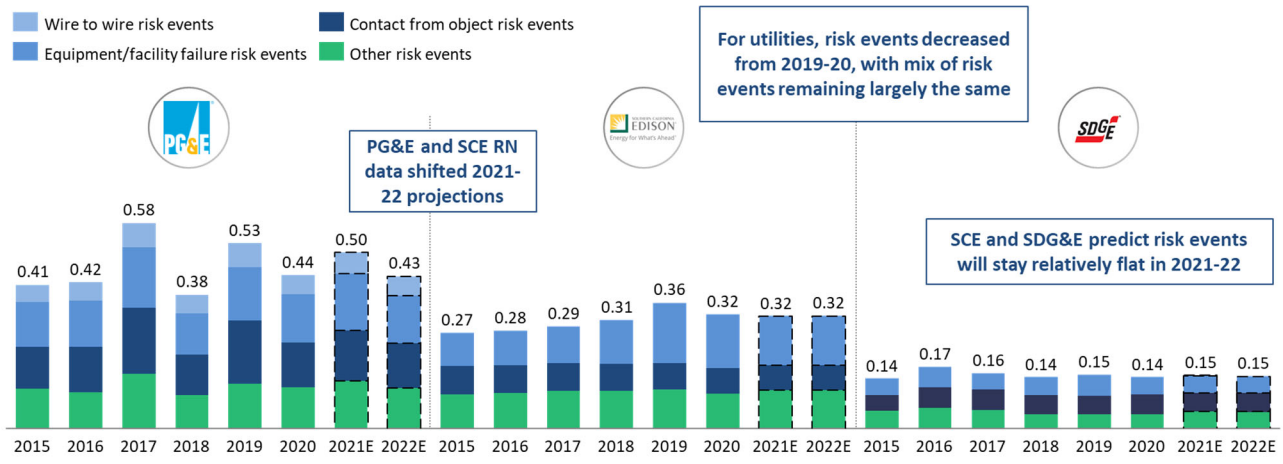


Source: Tables 6 and 7.1 from utility 2021 WMPs, PG&E Revision Notice
Note: In the data that PG&E, SCE and SDG&E submitted for Table 7.2, the total number of ignitions did not match the total number of ignitions in Table 7.1 in certain years.
Note: SCE submitted a typo for Q4 2020 ignitions from "other" in their 2021 WMP Table 7.1, which has been corrected in this version

Figure 4.5.a: Number of ignitions per 10,000 RFW circuit mile days, IOUs.

PG&E generally has more ignitions per overhead circuit mile compared to SCE and SDG&E (Figure 4.5.a). However, when normalized by RFW days, ignitions were reduced in 2020 for PG&E, SCE, and SDG&E. Ignitions are generally dominated by contact from objects, with equipment failure also representing a considerable fraction.

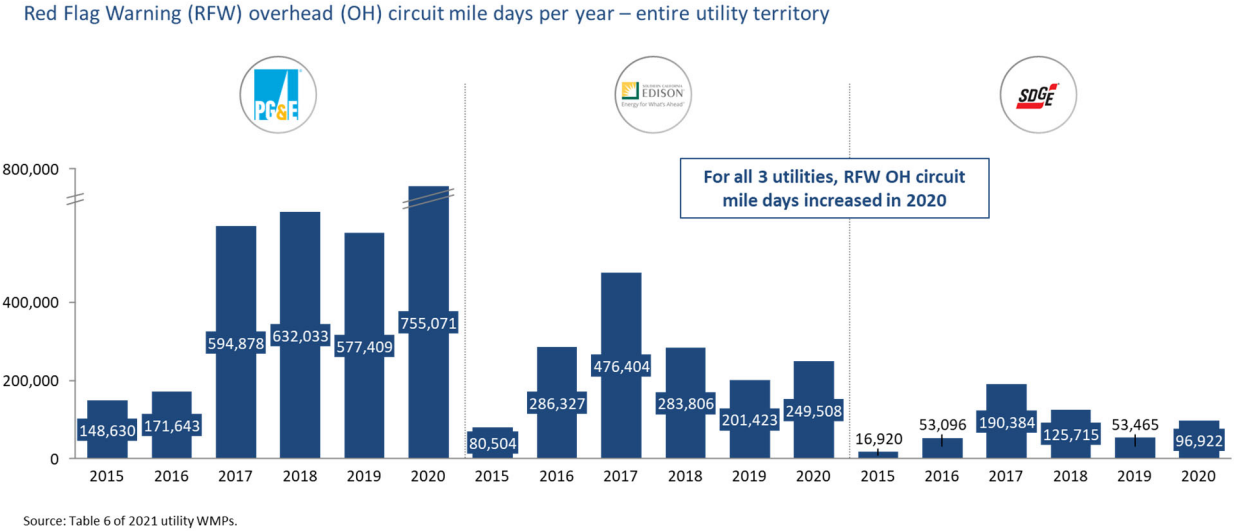
[67] Objectives are unique to each utility and reflect the 1, 3, and 10-year projections of progress toward the WMP goal. See section 5.4 for review of the utility's objectives.



Source: Risk events from Table 7.1 of utility 2021 WMPs, overhead circuit miles from Table 8 of utility 2021 WMPs, PG&E Revision Notice
Note: A risk event is defined as an event 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.

Figure 4.5.b: Risk events per overhead circuit mile, including ignitions, IOUs.

PG&E has the most risk events per overhead circuit mile, including ignitions (Figure 4.5.b) compared to SCE and SDG&E. PG&E projects a rise in risk event frequency in 2021, but then a slight decline in 2022. Consistent with this trend, PG&E experiences both more Red Flag Warning overhead circuit mile days per year than SCE and SDG&E do (Figure 4.5.c) as well as a greater percentage of increase from 2019 to 2020.



Source: Table 6 of 2021 utility WMPs.

Figure 4.5.c: Red Flag Warning (RFW) overhead circuit mile days, large utilities.

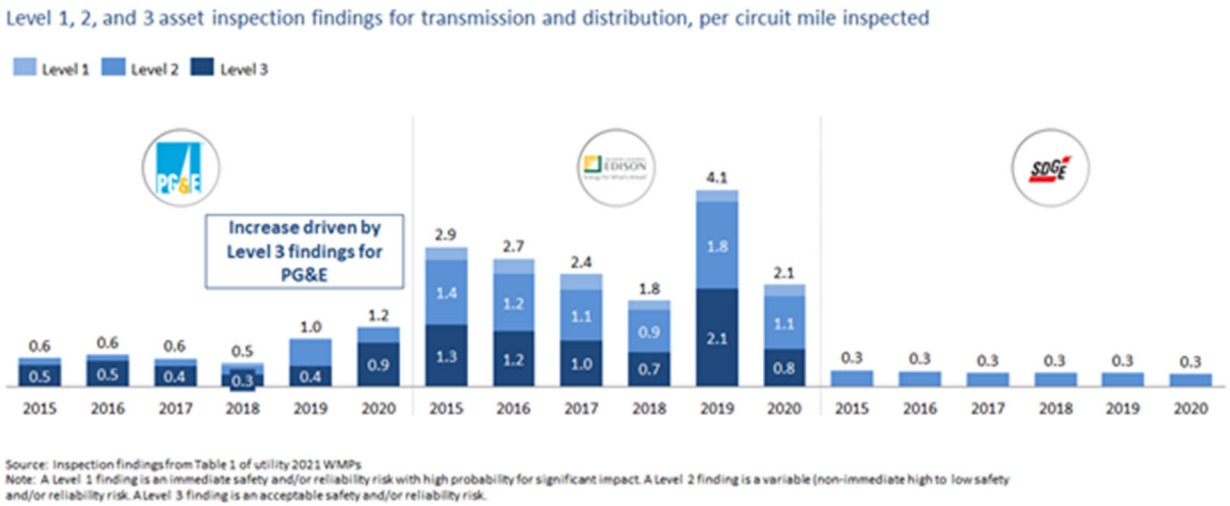


Figure 4.5.d: Asset inspection findings per circuit mile inspected, IOUs.

SCE has considerably more asset inspection findings than either PG&E or SDG&E (Figure 4.5.d). PG&E findings increased in 2019 and 2020 due to an increase in Level 3 findings but remain well below SCE findings.

A summary of PG&E's spatial data submission is included in the Data Governance section (Section 5.7).

5. MITIGATION INITIATIVES AND MATURITY EVALUATION

This section of the WMP Guidelines[68] is the heart of the plan and requires the utility to describe each mitigation initiative it will undertake to reduce the risk of catastrophic wildfire. The utility is also required to self-report its current and projected progress to mitigate wildfire risk effectively,[69] a capability referred to in this document as "maturity" and measured by Energy Safety Utility Wildfire Mitigation Maturity Model ("Maturity Model"). Utility maturity is measured across the same categories used to report mitigation initiatives listed below, allowing WSD to evaluate a utility's reported and projected maturity in wildfire mitigation in the context of its corresponding current and planned initiatives. The ten maturity and mitigation initiative categories are listed below, with further details in Appendix 10.3:

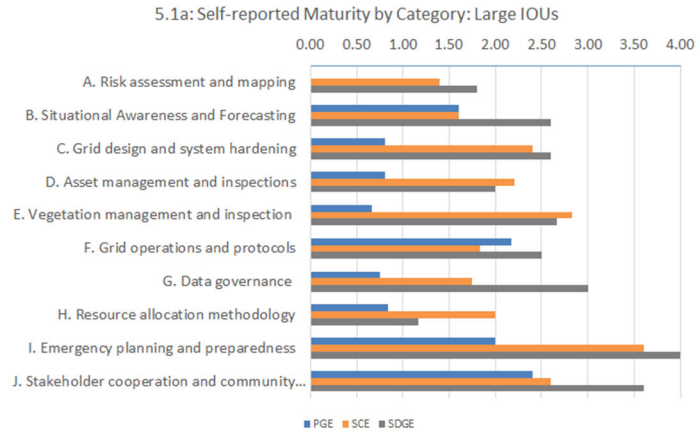
[68] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 42-46 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

[69] Utilities that submitted a WMP were required to complete a survey in which they answered specific questions which assessed their existing and future wildfire mitigation practices across 52 capabilities at the time of submission and at the end of the three-year plan horizon. The 52 capabilities are mapped to the same ten categories identified for mitigation initiatives. The results of the survey can be found in Attachment 11.1 The most recent survey for each utility can be found on Energy Safety website here: https://energysafety.ca.gov/what-we-do/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2021-wmp/.

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

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

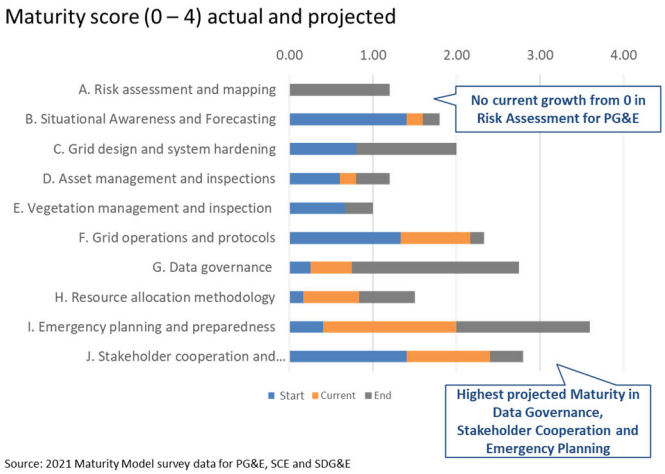


5.1a: Self-reported Maturity by Category: Large IOUs

Category	PGE	SCE	SDGE
A. Risk assessment and mapping	0.00	1.40	1.80
B. Situational Awareness and Forecasting	1.60	1.60	2.60
C. Grid design and system hardening	0.80	2.40	2.60
D. Asset management and inspections	0.80	2.20	2.00
E. Vegetation management and inspection	0.67	2.83	2.67
F. Grid operations and protocols	2.17	1.83	2.50
G. Data governance	0.75	1.75	3.00
H. Resource allocation methodology	0.83	2.00	1.17
I. Emergency planning and preparedness	2.00	3.60	4.00
J. Stakeholder cooperation and community engagement	2.40	2.60	3.60

Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.a: Self-reported maturity by category, IOUs.



Projected growth through WMP cycle in Maturity by Category: PGE

Category	Scores Start	Current	End
A. Risk assessment and mapping	0.0	0.0	1.2
B. Situational Awareness and Forecasting	1.4	1.6	1.8
C. Grid design and system hardening	0.8	0.8	2.0
D. Asset management and inspections	0.6	0.8	1.2
E. Vegetation management and inspection	0.7	0.7	1.0
F. Grid operations and protocols	1.3	2.2	2.3
G. Data governance	0.3	0.8	2.8
H. Resource allocation methodology	0.2	0.8	1.5
I. Emergency planning and preparedness	0.4	2.0	3.6
J. Stakeholder cooperation and community engagement	1.4	2.4	2.8

Figure 5.b: Projected growth through WMP cycle in maturity, PG&E.

In the following sections, Energy Safety evaluates PG&E's initiatives across the 10 categories in the context of its Maturity Model survey scores.

5.1 Risk Assessment and Mapping

Introduction

The risk assessment and mapping section of the WMP Guidelines[70] requires the utility to discuss initiatives implemented to minimize the risk of its causing wildfires. Utilities must describe initiatives related to equipment maps and modeling of overall wildfire risk, ignition probability, wildfire consequence, risk-reduction impact, match-drop simulations,[71] and climate/weather-driven risks. This section also requires the utility to provide data on spending, miles of infrastructure treated, spend per treated line mile, ignition probability drivers targeted, projected risk reduction achieved from implementing the initiative, and other (i.e., non-ignition) risk drivers addressed by the initiative.

The parameters of risk assessment (discussed in this section) and resource allocation (discussed later in section 5.8) to reduce wildfire risk derive from the S-MAP and RAMP proceedings for the utility GRC (D.18-12-014).

[70] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 43-44 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

[71] Simulations of the potential wildfire consequences of ignitions that occur along electric lines and equipment effectively showing the potential consequences if an ignition or "match was dropped" at a specific point in a utility's territory.

Each large investor-owned utility is at a different stage in using the S-MAP/RAMP methodology approved in D.18-12-014. Going forward, each is supposed to employ uniform processes and scoring methods to assess current risk and estimate risk reduction attributable to its proposed mitigations.

The risk modeling conducted should ultimately inform the RSE analyses discussed in category 8, resource allocation methodology.

Overview

Energy Safety finds that PG&E has made progress in its risk assessment and mapping[72] and finds this portion of PG&E's 2021 WMP Update to be generally sufficient, subject to remedies. PG&E continues to show growth and improvement in developing its Wildfire Risk Models, which inform its risk assessment and mapping. PG&E is expected to provide updates on its progress on identified issues in its ongoing required submissions with Energy Safety.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- PG&E redesigned its 2021 Wildfire Distribution Risk Model that includes a vegetation probability of ignition, an equipment probability of ignition model, and a fire consequence model (further discussed below). The updated model informs which circuit segments PG&E considers highest risk and enables PG&E to prioritize circuit segments for mitigation based on risk.
- In 2020, PG&E implemented machine learning techniques to develop its maximum entropy (MaxEnt) probability models, which specifically evaluates ignition probability, as well as its wind event forecasting system and vegetation index models. In 2021, PG&E plans on building additional machine learning models to undergo vision analysis from aerial inspections to further identify risks in-field.
- In 2020, PG&E shifted its regression ignition likelihood models for both equipment and vegetation to probability of ignition models. These models were developed by predicting the probability of ignitions within 100 meter by 100 meter pixels, and were trained using CPUC reportable ignitions from 2015 to 2018 and tested using the 2019 ignitions.[73]
- In 2020, PG&E changed vendors for its consequence risk model, which focuses more on the effects of ladder fuels than the previous model. In 2021, PG&E will incorporate the

[72] PG&E's Maturity Model score for Risk Assessment and Mapping did not increase from 2020 and remains at zero for 2021 due to limited improvements in automation. However, PG&E did show progress in some Maturity Model survey questions for Risk Assessment and Mapping. As described in Section 1.4, the scoring rubric for each the Maturity Model uses an "all or nothing" binary approach. Therefore, if an electrical corporation self-reports progress in survey questions, it does not always increase the Maturity Model score for that category.

[73] PG&E's Redlined 2021 WMP Update at pdf p. 136-137.

consequence model to include transmission asset failure probability, as well as integrating the impacts of mitigation measures implemented through the WMP process.
- Unlike SCE or SDG&E, PG&E establishes an RSE score for risk assessment.

Discussion of Revision Notice Critical Issue RN-PG&E-02

As described in Section 1.2, PG&E was issued a Revision Notice on May 4, 2021. PG&E responded to the Revision Notice on June 3, 2021. The table below lists the critical issues contained in the Revision Notice specific to this section of the Action Statement followed by discussion. PG&E resolved the critical issue by providing the information requested. However, Energy Safety requires updates to provide transparency for changes to the model as recommended by the third-party report PG&E contracted. Remedies outlined in the chart below must be addressed in a progress report due November 1, 2021.

Critical issue	Description	Utility response	Energy Safety evaluation
RN-PG&E-02	Inadequate Justification of Significant Changes to High Priority Circuit Segments	PG&E provided its internal validation report, its third-party review and validation, and other available supporting materials that reviewed and/or validated its 2021 Risk Model. PG&E provided an explanation and timeline for how and when it intends to address all recommendations provided by these reports, reviews, and validations. PG&E provided detailed descriptions of and justification for modeling assumptions, choice of inputs, and accuracy of outputs.	PG&E provided the required information. However, additional remedies are required. PG&E's third-party evaluation findings provided recommendations for improving PG&E's risk models, including further integration between PG&E's risk model and PSPS model, a need for a stronger connection between SMEs and the model, and the need for a roadmap for further development of the models. To provide transparency, as well as ensure that PG&E is addressing the contractor's findings, PG&E must provide updates on its progress for implementing the recommended changes. This issue is addressed in key area for improvement PG&E-21-06.

Revision Notice Critical Issue RN-PG&E-02 required PG&E to provide further justification of its shift in CPZ prioritization, including external validation and reviews. While PG&E provided the required justification within its response, it is critical for PG&E to continue to provide updates on its modeling efforts in order to maintain transparency between now and the 2022 WMP Update regarding its prioritization of circuit segments. Any updates to PG&E's risk models, particular regarding outputs and future work plans, should be discussed during the modeling working group established as part of PG&E-21-02 as well as PG&E-21-06 below.

In its response to the Revision Notice, PG&E provided a third-party review of PG&E's 2021 Wildfire Distribution Risk Model. The third-party's analysis included recommendations with areas in which PG&E could improve its Wildfire Risk Models. PG&E must continue to update its models and report its progress in implementing the third-party's evaluation recommendations as part of the remedy for PG&E-21-06 below.

One particular area of improvement listed by the third-party evaluator was to analyze using outage data instead of ignition data in order to train its models. The third-party points out that:

> *"the smaller ignition dataset raises concern about the statistical power of the models trained on them. If there are too few ignitions to deliver a good model fit, it will fail to accurately predict on out of sample data (new locations, future years, etc.)."*[74]

The third-party report, demonstrates that areas with high ignition rates do not necessarily correlate to areas of high outage rates.[75] However, due to the high volume of data points needed to reduce bias when implementing machine learning, SCE currently uses outage data in order to garner more accurate output from its model for ignition risk.[76] PG&E's use of only ignition data to train its model weighs more heavily on the parameters in which an event would lead to an ignition as opposed to the cause of the event. Similar parameters should also be covered by the consequence side of the model, therefore leading to a higher emphasis on areas of higher ignition risk as opposed to the events that caused the ignition themselves. This is of greater importance given that PG&E's second top ignition causes are from equipment failure,[77] as well as the impact that PG&E's mitigations will have on equipment failure moving forward, which PG&E is working to include in its future model iterations. PG&E has stated that it is currently working on setting up a process in order to integrate accurate outage data that had the potential to lead to an ignition.[78] PG&E should work with other utilities, stakeholders, and experts via the modeling working group established by PG&E-21-02 to determine the most accurate approach for which input data sets to use in its models.

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[74] E3 Review of PG&E's 2021 Wildfire Distribution Risk Model, p. 31.
[75] E3 Review of PG&E's 2021 Wildfire Distribution Risk Model, p. 32.
[76] PG&E's 2021 Wildfire Distribution Risk Model "used 222 ignition events for the Vegetation Probability of Ignition Model and 242 ignition events for the Equipment Probability of Ignition Model respectively," from PG&E's Response to WSD's DR 10 Question 16. In comparison, SCE provided that "54,000 events are used to train the model" and "Roughly 23,000 events are used to test the model" from PG&E's Response to WSD's DR 4 Question 2.
[77] PG&E's Redlined 2021 WMP Update at pdf p. 193.
[78] PG&E states that an improvement upon the imbalance of its ignition dataset could be to "[u]tilize an algorithm that predicts the probability of an ignition when an outage event occurs" which "allows the use of outage data, which is much less imbalanced than the ignitions dataset." From PG&E's 2021 Redlined 2021 WMP Update PGE-02 Attachment 01, PG&E's 2021 Wildfire Distribution Risk Model Overview, p. 91.

Another difference between PG&E's consequence risk model in comparison to SDG&E and SCE is that PG&E uses the 90 percent (P90) consequence threshold, as opposed to the max consequence threshold (that is, P100) used by SDG&E and SCE. All three utilities use the same vendor for the consequence portion of their risk models, but each utility can choose which level of consequence to use in its unique model. PG&E should work with other utilities, stakeholders, and experts via the modeling working group established by PG&E-21-02 to determine which wind speed threshold is most accurate to use in its consequence model. PG&E should also further provide evidence of proper integration of wind speed within its models in response to PG&E-21-04 below.

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
PG&E-21-01	Unclear inclusion of future climate data into planning	PG&E's 2021 WMP Update does not include PG&E's climate resilience team's evaluation of High Fire Risk Areas (HFRA)[79] map initiatives in order to validate that the maps are consistent with climate projections.	PG&E must explain how it incorporates components of its climate resilience team's report into its own risk assessment.
PG&E-21-02	Lack of consistency in approach to wildfire risk modeling across utilities	The utilities do not have a consistent approach to wildfire risk modeling. For example, in their wildfire risk models, utilities use different types of data, use their individual data sets in different ways, and use different third-party vendors. Energy Safety	The utilities[80] must collaborate through a working group facilitated by Energy Safety[81] to develop a more consistent statewide approach to wildfire risk modeling. After Energy Safety completes its evaluation of all the utilities' 2021 WMP Updates, it will provide

[79] PG&E 2021 WMP Update at p. 85. PG&E identified areas of increased fire risk that are not currently included in the CPUC-designated HFTD and defined these as High Fire Risk Areas.
[80] Here "utilities" refers to SDG&E and Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), PacifiCorp, Bear Valley Electric Service, Inc. (BVES), and Liberty Utilities; although this may not be the case every time "utilities" is used through the document.
[81] The WSD transitioned to the Office of Energy Infrastructure Safety (Energy Safety) on July 1, 2021.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		recognizes that the utilities have differing service territory characteristics, differing data availability, and are at different stages in developing their wildfire risk models. However, the utilities face similar enough circumstances that there should be some level of consistency in statewide approaches to wildfire risk modeling.	additional detail on the specifics of this working group. A working group to address wildfire risk modeling will allow for: 1. Collaboration among the utilities; 2. Stakeholder and academic expert input; and 3. Increased transparency.
PG&E-21-03	Inadequate speed of improvements made to risk modeling	PG&E self-reported a low risk assessment score in the Maturity Model with slower growth in comparison to the other two large investor-owned utilities (IOUs). While this seems to be largely due to lack of automation in many different areas, and while PG&E overhauled its modeling efforts between the 2020 and 2021 WMP submissions, PG&E fails to demonstrate growth at an adequate speed in regard to its risk assessment.	PG&E must: 1. Demonstrate that it is applying automation as quickly as possible, explaining any constraints on progress. 2. Supply its workplan to enhance its modeling efforts.
PG&E-21-04	PG&E does not adequately justify the wind speed inputs it uses in its Probability of Ignition models.	PG&E's Outage Producing Winds (OPW) model finds a correlation between equipment failure and high wind speed. Despite the correlation, PG&E does not use peak wind speed as part of its input data set for its Equipment Probability of Ignition	PG&E must: 1. Demonstrate that it appropriately accounts for wind speed in its Probability of Ignition models' input data sets. This shall be handled both within the Working Group set up in PG&E-21-

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		models. Instead, PG&E uses average wind speed. PG&E provides justification for its rationale in its Revision Notice Response, however inconsistencies remain between PG&E's approach and that of its peer utilities that use peak or near-peak wind speeds as part of their Wildfire Risk Modeling input data sets.	02, as well as an individualized report. 2. Address discrepancies between its input data sets and those of peer utilities.
PG&E-21-05	Lack of PSPS consequence model at a circuit-segment level	SCE and SDG&E both have functioning PSPS consequence models, while PG&E states that their PSPS consequence model is currently under development.[82] PG&E is working collaboratively with other California utilities and will complete the task by the second half of 2021. However, PG&E does not describe any specific efforts or progress regarding the development of the PSPS risk model. The incorporation of PSPS consequence risk into the total risk reduction of a mitigation initiative is crucial to the decision-making framework.	PG&E must provide: 1. A detailed update on the functionality of its PSPS consequence model at a circuit-segment level, and 2. Quantitative targets for any remaining work or future developments.
PG&E-21-06	Insufficient transparency for	Revision Notice Critical Issue RN-PG&E-02 required PG&E to provide	PG&E must:

[82] PG&E 2021 WMP Update – Clean at p. 49

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
	modifications to Wildfire Risk Models and circuit segment prioritization	further justification of its shift in CPZ prioritization, including external validation and reviews. While PG&E provided the required justification within its response, it is critical for PG&E to continue to provide updates on its modeling efforts in order to maintain transparency between now and the 2022 WMP Update regarding its prioritization of circuit segments. Additionally, in its response to the Revision Notice, PG&E provided a third-party review of its 2021 Wildfire Distribution Risk Model. The third-party's analysis included recommendations for PG&E to improve its Wildfire Risk Models.	1. Provide an update on progress made on each of the third-party's recommendations. 2. Provide any and all updates to the explanation and timeline for how and when it intends to address the recommendations. 3. Provide an Excel spreadsheet detailing what changes have been made to its 2021 risk models since the submission of its 2021 WMP Update. 4. Provide a description of any changes it has made to its circuit segment the prioritization as a result of changes to its risk model since the submission of its 2021 WMP Update.

Additional Issues and Remedies

In addition to the key areas listed above, Energy Safety finds the following issues and directs associated remedies. All remedies must be addressed in PG&E's 2022 WMP Update.

- ISSUE: In its 2021 WMP Update PG&E identifies areas of increased fire risk that are not currently included in the CPUC-designated HFTD and defines these as High Fire Risk Areas ("HFRAs").[83] PG&E extends its prioritization of initiatives to these self-defined HFRAs.
    - REMEDY: PG&E must separate HFRA from its non-HFTD costs, presented in the format of WMP Table 12.
    - REMEDY: If PG&E believes there are areas in its service territory that are not currently included in the HFTD but should be prioritized for mitigation

[83] PG&E's 2021 WMP Update, p. 85

efforts, PG&E shall provide a process outlining the formal steps necessary to have those areas considered for recognition in the CPUC-defined HFTD.[84]

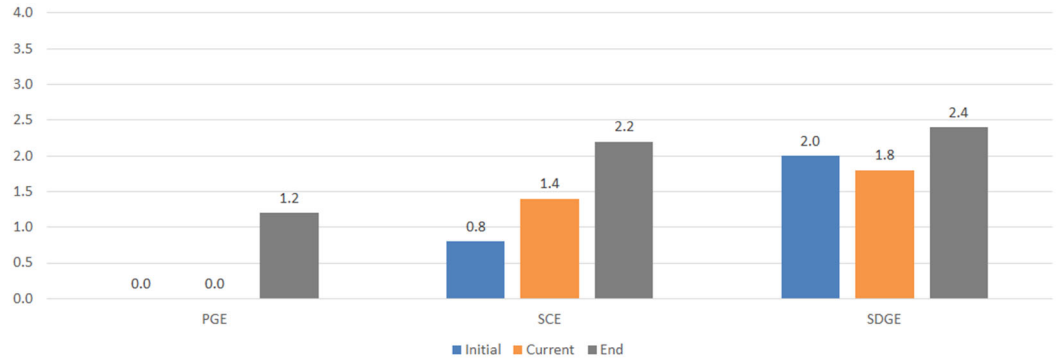
- ISSUE: In the Maturity Model, PG&E self-reported a low score in risk modeling automation, with slower growth than its peer utilities.[85] PG&E overhauled its modeling efforts between the 2020 and 2021 WMP submissions. However, PG&E fails to demonstrate growth at a rate comparable to its peers in its risk modeling automation.
    - REMEDY: PG&E must explain why it does not have the same level of automation for risk modeling as its peers, including an explanation of any constraints on progress; and
    - REMEDY: PG&E must supply a workplan and schedule for enhancing its automation capabilities in its risk modeling.
- ISSUE: PG&E's new model does not include egress as an input (in contrast to its previous wildfire risk model, which did include egress as an input). PG&E instead relies on subject matter expertise to account for egress when determining how to prioritize system hardening projects.
    - REMEDY: PG&E must provide an update on its development of a methodology to accurately measure and account for egress or explain how it accounts for egress in determining which circuits segments to prioritize for mitigation.

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

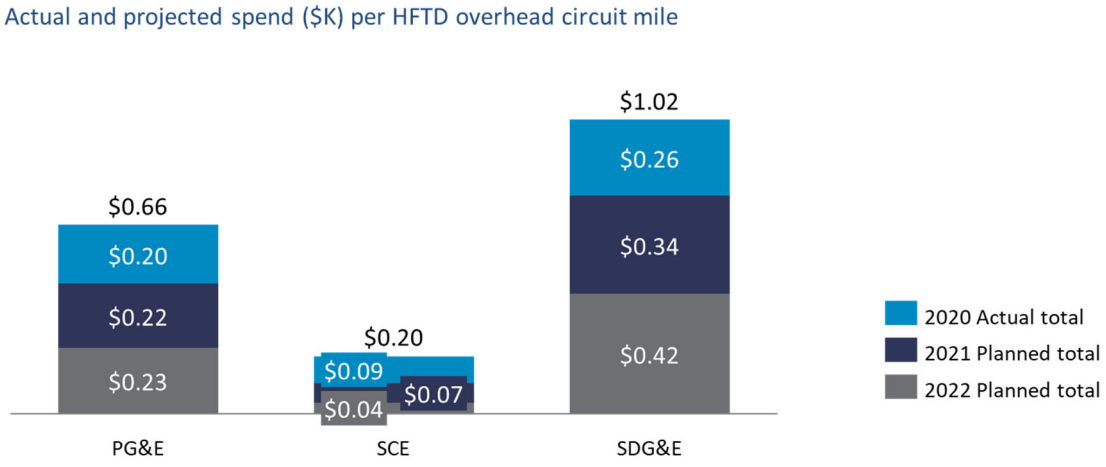
[84] Similarly to what occurred in the 2019 WMP review process, SCE was ordered to submit a "process for bringing its "High Fire Risk Areas" into conformity with the Commission's High Fire-Threat District area maps, or discuss in more detail why it should not be required to do so." (D.19-05-038, p. 53) As a result, in August 2019 SCE submitted a petition to modify D.17-12-024 to recognize SCE-identified HFRA as HFTD Tier 2 areas.

[85] Within the responses to the Maturity Survey, for capabilities 1 and 2, PG&E rated itself as not automated for its climate scenario modeling for both current and end of 2023 and ranked its ignition risk automation as currently not automated, expecting to move to partially automated (<50 percent) in 2023. In comparison, SCE rated itself as partially automated for climate scenario modeling for both current and end of 2023 and expects to move from partially automated to mostly automated (>50 percent) for ignition risk. SDG&E rated itself as mostly automated for climate scenario modeling for both current and end of 2023 and expects to move from partially automated to mostly automated for ignition risk.



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.1.a: Risk assessment and mapping maturity score progress, IOUs.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$0.20	$0.09	$0.26
2021 Planned Total	$0.22	$0.07	$0.34
2022 Planned Total	$0.23	$0.04	$0.42

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.1.b: Risk assessment and mapping spend per HFTD overhead circuit mile, IOUs.

5.2 Situational Awareness and Forecasting

Introduction

A strong weather monitoring and situational awareness system is an essential fire prevention/mitigation risk reduction strategy because it effectively alerts a utility's preparation and response to potentially dangerous fire weather conditions that can inform its decisions on PSPS implementation, grid design, and system hardening. It is also one of the most inexpensive strategies.

The situational awareness and forecasting section of the WMP Guidelines[86] requires the utility to discuss its use of cameras, weather stations, weather forecasting and modeling tools, grid monitoring sensors, fault indicators, and equipment monitoring. Situational awareness requires the utility to be aware of actual ignitions in real time and to understand the likelihood of utility ignitions based on grid and asset conditions, wind, fuel conditions, temperature, and other factors.

The WMP Guidelines refer to key situational awareness measures, including:

1. Installation of advanced weather monitoring and weather stations that collect data on weather conditions so as to develop weather forecasts and predict where ignition and wildfire spread are likely;
2. Installation of high-definition cameras throughout a utility's service territory, with the ability to control the camera's direction and magnification remotely;
3. Use of continuous monitoring sensors that can provide near-real-time information on grid conditions;
4. Use of a fire risk or fire potential index that takes numerous data points in given weather conditions and predicts the likelihood of wildfire; and,
5. Use of personnel to physically monitor areas of electric lines and equipment in elevated fire risk conditions.

Overview

Energy Safety finds that PG&E has made progress in its situational awareness and forecasting and finds this portion of PG&E's 2021 WMP Update to be sufficient. PG&E continues to show growth and improvement by expanding its High Definition (HD) wildfire camera network, enhancing its satellite fire detection capabilities, installing continuous monitoring sensors, and updating its fire potential index (FPI).

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- PG&E has the largest deployment of HD cameras in comparison to peer utilities. PG&E installed 216 HD cameras in 2020 with plans to continue installing 135 HD cameras for 2021. This is in alignment with its long-term goal to have 600 high-definition cameras in 2022 with 90 percent visual coverage of all their HFTD areas.
- PG&E continues to be the only utility that has established an in-house fire protection team. It's Safety Infrastructure Protection Teams (SIPT) provide real-time

[86] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 44 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

information on weather and field conditions and monitor for potential wildfire hazards. In 2020, PG&E increased their SIPT staff from 28 crews to 40 crews and 40 engines. This is in alignment with what they forecasted in the 2020 plan. This increased staffing should provide additional personnel for monitoring for wildfire risks and support its PSPS events.

- PG&E is at the forefront in its Satellite Fire Detection capability compared to peer utilities. PG&E added a fourth polar-orbiting satellite, NOAA-20, to its fire detection data suite, which should enhance its fire detection capabilities. PG&E uses these data in combination with its HD cameras to visualize new or expanding fires that could impact their infrastructure or personnel.
- PG&E continues to improve its FPI, which informs its operational decisions to reduce fire risk and is a direct input into its PSPS framework. Improvements include recalibration to incorporate landscape changes from the 2020 fire season and enhancing its fuel model input, similar to peer utilities. Future improvements by September 1, 2021, will include an updated fire occurrence data set to improve the granularity of its FPI.
- PG&E developed (RSE) Risk Spend Efficiency Values for 12 of its 18 initiatives in Situational Awareness & Forecasting, much more than their peer utilities.

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-07	PG&E's DFA and EFD technology pilot outcome is lacking justification for the scope of installment	PG&E's pilot project was completed in 2020 for Distribution Fault Anticipation (D) and Early Fault Detection (EFD) technology with the determination to continue deployment. However, PG&E lacks details and performance metrics on the outcome and how PG&E made the decision to ramp up deployment to 600-800 circuits.	PG&E must: 1. Provide details and performance metrics on the outcome of the 2020 DFA and EFD technology pilot program 2. Explain how the determination was made to increase deployments of DFA/EFD technology across its service territory.
PG&E-21-08	Weather station program	PG&E's 2021 WMP Update originally reported installation of 404 weather stations in	PG&E must:

Utility-#	Issue title	Issue description	Remedies required
	target not met	2020, surpassing its program target of 400. However, in PG&E's revised 2021 WMP Update the weather station installations changed to 378 in 2020 falling short of its target without explanation.	1. Provide details on why PG&E did not meet the targeted 400 weather station installs in 2020. 2. Explain why weather station installation totals in the original 2021 WMP Update differ from the revised 2021 WMP Update.

Additional Issues and Remedies

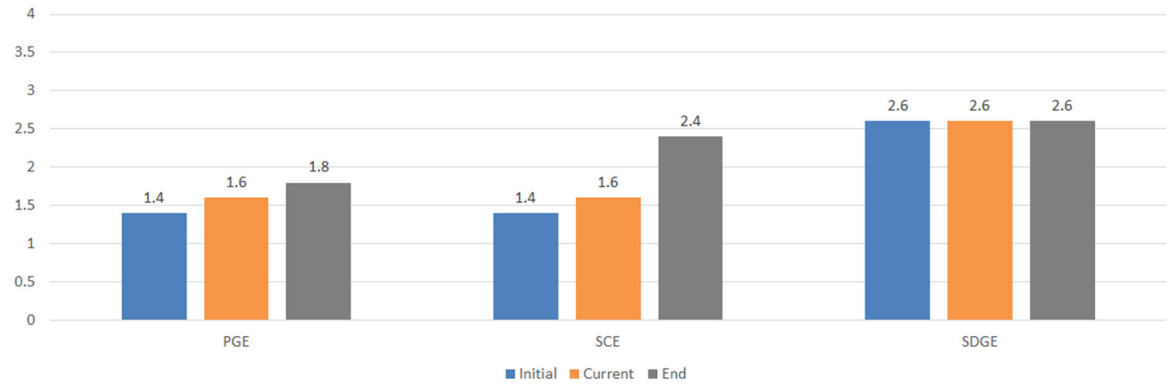
In addition to the key areas listed above, Energy Safety finds the following issue and directs the associated remedy. All remedies must be addressed in PG&E's 2022 WMP Update.

- ISSUE: PG&E does not have a proactive plan for installing fault indicators, which are typically placed by either troublemen[87] during restorations or by an engineering team after the fact to aid in future faults. These fault indicators typically aid in in electric service reliability, as they can be leveraged to concentrate focus to a much smaller portion of the electric circuit when trying to pinpoint a system failure/fault. This can also lead to a faster response to a location if an ignition exists. The lack of fault indicators can lead to longer duration of outages and/or make faults, damaged assets, or ignitions more difficult to locate.
    - REMEDY: PG&E must (1) develop a proactive plan to evaluate the benefit of installing fault indicators post-events; or (2) demonstrate that fault detection is sufficiently covered, including reducing time to restoration of service, by other existing initiatives.

Figures

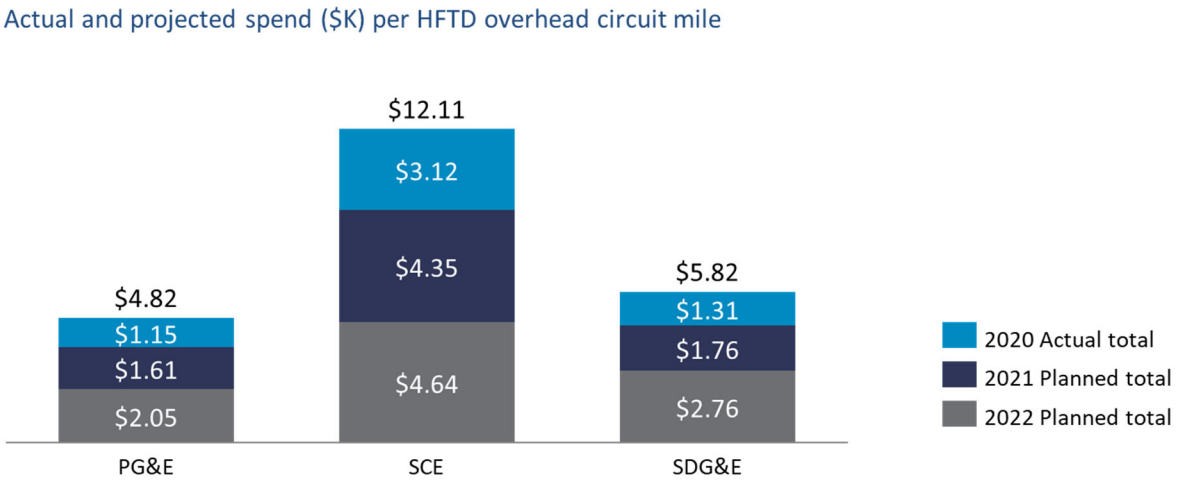
Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

[87] "Troublemen" are the PG&E responders sent to investigate the cause for outages.



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.2.a: Situational awareness and forecasting maturity score progress.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$1.15	$3.12	$1.31
2021 Planned Total	$1.61	$4.35	$1.76
2022 Planned Total	$2.05	$4.64	$2.76

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.2.b: Situational awareness and forecasting spend per HFTD overhead circuit mile, large utilities 2020-2022.

5.3 Grid Design and System Hardening

Introduction

The grid design and system hardening section of the WMPs Guidelines[88] examines how the utility is designing its system to reduce ignition risk and what it is doing to strengthen its distribution, transmission and substation infrastructure to prevent causing catastrophic wildfires. This section also requires discussion of routine and non-routine maintenance programs, including whether the utility replaces or upgrades infrastructure proactively rather than running facilities to failure. Programs in this category, which often cover the most expensive aspects of a WMP, include initiatives such as the installation of covered conductors to replace bare overhead wires, undergrounding of distribution or transmission lines, and pole replacement programs. The utility is required, at a minimum, to discuss grid design and system hardening in each of the following areas:

1. Capacitor maintenance and replacement,
2. Circuit breaker maintenance and installation to de-energize lines upon detecting a fault,
3. Covered conductor installation,
4. Covered conductor maintenance,
5. Crossarm maintenance, repair, and replacement,
6. Distribution pole replacement and reinforcement, including with composite poles,
7. Expulsion fuse replacement,
8. Grid topology improvements to mitigate or reduce PSPS events,
9. Installation of system automation equipment,
10. Maintenance, repair, and replacement of connectors, including hotline clamps,
11. Mitigation of impact on customers and other residents affected during PSPS event,
12. Other corrective action,
13. Pole loading infrastructure hardening and replacement program based on pole loading assessment program,
14. Transformers maintenance and replacement,
15. Transmission tower maintenance and replacement,
16. Undergrounding of electric lines and/or equipment,
17. Updates to grid topology to minimize risk of ignition in HFTDs, and
18. Other/not listed items if an initiative cannot feasibly be classified within those listed above.

[88] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 44 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

Overview

Energy Safety finds that PG&E has made progress in the areas of grid design and system hardening[89] and finds this portion of PG&E's 2021 WMP Update to be generally sufficient, subject to remedies. PG&E continues to show growth and improvement in its initiative selection process. PG&E has made progress in prioritizing its highest risk circuit segments for mitigation, as well as in its evaluation process to determine the appropriate mitigation alternative for each of those circuit segments. PG&E is expected to provide updates on its progress on identified issues in its ongoing required submissions with Energy Safety.

For 2021, PG&E is targeting hardening 180 miles of overhead facilities. PG&E plans that eighty percent of the miles targeted for hardening will be in the highest risk categories, listed below. Additionally, in the 2021 WMP Update PG&E plans that 10 percent of the hardening will be performed through undergrounding or asset removal over the 3-year period from 2021-2023. However, PG&E announced on July 21, 2021, a new multi-year initiative to expand the undergrounding plan to 10,000 miles of electric distribution power lines in their HFTD.[90] PG&E states that its highest wildfire risk miles include:

1. The top 20 percent of the riskiest circuit segments based on the rankings provided by PG&E's 2021 Wildfire Distribution Risk Model (i.e., the risk buydown curve);
2. Fire rebuild miles;
3. PSPS mitigation miles; and
4. Public Safety Specialist identified miles.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- PG&E is currently developing a program to remove unneeded capacitors and other voltage regulating equipment.[91] These removals would reduce the risk of an ignition caused by capacitors, which is particularly important because of PG&E's high incidence of failure of capacitor banks. PG&E is also investigating adding SCADA-enabled controllers to all capacitors and removing or using switches on fixed bank capacitors.[92]

[89] PG&E's Maturity Model score for Grid Design and System Hardening did not increase from 2020. However, in evaluating PG&E's 2021 WMP Update, Energy Safety found that PG&E did make progress in this area, as described in more detail in this section.

[90] https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20210721_pge_announces_major_new_electric_infrastructure_safety_initiative_to_protect_communities_from_wildfire_threat_undergrounding_10000_miles_of_power_lines_in_highest_fire-threat_areas

[91] PG&E 2021 WMP Redlined Update at pdf p.564.

[92] PG&E 2021 WMP Redlined Update at pdf p.565.

- In 2020, PG&E's System Hardening Program established a 220-mile target to harden overhead facilities within the highest fire risk miles based on their 2019-2029 Wildfire Risk Model. PG&E completed approximately 342 total miles, which includes approximately 194 miles hardened in HFTD areas during fire rebuild efforts and another 21 miles undergrounded through the Butte rebuild effort.
- In 2020, PG&E developed a standard tree strike analysis using LiDAR data for facilities and tree locations.
- PG&E standardized the use of wood poles with an intumescent wrap to increase fire resiliency of hardened lines and supplement the supply limitations and design challenges associated with composite poles.
- PG&E refined its project timelines to better coordinate permitting, easements, vegetation clearing, and other dependencies in advance of the construction process for pole replacements.
- PG&E updated its rankings for its highest risk circuit protection zones (CPZs) based on the outputs of its new wildfire risk model. Because PG&E bases its grid hardening improvement prioritization on the CPZ rankings, the updated CPZ rankings resulted in a corresponding update to PG&E's grid hardening improvement prioritizations and timelines. PG&E believes that these updates represent a more accurate prioritization of CPZs for grid hardening. PG&E attributes the changes to its change in vendors for its consequence model, stating that the new vendor places a greater emphasis on "ladder fuels" which PG&E believes provides more accurate results than its previous consequence model.
- PG&E developed a new System Hardening Approval process by which it evaluates which circuit segments to target for mitigation and determines the optimal mitigation measure for each of the selected circuit segments. PG&E updated its system hardening plan to target: 1) the top 20 percent of its risk buydown curve (as determined by its 2021 Wildfire Risk Models), 2) fire rebuild, 3) PSPS mitigation, and 4) miles identified by a Public Safety Specialist (PSS).[93] Once PG&E identifies which CPZs to prioritize for mitigation, it then analyzes each CPZ to determine the optimal mitigation method. PG&E's evaluation to determine the optimal mitigation method includes an analysis of costs, strike tree potential, ingress and egress, execution timelines, risk reduction, and other operational considerations.
- PG&E analyzes circuit segments across multiple initiatives, including vegetation management and system hardening. In 2021, PG&E plans to avoid overlapping initiatives, stating: "PG&E's System Hardening and EVM program leads are working together to avoid overlap between the two programs over the next 3 years, where

[93] "PG&E's System Hardening Program," presented to WSD on March 21, 2021, p. 5. "Public Safety Specialists" are subject matter experts that "bring a localized knowledge of areas that are high risk" and "identified miles [to add] in addition to the risk prioritized miles," p. 3.

reasonable, based on where System Hardening work is planned."[94] This further demonstrates that PG&E is working to tailor its initiative selections to the optimal solution for each CPZ, instead of choosing overarching initiatives that may overlap in benefits and therefore not provide the most efficient use of resources.

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-09	Limited evidence to support the effectiveness of covered conductor	The rationale to support the selection of covered conductor as a preferred initiative to mitigate wildfire risk lacks consistency among the utilities, leading some utilities to potentially expedite covered conductor deployment without first demonstrating a full understanding of its long-term risk reduction and cost-effectiveness. The utilities' current covered conductor pilot efforts are limited in scope[95] and therefore fail to provide a full basis for understanding how covered conductor will perform in the field. Additionally, utilities justify covered conductor installation by alluding to reduced PSPS risk but fail to provide adequate comparison	The utilities[96] must coordinate to develop a consistent approach to evaluating the long-term risk reduction and cost-effectiveness of covered conductor deployment, including: 1. The effectiveness of covered conductor in the field in comparison to alternative initiatives. 2. How covered conductor installation compares to other initiatives in its potential to reduce PSPS risk.

[94] PG&E's Response to WSD's DR 10 Question 13.
[95] Limited in terms of mileage installed, time elapsed since initial installation, or both.
[96] Here "utilities" refers to SDG&E and Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), PacifiCorp, Bear Valley Electric Service, Inc. (BVES), and Liberty Utilities; although this may not be the case every time "utilities" is used through the document.

Utility-#	Issue title	Issue description	Remedies required
		to other initiatives' ability to reduce PSPS risk.	
PG&E-21-10	Insufficient pace of expulsion fuse replacement plan	The pace of PG&E's current program for expulsion fuse replacements is not proportional to those of SDG&E and SCE.[97] This is especially problematic given PG&E's larger service territory.	PG&E must: 1. Demonstrate that it is replacing expulsion fuses with fuses that reduce wildfire risk at a speed that adequately addresses risk; 2. Explain any current limits or constraints on the scope of PG&E's expulsion fuse replacement program; 3. Increase the pace of its expulsion fuse replacement program, provided reasonable constraints do not limit such expansion.
PG&E-21-11	Insufficient detail regarding installation of expulsion fuses in HFTD areas	PG&E continues to install non-exempt expulsion fuses, which are considered to be fire hazards, in HFTD areas. PG&E installed approximately 71 non-exempt expulsion fuses in the HFTD 2019 and 44 fuses in 2020. PG&E states that it is acceptable to install non-exempt expulsion fuses in the HFTD under certain circumstances but does not detail whether the installed fuses were installed in those circumstances.	PG&E must: 1. Explain the circumstances under which it installed non-exempt expulsion fuses in HFTD areas. 2. Clarify if any of the new expulsion fuses it is installing in the HFTD in 2021 and beyond are non-exempt fuses.

[97] Cal Advocates' Comments state at p. 36: "PG&E has approximately 22,000 expulsion fuses in HFTDs and forecasts replacing about five percent of them in 2021" which is approximately 1,100 fuses. At this rate, it will take PG&E nearly two decades to remove all the expulsion fuses from the HFTD. By comparison, BVES replaced 2,200 in 2020, which is more expulsion fuses than PG&E in 2020, although PG&E's service territory is two thousand times larger than BVES. In 2021, SDG&E replaced "3,179 (with a focus in Tiers 3 and 2 of the HFTD), bringing the total replaced to 5,669 out of the 11,000 total populations of such fuses in the HFTD" (according to SDG&E's 2021 WMP Update, p. 197). SCE is replacing "13,000 locations by the end of 2022 (cumulative from the inception of the program in 2018)" (according to SCE's 2021 WMP Update, p. 216).

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-12	Failure to adequately track copper conductor replacements and insufficient detail regarding targeting replacements to highest risk areas	While PG&E has identified that copper conductor poses a high risk to its system due to its high incidence of failure PG&E does not currently track its completed copper reconductoring projects. Additionally, PG&E's copper reconductoring program extends outside of the HFTD, but PG&E does not provide sufficient evidence that its copper reconductoring plan targets its highest risk circuits.	PG&E must: 1. Develop a workplan to target and track copper reconductoring projects. 2. Demonstrate that it is targeting its copper reconductoring projects to its highest risk circuits, including justification for any projects outside of the HFTD.
PG&E-21-13	Failure to demonstrate that system hardening plan targets highest risk circuit segments	A small percentage of circuit-segments in PG&E's distribution system pose a high percentage of PG&E's wildfire risk.[98] However, PG&E does not clearly demonstrate that its system hardening plan targets these segments.	PG&E must fully demonstrate that its system hardening mitigation efforts target efficiently reducing wildfire risk and PSPS events, including a description of how PG&E determines the order in which circuit segments are scheduled for mitigation.
PG&E-21-14	Inadequate transparency of system hardening plan	PG&E provides limited detail regarding its short-term system hardening plan and does not include its long-term system hardening plan. Additionally, PG&E's July 21, 2021, press release[99] regarding its intention to underground 10,000 miles of power lines indicates that	PG&E must: 1. Provide its short-term[100] system hardening plans, including the following details for each planned project (via comprehensive list and GIS files): a. Location; b. Initiative type (covered conductor,

[98] "2021 Wildfire Mitigation Plan Workshop Grid Design and System Hardening" presented February 23, 2021, p. 4.
[99] "PG&E Announces Major New Electric Infrastructure Safety Initiative to Protect Communities From Wildfire Threat," July 21, 2021: https://investor.pgecorp.com/news-events/press-releases/press-release-details/2021/PGE-Announces-Major-New-Electric-Infrastructure-Safety-Initiative-to-Protect-Communities-From-Wildfire-Threat/default.aspx (accessed July 28, 2021).
[100] "Short-term" defined as a project that has entered the scoping process or planning phase, including the 1,120 miles identified for system hardening from 2021-2023, per PG&E's Redlined 2021 WMP Update, pdf p. 653.

Utility-#	Issue title	Issue description	Remedies required
		PG&E may need to change the system hardening plan and initiative selection process presented in PG&E's 2021 WMP Update. PG&E has not provided any potential modifications to its 2021 WMP Update related to this press release. While Energy Safety is generally supportive of PG&E's ambition to aggressively reduce its wildfire risk, PG&E must provide additional detail on its short-term and long-term plans for grid hardening, as well as an update on its progress.	undergrounding, line removal, etc.); c. Status of the project (scoping, design permitting, etc.); d. Relevant CPZs; e. Planned length; f. Risk-type identified for prioritization of the project (top 20 percent of risk buydown curve, fire rebuild, PSPS mitigation, public safety specialist identified, or non-risk related). 2. Provide its long-term system hardening plan regarding: a. Estimated rate of system hardening per year;[101] b. If/how PG&E plans to increase its resources to allow for an accelerated pace of system hardening. 3. Explain how, if at all, PG&E's recently announced undergrounding plan changes its decision-making framework for initiative selection for individual circuit segments.[102] 4. Provide an update on its completed system hardening efforts through November 1, 2021.

[101] If such differs from the 450 to 500 miles per year provided in PG&E's Redlined 2021 WMP Update, pdf p. 653.
[102] As described in PG&E's presentation to WSD on May 21, 2021 and summarized in a footnote above.

Additional Issues and Remedies

In addition to the key areas listed above, Energy Safety finds the following issues and directs associated remedies. All remedies must be addressed in PG&E's 2022 WMP Update.

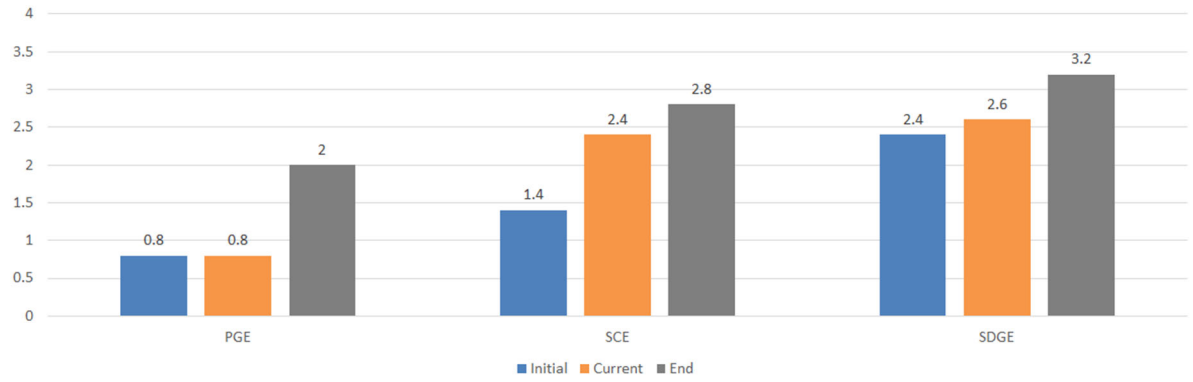
- ISSUE: Action PGE-14 (Class A)[103] from PG&E's 2020 WMP states: PG&E shall 1) provide an explanation as to how it is prioritizing replacing aluminum conductors in areas that overlap both corrosion zones and the HFTD, 2) if PG&E is not prioritizing aluminum conductors located in overlapping corrosion zones and HFTDs, explain why, and 3) explain whether any higher priority is given to aluminum conductor within corrosion zones outside of HFTDs.[104] PG&E states that is not prioritizing conductors located in overlapping corrosion zones and HFTDs but does not explain why.[105] PG&E does not specifically explain whether any higher priority is given to aluminum conductor within corrosion zones outside of HFTDs.
    - REMEDY: PG&E must explain why it is not prioritizing conductors located in overlapping corrosion zones and HFTDs.
    - REMEDY: PG&E must specifically explain whether any higher priority is given to aluminum conductor within corrosion zones outside of HFTDs.

- ISSUE: PG&E does not provide details on its program to remove unneeded capacitors and other voltage regulating equipment. It also did not provide details for investigating adding SCADA-enabled controllers to all capacitors and removing or using switches on fixed bank capacitors. PG&E also does not include a timeline for implementation of its these programs and investigations.
    - REMEDY: PG&E must (1) provide an update on the status, scope, and timeline for its unneeded capacitor program analysis, (2) provide an estimated number of capacitor removals based on its analysis, if available, (3) provide an update on the status, scope, and timeline for adding SCADA-enabled controllers to capacitors, (4) provide an update on the status, scope, and timeline for removing or using switches on fixed bank capacitors, and (5) explain how adding SCADA-enabled controllers to capacitors and removing or using switches on fixed bank capacitors will reduce ignition risk.

Figures

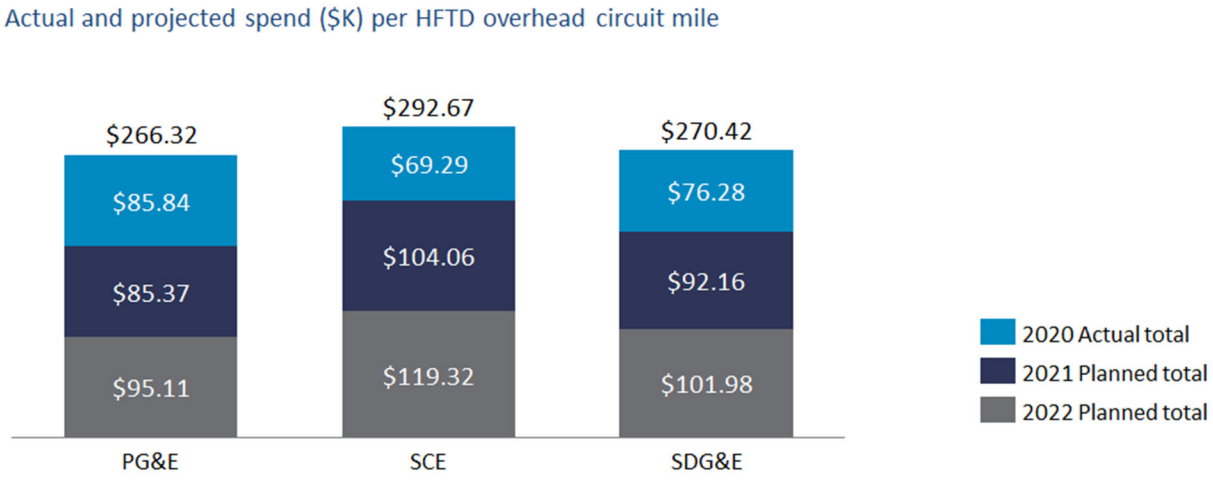
Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

[103] Action PGE-14 (Class A) can be found here (accessed July 30, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2020/docs/340895473.pdf at p. 40.
[104] PG&E 2021 WMP Update at p. 477.
[105] PG&E 2021 WMP Update at p. 477.



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.3.a: Grid design and system hardening maturity score progress.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$85.84	$69.29	$76.28
2021 Planned Total	$85.37	$104.06	$92.16
2022 Planned Total	$95.11	$119.32	$101.98

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.3.b: Grid design and system hardening spend per HFTD overhead circuit mile, large utilities 2020-2022.

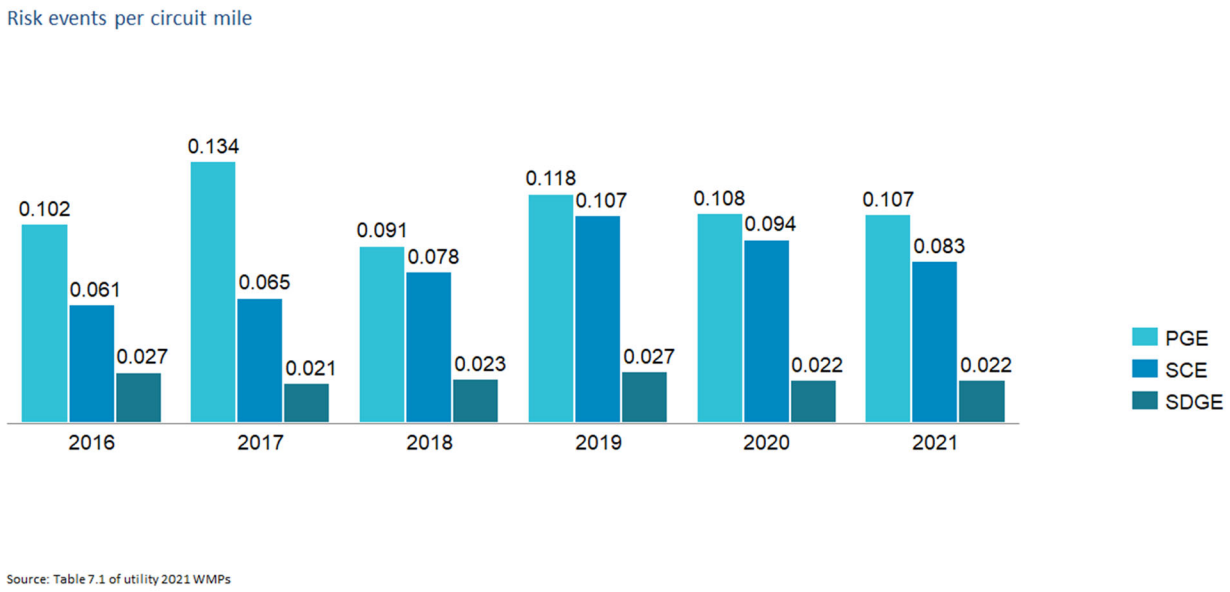


Figure 5.3.c: Risk events per circuit mile due to equipment/facility failure, large utilities 2020-2022.

5.4 Asset Management and Inspections

Introduction

The asset management and inspections section of the WMP Guidelines[106] requires the utility to discuss power line/infrastructure inspections for distribution and transmission assets within the HFTD, including infrared, light detection and ranging (LiDAR), substation, patrol, and detailed inspections, designed to minimize the risk of its facilities or equipment causing wildfires. The utility must describe its protocols relating to maintenance of any electric lines or equipment that could, directly or indirectly, relate to wildfire ignition. The utility must also describe how it ensures inspections are done properly through a program of quality control.

Overview

Energy Safety finds that PG&E has made progress in the areas of asset management and inspection and finds this portion of PG&E's 2021 WMP Update to be generally sufficient, subject to remedies. PG&E is expected to provide updates on its progress on identified issues in its ongoing required submissions with Energy Safety.

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[106] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, pp. 44-45 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- PG&E modified its enhanced inspection protocols after which time its corrective notification creation rate increased from 11 percent to 23 percent for distribution facilities.[107] Enhanced inspections include imaging of assets with checklists, as well as checklists that align with PG&E's Failure Modes and Effects Analysis (FMEA). The 2021 checklist included 14 components and 55 questions. In 2021 and moving forward, PG&E plans to use its distribution risk model to determine which circuits to prioritize when scheduling inspections.
- PG&E's corrective notifications generated from its transmission inspections increased from 10,137 in 2018 to 52,399 in 2020.
- PG&E states that in 2020 it completed approximately 3,000 distribution miles of LiDAR imagery, with data used for increasing GIS and pole loading accuracy.
- PG&E is piloting below-grade foundation inspections, corona inspections, conductor measurement, and drone-span inspections for its transmission assets. PG&E plans to include corona inspections as part of its infrared inspections in 2021. All other pilot programs are still under cost-benefit analysis.
- PG&E focuses enhanced inspections to specifically target components that present wildfire risk if left to "run to failure." In general, this can be seen by PG&E's projections for ignitions within HFTDs in 2021 and 2022, as seen in Figures 5.4.c and 5.4.d below. In particular, PG&E has seen a decrease in ignitions caused by conductor damage or failure as well as crossarm damage or failure. However, ignitions caused by transformer damage or failure as well as pole damage or failure remain relatively flat.

Discussion of Revision Notice Critical Issue RN-PG&E-04

As described in Section 1.2 a Revision Notice was issued to PG&E on May 4, 2021. PG&E responded to the Revision Notice on June 3, 2021. The table below lists the critical issues contained in the Revision Notice specific to this section of the Action Statement followed by discussion. RN-PG&E-04 was resolved in PG&E's Revision Notice Response.

[107] "Creation rate" PG&E's 2021 WMP Update, p. 635.

Critical issue	Description	Utility response	Energy Safety evaluation
RN-PG&E-04 Equivocating Language in Asset Inspection QA/QC Process Descriptions	PG&E continues to use vague, noncommittal, and equivocating language to describe its processes for quality assurance and quality control (QA/QC) of distribution and transmission asset inspections.	PG&E revised its 2021 WMP Update to describe its QA/QC processes for its asset inspections using specific, measurable, quantifiable, and verifiable language and described its internal plans to address QA/QC issues related to asset inspections.	PG&E's response was complete and this issue is resolved. See additional discussion below on key areas of improvement for QA/QC in PG&E-21-17.

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-15	Insufficient detail regarding covered conductor maintenance	PG&E states "[c]overed conductor maintenance will be performed anywhere covered conductor is installed and found to have conditions requiring maintenance."[108] PG&E does not provide more detail as to what conditions require maintenance. PG&E also does not explain or justify its spend projections for covered conductor maintenance. PG&E's projected spend for covered conductor maintenance is higher in 2021 than in 2022, however the projected line miles to be treated remain the same.[109]	PG&E must: 1. Provide its procedures for determining when covered conductor maintenance is required, including any thresholds and aspects analyzed during inspections. 2. Explain why PG&E's cost projections decrease from 2021 to 2022 despite line mile projections remain the same.

[108] PG&E 2021 WMP Update at p. 479.
[109] PG&E Table 12, Line 40.

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-16	Insufficient evidence of effective covered conductor maintenance program	PG&E does not have a separate covered conductor maintenance program.	PG&E must provide all supporting material to demonstrate that its maintenance programs effectively maintain its covered conductor, including the following information: 1. Pace and quantity of scheduled maintenance; and 2. Pace and quantity of inspections. If PG&E finds that its existing maintenance programs do not provide effective maintenance for covered conductor, PG&E must: 1. Enhance its current operations to provide such maintenance; 2. Detail the enhancements to its existing programs; and 3. Provide all supporting material for the enhancements to its existing program, including the information listed above.
PG&E-21-17	Insufficient evidence of QA/QC for work performed by contractors	Several PG&E internal audits revealed contractors that failed to follow procedures or were unaware of the correct procedures that needed to be followed. PG&E's response to cases where the vendor was unaware of or did not follow procedures often amounted to a reminder of how procedures should have been followed. In most cases, PG&E did not further investigate the quality of other work the same vendor	PG&E must: 1. Demonstrate that it is tracking the quality of work of contractors performing asset management and inspection work. 2. Describe how it is addressing underperforming asset management and inspection contractors. 3. Describe how it is expanding quality control of work performed by asset management and inspection vendors, including additional quality controls for

Utility-#	Issue title	Issue description	Remedies required
		had performed, nor require full retraining on the topic.	those with a history of flawed work.

Additional Issues and Remedies

In addition to the key areas listed above, Energy Safety finds the following issues and directs associated remedies. All remedies must be addressed in PG&E's 2022 WMP Update.

- ISSUE: In order to address PG&E's higher incidence of equipment failure in comparison to other utilities, PG&E's Ignition Investigation and Asset Failure Analysis team has started to benchmark with counterparts within the other utilities and plans to continue to do so in 2021.[110] PG&E outlines other updates to its programs to address equipment failure rates, such as enhancing its failure analysis program and increasing accuracy on ignition cause. While these changes appear beneficial, in order to adequately address deficiencies found in 2020, PG&E must continue to develop these programs and demonstrate its progress in its 2022 WMP Update.
    - REMEDY: PG&E must (1) provide any findings and associated corrective actions as a result of its failure analysis program development, (2) provide an update on any findings relating to equipment failure rates in comparison to other utilities, including explanations on modifications made to PG&E's asset inspections and maintenance programs as a result of such findings, and (3) explain why projected ignition rates based on equipment failure or damage remains flat for some equipment types.

- ISSUE: PG&E experienced increased corrective notifications[111] for both distribution and transmission facilities. It is unclear if the increases are due to PG&E's enhanced inspection protocols enabling PG&E to identify critical infrastructure issues that it previously did not identify or if the increases are due to the ongoing deterioration of PG&E's assets. PG&E must provide further details on the increase in corrective notifications for both distribution and transmission to demonstrate the adequacy of its enhanced inspections.
    - REMEDY: PG&E must (1) provide statistics (such as asset type, asset age, potential ignition risk, etc.) on the types of corrective notifications created as part of its distribution and transmission inspections, including 2020 and 2021 notifications, and track such statistics moving forward, (2) provide details on the types of corrective notifications that the enhanced inspections generate that

[110] PG&E's Supplemental Filing Addressing Remedial Compliance Plan and First Quarterly Report Action Items, February 26, 2021, p. 35.
[111] "Corrective notifications" are PG&E's work orders when an issue is found in-field that requires replacement or repair.

previous inspection practices would have overlooked, (3) explain how PG&E has adjusted its inspection and maintenance practices as a result of the additional corrective notifications, (4) discuss how PG&E assesses trends in issues identified by corrective notifications, any trends it has recognized, and the associated actions it has taken in relation to these trends, and (4) discuss PG&E's predictions for future corrective notification trends, including whether PG&E expects a decrease in corrective notifications in the future.

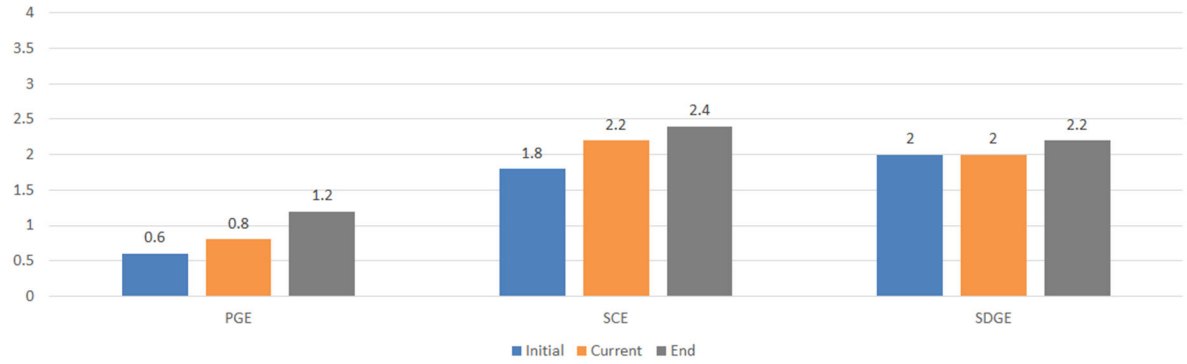
- ISSUE: PG&E does not currently use drones for detailed inspections of distribution assets despite its use of drones for transmission and substation inspections as well as distribution patrols. SCE and SDG&E both use drones to augment their distribution inspections and have reported some benefits, such as lower noise for customers.[112]
    - REMEDY: PG&E must either (1) pilot use of drones or other aerial inspections as part of its inspections of its distribution assets and include a cost-benefit analysis in its evaluation of the success of the pilot program, or (2) explain why its current detailed inspections of its distribution assets are adequate without the enhancement of aerial inspections, including a cost-benefit comparison of PG&E's existing program of using aerial inspections to enhance distribution patrols to detailed inspections, including findings per mile.

- ISSUE: In its Maturity Model, PG&E's self-assessment shows that it currently updates condition assessments in its equipment inventory database on an annual basis, and shows that PG&E does not anticipate progressing to more frequent updates by the start of 2023.[113] However, regarding updates to asset information in its distribution risk model, PG&E states in its 2021 WMP Update: "[t]he frequency of updates in planning models to reflect the completion of risk mitigation work will occur on a quarterly basis beginning in 2021."[114] It is unclear if these statements are contradictory, or if PG&E plans to update its distribution risk model more frequently than its equipment inventory database. Regardless, PG&E appears to have the capacity to update its equipment inventory database more frequently that it currently shows in its Maturity Model.
    - REMEDY: PG&E must (a) explain the discrepancy of asset information updates between its Maturity Model assessment and the text within the WMP, and (b) develop a plan to increase the frequency in which condition assessments are updated in its equipment inventory database before the start of 2023 or explain why it is not possible for PG&E to do so.

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

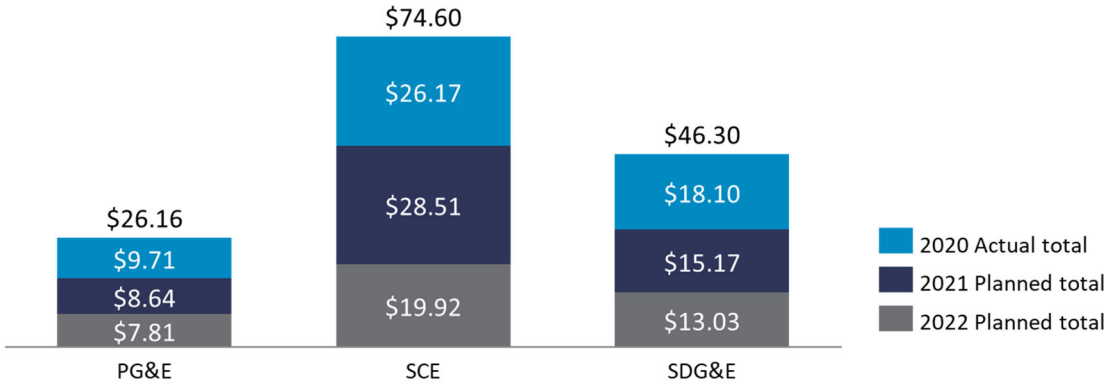
[112] SCE's 2021 WMP Update, p. 242.
[113] PG&E's responses to the Utility Survey, p. 21.
[114] PG&E's 2021 WMP Update, p. 143.



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.4.a: Asset management & inspections maturity score progress.

Actual and projected spend ($K) per HFTD overhead circuit mile



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$9.71	$26.17	$18.10
2021 Planned Total	$8.64	$28.51	$15.17
2022 Planned Total	$7.81	$19.92	$13.03

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.4.b: Asset management and inspections spend per HFTD overhead circuit mile, large utilities 2020-2022.

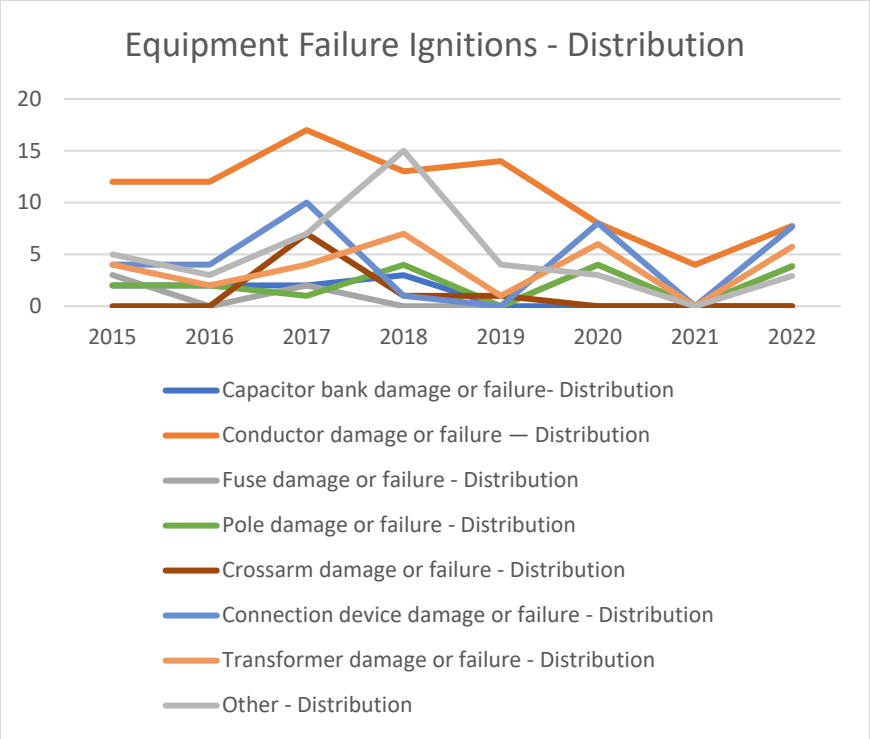


Figure 5.4.c: Distribution Equipment Failure Ignitions in HFTD Tier 2 or 3, measured and projected, from Table 7.2 of PG&E's 2021 WMP Update. Any causes that had two or less ignitions throughout 2015-2022 were not included in the chart.

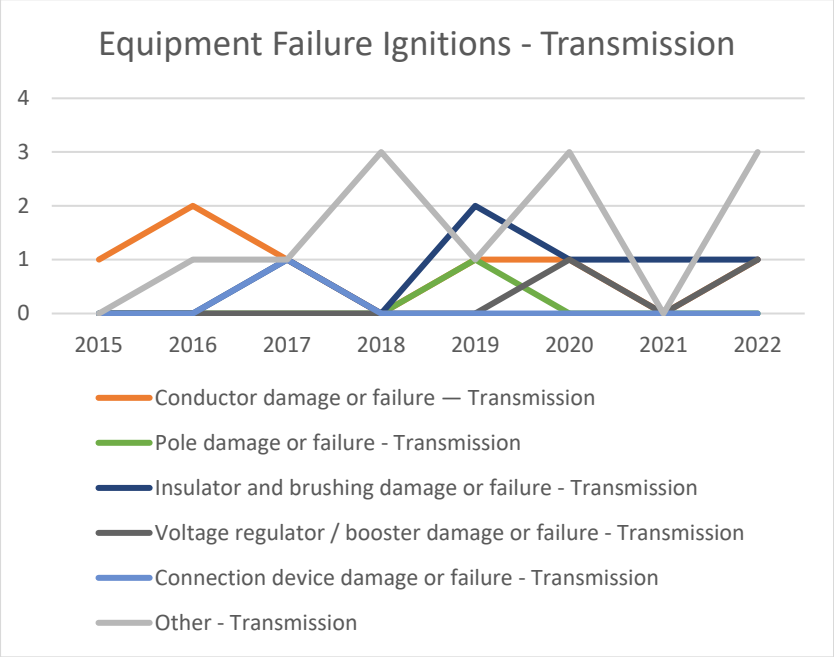


Figure 5.4.d: Transmission Equipment Failure Ignitions in HFTD Tier 2 or 3, measured and projected, from Table 7.2 of PG&E's 2021 WMP Update. Any causes that had zero ignitions throughout 2015-2022 were not included in the chart.

5.5 Vegetation Management and Inspections

Introduction

This section of the WMP Guidelines[115] requires utilities to discuss vegetation management inspections, including inspections that go beyond existing regulation, as well as infrared, light detection and ranging (LiDAR), and patrol inspections of vegetation around distribution and transmission lines/equipment, quality control of those inspections, and limitations on the availability of workers. The utility must also discuss collaborative efforts with local land managers, including efforts to maximize benefit from fuel treatment activities and fire break creation as well as the collaborative development of methods for identifying at-risk vegetation, determining trim clearances beyond minimum regulations, and identifying and mitigating impacts from tree trimming and removal (erosion, flooding, etc.).

Overview

PG&E's vegetation management (VM) program is unequivocally larger and more complex than those of other IOUs. While PG&E has made progress - updating its Vegetation Risk Model and developing a new GIS-based Vegetation Management System[116] - it lags behind its peer utilities, SCE and SDG&E, in many aspects of its VM program. This latency is illustrated by PG&E's Maturity Model; PG&E does not foresee maturing five of six VM Maturity Model capabilities. PG&E's planned end WMP cycle VM maturity is 1, up from 0.7 in 2020, on a 0-4 scale with 0 being lowest. Comparatively, SCE and SDG&E have a planned end WMP cycle VM maturities of 3 and 3.3 respectively (see Attachment 1, Category E, page Attachements-23 for PG&E's 2021 VM Maturity Model Assessment).

In addition to the numerous VM issues Energy Safety has identified in PG&E's 2021 WMP Update, PG&E has other issues derived from the implementation of its VM program. As such, Energy Safety's Compliance Division, along with complaints from ratepayers and local governments, have informed several key areas for improvement in this section.

Below are summaries of other issues affecting PG&E's VM program:

PG&E's Oversight by U.S. Probation Court and the Federal Monitor

[115] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 45 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.
[116] PG&E 2021 WMP Update Revision – Clean, p. 807.

Oversight of PG&E by U.S. Probation Court and the Federal Monitor stems from criminal proceedings for the San Bruno gas explosion on September 9, 2010.

In an October 16, 2020 letter to U.S. District Court Judge Alsup, who oversees PG&E's criminal probation, the Federal Monitor alerted the court that "the Monitor team has not seen a meaningful improvement in the quality of [PG&E's] work from late 2019 to 2020."[117]

The letter outlines vegetation related issues the Federal Monitor has found: "the Monitor team is finding more missed trees…in 2020 than we did in the later part of 2019… although there were meaningful improvements within 2019, that improvement appears to have, at best, plateaued, and perhaps actual regression has occurred."[118]

Ultimately, the letter concludes that PG&E "failed to adhere to its risk models in its work execution and could have done better under its own chosen metrics and approaches. The Monitor team has identified these shortcomings to PG&E leadership and will monitor progress towards meeting past and current PG&E goals."[119]

Enhanced Vegetation Management Audit by Energy Safety and Enhanced Oversight and Enforcement

On February 8, 2021, WSD published an audit of PG&E's 2020 Enhanced Vegetation Management (EVM) program which resulted in seven findings:

1. PG&E failed to communicate its use of a new Risk Overlay Model and provided the WSD with conflicting information regarding when different risk prioritization models were used.
2. WSD received three different EVM prioritization models from PG&E (in September 2020, December 2020, and January 2021) and found that these three data submissions contain inconsistencies and conflicting information.
3. WSD identified concerns in the methodology used to arrive at the final risk score rankings provided in the December model.
4. PG&E appeared to not be sufficiently prioritizing or reducing the risk of wildfire ignition in its implementation of its EVM initiative.
5. PG&E's January 13, 2021, data request response did not provide confidence that PG&E's risk prioritization activities were being effectively operationalized.
6. WSD documented four EVM defects through inspections.
7. PG&E has not communicated adequately with WSD regarding defect resolution (PG&E corrected seven Energy Safety-identified defects that were documented as

[117] Letter from Federal Monitor to U.S. District Court Judge Alsup, October 16, 2020, p. 1.
[118] Letter from Federal Monitor to U.S. District Court Judge Alsup, October 16, 2020, p. 1.
[119] Letter from Federal Monitor to U.S. District Court Judge Alsup, October 16, 2020, p. 6.

disputed/unresolved without notifying WSD), data requests, or large-scale clearing projects.

As a result of these findings, the CPUC passed Resolution M-4852 on April 15, 2021. The Resolution confirmed that PG&E failed to make sufficient risk-driven investments in its vegetation management practices and placed PG&E into the first step of an enhanced oversight and enforcement process (EOE) developed in CPUC Decision 20-05-053. On May 6, 2021, PG&E submitted to the CPUC its Corrective Action Plan (CAP) in response to the findings listed above.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- PG&E's Enhanced Vegetation Management (EVM) program is establishing new, increased clearances for high-risk circuits. Once established through the EVM program, the new clearances are maintained by routine trimming and inspections. The EVM program targets about 1800 circuit miles per year for treatment.
    - In its CAP submitted to the CPUC and Energy Safety as part of the EOE process noted above, PG&E has newly included in the 2021 EVM Scope of Work an additional 600 miles for EVM. These 600 miles "can be substituted for any miles in the highest risk 1,800 miles if we are unable to perform work on any of these miles."[120] PG&E cites permitting timelines and customer refusals as reasons its crews are sometimes "unable to perform work."
- The updated 2021 Vegetation Risk Model allows PG&E to prioritize work with more granularity at the level of circuit protection zones (CPZs).[121] This model is used to prioritize work for PG&E's EVM program.
- A targeted tree species study is being developed and executed to quantify failure risk by species and region. This study will enable PG&E to better asses the risk of individual trees in its large, biologically diverse service territory.
- PG&E forecasts a reduction in vegetation-caused ignitions due to mitigation programs that are informed by risk models over the three-year WMP term.[122]
- PG&E conducted LiDAR inspections for 100 percent of its transmission circuits in the HFTD during mid-cycle which coincides with fire season.
- PG&E will expand the use of ground-based LiDAR for quality control (QC), monitoring the regulatory minimum four-foot radial clearance in HFTD Tier 2 and Tier 3.

[120] PG&E Enhanced Oversight and Enforcement Process Corrective Action Plan Pursuant to Resolution M-4852, May 6, 2021, p. 14.
[121] CPZs are portions of a circuit that can be isolated from the rest of the system. https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/vegetation-management.page (accessed July 12, 2021).
[122] PG&E 2021 WMP Update Revision – Clean, p. 95.

- PG&E is increasing the pool of qualified VM workers "by partnering with the IBEW and educational institutions… to establish a training program designed to provide the skills and knowledge necessary to perform tree crew work safely and competently."[123]
- PG&E is working toward consolidating the data collection tools for various VM activities into a new GIS-based vegetation management system it calls "One Vegetation Management."[124]

PG&E has room for improvement in the following areas:

- Ignitions due to contact with vegetation has remained static since 2017, with 13-14 ignitions per 10,000 overhead circuit miles. (Figure 2.6a)
- PG&E lags behind its peer utilities in the current and anticipated maturity of its VM capabilities (21-26) (Figure 5.3.5a) (see related key issue below).
- As shown in Figure 5.5.a, the percentage of spans inspected where at least some vegetation was found in non-complaint condition has increased significantly since 2015 and rapidly since 2018. Ideally, as PG&E's VM program progresses, this percentage should decrease and plateau, indicating that PG&E vegetation crews are maintaining clearance effectively.

Discussion of Revision Notice Critical Issues RN-PG&E-05 and RN-PG&E-06

As described in Section 1.2, WSD issued a Revision Notice to PG&E on May 4, 2021. PG&E responded to the Revision Notice on June 3, 2021. The table below lists the critical issues contained in the Revision Notice specific to this section of the Action Statement followed by discussion.

Critical issue	Description	Utility response	Energy Safety evaluation
RN-PG&E-05:	Unresolved Discrepancies in Vegetation Management Expenditure Data and Their Effect on the WMP	PG&E attributes the discrepancies for inconsistent spend data due to changing assumptions.	PG&E provided the required information, including a revised Table 12. However, Energy Safety remains concerned about the inconsistency of data and supports PG&E's proposal to hire a "business liaison" for each major WMP initiative category." See below for additional discussion.
RN-PG&E-06	Contradictory Reduction in	PG&E explained how it is ensuring it is still	PG&E's response is complete. However, the

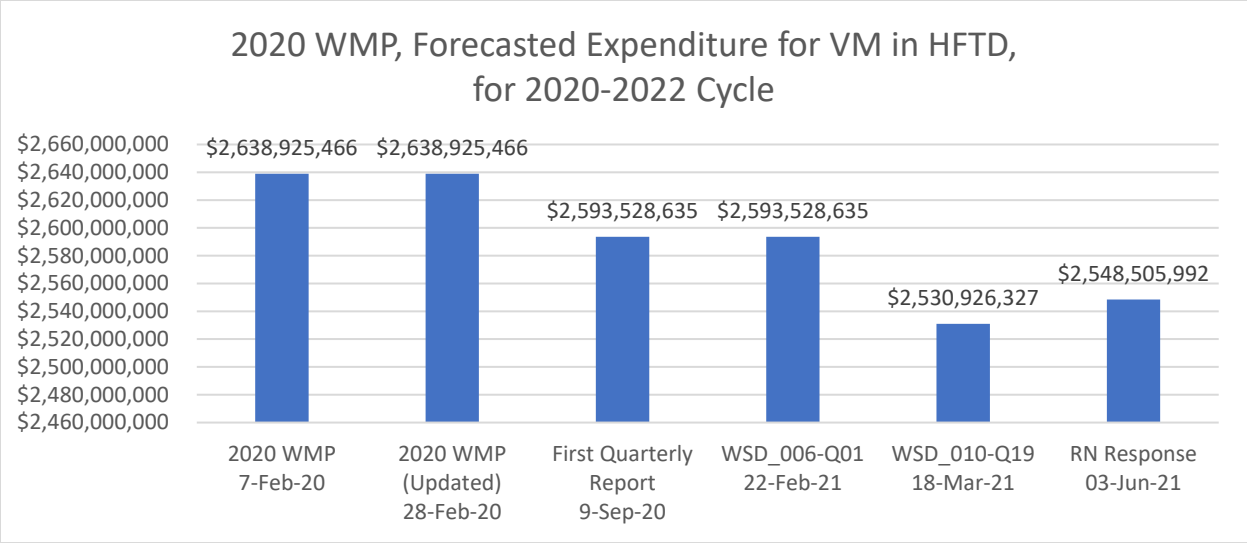
[123] PG&E 2021 WMP Update Revision – Clean, p. 724.
[124] PG&E 2021 WMP Update Revision – Clean, p. 807.

Critical issue	Description	Utility response	Energy Safety evaluation
	Expenditure Allocation for Critical Vegetation Management Initiatives	meeting its risk reduction targets from vegetation contact despite modified percentage allocation and expenditure reduction and provided additional information regarding Section 7.3.5.13 and 7.3.5.14.	details PG&E provided regarding initiatives 7.3.5.13, Quality Assurance / Quality Control of vegetation inspections, and 7.3.5.14, Recruiting and training of vegetation management personnel, raise additional concerns for Energy Safety. See below for additional discussion on future remedies required in the 2022 WMP Update.

Discussion of Revision Notice Critical Issue RN-PG&E-05

Revision Notice critical issue RN-PG&E-05 concerns discrepancies in PG&E's vegetation management expenditure data. In its response PG&E cites changing assumptions for inconsistent spend data. In 2020, Energy Safety had asked PG&E to disaggregate[125] its spend throughout the WMP to align its programs with WSD-defined initiatives; this disaggregated spend was presented in PG&E's First Quarterly Report. Since the first Quarterly report, PG&E has reported its 2020 WMP forecasted expenditure for the 2020-2022 WMP cycle for VM initiatives in the HFTD (VM HFTD Cycle) three times;[126] two of those submissions, including PG&E's Revision Notice Response, were inconsistent with PG&E's First Quarterly Report (see the bar graph below).

[125] Resolution WSD-002 condition Guidance-05 (Class B) and Resolution WSD-003 condition PG&E-1 (Class A).
[126] WSD_006-Q01, received February 22, 2021; WSD_010-Q19, received March 18, 2021; and PG&E's Revision Notice Response, received June 3, 2021.



In its response to remedy 2 of RN_PG&E-05, PG&E states "WSD identified $1,326,981,802 as the HFTD spend from the 2020 WMP. This amount is incorrect… The correct number representing the HFTD VM spend… is $2,547,592,428."[127] However, WSD corrected this $1,326,981,802 figure on May 7, 2021, revising the figure to $2,530,926,327. As Cal Advocates point out, even though PG&E corrects the value, it ignores the fact that value is still less than the values previously reported in September 2020 and February 2021.[128]

Additionally, according to PG&E, WSD miscalculated the 2020 WMP VM territory cycle expenditure from WSD-006-Q01. However, PG&E does not address nor dispute the fact that "On March 9, 2021, PG&E responded to DR WSD_008-Q01 and confirmed that calculations Energy Safety made in 'PGE - Table 12_v2', analysis derived from PG&E's response to WSD_006-Q01, are correct."[129]

In PG&E's Revision Notice Response reply comments, PG&E further explains the discrepancies in expenditure stating:

> The small difference (less than 1 percent) between the 2020 WMP VM HFTD expenditure figure presented in the Revised 2021 WMP ($2,547,592,428) and the figure presented in response to WSD_010-Q19 ($2,530,926,327) exists because point forecasts for QA/QC, LiDAR, and fuel reduction initiatives were not removed from the total programmatic spend correctly before being broken down into HFTD vs. Non-HFTD when disaggregating the initiative-level details in order to respond to the request… This small difference is not material to approval of PG&E's 2021 WMP Update.[130]

[127] PG&E 2021 WMP Update Revision – Clean, p. 416.
[128] Comments of the Public Advocates Office on Pacific Gas and Electric's (PG&E) June 3, 2021, Revision of its 2021 Wildfire Mitigation Plan Update, June 10, 2021, p. 18.
[129] Wildfire Safety Division's Revision Notice for Pacific Gas & Electric Company's 2021 Wildfire Mitigation Plan Update, May 4, 2021, p. 16.
[130] Reply Comments on Pacific Gas and Electric Company's (U 39 E) Revision Notice Response, June 16, 2021, p. 17.

While $16,666,101 may not be "material" in the grand scheme of wildfire mitigation, Energy Safety is less concerned with the values themselves but rather is alarmed by PG&E's seeming inability to produce consistent expenditure figures. Errors like the one described above illustrate that PG&E is not performing simple quality control checks on its expenditure data submissions.

Energy Safety expects PG&E to have consistent financial expenditure data. In response to RN-PG&E-05 remedy 4, PG&E says it exploring having a dedicated "business liaison" for each major WMP initiative category to verify the financial, unit, and RSE assumptions.[131] For the sake of consistency across all WMP-related submissions, Energy Safety fully supports this idea and encourages PG&E to implement it immediately.

Discussion of Revision Notice Critical Issue RN-PG&E-06

Energy Safety identified significant reductions in PG&E's budget allocations for initiatives considered critical to effective execution of its vegetation management programs.

For remedy 1, in which PG&E is required to explain how it is ensuring it is still meeting its risk reduction targets from vegetation contact despite modified percentage allocation and expenditure reduction, PG&E provided normalized expenditure figures using 2021 WMP Update assumptions to compare 2020 WMP and 2021 WMP Update expenditure.[132] While insightful, these figures again highlight that PG&E forecasts spending only $39,372 on recruitment and training of VM personnel (initiative 7.3.5.14) during the 2020-2022 WMP cycle. PG&E does provide an estimate for the total costs associated with completion of the initial VM trainings by VM personnel ($1,345,727.50 for 2020 and 2021)[133] but this estimate is not included as part of the WMP initiative expenditure. As such, it remains unclear what PG&E's reported $39,372 actually encompasses.

PG&E's response to remedy 2 and 3 are complete. However, the details PG&E provided regarding initiatives 7.3.5.13, Quality Assurance / Quality Control of vegetation inspections, and 7.3.5.14, Recruiting and training of vegetation management personnel, raise additional concerns for Energy Safety. These concerns are included in the Additional Issues and Remedies of this section of the Action Statement.

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

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[131] PG&E 2021 WMP Update Revision – Clean, p. 417.
[132] Table PG&E-Revision Notice-7.3.5-1: Comparison of 2020 and 2021 Expenditure Data for 7.3.5.6, 7.3.5.13, and 7.3.5.14 (using 2021 WMP financial assumptions), PG&E Revised 2021 WMP Update p. 689.
[133] PG&E 2021 WMP Update Revision – Clean, p. 729.

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-18	Minimally planned maturity of VM program	PG&E has increased the scale of its VM program but does not foresee maturing five of six VM Maturity Model capabilities. PG&E's planned end WMP cycle VM maturity is 1, up from 0.7 in 2020. Comparatively, SCE and SDG&E have a planned end WMP cycle VM maturities of 3 and 3.3 respectively (see Figure 5.3.5a, below). Additionally, PG&E does not provide adequate discussions in the reoccurring subsection "5. Future improvements to initiative" nor in response to Quarterly Report Action PGE-25 (Class B), subpart 1. PG&E must create a long-term VM maturation strategy and establish clear goals and targets to prioritize work and monitor progress towards its risk-reduction goals.	PG&E must: 1. Reach a maturity of at least 1 for capabilities 24 "Vegetation grow-in mitigation" and 25 "Vegetation fall-in mitigation" by the end of 2023. 2. Clearly define goals and targets to reach each level of maturity for capabilities 21-26. 3. Include a timeline for completion of the goals and targets from (1). 4. Provide a long-term vision for each VM initiative in Subsection 5 "Future improvements to the initiative" (or similar) including any relevant timelines.
PG&E-21-19	Delays in achieving mutually agreeable environmental mitigation	PG&E cites delays in reaching mutually agreeable environmental and community impact mitigation efforts that result in PG&E seeking court orders.[134] These delays, judicial or otherwise, can compromise working relationships between the community	PG&E must show progress on achieving environmental and community impact mitigation agreements with agencies, local governments, and tribal governments. This includes establishing and documenting regularly scheduled meetings between relevant parties to identify permit requirements and potential

[134] PG&E Revised 2021 WMP Update p. 691.

Utility-#	Issue title	Issue description	Remedies required
		and state and local environmental agencies and cause further delays to WMP initiatives.	environmental and community impacts from vegetation management prior to commencement of work. Meeting cadence shall be appropriately in advance of permit applications and scheduled work. PG&E must consider the development of Operations and Maintenance Plans and Memorandums of Understandings with relevant federal, state, and local land managing agencies to facilitate agreed-upon review times of permits and/or vegetation management activities. PG&E must document the outcomes of these efforts and any lessons learned.
PG&E-21-20	Non-inclusion of fire damage attributes in hazard tree assessments	In DR WSD_011, WSD asked PG&E whether fire impact characteristics (char, scorch, etc.) were included in PG&E's Tree Assessment Tool (TAT). PG&E stated that the TAT "does not include post-fire specific factors such as char, etc. This tool was not developed for, or intended to be used in, post-wildfire response circumstances. When wildfires occur, PG&E performs a hazard tree assessment of the burned area to determine whether trees pose a threat to electric assets and	PG&E must: 1. Clarify what tool or standard PG&E and its contractors use in post-wildfire response circumstances for hazard tree assessments; 2. If such a tool or standard does not already include post-fire specific factors (e.g., crown, bole, and root scorch, char, duff consumption[135]). PG&E must include these factors in such tool or standard. 3. If such a tool or standard does not exist, PG&E shall develop one to use in post-wildfire response circumstances. 4. Provide the training to its staff and contractors in post-fire tree assessments.

[135] *Factors Affecting Survival of Fire Injured Trees: A Rating System For Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains*, United States Forest Service, November 25, 2002.

Utility-#	Issue title	Issue description	Remedies required
		if they should be abated." Contradictorily, PG&E specifically defines the TAT in its WMP as a "Tool that evaluates an individual tree's likelihood of failing and supplies instruction of whether to abate or not abate the tree." It is unclear whether PG&E has another tool, other than its TAT, it uses to perform hazard tree assessments in post-wildfire response circumstances or whether it uses no tool or standard assessment for hazard tree assessments in post-wildfire response circumstances.	5. Use such a tool during PG&E's Phase 2 "Non-Imminent Hazard Trees" post-wildfire response.[136] PG&E should use such a tool during Phase 1 "Imminent Threat Inspection" as feasible.
PG&E-21-21	Unknown environmental impact of fire-retardant used on a planned basis	PG&E plans to undertake a review of fire-retardant chemicals ahead of the 2021 wildfire season to pilot under its Utility Defensible Space (UDS) program "pre-treat[ing] ROWs and around equipment in select locations to limit a spark from causing an ignition." PG&E has not determined a long-term plan for this initiative, considers it a	PG&E must provide: 1. The environmental review report to Energy Safety (e.g., Environmental Impact Report (EIR), Environmental Impact Statement (EIS), etc.). 2. The planned bases for which it will use fire-retardant including but not limited to the frequency of applications, timing of applications, amount and type of retardant, and locations of

[136] Phase 2 "Non-Imminent Hazard Trees" is described in "WSD-001 Glass Fire," response received March 1, 2021: Under PG&E's emergency operations protocols, there are two phases of vegetation management inspections. The duration of each phase will vary due to timeline dependencies such as CAL FIRE clearance/accessibility, availability of pre-inspectors and the volume of damage or fire footprint. Phase 1 - Imminent Threat Inspection: Inspect and eliminate any tree that is actively failing and identify trees that will need to be removed by construction crews to support reconstruction work to restore power. Phase 2 - Non-Imminent Hazard Trees: Listing non-immediate hazard trees for work; this can be done in parallel with Phase 1 if inspectors are available.

Utility-#	Issue title	Issue description	Remedies required
		pilot, and has no set targets (e.g., number of circuit miles or acres to be treated with retardant). Fire retardant is typically used as an emergency measure, not as a pre-treatment; long-term, repeated applications of fire-retardant in the same area will likely have negative environmental impacts. A USFS publication[137] highlights some of the environmental impact of fire retardants but does not focus on long-term and repeated use in the same area.	applications to the circuit name and CPZ. 3. Quarterly reports regarding the deployment of fire-retardant to the Compliance Division of OEIS per CPUC approved Compliance Operational Protocols.[138] These reports must include where and when the retardant was used, how much retardant was used, and the specific fire-retardant that was used. 4. An RSE value for planned basis fire retardant applications.
PG&E-21-22	Incomplete identification of vegetation species and record keeping	In Table PG&E-7.3.5-6 on p. 666, PG&E reports that "Oak" and "Pine" are species that have caused >1 percent of several regions' outages. PG&E must ensure proper identification of species so that the "regional species risk values"[139] input to the TAT are updated and accurate. While PG&E does not currently prescribe tree-work based on specific	PG&E must: 1. Use scientific names in its reporting (as opposed to common names). This change will be reflected in the upcoming updates to Energy Safety GIS Reporting Standard. 2. Add genus and species designation input capabilities into its systems which track vegetation (e.g., vegetation inventory system and vegetation-caused outage reports). 3. Identify the genus and species of a tree that has caused an outage[141] or ignition[142] in the Quarterly Data

[137] https://www.fs.fed.us/rm/fire/wfcs/documents/EcoRA-Retardants-PUBLIC-Dec2013-rev3_080614.pdf
[138] Wildfire Safety Division – Compliance Operational Protocols, February 16, 2021: https://energysafety.ca.gov/wp-content/uploads/docs/misc/wsd/2021.02.16-compliance-operational-protocols.pdf.
[139] PG&E 2021 WMP Update p. 667.
[141] WSD GIS Data Reporting Standard Version 2, Transmission Vegetation Caused Unplanned Outage (Feature Class), Section 3.4.5 & Distribution Vegetation Caused Unplanned Outage (Feature Class), Section 3.4.7.
[142] WSD GIS Data Reporting Standard Version 2, Ignition (Feature Class), Section 3.4.3.

Utility-#	Issue title	Issue description	Remedies required
		species,[140] it may choose to do so in the future; in this case, accurate recordkeeping of the species designation is essential.	Reports (QDRs) (in these cases, an unknown "sp." designation is not acceptable). 4. If the tree's species designation is unknown (i.e., if the inspector knows the tree as "Quercus" but is unsure whether the tree is, for example, Quercus kelloggii, Quercus lobata, or Quercus agrifolia), it must be recorded as such. Instead of simply "Quercus," use "Quercus sp." If referencing multiple species within a genus use "spp." (e.g., Quercus spp.).[143] 5. Teach tree species identification skills in its VM personnel training programs, both in initial and continuing education. 6. Encourage all VM personnel identify trees to species in all VM activities and reporting, where possible.
PG&E-21-23	Inadequate joint plan to study the effectiveness of enhanced clearances	RCP Action-PGE-35[144] (Class A) required PG&E, SCE, and SDG&E to "submit a joint, unified plan" to begin a study of the effectiveness of extended vegetation clearances. PG&E submitted its plan to study the effectiveness of extended vegetation clearance as part of its February 26, 2021,	PG&E, SCE, and SDG&E will participate in a multi-year vegetation clearance study. Energy Safety will confirm the details of this study in due course. The objectives of this study are to: 1. Establish uniform data collection standards. 2. Create a cross-utility database of tree-caused risk events (i.e., outages and ignitions caused by vegetation contact).

[140] PG&E 2021 WMP Update p. 667.
[143] Jenks, Matthew A. (undated, from 2012 archived copy), "Plant Nomenclature," Department of Horticulture and Landscape Architecture, Purdue University, accessed May 18, 2021.
[144] Wildfire Safety Division Evaluation of Pacific Gas and Electric Company's Remedial Compliance Plan can be found here (accessed August 2, 2021):
https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2020/pge-rcp-action-statement-20201230.pdf

Utility-#	Issue title	Issue description	Remedies required
		"Supplemental Filing Addressing Remedial Compliance Plan and First Quarterly Report Action Items." PG&E, SCE, and SDG&E presented the "joint, unified" plan to Energy Safety on February 18, 2021. While it was apparent the three large utilities had discussed a unified approach, each utility presented differing analyses that would be performed to measure the effectiveness of enhanced clearances. This presentation's content was not included in the February 26, 2021, "Supplemental Filing Addressing Remedial Compliance Plan and First Quarterly Report Action Items." Energy Safety acknowledges the complexity of this issue; any study performed assessing the effectiveness of enhanced clearances will take years of data collection and rigorous analysis.	3. Incorporate biotic and abiotic factors[145] into the determination of outage and ignition risk caused by vegetation contact. 4. Assess the effectiveness of enhanced clearances. In preparation for this study and the eventual analysis, PG&E must collect the relevant data; the required data are currently defined by Energy Safety Geographic Information System (GIS Data Reporting Standard for California Electrical Corporations - V2). Table 2 below outlines the feature classes which Energy Safety believes will be most relevant to the study. Energy Safety will also be updating the GIS Reporting Standards in 2021, which may include additional data attributes for vegetation-related risk events.
PG&E-21-24	Need for quantified	In Table 12, PG&E only defines quantitative targets	PG&E must define quantitative targets for all VM initiatives. If

[145] Biotic factors include all living things (e.g., an animal or plant) that influence or affect an ecosystem and the organisms in it; abiotic factors include all nonliving conditions or things (e.g., climate or habitat) that influence or affect an ecosystem and the organisms in it.

Utility-#	Issue title	Issue description	Remedies required
	vegetation management (VM) compliance targets	for six of 20 VM initiatives. Energy Safety is statutorily required to audit PG&E when a "substantial portion" of PG&E's VM work is complete;[146] without quantifiable targets in the WMP and subsequent reporting on those targets in the Quarterly Data Report (QDR) and Quarterly Initiative Update (QIU), Energy Safety cannot fully realize its statutory obligations.	quantitative targets are not applicable to an initiative, PG&E must fully justify this, define goals within that initiative, and include a timeline in which it expects to achieve those goals.

Additional Issues and Remedies

In addition to the key areas listed above, Energy Safety finds the following issues and directs associated remedies. All remedies must be addressed in PG&E's 2022 WMP Update.

- ISSUE: PG&E describes creating defensible space around substations "beyond PRC 4291 defensible space recommended zones."[147] PG&E does not provide justification for increased clearances at substations.
    - REMEDY: Define the extent of the expanded substation clearance and the activities that occur beyond PRC 4291 Defensible Space recommended zones (e.g., removal of flash fuels, limbing trees, felling hazard trees, etc.)
    - REMEDY: Justify the decision to increase clearances at substations beyond PRC 4291 defensible space recommended zones.
- ISSUE: PG&E indicates there were an unspecified number of "carry-over" trees trimmed in 2020.[148] Work was scheduled and began on these trees in 2019 but the work was not 100 percent completed and verified until 2020.
    - REMEDY: Detail PG&E's efforts to reduce the number of "carry-over" trees so repeat visits due to barriers (e.g., permitting, access) are limited and trees are trimmed in a more timely and efficient manner.

[146] Pub. Util. Code § 8386.3(c)(5)(A).
[147] PG&E 2021 WMP Update, p. 679.
[148] PG&E 2021 WMP Update Revision – Clean, p. 694.

  - REMEDY: Provide a table that indicates the number of "carry-over" trees by region and Priority Level Finding.
- ISSUE: PG&E's audit target for 2021 quality verification (QV) is the same as 2020; this is despite PG&E having exceeded its target by 500 audits in 2020. Additionally, PG&E states that "For 2021, PG&E anticipates more than tripling our work verification workforce by adding more than 200 quality inspectors to increase our ability to verify that vegetation management was completed to meet or exceed state and federal standards." With a tripled workforce, PG&E should be able increase the target number of audits.
  - REMEDY: PG&E must consider increasing its QV audit goal for 2021 and beyond.
- ISSUE: PG&E does not detail how it "proactively communicates and partners with impacted customers, landowners, government agencies and community organizations regarding the planned work."[149] Rather it lists "various forms of communication."[150] In In subsection 4 "Progress on initiative and plans for next year," PG&E does not detail how it will work with the community, rather it details its internal environmental review process, and cites seeking court orders and working with agencies and legislature to address constraints to their activities.
  - REMEDY: Provide a flow chart or decision tree[151] on communication forms for customers and partner agencies for routine VM, EVM, and emergency work.
  - REMEDY: Explain the capabilities of ProjectWise,[152] and whether it will be used to communicate with customers, governments, and agencies.
- ISSUE: In Section 7.3.5.5, PG&E describes a new pilot program, Utility Defensible Space (UDS), for fuel reduction work along powerline right of ways. However, PG&E does not describe their process for removal, disposal, and cleanup of vegetative material (slash, cut limbs, trees, etc.). This discussion is required by the 2021 WMP Guidelines and was obtained only through a data request.[153]
  - REMEDY: In Section 7.3.5.5, PG&E must discuss its plan and execution of fuel management activities that reduce the availability of fuel in proximity to potential sources of ignition, including both reduction or adjustment of live fuel (in terms of species or otherwise) and of dead fuel, including "slash" from VM activities that produce vegetation material such as branch trimmings and felled trees.
- ISSUE: In response to Revision Notice critical issue RN-PG&E-06, PG&E explained that audits (i.e., its QA, QV, and WV programs) "track retention of initial VM training retention,"[154] "reinforce expectations of quality, wildfire risk mitigation, and safety,"[155] and "identify deficiencies."[156] In the same response, PG&E admits that it "does not have

[149] PG&E 2021 WMP Update Revision – Clean, p. 690.
[150] PG&E 2021 WMP Update Revision – Clean, p. 690.
[151] For an example of a decision tree visit https://hbr.org/1964/07/decision-trees-for-decision-making
[152] PG&E 2021 WMP Update Revision – Clean, p. 691.
[153] WildfireMitigationPlans_DR_WSD_011-Q05
[154] PG&E 2021 WMP Update Revision – Clean, p. 731
[155] PG&E 2021 WMP Update Revision – Clean, p. 733
[156] PG&E 2021 WMP Update Revision – Clean, p. 733

a continuing education, or 'refresher' curriculum for VM." Energy Safety contends that PG&E has been reactively training its VM crews using deficiencies found during audits rather than requiring proactive continuing education; this reactive vs proactive approach is illustrated by the disparity between PG&E's reported 2020-2022 WMP cycle spend on 7.3.5.13, Quality Assurance / Quality Control of vegetation inspections, and 7.3.5.14, Recruiting and training of vegetation management personnel, which are $32,506,607 and $39,372, respectively. Continuing education and audits are not mutually exclusive and should work in tandem to avoid and remedy VM error. PG&E does state that it is "currently in the process of creating a refresher course that will be updated yearly" which will be "ready for use in 2022."[157]

  - REMEDY: PG&E must report on the progress of developing and implementing its new refresher curriculum in Section 7.3.5.14 (or equivalent). This includes detailing the "issues across various scopes of work identified in the previous year"[158] and the "changes to [its] VM programs or changes to safety or work standards"[159] which PG&E intends to include as part of the refresher course.

- ISSUE: In Revision Notice critical issue RN-PG&E-06, PG&E is required to provide VM training pass/fail rates.[160] In its response, PG&E states that its Structured Learning Path (SLP) software allows individuals to re-take the knowledge checks as many times as needed in order to pass, and as a result, PG&E does not track pass/fail rates.[161] As Cal Advocates points out, "since PG&E allows individuals to re-take the knowledge checks as many times as needed, it is possible for an individual to pass through rote memorization after multiple failed attempts, without necessarily comprehending the material. Additionally, if PG&E does not track the number of attempts individuals take to pass, it is impossible to track statistical anomalies that may indicate a problem."[162] PG&E had planned for VM personnel to take a proctored exam at the conclusion of the SLP which would limit participants to only three attempts to pass.; however, this exam was not implemented due to the COVID-19 pandemic.[163]
  - REMEDY: PG&E must begin tracking passing metrics including, but not limited to, the number of attempts taken to pass the SLP knowledge checks in order to track statistical anomalies that may indicate a problem.
  - REMEDY: PG&E should consider implementing its proctored exam with limited pass attempts at the conclusion of the SLP as soon as possible.

[157] PG&E 2021 WMP Update Revision – Clean, p. 722
[158] PG&E 2021 WMP Update Revision – Clean, p. 728
[159] PG&E 2021 WMP Update Revision – Clean, p. 728
[160] Wildfire Safety Division's Revision Notice for Pacific Gas & Electric Company's 2021 Wildfire Mitigation Plan Update, May 4, 2021, p. 22.
[161] PG&E 2021 WMP Update Revision – Clean, p. 730.
[162] Comments of the Public Advocates Office on Pacific Gas and Electric's (PG&E) June 3, 2021 Revision of its 2021 Wildfire Mitigation Plan Update, June 10, 2021, p. 22.
[163] PG&E 2021 WMP Update Revision – Clean, p. 730.

- ISSUE: In response to revision notice critical issue RN-PG&E-06, PG&E states it "currently tracks the ISA certification of VM team members as part of the onboarding process" and that it has been providing the ISA's Tree Risk Assessment Qualification (TRAQ)[164] training to current ISA Certified Arborists.[165] PG&E's response indicates that PG&E does not track ISA certification after onboarding for renewals or initial certification of existing employees. Additionally, there is no indication that PG&E invests in, encourages, monitors, or tracks employee or contractor's progress towards initial certification after onboarding. ISA training and certification is one pathway towards creating a more qualified workforce; PG&E is missing an opportunity to improve the skills of its workers and prove to Energy Safety, agencies, governments, and public that it is invested in improving the skills and qualifications of its workers.
    - REMEDY: PG&E must describe how it is it is promoting and ensuring the continued professional growth of its VM personnel.

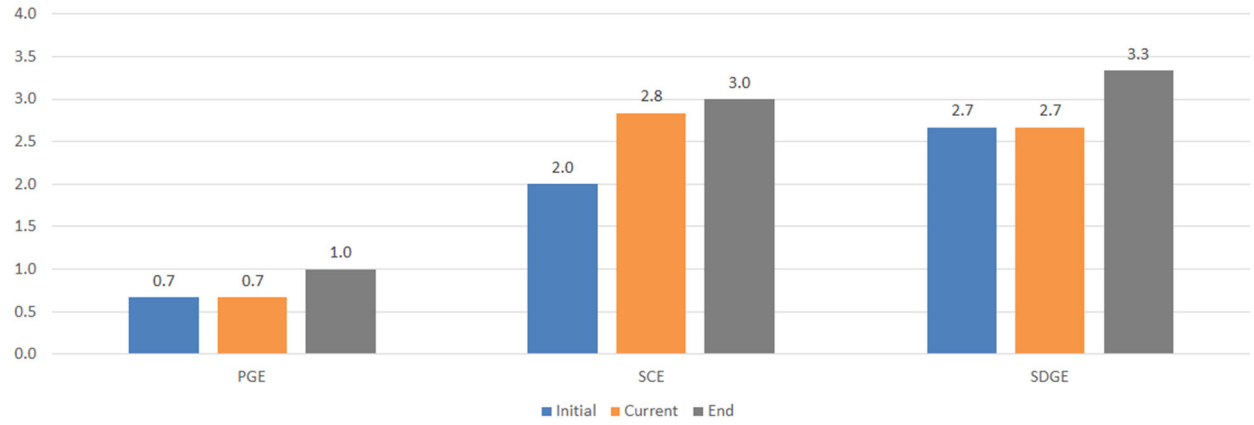
Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

		2015	2016	2017	2018	2019	2020
Vegetation clearance findings from inspection - total	Number of spans inspected where at least some vegetation was found in non-compliant condition - total	2,402	3,010	3,372	5,072	37,914	52,248
	Number of spans inspected for vegetation compliance - total	1,443,176	1,562,166	1,458,738	1,496,906	1,525,349	1,649,978
	Percentage of spans inspected where at least some vegetation was found in non-complaint condition	0.17%	0.19%	0.23%	0.34%	2.49%	3.17%
Vegetation clearance findings from inspection - in HFTD	Number of spans inspected where at least some vegetation was found in non-compliant condition in HFTD	204	442	912	1,919	14,469	24,998
	Number of spans inspected for vegetation compliance in HFTD	170,577	337,899	323,228	428,070	457,740	546,184
	Percentage of spans inspected where at least some vegetation was found in non-complaint condition in HFTD	0.12%	0.13%	0.28%	0.45%	3.16%	4.58%

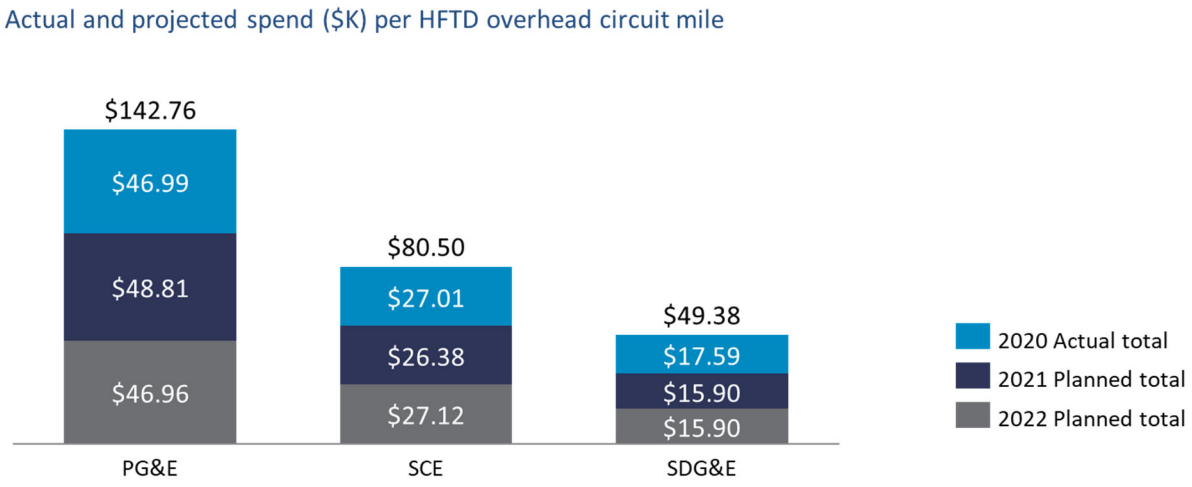
Figure 5.5.a: Vegetation clearance finding from inspections (from WMP Table 1)

[164] https://www.isa-arbor.com/Credentials/ISA-Tree-Risk-Assessment-Qualification
[165] PG&E 2021 WMP Update Revision – Clean, pp. 731-732.



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.5.b: Vegetation management and inspections maturity score progress.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$46.99	$27.01	$17.59
2021 Planned Total	$48.81	$26.38	$15.90
2022 Planned Total	$46.96	$27.12	$15.90

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.5.c: Vegetation management and inspections spend per HFTD overhead circuit mile, large utilities 2020-2022.

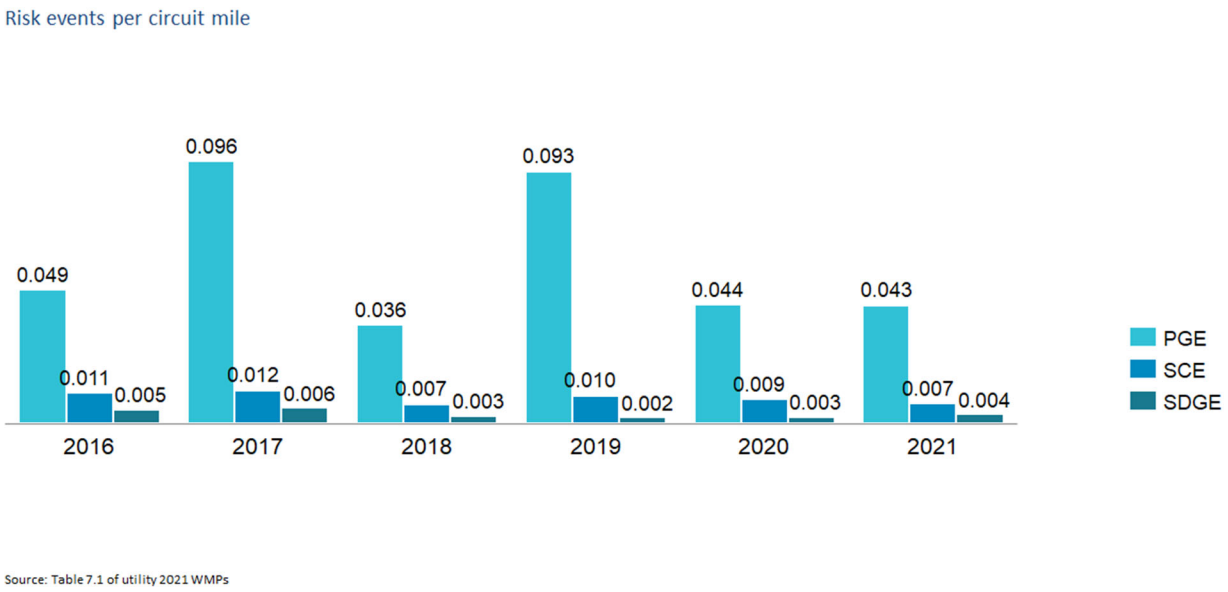


Figure 5.3.d: Risk events per circuit mile due to vegetation contact, large utilities 2016-2021.

5.6 Grid Operations and Operating Protocols, Including PSPS

Introduction

The grid operations and operating protocols section of the WMP Guidelines[166] requires discussion of ways the utility operates its system to reduce wildfire risk. For example, disabling the reclosing function of automatic reclosers[167] during periods of high fire danger (e.g., during Red Flag Warning conditions) can reduce utility ignition potential by minimizing the duration and amount of energy released when there is a fault. This section also requires discussion of work procedures in elevated fire risk conditions and protocols to reduce the frequency and scope of de-energization including PSPS events (e.g., through sectionalization, etc.). This section also requires the utility to report whether it has stationed and/or on-call ignition prevention and suppression resources and services.

Overview

Energy Safety finds that PG&E has made progress in the areas of grid operations and operating protocols and finds this portion of PG&E's 2021 WMP Update to be generally sufficient, subject

[166] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 45 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

[167] A recloser is a switching device that is designed to detect and interrupt momentary fault conditions. The device can reclose automatically and reopen if a fault condition is still detected. However, if a recloser closes a circuit that poses the risk of ignition, wildfire may be the result. For that reason, reclosers are disabled in certain high fire risk conditions. During overcurrent situations, circuit breakers trip a switch that shuts off power to the electrical line.

to remedies. PG&E is expected to provide updates on its progress on identified issues in its ongoing required submissions with Energy Safety. PSPS is also discussed in Section 6.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- In 2020, PG&E disabled all of its automatic reclosers within Tier 2 and 3 HFTDs prior to fire season. In 2021, PG&E plans to continue following its Utility Procedure TD-1464P-01 (Fire Index Patrol and Non-Reclose Procedure) which outlines recloser settings during fire season. PG&E states that 99 percent of distribution reclosing devices and 95 percent of transmission line devices are SCADA-enabled, but the remaining are disabled manually.
- PG&E continued to grow its Safety and Infrastructure Protection Team (SIPT) Program. SIPTs consist of two-person crews certified in safety and infrastructure protection and trained in fire suppression and prevention who accompany PG&E personnel during high-risk work activities in elevated fire risk conditions.[168] As of PG&E's 2021 WMP Update, PG&E's SIPT Program consisted of 40 SIPTs available to respond Monday through Friday, with eight SIPTs on-call on weekends and holidays during the summer preparedness period.
- In 2020, PG&E developed "SafetyNet observation cards" that allowed PG&E personnel to submit comments about the safety of activities being performed. PG&E received 9,500 observation cards, with 99.1 percent demonstrating safe activities in which employees adhered to Standard TD-1464S (Preventing and Mitigating Fires While Performing PG&E Work).[169] In 2021, PG&E states that it is using lessons-learned and findings to expand a quality control program for following Standard TD-1464S.
- PG&E installed over 600 sectionalization devices and 54 transmission switches in order to narrow the de-energization scope of PSPS events. These installations are intended to narrow the boundaries of PSPS events to be as close as possible to the boundaries of PG&E's critical fire weather areas.[170]

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

[168] PG&E's 2021 WMP Update, p. 686.
[169] PG&E's 2021 WMP Update, p. 689.
[170] PG&E's 2021 WMP Redlined Update at pdf p. 810.

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-25	Lack of specificity regarding how increased grid hardening will change system operations, change PSPS thresholds, and reduce PSPS events	PG&E does not commit to changes in its PSPS thresholds for increased grid hardening. PG&E does not specify how increased grid hardening will change system operations.	For each mitigation alternative, including pilot program initiatives, PG&E must provide quantitative analysis on: 1. Changes in system operations. 2. Changes in PSPS thresholds. 3. Estimated changes in the frequency, duration, and number of customers impacted by PSPS events.

Additional Issues and Remedies

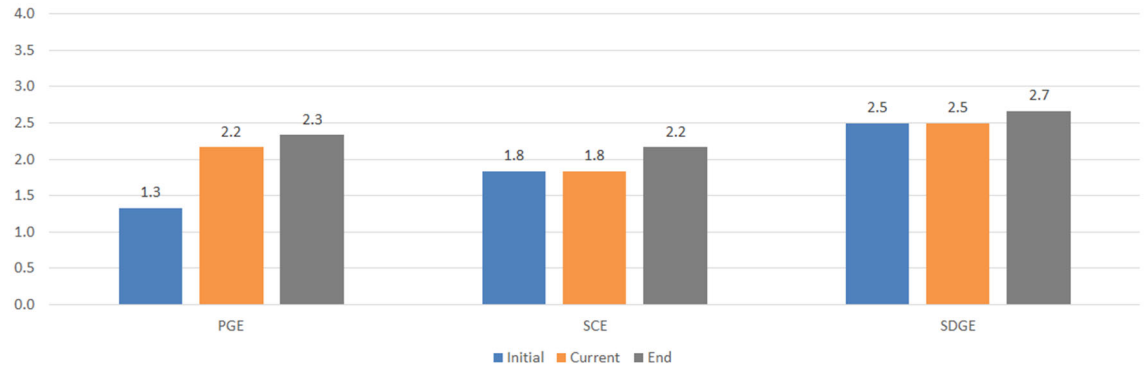
In addition to the key areas listed above, Energy Safety finds the following issue and directs the associated remedy. All remedies must be addressed in PG&E's 2022 WMP Update.

ISSUE: PG&E states that it may potentially increase its fixed-wing fleet in the next two years, therefore decreasing the need to contract aircraft operators for inspection work. However, PG&E does not provide details on its evaluation of this program.

REMEDY: PG&E must (1) explain how it is evaluating the need to increase its fixed-wing fleet, including providing a cost-benefit analysis comparing increasing its fixed-wing fleet to contracting aircraft operators for inspection work, (2) provide details on the intended increase for PG&E's fixed-wing fleet, including how PG&E has determined or will determine the additional number of fixed-wing crafts to purchase, and (3) discuss how it anticipates an increase in its fixed-wing fleet would impact helicopter inspections.

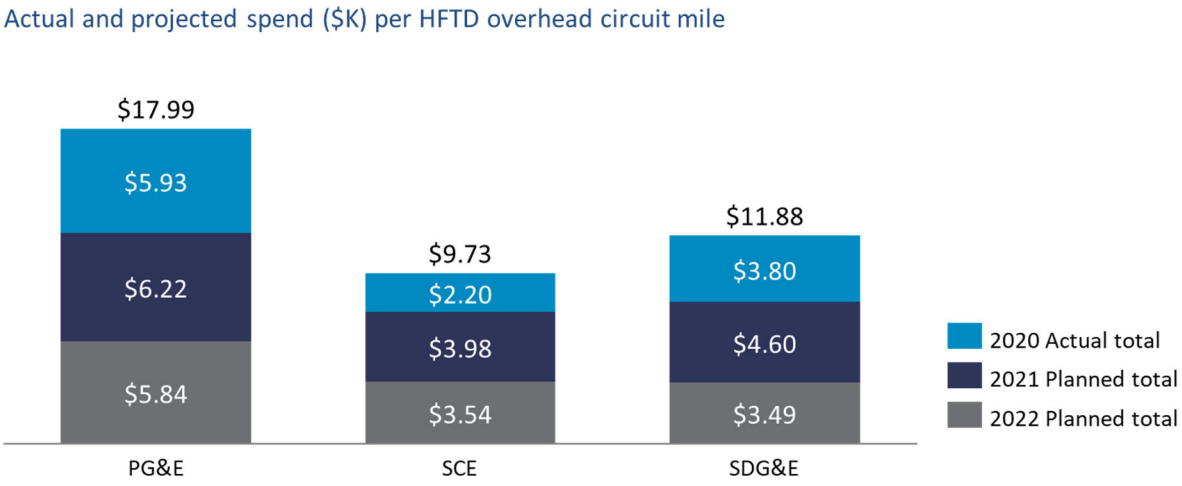
Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.6.a: Grid operations and protocols maturity score progress.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$5.93	$2.20	$3.80
2021 Planned Total	$6.22	$3.98	$4.60
2022 Planned Total	$5.84	$3.54	$3.49

Source: Table 12 of utility 2021 WMPs and subsequent data requests

Figure 5.6.b: Grid operations and protocols spend per HFTD overhead circuit mile, large utilities 2020-2022.

5.7 Data Governance

Introduction

The data governance section of the WMP Guidelines[171] requires information on the utility's initiatives to create a centralized wildfire-related data repository, conduct collaborative research on utility ignition and wildfire, document and share wildfire-related data and algorithms, and track and analyze near-miss data. In addition, this section discusses the quality and completeness of Quarterly Data Reports (QDR), consisting of spatial and non-spatial data submitted as required by condition Guidance-10 in resolution WSD-002. Initial submissions of data were received in September 2020, and QA/QC reports were issued for the spatial data component of those submissions in December 2020. Since those initial QA/QC reports, WSD received two more QDRs in December 2020 and in February or March 2021 (submitted with the utility's 2021 WMP Update). The spatial data are subject to the WSD GIS Data Reporting Standard (GIS Standard), the first version of which was published by the WSD on August 21, 2020, and which was updated on February 4, 2021.[172] The analysis of spatial data in this section focuses on specific areas where the data PG&E submitted with its 2021 WMP Update do not meet the GIS Standard.

Overview

Over the last year, PG&E made progress in developing its data governance program and took important steps to create a central data repository. PG&E provided some information on its collaborative research, but that information was not sufficiently detailed. PG&E provided some information on documentation and disclosure of wildfire-related data and algorithms, but this information was not sufficiently detailed. PG&E did not substantially improve the quality of its quarterly spatial data compared to previous submissions, but these data were generally fairly complete.

Progress over the past year

Energy Safety finds that PG&E has made the following progress:

- Implemented centralized enterprise data platform
- Established an enterprise data management organization
- Built prototype asset failure analysis tool for conductor and distribution transformer failure

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[171] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 45 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

[172] The most recent version of the standard, version 2, is available here: https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/wsd-gis-data-reporting-standard-v2.pdf (accessed July 15, 2021).

- Built prototype Grid Data Analytics Tool to identify and resolve the source of outages
- Ongoing probabilistic wildfire risk assessment modeling (collaboration with UCLA)
- Ongoing research in monitoring distribution feeder using optical sensors to detect faults
- New partnership with Cal Poly wildland urban interface institute - "advising on the direction of research"
- Created a team to collect risk event data

PG&E has room for improvement in the following areas:

- Spatial data in the Quarterly Data Report (QDR) submission: PG&E has not made significant progress compared to the previous quarterly data submission. The data submitted for Q4 2020 have several fundamental issues which negatively affect the useability of the data and do not meet the standard. Many of the issues indicate a lack of internal quality control review of data which may have been converted from other formats or systems. Some of the more significant problems were:
    - Locations which are obviously in error: some of the data submitted in several feature classes, including vegetation management inspections, had no location or were located well outside the continental US.
    - Missing age data: PG&E did not provide age data for the majority of its transmission line assets or any connection devices. Notably, PG&E did not provide estimated age ranges for any assets, which are requested when more specific age data are not available.
    - Missing primary keys: primary key/unique ID fields are fundamental, and data submitted without a unique primary key are not useable. The listed feature classes or tables had some records with missing primary keys or values in primary key fields that are not unique to each record:
        - Vegetation Management Project Log
        - PSPS Event Damage Point
        - PSPS Event Conductor Damage Detail
        - Risk Event Asset Log

Issues and Remedies

While Energy Safety did not identify key areas for improvement in this competency, Energy Safety finds the following issue and directs the associated remedy. Energy Safety expects PG&E to take action to address this issues and report on progress made over the year in its 2022 WMP Update.

- ISSUE: PG&E's spatial QDR data submissions have shortcomings that must be remedied. PG&E lacks internal quality control on its data submissions. Data are sometimes incomplete or unexplained.

- REMEDY: PG&E must submit correct locations, complete age data, and primary keys.

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

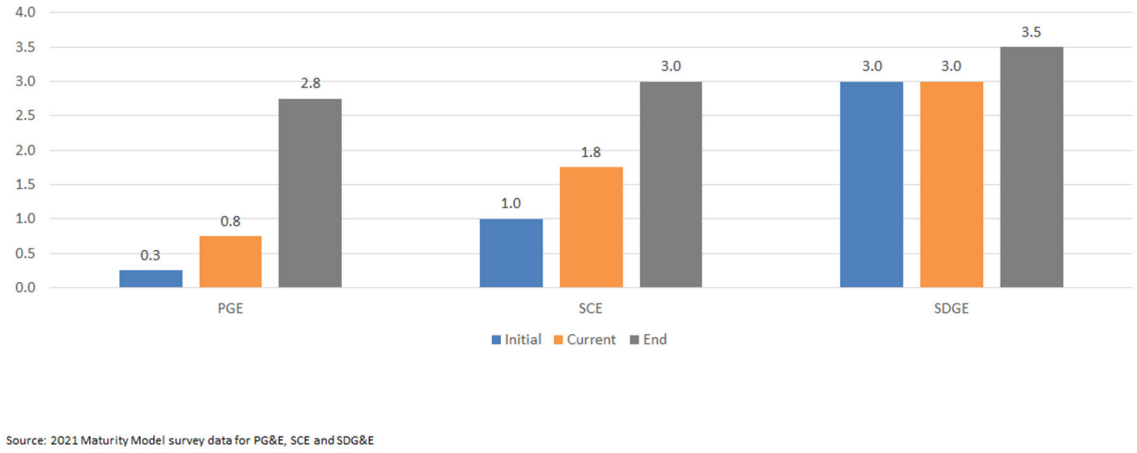
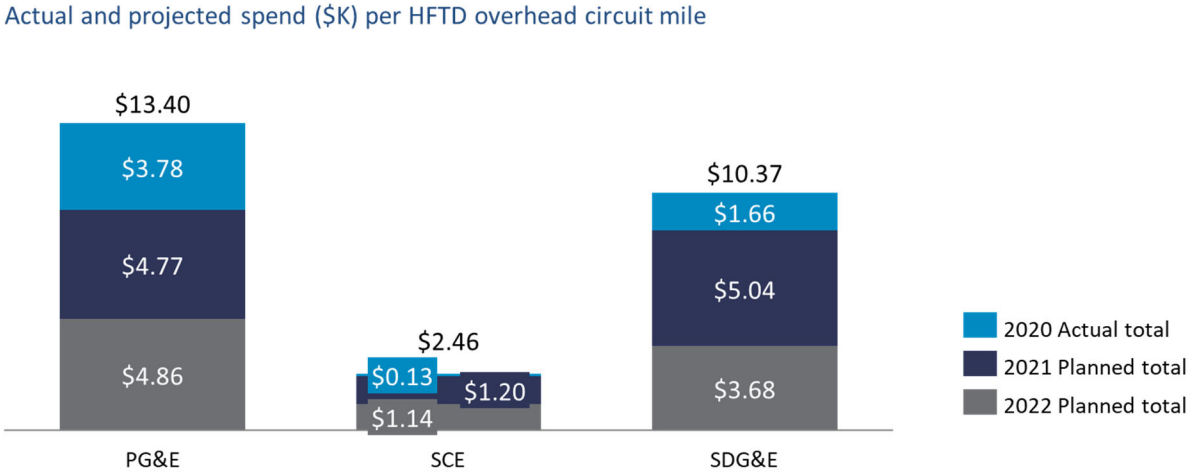


Figure 5.7.a: Data governance maturity score progress.

As noted in Figure 5.7.a, PG&E shows significant progression in their data governance maturity score, however, it remains behind both SCE and SDG&E in this area.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$3.78	$0.13	$1.66
2021 Planned Total	$4.77	$1.20	$5.04
2022 Planned Total	$4.86	$1.14	$3.68

Source: Table 12 of utility 2021 WMPs and subsequent data requests

Figure 5.7.b: Data governance spend per HFTD overhead circuit mile, large utilities 2020-2022.

As Figure 5.7.b shows, PG&E is spending more per HFTD overhead circuit mile on data governance than either SCE or SDG&E.

5.8 Resource Allocation Methodology

Introduction

The resource allocation methodology section of the WMP Guidelines[173] requires the utility to describe its methodology for prioritizing programs by cost-efficiency. This section requires utilities to discuss risk reduction scenario analysis and provide an RSE analysis for each aspect of the plan.

Overview

In its initial WMP Update submission, PG&E aggregated several system hardening initiatives into a larger program. In a Revision Notice, PG&E was required to disaggregate its system hardening program and report the miles treated, spend, and RSE estimates for individual initiatives. PG&E sufficiently addressed the critical issue.

Since the 2020 WMP, PG&E has made progress in its resource allocation methodology capabilities. Specifically, PG&E reported over 10 times more RSE estimates for mitigation initiatives compared to last year. Even with the recent developments, however, it is still unclear how RSE estimates are weighted against other decision-making factors for the initiative-selection process. PG&E must bring clarity to its initiative-selection process by providing a thorough overview of the initiative selection procedure from beginning to implementation. Energy Safety and the WSAB recommend the utilities provide a visual diagram to bring clarity to the utilities' decision-making process.[174] Energy Safety finds that PG&E has made progress in its resource allocation methodology capabilities and finds this portion of PG&E's 2021 WMP Update to be sufficient, subject to remedies.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- PG&E provided 10 times more RSE estimates for mitigation initiatives compared to the 2020 WMP.
- PG&E updated its fire spread technology to show the locations where specific infrastructure failures can lead to ignitions that have the highest consequences. This

[173] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 45 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

[174] WSAB's "Recommendations on the 2021 Wildfire Mitigation Plan Updates for Large Investor-Owned Utilities," Recommendation 3 of Section 2, p. 5.

update allows PG&E to make better risk-informed decisions for infrastructure inspections.

- PG&E incorporated the updated risk model in its System Inspection Program to prioritize inspection workplans.
- PG&E estimated the fire season ignition probabilities using MaxEnt. The models are trained on ignition (or outage) locations and gridded spatial (raster) environmental and asset attribute data. This is an improvement by inputting more accurate data sets (tree type, wind scores, and ground cover) and includes machine learning.

PG&E has room for improvement in the following area:

- PG&E does not report progress in portfolio-wide initiative allocation methodology (capability 41) and portfolio-wide innovation in new wildfire initiatives (capability 42). PG&E reports stagnant growth in these capabilities due to a lack of RSE verification methodology for existing and new initiatives. Specifically, for capabilities 41c and 42b, PG&E states that the utility does not verify RSE estimates and does not have a program in place for evaluating the RSE estimates of new initiatives. PG&E must improve in this category by developing a robust RSE verification methodology. More discussion relating to this topic is found in PG&E-21-28.
- PG&E's RSE estimate for covered conductor installation is vastly different from the other large electrical utilities, as shown in Table 3 below.

Table 3: Covered conductor values from the large electrical utilities.

Utility	2020-2022 Circuit Miles[175]	2020-2022 Cost Per Mile[176]	Risk Reduction Efficiency[177]	RSE[178]
PG&E	918	$1,498,188	62%	4.08
SDG&E	81.9	$1,883,977	70%	76.73
SCE	3,965	$550,725	64%	4,192

The reason for the discrepancy between RSE estimates is not clear at this time, with differences potentially stemming from the comparatively much lower cost per mile given by SCE while maintaining a comparatively similar risk reduction efficiency, as seen in Table 3. More evaluation is needed to determine why PG&E's RSE value differs from the other two large electrical utilities. RSE values for covered conductor should be more standardized in future WMP updates. More discussion relating to this topic is found in PG&E-21-28.

[175] Comments of The Utility Reform Network on 2021 Wildfire Mitigation Plan Updates, p. 35.
[176] Ibid.
[177] Values from PG&E's response to WSD-PGE-010 Q011, provided on March 18, 2021; SDG&E 2021 WMP, p. 192; and SCE's response to TURN-SCE-006 Q004, provided on March 17, 2021.
[178] Values from Table 12 of the WMP Update submissions under the "Estimated RSE for HFTD Tier 3" column for "Covered Conductor Installation"; PG&E's RSE value comes from the utility's Errata (dated March 17, 2021, accessed May 19, 2021: https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan/2021-Wildfire-Safety-Plan-Errata.pdf).

Discussion of Revision Notice Critical Issue RN-PG&E-03

As described in Section 1.2, a Revision Notice was issued to PG&E on May 4, 2021. PG&E responded to the Revision Notice on June 3, 2021. The table below lists the critical issue contained in the Revision Notice specific to this section of the Action Statement followed by discussion. The issue was resolved.

Critical issue	Description	Utility response	Energy Safety evaluation
RN-PG&E-03	Unacceptable Aggregation of System Hardening Risk-Spend Efficiencies (RSEs)	PG&E provided the detailed costs, miles treated, RSE estimates, and other relevant information and data for each of the following mitigations: covered conductor installation, undergrounding, and remote grid. PG&E submitted this information as a revised Table 12.	PG&E addressed the critical issue by providing the costs, miles treated, and RSE estimates for covered conductor installation, undergrounding, and remote grid.

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-26	Inadequate discussion on impact of RSEs in initiative selection	PG&E does not clearly explain how RSE estimates impact the initiative selection process. RSE estimates provide a pathway to assess the relative benefit provided by the mitigation initiatives and must play an integral role in the selection process. Energy Safety understands the dynamic nature of initiative selection due to work management	PG&E must provide an overview of its decision-making framework to include a clear explanation of how RSE estimates impact decision making for initiative selection. The overview must show the rankings of the relative decision-making factors (e.g., planning and execution lead times, resource constraints, etc.) and pinpoint where quantifiable risk reductions and RSE estimates

		efficiencies, operational realities, resource constraints, and other factors. However, a clear description of how RSE estimates impact the selection process must be provided to ensure consistency across initiatives.	are considered in the initiative selection process. Energy Safety recommends a cascading, dynamic "if-then" style flowchart to effectively demonstrate this prioritization process and satisfy this requirement.
PG&E-21-27	Lack of methodology to verify RSE estimates	For capability 41c of the 2021 Maturity Survey, PG&E showed no planned progress by selecting "Utility does not verify RSE estimates" for the years 2020 - 2023. In order to rely on RSEs to select mitigation initiatives, PG&E must have high confidence that the calculated RSEs are accurate. Moreover, for capability 40a of the 2021 Maturity Survey PG&E selected "Utility has accurate relative understanding of cost and effectiveness to produce a reliable risk spend efficiency estimate." Without a verification process, the utility cannot guarantee reliability of RSE estimations. PG&E must develop a methodology to assess the accuracy of its RSE estimates. Comparatively SCE and SDG&E can, at a base level, verify their calculated RSEs with historical and experimental pilot data.	PG&E must provide a detailed RSE verification plan with attainable benchmarks and timeline.
PG&E-21-28	RSE values vary across utilities	Energy Safety raises a concern that there are stark variances in RSE estimates, sometimes on several orders of	The utilities[182] must collaborate through a working group facilitated by Energy Safety[183] to develop a more standardized

[182] Here "utilities" refers to PG&E, San Diego Gas & Electric (SDG&E), Southern California Edison Company (SCE).
[183] The WSD transitioned to the Office of Energy Infrastructure Safety (Energy Safety) on July 1, 2021.

		magnitude, for the same initiatives calculated by different utilities. For example, PG&E's RSE for covered conductor installation was 4.08,[179] SDG&E's RSE was 76.73,[180] and SCE's RSE was 4,192.[181] These drastic differences reveal that there are significant discrepancies between the utilities' inputs and assumptions, which further support the need for exploration and alignment of these calculations.	approach to the inputs and assumptions used for RSE calculations. After Energy Safety completes its evaluation of the 2021 WMP Updates, it will provide additional detail on the specifics of this working group. This working group will focus on addressing the inconsistencies between the utilities' inputs and assumptions, used for their RSE calculations, which will allow for: 1. Collaboration among utilities; 2. Stakeholder and academic expert input; and 3. Increased transparency.

Additional Issues and Remedies

In addition to the key areas listed above, Energy Safety finds the following issues and directs associated remedies. All remedies must be addressed in PG&E's 2022 WMP Update.

- ISSUE: In its 2021 WMP Update, PG&E continues to use noncommittal and equivocating language to describe future improvements to resource allocation methodology. Per Guidance-8, part iii of Section 5.4.4 of Resolution WSD-002, "Continued use of equivocating language may result in denial of future WMPs."[184] Regarding PG&E's future improvements to PG&E's risk spend efficiency analysis, PG&E states, "RSE calculations are *continually being refined* by *better data* for effectiveness and scope calculations, coupled with *better input* from the SME as the use of data for RSE calculations is *better understood* with time." [185] The phrases "continually being refined", "better data", "better input", and "better understood" are not measurable, quantifiable, or verifiable

[179] Value from PG&E's Errata (dated March 17, 2021, accessed May 19, 2021: https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan/2021-Wildfire-Safety-Plan-Errata.pdf

[180] Value from Table 12 of SDGE's 2021 WMP Update submissions under the "Estimated RSE for HFTD Tier 3" column for "Covered Conductor Installation."

[181] Value from Table 12 of SCE's 2021 WMP Update submissions under the "Estimated RSE for HFTD Tier 3" column for "Covered Conductor Installation."

[184] "Condition (Guidance-8, Class C): In its 2021 WMP update, each electrical corporation shall: […] iii) Dispense with empty rhetoric and not use terms that are ambiguous, misleading, or otherwise have the result of diluting commitments. Continued use of equivocating language may result in denial of future WMPs" (p. 24).

[185] PG&E's 2021 WMP Update Revised – Clean, p. 813-814

by Energy Safety. The usage of these phrases indicts a lack of commitment for PG&E to improve its resource allocation methodology.

- REMEDY: PG&E must eliminate the usage of equivocating language in order to provide measurable, quantifiable, and verifiable benchmarks.

- ISSUE: For capability 41a of the 2021 Maturity Survey, PG&E selected "Utility does not base capital allocation on RSE" for 2021 and starting 2023, the "Utility will consider estimates of RSE for capital allocation". Compared to its peers, SCE and SDGE are at least considering estimates of RSE when allocating capital resources.
  - REMEDY: PG&E must: 1) explain why it does not currently consider RSE estimates for capital resource allocation, and 2) provide a detailed pathway to begin the consideration of RSE estimates for capital resource allocation in its 2022 WMP Update.

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

Top 5 Initiative Activities by Planned Spend – PG&E ($M)

	Initiative Activity	Category	2020 Plan *From 2020 WMP*	2020 Actual *From 2021 WMP*	2021 Plan	2022 Plan	Total WMP Cycle Planned Spend	Initiative Spend as % of Total Planned Spend
1	7.3.5.2 Detailed inspections of vegetation around distribution electric lines and equipment	Vegetation Management	$188	$1,098	$1,065	$1,023	$3,186	21%
2	7.3.3.17.1 Updates to grid topology to minimize risk of ignition in HFTDs, System Hardening, Distribution	Grid Design & System Hardening	$246	$460	$338	$872	$1,671	11%
3	7.3.3.12.3 Other corrective action, Maintenance, Transmission	Grid Design & System Hardening	$237	$552	$544	$390	$1,486	10%
4	7.3.3.12.4 Other corrective action, Maintenance, Distribution	Grid Design & System Hardening	$305	$348	$322	$297	$968	7%
5	7.3.3.6 Distribution pole replacement and reinforcement, including with composite poles	Grid Design & System Hardening	$253	$244	$304	$360	$908	6%
	Total spend for top 5 initiatives		$1,229	$2,702	$2,574	$2,943	$8,219	55%

7.3.5.2 in top 5 for SDG&E as well

Large 21-22 increase

7.3.3.6 in top 5 for SCE as well

Top 5 initiatives make up over 50% of total WMP cycle planned spend

Source: Table 12 of 2021 utility WMPs, PGE Revision Notice data and subsequent data requests

Figure 5.8.a: Resource allocation detail for top five initiative activities by planned spend, PG&E.

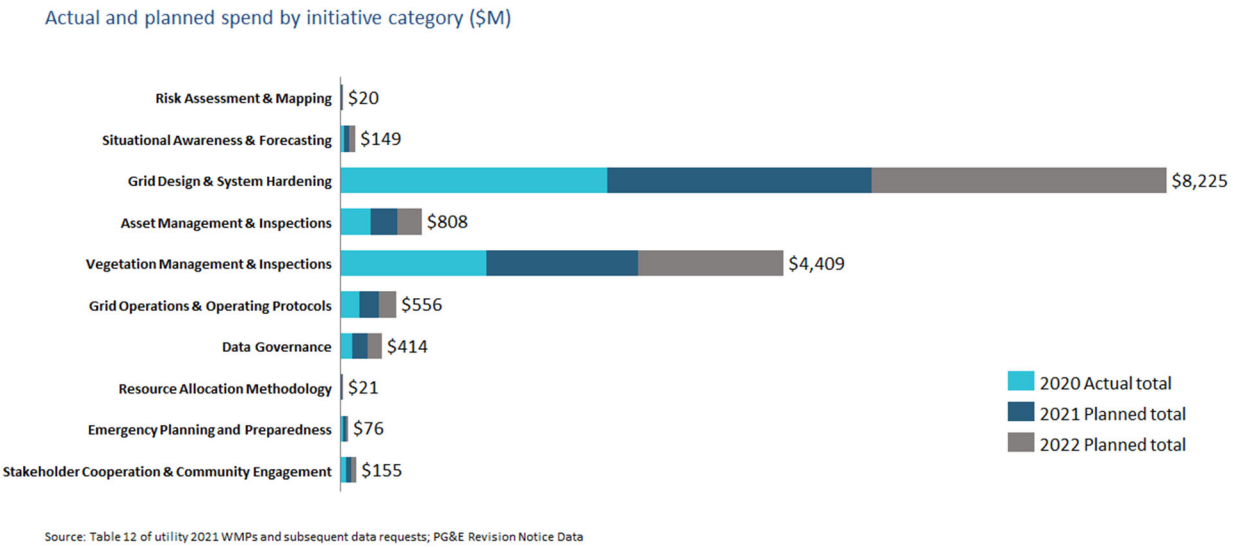


Figure 5.8.b: Overview of spend by initiative category, PG&E.

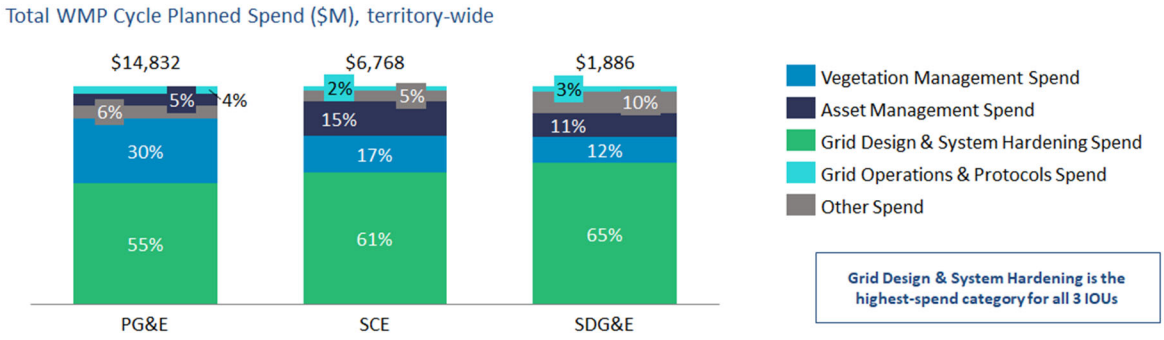
Total WMP Cycle Planned Spend ($M and %)

Top 3 spend categories the same across all utilities

	PG&E Plan Total	SCE Plan Total	SDG&E Plan Total
Grid Design & System Hardening	$8,225 M (56%)	$4,097 M (61%)	$1,219 M (65%)
Veg Mgmt. & Inspections	$4,409 M (30%)	$1,127 M (17%)	$223 M (12%)
Asset Mgmt. & Inspections	$808 M (5%)	$1,044 M (15%)	$209 M (11%)
Grid Operations & Protocols	$556 M (4%)	$136 M (2%)	$54 M (3%)
Data Governance	$414 M (3%)	$35 M (0.5%)	$47 M (2%)
Situational Awareness & Forecasting	$149 M (1%)	$170 M (3%)	$26 M (1%)
Emergency Planning & Preparedness	$76 M (0.5%)	$35 M (1%)	$47 M (3%)
Stakeholder Cooperation & Community Engagement	$155 M (1%)	$51 M (1%)	$39 M (2%)
Resource Allocation & Methodology	$21 M (0.1%)	$59 M (1%)	$18 M (1%)
Risk Assessment & Mapping	$20 M (0.1%)	$ 3 (0.04%)	$5 M (0.2%)
Total Planned Spend for WMP cycle	**$14,832 M**	**$6,768 M[1]**	**$1,886 M**

Source: Tables 3-1, 3-2 and 12 of 2021 utility WMPs, subsequent data requests, SCE and PGE Revision Notices
1. SCE's total planned spend for WMP cycle includes the addition of initiative 7.1.D – Alternative Technologies, which does not belong to a WMP category

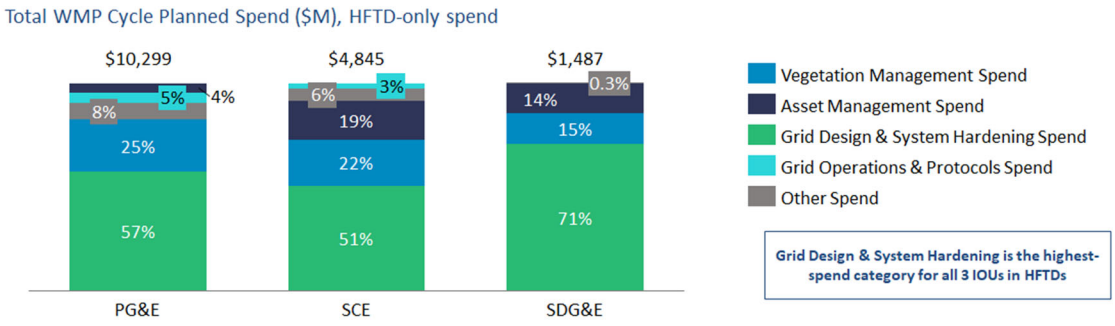
Figure 5.8.c: Breakdown of planned spend by category, large utilities.



	PG&E ($M)	SCE ($M)	SDG&E ($M)
Grid Design & System Hardening	$8,225	$4,097	$1,219
Veg. Mgmt. & Inspections	$4,409	$1,127	$223
Asset Mgmt. & Inspections	$808	$1,044	$209
Grid Operations & Protocols	$556	$136	$54
Other	$835	$363	$182

Source: Table 12 of utility 2021 WMPs, SCE and PGE Revision Notices, and subsequent data requests.

Figure 5.8.d: Overview of planned spend, territory-wide, large utilities.

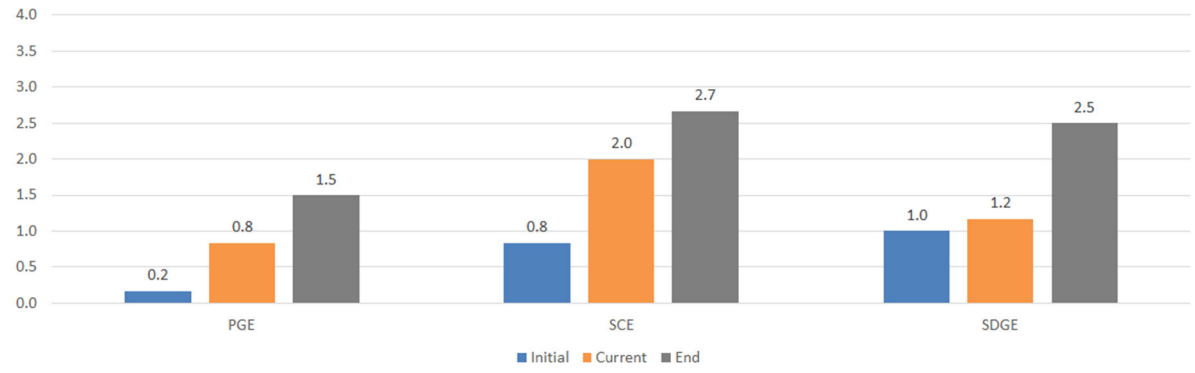


	PG&E ($M)	SCE ($M)	SDG&E ($M)
Grid Design & System Hardening	$5,920	$2,457	$1,050
Veg. Mgmt. & Inspections	$2,569	$1,063	$223
Asset Mgmt. & Inspections	$457	$899	$210
Grid Operations & Protocols	$555	$136	$0
Other	$798	$289	$4

SDG&E did not report HFTD / non-HFTD split for Grid. Ops

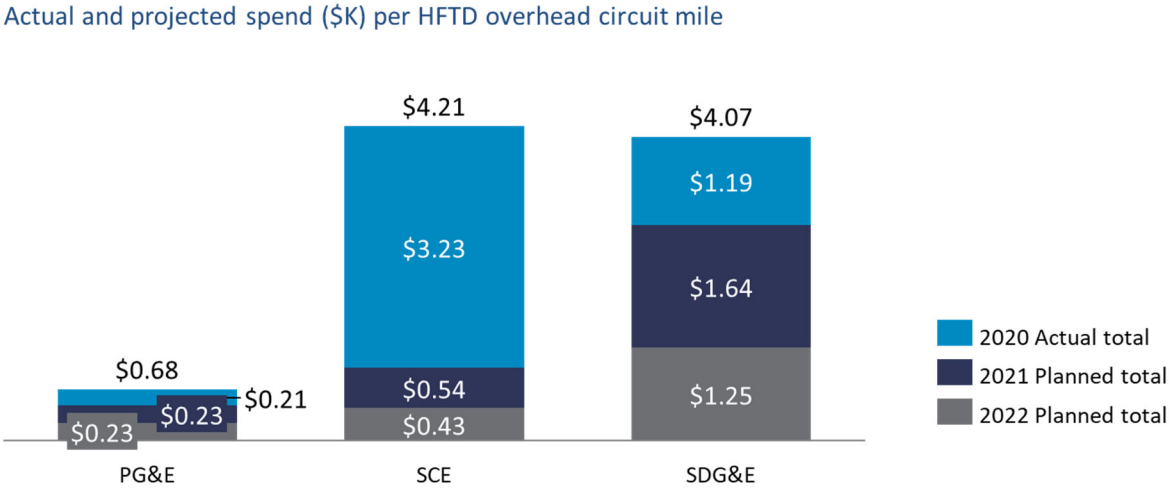
Source: Table 12 of utility 2021 WMPs, PG&E and SCE Revision Notices, and subsequent data requests

Figure 5.8.e: Overview of total planned spend, HFTD-only, large utilities.



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.8.f: Resource allocation methodology maturity score progress.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$0.21	$3.23	$1.19
2021 Planned Total	$0.23	$0.54	$1.64
2022 Planned Total	$0.23	$0.43	$1.25

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.8.g: Resource allocation methodology spend per HFTD overhead circuit mile, large utilities 2020-2022.

5.9 Emergency Planning and Preparedness

Introduction

This section of the WMP Guidelines[186] requires a general description of the utility's overall emergency preparedness and response plan, including discussion of how the plan is consistent with legal requirements for customer support before, during, and after a wildfire, including support for low-income customers, billing adjustments, deposit waivers, extended payment plans, suspension of disconnection and nonpayment fees, and repairs. Utilities are also required to describe emergency communications before, during, and after a wildfire in languages deemed prevalent in a utility's territory (D.19-05-036, supplemented by D.20-03-004),[187] and other languages required by the Commission.

This section of the WMP Guidelines also requires discussion of the utility's plans for coordination with first responders and other public safety organizations, plans to prepare for and restore service, including workforce mobilization and prepositioning of equipment and employees, and a showing that the utility has an adequately sized and trained workforce to promptly restore service after a major event.

Overview

PG&E's Emergency Planning and Preparedness has improved from 2020, including its implementation of training workforce for service restoration, community outreach and emergency preparedness protocols. PG&E continues to improve the adequacy of its workforce by providing its apprentices and linemen with the training and tools necessary to support outage restoration, patrols, inspection, and maintenance to reduce system impacts, ensure public safety, and reduce the risk of wildfire.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- In 2020, PG&E reports it met its hiring goal for 2020 by hiring 40 linemen and 100 apprentices.[188] PG&E indicates it has departments focused on identifying, hiring, retaining, and training a qualified field workforce to ensure restoration of power to customers in a safe, efficient, and timely manner. In February 2020, PG&E, Cal OES, the

[186] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 46 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.
[187] A language is prevalent if it is spoken by 1,000 or more persons in the utility's territory or if it is spoken by 5 percent or more of the population within a "public safety answering point" in the utility territory. See California Government Code Section 53112 for more information.
[188] PG&E 2021 WMP Update at p. 769.

CPUC, and the other utilities entered an agreement to help ensure consistent training requirements for all EOC staff.[189]

- PG&E reports that it engages with stakeholders with a focus on emergency planning and preparedness; has updated its outreach approach based on individual communities' past PSPS and wildfire impacts with a focus on providing support to heavily impacted communities with information and resources; and details its community outreach, public awareness, and engagement plan.
- PG&E established a plan in 2019 to ensure the restoration of basic services, community functionality, and support access to resources that facilitate recovery. PG&E indicates it has used the plan in six emergencies through 2020.
- In 2021, PG&E updated its emergency response plan standards and published its 2020 Company Emergency Response Plan (CERP) to align with standardized emergency management practices of public partners and facilitate stronger coordination during emergency response. It also expanded roles and responsibilities of its Emergency Operations Center.
- In 2020, PG&E reports it focused on the creation or update of standards for service restoration with training for 1) performing work within vegetated lands that could result in fire ignition, 2) disabling, reclosing, and testing electric circuits and patrol/restoration actions during fire season, 3) establishing guidelines for PSPS events, and 4) PSPS scoping, de-energizing, and restoration.[190]
- In 2020, PG&E reports it acquired 65 helicopters, as well as two fixed-wing aircraft, equipped with cameras, capable of night flying. These aircraft were used during PSPS events to expedite patrols and restoration activities and supported emergent wildfire events and other activities as they occurred.[191]

Issues and Remedies

Energy Safety finds the following issues and directs associated remedies. All remedies must be addressed in PG&E's 2022 WMP Update.

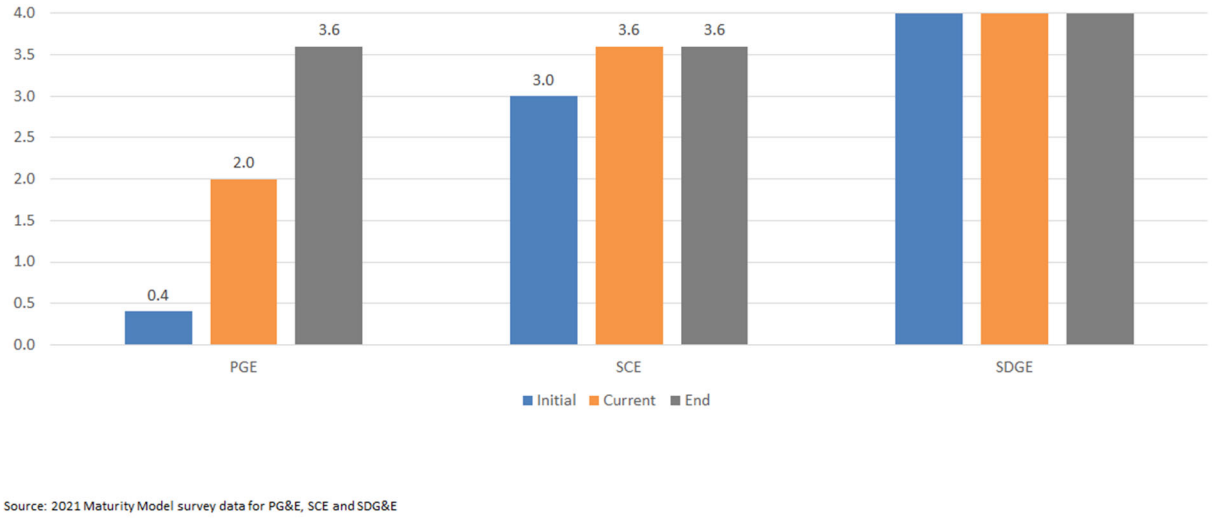
- ISSUE: PG&E states that after a wildfire event the utility reviews and evaluates communications to customers and the public. This feedback is then used to improve customer and public communications and outreach efforts for the following year. However, PG&E fails to explain the type of information collected about wildfire outreach efforts, how it is collected, and how it is used to inform future outreach efforts (or prioritize improvements).
    - REMEDY: PG&E needs to develop a transparent methodology to track customer feedback, identify priorities and incorporate those into future plans.
- ISSUE: PG&E indicates it uses the After Action Review (AAR) process to identify key lessons learned from each Emergency Operations Center (EOC) and develop protocols learned from wildfire response. While PG&E explains how it formalizes the AAR process,

[189] PG&E 2021 WMP Update, p. 746.
[190] PG&E 2021 WMP Update, p. 811.
[191] PG&E 2021 WMP Update, p. 813.

it is difficult to determine the how effective the process has been in improving protocols.
    - REMEDY: PG&E must describe what lessons it learned through its AAR process and how the corrective action improvements were implemented following this process.
- ISSUE: PG&E shows a decrease in its Emergency Planning and Preparedness spend, despite significant increases in self-reported maturity.
    - REMEDY: PG&E must describe how it plans to accomplish its projected maturity in Emergency Planning and Preparedness initiatives when spend has decreased.

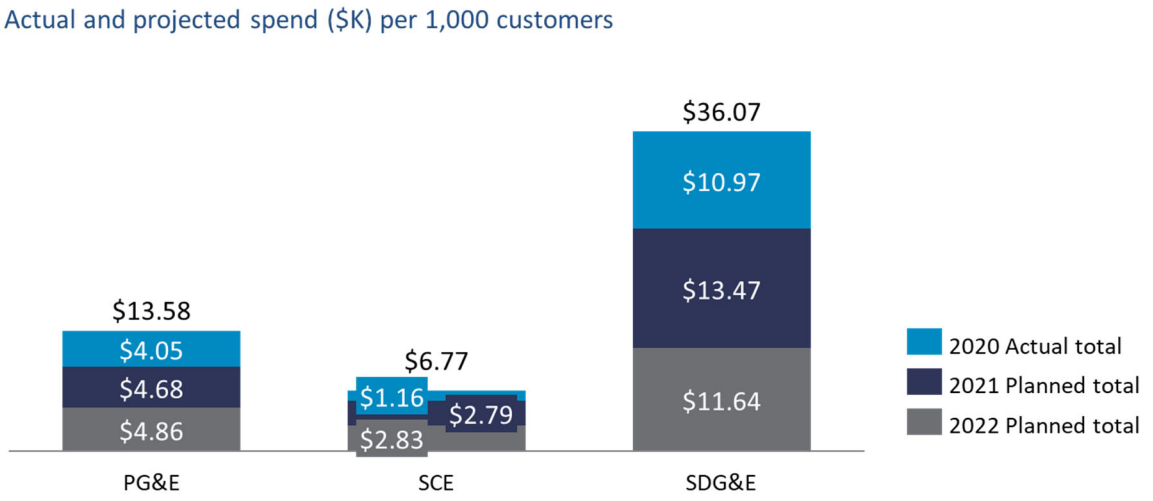
Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.9.a: Emergency planning and preparedness maturity score progress.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$4.05	$1.16	$10.97
2021 Planned Total	$4.68	$2.79	$13.47
2022 Planned Total	$4.86	$2.83	$11.64

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.9.b: Emergency planning and preparedness spend per HFTD overhead circuit mile, large utilities 2020-2022.

5.10 Stakeholder Cooperation and Community Engagement

Introduction

The final initiative category in the WMP Guidelines[192] requires the utility to report on the extent to which it will engage the communities it serves and cooperate and share best practices with community members, agencies outside California, fire suppression agencies, forest service entities and others engaged in vegetation management or fuel reduction.

Overview

Energy Safety finds that PG&E has made progress in Stakeholder Cooperation and Community Engagement and finds this portion of PG&E's 2021 WMP Update to be sufficient. PG&E has a strategic approach toward stakeholder cooperation and community engagement and details its

[192] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 46 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.

outreach and engagement plan support fueled by ongoing evaluation on the effectiveness of its efforts.

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- In 2020, PG&E reports it launched a new PSPS Portal for public safety partners and established a PSPS Advisory Board, which includes representatives from local and tribal governments.
- In 2020, PG&E states it engaged with over 250 community-based organizations (CBO) and has secured contracts with 66 CBOs to provide additional resources to customers during PSPS events.[193]
- PG&E reports progress on engagement and outreach efforts, including hosting 200 meetings, establishing five regional working groups, three PSPS workshops, co-hosting 35 wildfire sessions with OES, and having 84 million average monthly advertising impressions in advance of PSPS events or likelihood of wildfire. [194]
- PG&E describes growth in cooperation and sharing best practices with entities both inside and outside of California as it became a founding member of the Utility Executive Steering Group for the International Wildfire Risk Mitigation Consortium (IWRMC). An example benefit was the Rapid Earth Fault Current Limiter technology that PG&E installed in 2020 and is actively testing to assess wildfire risk mitigation.
- In 2020, PG&E reports its Public Safety Specialist (PSS) team supported 600 external engagement activities including: hosting PSPS listening sessions, Wildfire Safety Working Sessions, regional working group meetings, gas/electric safety workshops, professional group meetings, wildfire safety trainings, and gas safety outreach with external public safety partners.[195]
- In 2020 PG&E reports it combined its PSS team with Gas Operations and Electric Operations, hired additional members and expanded the team. PG&E claims its collaboration with external safety partners improved its overall operational efficiencies and communications.
- As part of an existing agreement with the United States Forest Service (USFS), PG&E reports it developed the Fuels Reduction Partnership Program that received $5M in funding to address fuel reduction within all 11 USFS forests in PG&E's service territory. In 2020, the USFS was able to acquire the necessary machinery to efficiently and safely complete fuels reduction project work. This machinery will also support additional fuels reduction work over multiple years on acreages beyond the 2020 work areas.
- PG&E reports it established agreements to reduce wildfire risk by allowing PG&E to expedite critical, routine operations and maintenance activity on land managed by other

[193] PG&E 2021 WMP Update, p. 823
[194] PG&E 2021 WMP Update, p. 824
[195] PG&E 2021 WMP Update, p. 835.

federal and state landowners, including with California State Parks, the Bureau of Land Management, and the National Park Service.

- In 2020, PG&E reports the Community Wildfire Safety Program (CWSP) Project Management Office (PMO) Team increased to seven PG&E staff plus contractor support to cover program management, work tracking, regulatory deliverables (including the development of the WMP itself), wildfire workstream coordination, communications planning, and issue resolution.

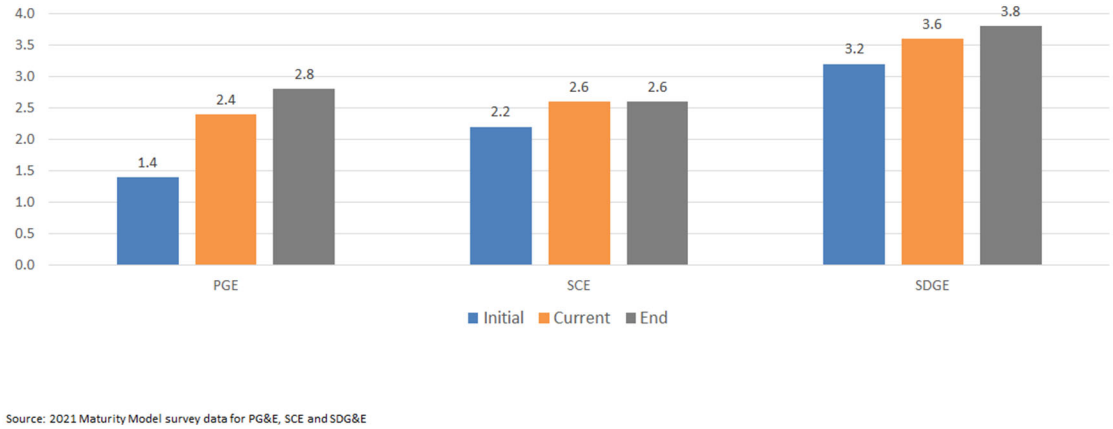
PG&E has room for improvement in the following area:

- While PG&E describes how it reaches out to stakeholders, it fails to provide information about how it collects stakeholder feedback (not just feedback about outreach efforts) and how it incorporates this information into both its community engagement efforts and its wildfire mitigation planning.
- As described above, PG&E indicates longstanding relationships with the USFS[196] and other agencies to coordinate fuel reduction, system maintenance on non-PG&E rights of way, and secure government funding to support coordinated mitigation initiatives. However, its responses to questions under capability 52 of the Utility Maturity Survey ("Collaboration on wildfire mitigation planning with stakeholders") show little growth between year 1 and year 3 in this area. PG&E also reports reorganization and expansion of its Public Safety Specialists (PSS) team, which supports and prioritizes external engagement activities, in 2020. Energy Safety expects to see growth reflected in PG&E's Maturity Survey responses to match progress described by PG&E in its 2021 WMP Update. For instance, how PG&E is adjusting its plans to cooperate with other stakeholders state-wide, with focus on areas that would have the biggest impact in reducing wildfire risk.

Figures

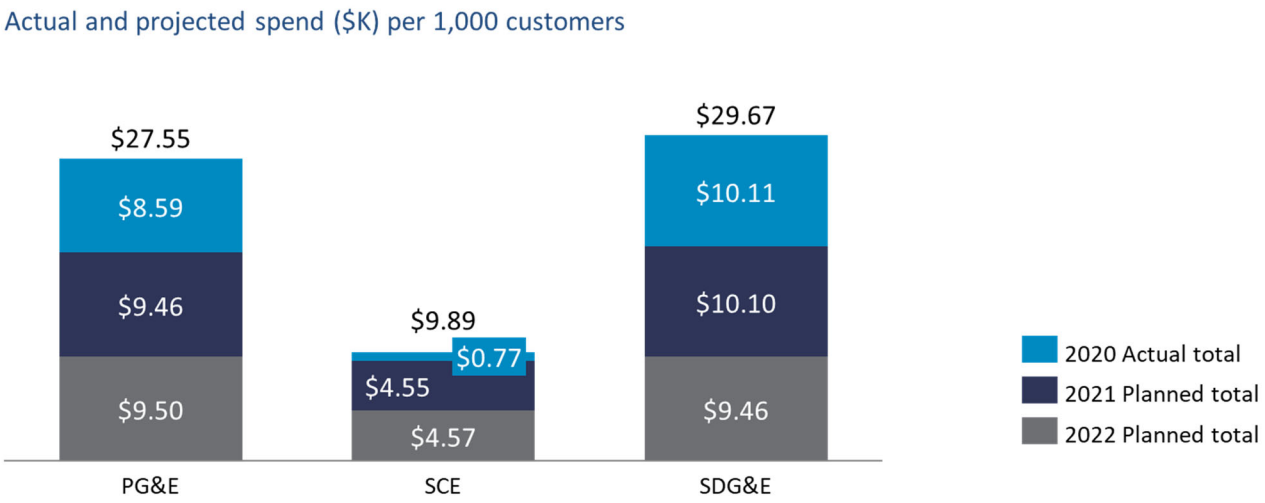
Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

[196] PG&E 2021 WMP Update, p. 840-841. PG&E indicates it "is the first IOU in California to partner with a federal agency on a program of this type. The Company is always looking at ways to improve and make the Fuels Reduction Partnership Program more effective. [...] Future coordination of the program will also identify and focus on areas of improvement such as funding adjustments, use of new technologies, and new process developments for fuels management."



Source: 2021 Maturity Model survey data for PG&E, SCE and SDG&E

Figure 5.10.a: Stakeholder cooperation and community engagement maturity score progress.



	PG&E ($K)	SCE ($K)	SDG&E ($K)
2020 Actual Total	$8.59	$0.77	$10.11
2021 Planned Total	$9.46	$4.55	$10.10
2022 Planned Total	$9.50	$4.57	$9.46

Source: Table 12 of utility 2021 WMPs and subsequent data requests; PG&E and SCE Revision Notice Data

Figure 5.10.b: Stakeholder cooperation and community engagement spend per 1,000 customers, large utilities 2020-2022.

6 PUBLIC SAFETY POWER SHUTOFF (PSPS), INCLUDING DIRECTIONAL VISION FOR PSPS

Introduction

In recent years, Public Safety Power Shutoffs (PSPS) have been increasingly used by utilities to mitigate wildfire risk. PSPS events introduce substantial risk to the public and impose a

significant burden on public services that must activate during a PSPS event. Energy Safety supports the use of PSPS only as a last resort and expects the utilities to clearly present plans for reducing the scale, scope, and frequency of PSPS events.

In 2021, WSD separated the reporting of PSPS from the reporting of mitigations and progress metrics to reflect the definition of PSPS as a last resort rather than a mitigation option (pursuant to CPUC Guidance Resolution WSD-002 and PSPS CPUC decisions D.19-05-036 and D.20-03-004).[197] This section of the WMP Guidelines[198] requires utilities to report their current and projected progress in PSPS mitigation, including lessons learned from the prior year, de-energization and re-energization protocols, PSPS outcome metrics, plans to reduce future PSPS impacts, and community engagement.

Overview

Energy Safety finds that PG&E has made progress in addressing PSPS, including directional vision for PSPS and finds this portion of PG&E's 2021 WMP Update to be sufficient, subject to remedies.

In its initial WMP submission, PG&E omitted targets for reduction in scale, scope, and frequency of PSPS, citing uncertainty surrounding proposed conditions in its federal probation case.[199] In a Revision Notice, PG&E was required to update its WMP to remedy the omission of quantitative targets. PG&E sufficiently addressed the remedy in its Revision Notice Response and the critical issue is de-escalated.

In the WMP, PG&E outlines its plans to make PSPS events "smaller, shorter, and smarter"[200] and recognizes PSPS as a measure of last resort to reduce the risk of catastrophic fires. Over the long-term, PG&E expects a significant reduction in PSPS customer impact as new technologies are deployed and hardening projects are completed.

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[197] When calculating RSE for PSPS, electrical corporations generally assume 100 percent wildfire risk mitigation and very low implementation costs because societal costs and impact are not included. When calculated this way, PSPS will always rise to the top as a wildfire mitigation tool, but it will always fail to account for its true costs to customers. Therefore, electrical corporations shall not rely on RSE calculations as a tool to justify the use of PSPS.
[198] WSD-011 Attachment 2.2, 2021 Wildfire Mitigation Plan Guidelines Template, p. 46-49 (accessed July 18, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2021/attachment-2.2-to-wsd-011-2021-wmp-guidelines-template.pdf.
[199] PG&E 2021 Wildfire Mitigation Plan Report, February 5, 2021, p. 847.
[200] PG&E 2021 Wildfire Mitigation Plan – Revised, June 3, 2021, p. 932,

Progress Over the Past Year

Energy Safety finds that PG&E has made the following progress:

- PG&E reduced the size of PSPS events from 2019, despite more severe weather events in 2020. PG&E attributes the reductions in improvements to meteorology tools and increased segmentation.
- PG&E has scaled and improved post-PSPS restoration operations.
- PG&E updated its PSPS Portal tool for 2020, providing maps, situation reports, critical facility lists, and Medical Baseline customer lists to local agencies, state agencies, and first responders.
- In 2020, PG&E established the Telecommunications Resiliency Collaborative to coordinate during emergency events and promote overall resiliency with telecommunication providers.
- PG&E has shown continued refinement of the models and factors that are considered during decision-making. PG&E does not have a singular algorithm that yields an objective result on whether to initiate a PSPS event and the ultimate decision is a "judgement by the meteorology team".[201]

PG&E has room for improvement in the following areas:

- PG&E's methodology for projecting PSPS customer hours requires further refinement. PSPS projections generate great stakeholder and public interest,[202] yet PG&E's projections are difficult to compare to recorded data from past PSPS events.
- As highlighted in PG&E-21-25, in section 5.6 above, PG&E lacks specificity regarding how grid hardening efforts will change PSPS thresholds and reduce PSPS events.

Discussion of Revision Notice Critical Issue RN-PG&E-01

As described in Section 1.2, a Revision Notice was issued to PG&E on May 4, 2021. PG&E responded to the Revision Notice on June 3, 2021. The table below lists the critical issues contained in the Revision Notice specific to this section of the Action Statement followed by discussion. While PG&E provided sufficient information to resolve the critical issue, additional information and remedies are required in the future. Please see the section on "key areas for improvement" below for more information.

[201] PG&E 2021 Wildfire Mitigation Plan Report, February 5, 2021, p. 881.
[202] Comments on PG&E's 2021 WMP Update from: Cal Advocates, ATC, Kevin Collins, GPI, MGRA, RCRC, SCC, Valley Women's Club for the San Lorenzo Valley, Professor Sandoval, and TURN.

Critical issue	Description	Utility response	Energy Safety evaluation
RN-PG&E-01 Omission of Quantitative Targets for Reduction in PSPS Scale, Scope, and Frequency	PG&E omitted inclusion of quantitative targets for reducing the scale, scope, and frequency of PSPS events; it does not fully explain how its programmatic commitments over the next WMP cycle will reduce PSPS events; and it projects an increase in customer planned outage hours for 2021 and 2022 despite the implementation of mitigation measures over this time period.	PG&E responded to each required remedy, including: 1) description of changes to its PSPS protocols, 2) quantitative targets for reducing scale, scope, and frequency of PSPS, 3) description of PSPS target methodology, 4) expected quantitative reduction of PSPS scale, scope, and/or frequency from programmatic commitments, 5) detail of how major programs are factored into PSPS projections, and 6) explanation of why its projected customer outage hours for 2021 and 2022 are an increase over recorded customer outage hours in 2020.	PG&E's response sufficiently addresses each required remedy; however, PG&E states that its PSPS approach will likely change in August 2021 and the new approach may be "substantially"[203] different than PG&E's current approach.[204] Energy Safety recognizes the need to continually refine and improve PSPS protocols, but significant changes to PSPS protocols could result in significant changes to PSPS commitments. As soon as practicable, PG&E must provide an update, including showing how its new PSPS protocols affect targets. See key area for improvement PG&E-21-29 below.

Key Areas for Improvement and Remedies

Energy Safety finds that PG&E must focus on the following areas as significant to reducing utility-related wildfire risk. Remedies to the following issues must be addressed in a progress report due November 1, 2021.

[203] PG&E Revision Notice response, section 2 "2021 PSPS Protocols," page 983.
[204] In its Revision Notice response, PG&E labels its current PSPS protocols, in effect from May 2021 through August 2021, as "2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags."

Utility-#	Issue title	Issue description	Remedies required
PG&E-21-29	PSPS targets and projections set to expire	PG&E states that its PSPS approach will likely change in August 2021. When PG&E updates its approach, the PSPS targets and projections presented in its WMP Update and Revision Notice response will become obsolete.	As soon as practicable, and no later than September 30, 2021, PG&E must submit a Change Order Report:[205] 1. Describing in full and complete detail its updated PSPS protocols. 2. Showing how its updated PSPS protocols affect PSPS projections (Table 11). 3. Showing how its updated PSPS protocols affect all quantitative and qualitative targets for reducing the scale, scope, and frequency of PSPS. 4. Meeting all requirements for a Change Order Report set out in section 7 of this Action Statement.

Additional Issues and Remedies

In addition to the key areas listed above, Energy Safety finds the following issue and directs the associated remedy. All remedies must be addressed in PG&E's 2022 WMP Update.

- ISSUE: PG&E's projections for customer outage hours uses an 11-year average of simulated historical PSPS events. In the lookback simulation, the PSPS duration each customer experienced is calculated as the weather duration plus restoration time, which results in the lookback simulation using maximum event hours for customers, regardless of the hours actually experienced by customers. This methodology does not provide an accurate projection of PSPS customer hours and creates an estimate that is difficult to compare to past events.
    - REMEDY: PG&E must refine its PSPS projection methodology. Projections must be comparable to recorded data from past events. To the extent practicable, projections should factor the actual duration experienced from past PSPS events.

[205] This reporting requirements do not replace or amend any reporting or other obligations that may be imposed on PG&E by the CPUC, including CPUC Resolution M-4856 associated with PG&E's new considerations of tree overstrike factors into its PSPS protocols.

Figures

Below are additional charts, maps and tables used as part of Energy Safety's review of PG&E's WMP Update:

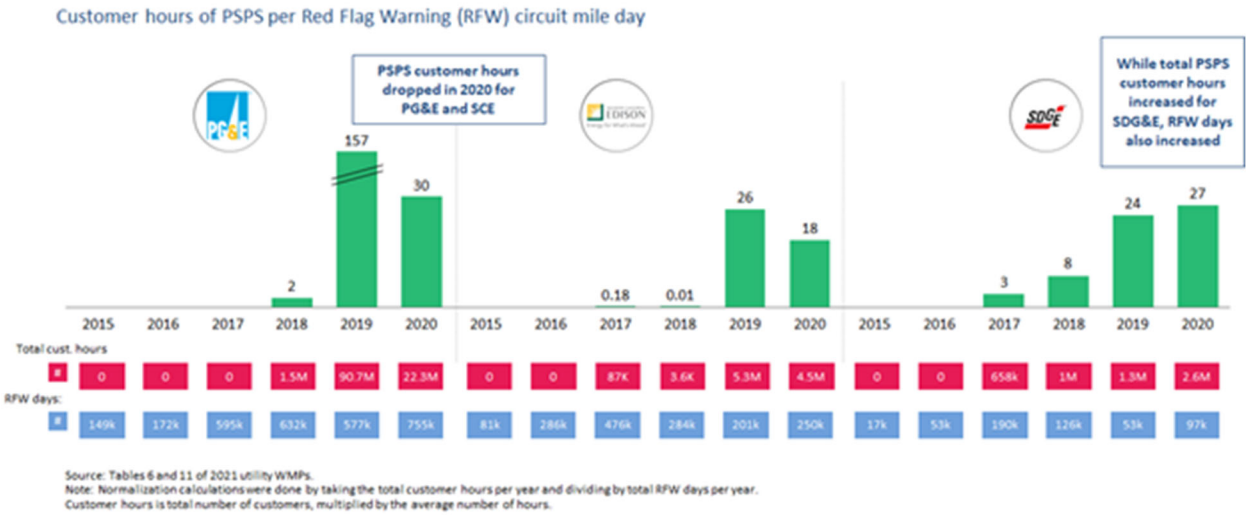


Figure 6.a: Customer hours of PSPS per Red Flag Warning (RFW) circuit mile day

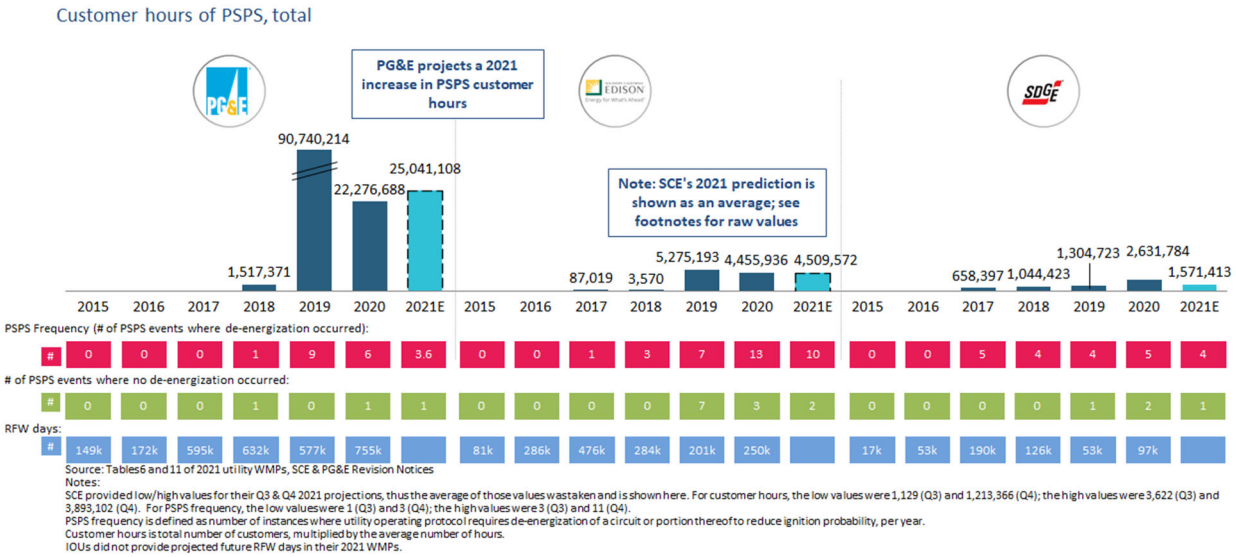


Figure 6.b: PSPS duration in customer hours (total), PG&E Scenario 1: Forecasted data as average of historical data

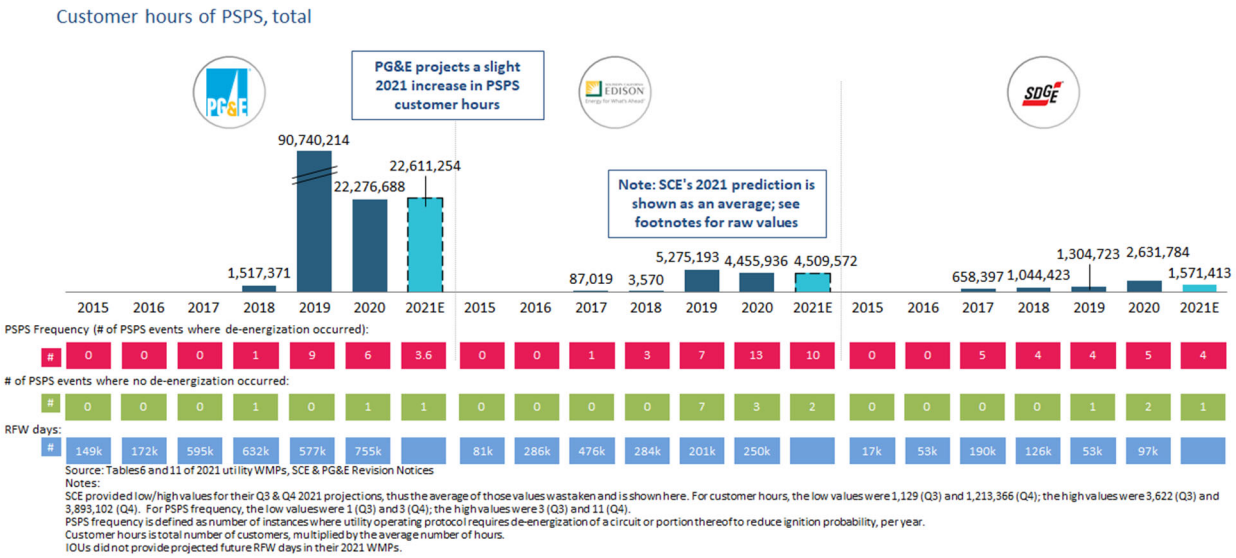


Figure 6.c: PSPS duration in customer hours (total), PG&E Scenario 2: Forecasted data with 2021 planned WMP mitigations in place

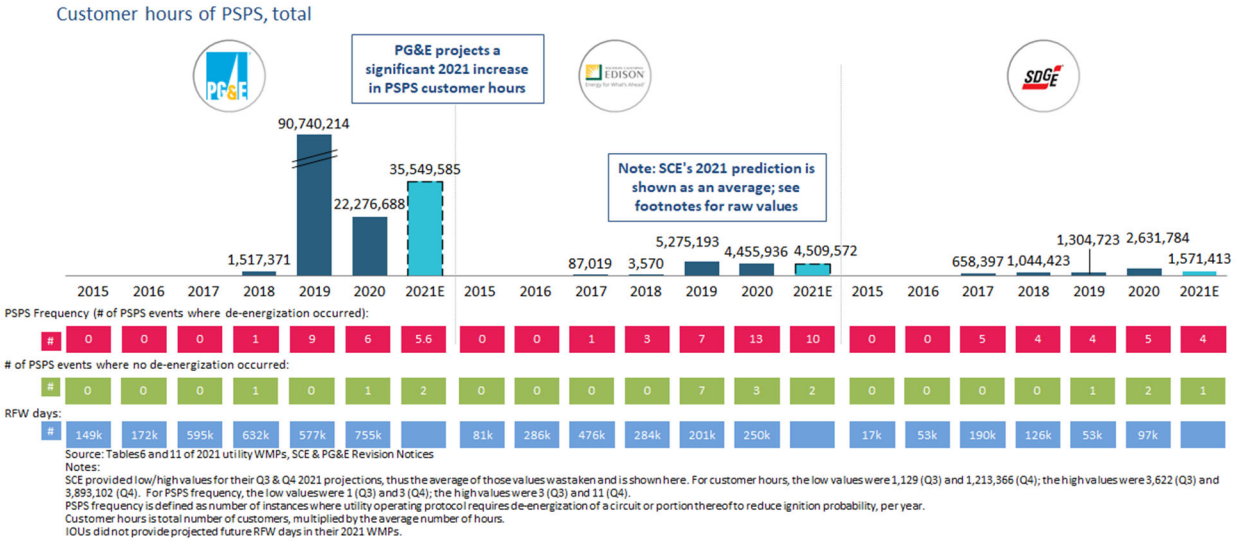


Figure 6.d: PSPS duration in customer hours (total), PG&E Scenario 3: Forecasted data with 2021 mitigations and 2020 PSPS protocols plus tree overstrike potential and priority tags criteria added

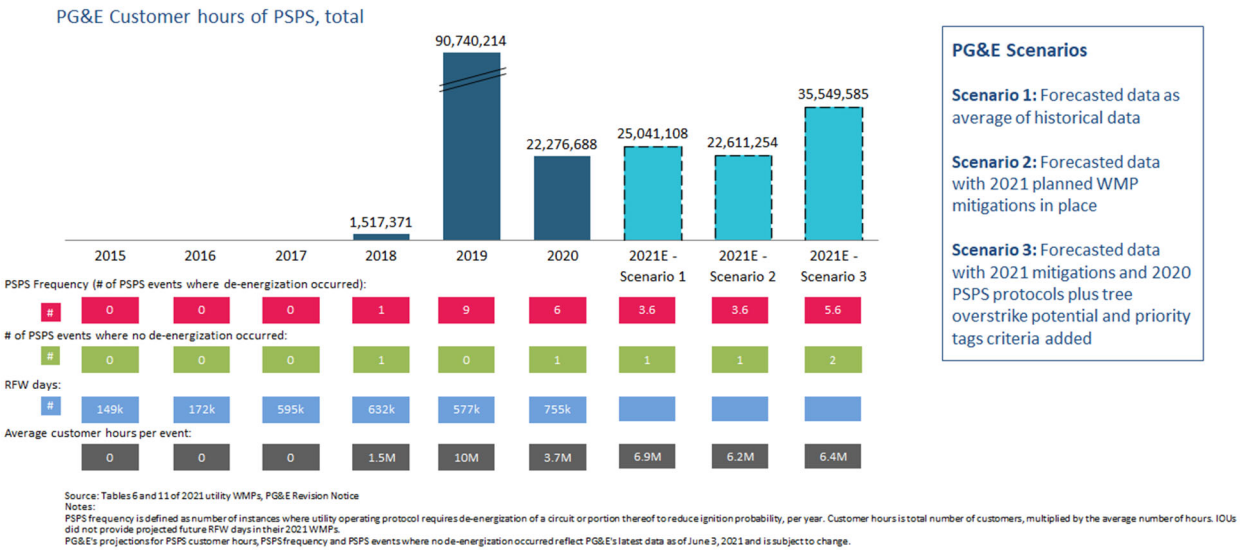


Figure 6.e: PSPS duration in customer hours (total), PG&E all scenarios

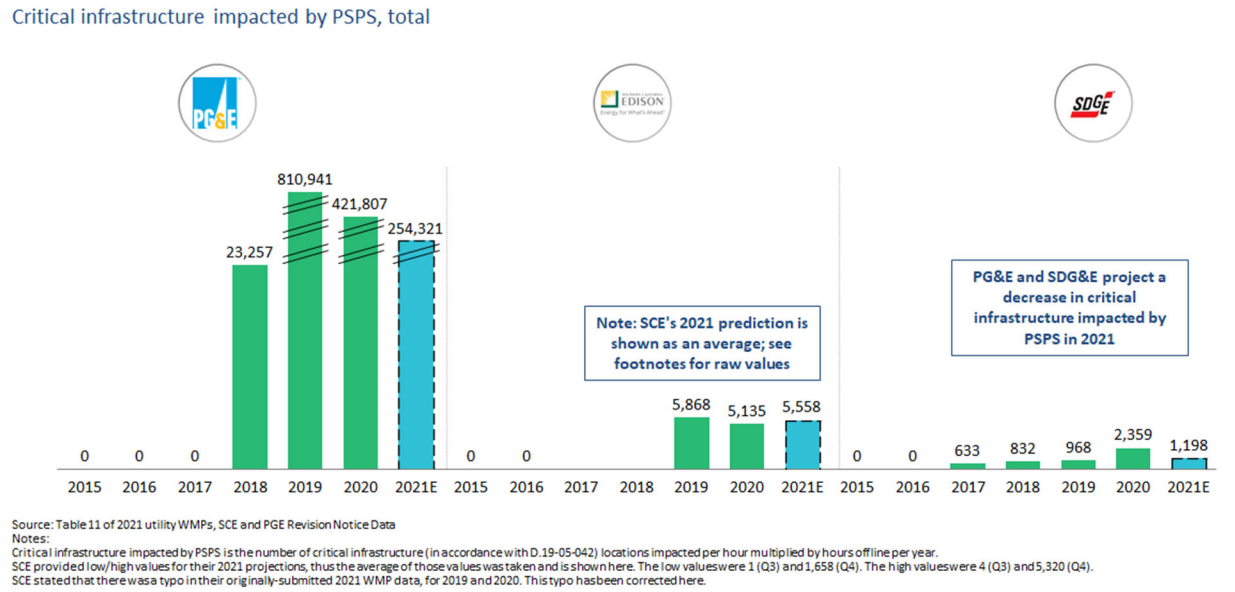
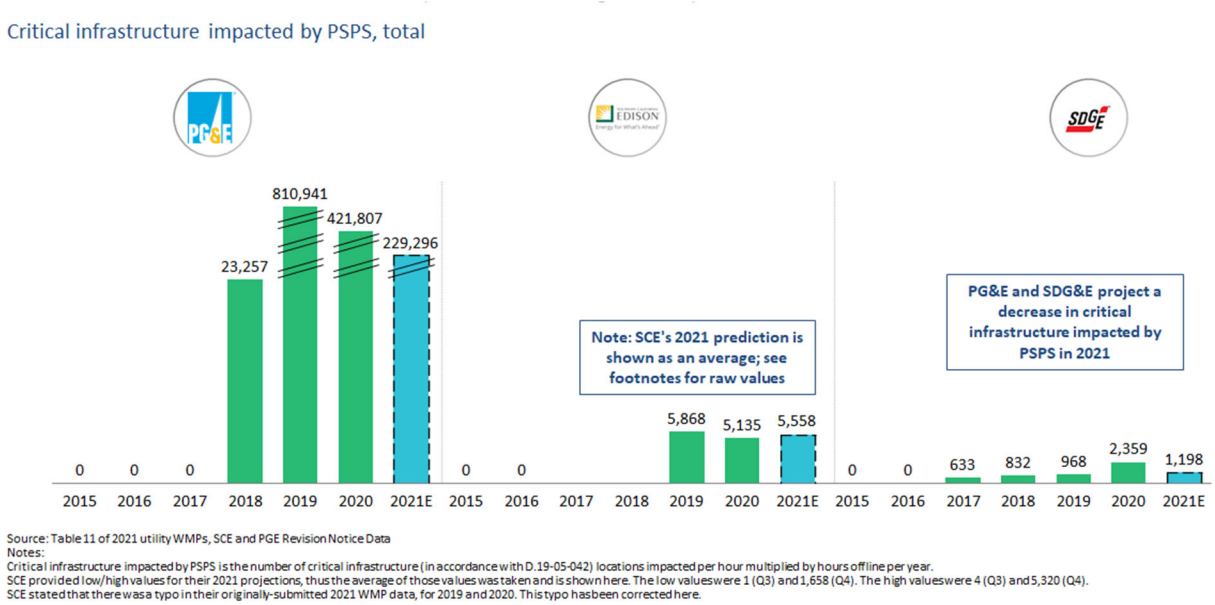
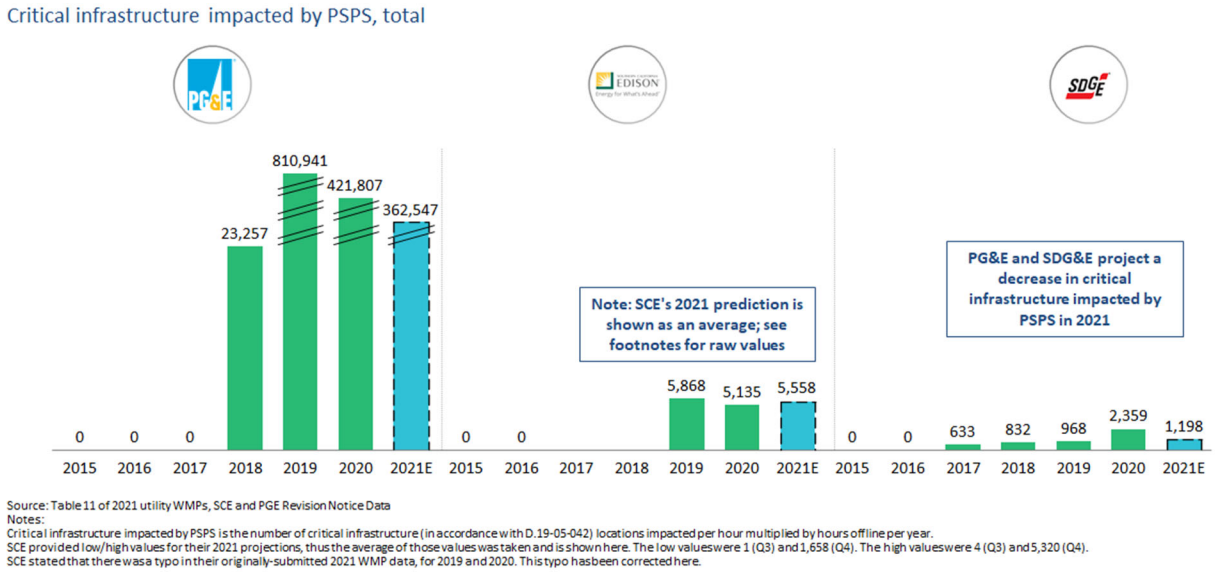


Figure 6.f: PSPS impacts on critical infrastructure, PG&E Scenario 1: Forecasted data as average of historical data



Source: Table 11 of 2021 utility WMPs, SCE and PGE Revision Notice Data
Notes:
Critical infrastructure impacted by PSPS is the number of critical infrastructure (in accordance with D.19-05-042) locations impacted per hour multiplied by hours off line per year.
SCE provided low/high values for their 2021 projections, thus the average of those values was taken and is shown here. The low values were 1 (Q3) and 1,658 (Q4). The high values were 4 (Q3) and 5,320 (Q4).
SCE stated that there was a typo in their originally-submitted 2021 WMP data, for 2019 and 2020. This typo has been corrected here.

Figure 6.g: PSPS impacts on critical infrastructure, PG&E Scenario 2: Forecasted data with 2021 planned WMP mitigations in place



Source: Table 11 of 2021 utility WMPs, SCE and PGE Revision Notice Data
Notes:
Critical infrastructure impacted by PSPS is the number of critical infrastructure (in accordance with D.19-05-042) locations impacted per hour multiplied by hours off line per year.
SCE provided low/high values for their 2021 projections, thus the average of those values was taken and is shown here. The low values were 1 (Q3) and 1,658 (Q4). The high values were 4 (Q3) and 5,320 (Q4).
SCE stated that there was a typo in their originally-submitted 2021 WMP data, for 2019 and 2020. This typo has been corrected here.

Figure 6.h: PSPS impacts on critical infrastructure, PG&E Scenario 3: Forecasted data with 2021 mitigations and 2020 PSPS protocols plus tree overstrike potential and priority tags criteria added

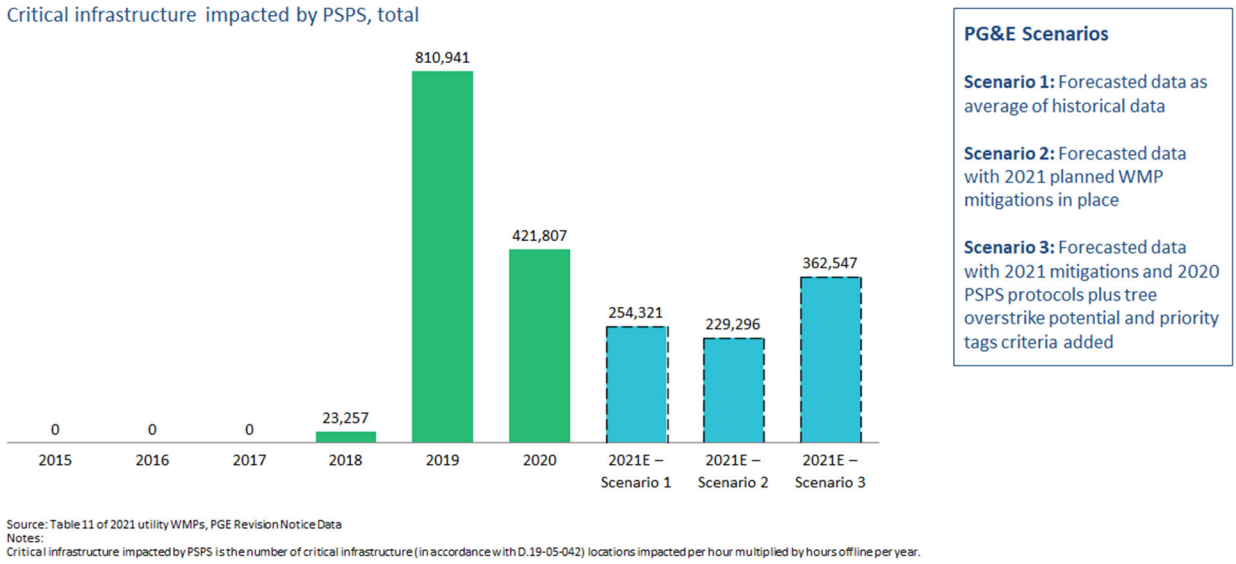


Figure 6.i: PSPS impacts on critical infrastructure, PG&E all scenarios

7 NEXT STEPS

PG&E must address the issues identified in Energy Safety's review of PG&E's 2021 WMP Update over the course of the next year. PG&E must place particular focus on the key areas for improvement described above. PG&E must report progress on these key areas in the Progress Reports, as described in Section 1.3 of this Action Statement.

Change Orders

If PG&E seeks to significantly modify (i.e., reduce, increase, or end) WMP mitigation measures in response to data and results on electrical corporation ignition risk reduction impacts, PG&E must submit a Change Order Report. At a high level, the objective of the change order process is to ensure the electrical corporation continues to follow the most effective and efficient approach to mitigating its wildfire risk. This could change as new information becomes available and as the electrical corporation gains experience and measures the outcomes of its initiatives.

The change order process set forth herein provides a mechanism for the electrical corporation to make adjustments based on this information and experience. The goal of this process is to ensure that utilities make significant changes to their WMPs only if the utilities demonstrate these changes to be improvements per WMP approval criteria (i.e., completeness, technical feasibility, effectiveness, and resource use efficiency). Another goal of the change order process is to maximize Energy Safety's visibility and ability to respond to any significant changes to the approved plan as efficiently and in as streamlined a way as possible.

A "significant" change to a utility's WMP that would trigger the change order process is defined below:

- A change falls into the following initiative categories, i) risk assessment and mapping, ii) vegetation management and inspections, iv) grid design and system hardening, or v) asset management and inspections.

or

- A change to the utility's PSPS strategy, protocols and/or decision-making criteria.

and

- Meets one or more of the following criteria:
  - A change that would result in an increase, decrease, or reallocation of more than $5 million constituting a greater than 10 percent change in spend allocation.
  - A change that reduces or increases the estimated risk reduction value of an initiative more than 25 percent.
  - A change that results in a radical shift of either the strategic direction or purpose of an initiative (e.g., introducing use of a novel risk model that reverses the risk profile of the utility's circuits).

If an electrical corporation is unsure whether a change is significant, the corporation is encouraged to submit an advance inquiry on the matter. The change order process is not intended to provide electrical corporations with a pass to unilaterally change their WMP initiatives and program targets; rather, its purpose is to provide a mechanism for refining certain elements of WMP initiatives when there is demonstrable quantitative and qualitative justification for doing so.

Utilities shall submit any Change Order Reports by 5:00 p.m. on November 1, 2021. Energy Safety will review change orders and may issue either an approval or a denial if proposed changes are deemed to be materially out of alignment with Energy Safety's goals.

At a minimum, each proposed change order shall provide the following information:

i. The proposed change
   a. The initiative being altered with reference to where in the WMP the initiative is discussed
   b. The planned budget of that initiative, including:
      i. Planned spend in the 2020 WMP and the 2021 WMP Update of the initiative being altered
      ii. Of the planned spend identified in i. above, how much has already been spent
      iii. Planned spend for the remainder of the WMP plan period
      iv. If spend is being redeployed, how much is being redeployed and to/from which budget
   c. The type of change being proposed, reported as one of the following:
      i. Increase in scale

ii. Decrease in scale
iii. Change in prioritization
iv. Change in deployment timing
v. Change in work being done
vi. Other change (described)

d. A detailed description of the proposed change

ii. Justification for the proposed change

a. In what way, if any, does the change address or improve:
i. Completeness
ii. Technical feasibility of the initiative
iii. Effectiveness of the initiative
iv. Resource use efficiency over portfolio of WMP initiatives

iii. Change in expected outcomes from the proposed change

a. What outcomes, including quantitative ignition probability and PSPS risk reduction, was the changed initiative expected to achieve in the 2021 WMP Update?
b. What outcomes, including quantitative ignition probability and PSPS risk reduction, will the initiative deliver with the proposed adjustment?

Submission of Change Order Reports shall be through Energy Safety's e-filing system. Change orders must be submitted to the 2021 WMPs Docket (docket #2021-WMPs). Utilities shall concurrently serve all reports on the Department of Forestry and Fire Protection at CALFIREUtilityFireMitigationUnit@fire.ca.gov and the CPUC listserve for R.18-10-007.

Stakeholders may comment on Change Order Reports within fifteen days of submission following the submission instructions above but may not otherwise seek change orders through this process. Energy Safety may modify the process for submitting or reviewing change orders at its discretion with written notice.

8 CONSULTATION WITH CAL FIRE HAS OCCURRED

Pub. Util. Code Section 8386.3(a) requires Energy Safety to consult with CAL FIRE in reviewing electrical corporations' 2021 WMP Updates. Energy Safety and CAL FIRE have a memorandum of understanding in place to facilitate this consultation (Pub. Util. Code Section 8386.5). Energy Safety has met these requirements, but this Action Statement does not purport to speak for CAL FIRE.

9 CONCLUSION

PG&E's 2021 WMP Update is approved. However, PG&E must continue to improve its efforts to reduce wildfire risk and meet or exceed the efforts of peer utilities. PG&E must scale up the scope and pace of its wildfire mitigation efforts to match the scale of the risks it faces.

Catastrophic wildfires remain a serious threat to the health and safety of Californians. Electrical corporations, including PG&E must continue to make progress toward reducing utility-related

wildfire risk. Through the approval of PG&E's 2021 WMP Update submission, Energy Safety expects PG&E to effectively implement its wildfire mitigation activities to reduce the risk of utility-related ignitions and the potential catastrophic consequences if an ignition occurs as well as to reduce the scale, scope, and frequency of PSPS events. PG&E must meet the commitments in its 2021 WMP Update and fully comply with the conditions listed in this Action Statement to ensure it is achieving a meaningful reduction of utility-related wildfire and PSPS risk within its service territory. Energy Safety expects that in the November 1, 2021, Progress Report PG&E will address all of the key areas of concern outlined in this Action Statement and undertake every effort necessary to accelerate a reduction in its wildfire risk.

Lucy Morgans

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Acting Program Manager, Safety Policy Division
Office of Energy Infrastructure Safety

10 APPENDIX

10.1 Complete Table of 2021 Key Areas for Improvement and Remedies

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
PG&E-21-01	Unclear inclusion of future climate data into planning	PG&E's 2021 WMP Update does not include PG&E's climate resilience team's evaluation of High Fire Risk Areas (HFRA)[206] map initiatives in order to validate that the maps are consistent with climate projections.	PG&E must explain how it incorporates components of its climate resilience team's report into its own risk assessment.
PG&E-21-02	Lack of consistency in approach to wildfire risk modeling across utilities	The utilities do not have a consistent approach to wildfire risk modeling. For example, in their wildfire risk models, utilities use different types of data, use their individual data sets in different ways, and use different third-party vendors. Energy Safety recognizes that the utilities have differing service territory characteristics, differing data availability, and are at different stages in developing their wildfire risk models. However, the utilities face similar enough circumstances that there should be some level of consistency in statewide	The utilities[207] must collaborate through a working group facilitated by Energy Safety[208] to develop a more consistent statewide approach to wildfire risk modeling. After Energy Safety completes its evaluation of all the utilities' 2021 WMP Updates, it will provide additional detail on the specifics of this working group. A working group to address wildfire risk modeling will allow for: 1. Collaboration among the utilities; 2. Stakeholder and academic expert input; and 3. Increased transparency.

[206] PG&E 2021 WMP Update at p. 85. PG&E identified areas of increased fire risk that are not currently included in the CPUC-designated HFTD and defined these as High Fire Risk Areas.

[207] Here "utilities" refers to SDG&E and Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), PacifiCorp, Bear Valley Electric Service, Inc. (BVES), and Liberty Utilities; although this may not be the case every time "utilities" is used through the document.

[208] The WSD transitioned to the Office of Energy Infrastructure Safety (Energy Safety) on July 1, 2021.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		approaches to wildfire risk modeling.	
PG&E-21-03	Inadequate speed of improvements made to risk modeling	PG&E self-reported a low risk assessment score in the Maturity Model with slower growth in comparison to the other two large investor-owned utilities (IOUs). While this seems to be largely due to lack of automation in many different areas, and while PG&E overhauled its modeling efforts between the 2020 and 2021 WMP submissions, PG&E fails to demonstrate growth at an adequate speed in regard to its risk assessment.	PG&E must: 1. Demonstrate that it is applying automation as quickly as possible, explaining any constraints on progress. 2. Supply its workplan to enhance its modeling efforts.
PG&E-21-04	PG&E does not adequately justify the wind speed inputs it uses in its Probability of Ignition models.	PG&E's Outage Producing Winds (OPW) model finds a correlation between equipment failure and high wind speed. Despite the correlation, PG&E does not use peak wind speed as part of its input data set for its Equipment Probability of Ignition models. Instead, PG&E uses average wind speed. PG&E provides justification for its rationale in its Revision Notice Response, however inconsistencies remain between PG&E's approach and that of its peer utilities that use peak or near-peak wind speeds as part of	PG&E must: 1. Demonstrate that it appropriately accounts for wind speed in its Probability of Ignition models' input data sets. This shall be handled both within the Working Group set up in PG&E-21-02, as well as an individualized report. 2. Address discrepancies between its input data sets and those of peer utilities.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		their Wildfire Risk Modeling input data sets.	
PG&E-21-05	Lack of PSPS consequence model at a circuit-segment level	SCE and SDG&E both have functioning PSPS consequence models, while PG&E states that their PSPS consequence model is currently under development.[209] PG&E is working collaboratively with other California utilities and will complete the task by the second half of 2021. However, PG&E does not describe any specific efforts or progress regarding the development of the PSPS risk model. The incorporation of PSPS consequence risk into the total risk reduction of a mitigation initiative is crucial to the decision-making framework.	PG&E must provide: 1. A detailed update on the functionality of its PSPS consequence model at a circuit-segment level, and 2. Quantitative targets for any remaining work or future developments.
PG&E-21-06	Insufficient transparency for modifications to Wildfire Risk Models and circuit segment prioritization	Revision Notice Critical Issue RN-PG&E-02 required PG&E to provide further justification of its shift in CPZ prioritization, including external validation and reviews. While PG&E provided the required justification within its response, it is critical for PG&E to continue to provide updates on its modeling	PG&E must: 1. Provide an update on progress made on each of the third-party's recommendations. 2. Provide any and all updates to the explanation and timeline for how and when it intends to address the recommendations. 3. Provide an Excel spreadsheet detailing what changes have been made to its 2021 risk models since

[209] PG&E 2021 WMP Update – Clean at p. 49

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		efforts in order to maintain transparency between now and the 2022 WMP Update regarding its prioritization of circuit segments. Additionally, in its response to the Revision Notice, PG&E provided a third-party review of its 2021 Wildfire Distribution Risk Model. The third-party's analysis included recommendations for PG&E to improve its Wildfire Risk Models.	the submission of its 2021 WMP Update. 4. Provide a description of any changes it has made to its circuit segment the prioritization as a result of changes to its risk model since the submission of its 2021 WMP Update.
PG&E-21-07	PG&E's DFA and EFD technology pilot outcome is lacking justification for the scope of installment	PG&E's pilot project was completed in 2020 for Distribution Fault Anticipation (D) and Early Fault Detection (EFD) technology with the determination to continue deployment. However, PG&E lacks details and performance metrics on the outcome and how PG&E made the decision to ramp up deployment to 600-800 circuits.	PG&E must: 1. Provide details and performance metrics on the outcome of the 2020 DFA and EFD technology pilot program 2. Explain how the determination was made to increase deployments of DFA/EFD technology across its service territory.
PG&E-21-08	Weather station program target not met	PG&E's 2021 WMP Update originally reported installation of 404 weather stations in 2020, surpassing its program target of 400. However, in PG&E's revised 2021 WMP Update the weather station installations changed to 378 in 2020	PG&E must: 1. Provide details on why PG&E did not meet the targeted 400 weather station installs in 2020. 2. Explain why weather station installation totals in the original 2021 WMP Update differ from the revised 2021 WMP Update.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		falling short of its target without explanation.	
PG&E-21-09	Limited evidence to support the effectiveness of covered conductor	The rationale to support the selection of covered conductor as a preferred initiative to mitigate wildfire risk lacks consistency among the utilities, leading some utilities to potentially expedite covered conductor deployment without first demonstrating a full understanding of its long-term risk reduction and cost-effectiveness. The utilities' current covered conductor pilot efforts are limited in scope[210] and therefore fail to provide a full basis for understanding how covered conductor will perform in the field. Additionally, utilities justify covered conductor installation by alluding to reduced PSPS risk but fail to provide adequate comparison to other initiatives' ability to reduce PSPS risk.	The utilities[211] must coordinate to develop a consistent approach to evaluating the long-term risk reduction and cost-effectiveness of covered conductor deployment, including: 1. The effectiveness of covered conductor in the field in comparison to alternative initiatives. 2. How covered conductor installation compares to other initiatives in its potential to reduce PSPS risk.
PG&E-21-10	Insufficient pace of expulsion fuse	The pace of PG&E's current program for expulsion fuse	PG&E must:

[210] Limited in terms of mileage installed, time elapsed since initial installation, or both.

[211] Here "utilities" refers to SDG&E and Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), PacifiCorp, Bear Valley Electric Service, Inc. (BVES), and Liberty Utilities; although this may not be the case every time "utilities" is used through the document.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
	replacement plan	replacements is not proportional to those of SDG&E and SCE.[212] This is especially problematic given PG&E's larger service territory.	1. Demonstrate that it is replacing expulsion fuses with fuses that reduce wildfire risk at a speed that adequately addresses risk; 2. Explain any current limits or constraints on the scope of PG&E's expulsion fuse replacement program; 3. Increase the pace of its expulsion fuse replacement program, provided reasonable constraints do not limit such expansion.
PG&E-21-11	Insufficient detail regarding installation of expulsion fuses in HFTD areas	PG&E continues to install non-exempt expulsion fuses, which are considered to be fire hazards, in HFTD areas. PG&E installed approximately 71 non-exempt expulsion fuses in the HFTD 2019 and 44 fuses in 2020. PG&E states that it is acceptable to install non-exempt expulsion fuses in the HFTD under certain circumstances but does not detail whether the installed fuses were installed in those circumstances.	PG&E must: 1. Explain the circumstances under which it installed non-exempt expulsion fuses in HFTD areas. 2. Clarify if any of the new expulsion fuses it is installing in the HFTD in 2021 and beyond are non-exempt fuses.

[212] Cal Advocates' Comments state at p. 36: "PG&E has approximately 22,000 expulsion fuses in HFTDs and forecasts replacing about five percent of them in 2021" which is approximately 1,100 fuses. At this rate, it will take PG&E nearly two decades to remove all the expulsion fuses from the HFTD. By comparison, BVES replaced 2,200 in 2020, which is more expulsion fuses than PG&E in 2020, although PG&E's service territory is two thousand times larger than BVES. In 2021, SDG&E replaced "3,179 (with a focus in Tiers 3 and 2 of the HFTD), bringing the total replaced to 5,669 out of the 11,000 total populations of such fuses in the HFTD" (according to SDG&E's 2021 WMP Update, p. 197). SCE is replacing "13,000 locations by the end of 2022 (cumulative from the inception of the program in 2018)" (according to SCE's 2021 WMP Update, p. 216).

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
PG&E-21-12	Failure to adequately track copper conductor replacements and insufficient detail regarding targeting replacements to highest risk areas	While PG&E has identified that copper conductor poses a high risk to its system due to its high incidence of failure PG&E does not currently track its completed copper reconductoring projects. Additionally, PG&E's copper reconductoring program extends outside of the HFTD, but PG&E does not provide sufficient evidence that its copper reconductoring plan targets its highest risk circuits.	PG&E must: 1. Develop a workplan to target and track copper reconductoring projects. 2. Demonstrate that it is targeting its copper reconductoring projects to its highest risk circuits, including justification for any projects outside of the HFTD.
PG&E-21-13	Failure to demonstrate that system hardening plan targets highest risk circuit segments	A small percentage of circuit-segments in PG&E's distribution system pose a high percentage of PG&E's wildfire risk.[213] However, PG&E does not clearly demonstrate that its system hardening plan targets these segments.	PG&E must fully demonstrate that its system hardening mitigation efforts target efficiently reducing wildfire risk and PSPS events, including a description of how PG&E determines the order in which circuit segments are scheduled for mitigation.
PG&E-21-14	Inadequate transparency of system hardening plan	PG&E provides limited detail regarding its short-term system hardening plan and does not include its long-term system hardening plan. Additionally, PG&E's July	PG&E must: 1. Provide its short-term[215] system hardening plans, including the following details for each planned project (via comprehensive list and GIS files): a. Location; b. Initiative type (covered conductor,

[213] "2021 Wildfire Mitigation Plan Workshop Grid Design and System Hardening" presented February 23, 2021, p. 4.

[215] "Short-term" defined as a project that has entered the scoping process or planning phase, including the 1,120 miles identified for system hardening from 2021-2023, per PG&E's Redlined 2021 WMP Update, pdf p. 653.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		21, 2021, press release[214] regarding its intention to underground 10,000 miles of power lines indicates that PG&E may need to change the system hardening plan and initiative selection process presented in PG&E's 2021 WMP Update. PG&E has not provided any potential modifications to its 2021 WMP Update related to this press release. While Energy Safety is generally supportive of PG&E's ambition to aggressively reduce its wildfire risk, PG&E must provide additional detail on its short-term and long-term plans for grid hardening, as well as an update on its progress.	undergrounding, line removal, etc.); c. Status of the project (scoping, design permitting, etc.); d. Relevant CPZs; e. Planned length; f. Risk-type identified for prioritization of the project (top 20 percent of risk buydown curve, fire rebuild, PSPS mitigation, public safety specialist identified, or non-risk related). 2. Provide its long-term system hardening plan regarding: a. Estimated rate of system hardening per year;[216] b. If/how PG&E plans to increase its resources to allow for an accelerated pace of system hardening. 3. Explain how, if at all, PG&E's recently announced undergrounding plan changes its decision-making framework for initiative selection for individual circuit segments.[217] 4. Provide an update on its completed system hardening efforts through November 1, 2021.

[214] "PG&E Announces Major New Electric Infrastructure Safety Initiative to Protect Communities From Wildfire Threat," July 21, 2021: https://investor.pgecorp.com/news-events/press-releases/press-release-details/2021/PGE-Announces-Major-New-Electric-Infrastructure-Safety-Initiative-to-Protect-Communities-From-Wildfire-Threat/default.aspx (accessed July 28, 2021).

[216] If such differs from the 450 to 500 miles per year provided in PG&E's Redlined 2021 WMP Update, pdf p. 653.

[217] As described in PG&E's presentation to WSD on May 21, 2021 and summarized in a footnote above.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
PG&E-21-15	Insufficient detail regarding covered conductor maintenance	PG&E states "[c]overed conductor maintenance will be performed anywhere covered conductor is installed and found to have conditions requiring maintenance."[218] PG&E does not provide more detail as to what conditions require maintenance. PG&E also does not explain or justify its spend projections for covered conductor maintenance. PG&E's projected spend for covered conductor maintenance is higher in 2021 than in 2022, however the projected line miles to be treated remain the same.[219]	PG&E must: 1. Provide its procedures for determining when covered conductor maintenance is required, including any thresholds and aspects analyzed during inspections. 2. Explain why PG&E's cost projections decrease from 2021 to 2022 despite line mile projections remain the same.
PG&E-21-16	Insufficient evidence of effective covered conductor maintenance program	PG&E does not have a separate covered conductor maintenance program.	PG&E must provide all supporting material to demonstrate that its maintenance programs effectively maintain its covered conductor, including the following information: 1. Pace and quantity of scheduled maintenance; and 2. Pace and quantity of inspections. If PG&E finds that its existing maintenance programs do not provide effective maintenance for covered conductor, PG&E must:

[218] PG&E 2021 WMP Update at p. 479.
[219] PG&E Table 12, Line 40.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
			1. Enhance its current operations to provide such maintenance; 2. Detail the enhancements to its existing programs; and 3. Provide all supporting material for the enhancements to its existing program, including the information listed above.
PG&E-21-17	Insufficient evidence of QA/QC for work performed by contractors	Several PG&E internal audits revealed contractors that failed to follow procedures or were unaware of the correct procedures that needed to be followed. PG&E's response to cases where the vendor was unaware of or did not follow procedures often amounted to a reminder of how procedures should have been followed. In most cases, PG&E did not further investigate the quality of other work the same vendor had performed, nor require full retraining on the topic.	PG&E must: 1. Demonstrate that it is tracking the quality of work of contractors performing asset management and inspection work. 2. Describe how it is addressing underperforming asset management and inspection contractors. 3. Describe how it is expanding quality control of work performed by asset management and inspection vendors, including additional quality controls for those with a history of flawed work.
PG&E-21-18	Minimally planned maturity of VM program	PG&E has increased the scale of its VM program but does not foresee maturing five of six VM Maturity Model capabilities. PG&E's planned end WMP cycle VM maturity is 1, up from 0.7 in 2020. Comparatively, SCE and SDG&E have a planned end WMP cycle VM	PG&E must: 1. Reach a maturity of at least 1 for capabilities 24 "Vegetation grow-in mitigation" and 25 "Vegetation fall-in mitigation" by the end of 2023. 2. Clearly define goals and targets to reach each level of maturity for capabilities 21-26.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		maturities of 3 and 3.3 respectively (see Figure 5.3.5a, below). Additionally, PG&E does not provide adequate discussions in the reoccurring subsection "5. Future improvements to initiative" nor in response to Quarterly Report Action PGE-25 (Class B), subpart 1. PG&E must create a long-term VM maturation strategy and establish clear goals and targets to prioritize work and monitor progress towards its risk-reduction goals.	3. Include a timeline for completion of the goals and targets from (1). 4. Provide a long-term vision for each VM initiative in Subsection 5 "Future improvements to the initiative" (or similar) including any relevant timelines.
PG&E-21-19	Delays in achieving mutually agreeable environmental mitigation	PG&E cites delays in reaching mutually agreeable environmental and community impact mitigation efforts that result in PG&E seeking court orders.[220] These delays, judicial or otherwise, can compromise working relationships between the community and state and local environmental agencies and cause further delays to WMP initiatives.	PG&E must show progress on achieving environmental and community impact mitigation agreements with agencies, local governments, and tribal governments. This includes establishing and documenting regularly scheduled meetings between relevant parties to identify permit requirements and potential environmental and community impacts from vegetation management prior to commencement of work. Meeting cadence shall be appropriately in advance of permit applications and scheduled work. PG&E must consider the development of Operations and Maintenance Plans

[220] PG&E Revised 2021 WMP Update p. 691.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
			and Memorandums of Understandings with relevant federal, state, and local land managing agencies to facilitate agreed-upon review times of permits and/or vegetation management activities. PG&E must document the outcomes of these efforts and any lessons learned.
PG&E-21-20	Non-inclusion of fire damage attributes in hazard tree assessments	In DR WSD_011, WSD asked PG&E whether fire impact characteristics (char, scorch, etc.) were included in PG&E's Tree Assessment Tool (TAT). PG&E stated that the TAT "does not include post-fire specific factors such as char, etc. This tool was not developed for, or intended to be used in, post-wildfire response circumstances. When wildfires occur, PG&E performs a hazard tree assessment of the burned area to determine whether trees pose a threat to electric assets and if they should be abated." Contradictorily, PG&E specifically defines the TAT in its WMP as a "Tool that evaluates an individual tree's likelihood	PG&E must: 1. Clarify what tool or standard PG&E and its contractors use in post-wildfire response circumstances for hazard tree assessments; 2. If such a tool or standard does not already include post-fire specific factors (e.g., crown, bole, and root scorch, char, duff consumption[221]). PG&E must include these factors in such tool or standard. 3. If such a tool or standard does not exist, PG&E shall develop one to use in post-wildfire response circumstances. 4. Provide the training to its staff and contractors in post-fire tree assessments. 5. Use such a tool during PG&E's Phase 2 "Non-Imminent Hazard Trees" post-wildfire response.[222]

[221] *Factors Affecting Survival of Fire Injured Trees: A Rating System For Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains*, United States Forest Service, November 25, 2002.

[222] Phase 2 "Non-Imminent Hazard Trees" is described in "WSD-001 Glass Fire," response received March 1, 2021: Under PG&E's emergency operations protocols, there are two phases of vegetation management inspections. The

Footnote continued on next page.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		of failing and supplies instruction of whether to abate or not abate the tree." It is unclear whether PG&E has another tool, other than its TAT, it uses to perform hazard tree assessments in post-wildfire response circumstances or whether it uses no tool or standard assessment for hazard tree assessments in post-wildfire response circumstances.	PG&E should use such a tool during Phase 1 "Imminent Threat Inspection" as feasible.
PG&E-21-21	Unknown environmental impact of fire-retardant used on a planned basis	PG&E plans to undertake a review of fire-retardant chemicals ahead of the 2021 wildfire season to pilot under its Utility Defensible Space (UDS) program "pre-treat[ing] ROWs and around equipment in select locations to limit a spark from causing an ignition." PG&E has not determined a long-term plan for this initiative, considers it a pilot, and has no set targets (e.g., number of circuit miles or acres to be treated with retardant). Fire retardant is typically used as an emergency	PG&E must provide: 1. The environmental review report to Energy Safety (e.g., Environmental Impact Report (EIR), Environmental Impact Statement (EIS), etc.). 2. The planned bases for which it will use fire-retardant including but not limited to the frequency of applications, timing of applications, amount and type of retardant, and locations of applications to the circuit name and CPZ. 3. Quarterly reports regarding the deployment of fire-retardant to the Compliance Division of OEIS per CPUC approved Compliance

duration of each phase will vary due to timeline dependencies such as CAL FIRE clearance/accessibility, availability of pre-inspectors and the volume of damage or fire footprint. Phase 1 - Imminent Threat Inspection: Inspect and eliminate any tree that is actively failing and identify trees that will need to be removed by construction crews to support reconstruction work to restore power. Phase 2 - Non-Imminent Hazard Trees: Listing non-immediate hazard trees for work; this can be done in parallel with Phase 1 if inspectors are available.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		measure, not as a pre-treatment; long-term, repeated applications of fire-retardant in the same area will likely have negative environmental impacts. A USFS publication[223] highlights some of the environmental impact of fire retardants but does not focus on long-term and repeated use in the same area.	Operational Protocols.[224] These reports must include where and when the retardant was used, how much retardant was used, and the specific fire-retardant that was used. 4. An RSE value for planned basis fire retardant applications.
PG&E-21-22	Incomplete identification of vegetation species and record keeping	In Table PG&E-7.3.5-6 on p. 666, PG&E reports that "Oak" and "Pine" are species that have caused >1 percent of several regions' outages. PG&E must ensure proper identification of species so that the "regional species risk values"[225] input to the TAT are updated and accurate. While PG&E does not currently prescribe tree- work based on specific species,[226] it may choose to do so in the future; in this case, accurate recordkeeping of	PG&E must: 1. Use scientific names in its reporting (as opposed to common names). This change will be reflected in the upcoming updates to Energy Safety GIS Reporting Standard. 2. Add genus and species designation input capabilities into its systems which track vegetation (e.g., vegetation inventory system and vegetation-caused outage reports). 3. Identify the genus and species of a tree that has caused an outage[227] or ignition[228] in the Quarterly Data Reports (QDRs) (in these cases, an

[223] https://www.fs.fed.us/rm/fire/wfcs/documents/EcoRA-Retardants-PUBLIC-Dec2013-rev3_080614.pdf
[224] Wildfire Safety Division – Compliance Operational Protocols, February 16, 2021: https://energysafety.ca.gov/wp-content/uploads/docs/misc/wsd/2021.02.16-compliance-operational-protocols.pdf.
[225] PG&E 2021 WMP Update p. 667.
[226] PG&E 2021 WMP Update p. 667.
[227] WSD GIS Data Reporting Standard Version 2, Transmission Vegetation Caused Unplanned Outage (Feature Class), Section 3.4.5 & Distribution Vegetation Caused Unplanned Outage (Feature Class), Section 3.4.7.
[228] WSD GIS Data Reporting Standard Version 2, Ignition (Feature Class), Section 3.4.3.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		the species designation is essential.	unknown "sp." designation is not acceptable). 4. If the tree's species designation is unknown (i.e., if the inspector knows the tree as "Quercus" but is unsure whether the tree is, for example, Quercus kelloggii, Quercus lobata, or Quercus agrifolia), it must be recorded as such. Instead of simply "Quercus," use "Quercus sp." If referencing multiple species within a genus use "spp." (e.g., Quercus spp.).[229] 5. Teach tree species identification skills in its VM personnel training programs, both in initial and continuing education. 6. Encourage all VM personnel identify trees to species in all VM activities and reporting, where possible.
PG&E-21-23	Inadequate joint plan to study the effectiveness of enhanced clearances	RCP Action-PGE-35[230] (Class A) required PG&E, SCE, and SDG&E to "submit a joint, unified plan" to begin a study of the effectiveness of extended vegetation clearances. PG&E submitted its plan to study the effectiveness of extended vegetation clearance as part of its February 26, 2021, "Supplemental Filing	PG&E, SCE, and SDG&E will participate in a multi-year vegetation clearance study. Energy Safety will confirm the details of this study in due course. The objectives of this study are to: 1. Establish uniform data collection standards. 2. Create a cross-utility database of tree-caused risk events (i.e., outages and ignitions caused by vegetation contact).

[229] Jenks, Matthew A. (undated, from 2012 archived copy), "Plant Nomenclature," Department of Horticulture and Landscape Architecture, Purdue University, accessed May 18, 2021.

[230] Wildfire Safety Division Evaluation of Pacific Gas and Electric Company's Remedial Compliance Plan can be found here (accessed August 2, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2020/pge-rcp-action-statement-20201230.pdf

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		Addressing Remedial Compliance Plan and First Quarterly Report Action Items." PG&E, SCE, and SDG&E presented the "joint, unified" plan to Energy Safety on February 18, 2021. While it was apparent the three large utilities had discussed a unified approach, each utility presented differing analyses that would be performed to measure the effectiveness of enhanced clearances. This presentation's content was not included in the February 26, 2021, "Supplemental Filing Addressing Remedial Compliance Plan and First Quarterly Report Action Items." Energy Safety acknowledges the complexity of this issue; any study performed assessing the effectiveness of enhanced clearances will take years of data collection and rigorous analysis.	3. Incorporate biotic and abiotic factors[231] into the determination of outage and ignition risk caused by vegetation contact. 4. Assess the effectiveness of enhanced clearances. In preparation for this study and the eventual analysis, PG&E must collect the relevant data; the required data are currently defined by Energy Safety Geographic Information System (GIS Data Reporting Standard for California Electrical Corporations - V2). Table 2 in Section 5.5 of this Action Statement outlines the feature classes which Energy Safety believes will be most relevant to the study. Energy Safety will also be updating the GIS Reporting Standards in 2021, which may include additional data attributes for vegetation-related risk events.
PG&E-21-24	Need for quantified vegetation	In Table 12, PG&E only defines quantitative targets for six of 20 VM	PG&E must define quantitative targets for all VM initiatives. If quantitative targets are not

[231] Biotic factors include all living things (e.g., an animal or plant) that influence or affect an ecosystem and the organisms in it; abiotic factors include all nonliving conditions or things (e.g., climate or habitat) that influence or affect an ecosystem and the organisms in it.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
	management (VM) compliance targets	initiatives. Energy Safety is statutorily required to audit PG&E when a "substantial portion" of PG&E's VM work is complete;[232] without quantifiable targets in the WMP and subsequent reporting on those targets in the Quarterly Data Report (QDR) and Quarterly Initiative Update (QIU), Energy Safety cannot fully realize its statutory obligations.	applicable to an initiative, PG&E must fully justify this, define goals within that initiative, and include a timeline in which it expects to achieve those goals.
PG&E-21-25	Lack of specificity regarding how increased grid hardening will change system operations, change PSPS thresholds, and reduce PSPS events	PG&E does not commit to changes in its PSPS thresholds for increased grid hardening. PG&E does not specify how increased grid hardening will change system operations.	For each mitigation alternative, including pilot program initiatives, PG&E must provide quantitative analysis on: 1. Changes in system operations. 2. Changes in PSPS thresholds. 3. Estimated changes in the frequency, duration, and number of customers impacted by PSPS events.
PG&E-21-26	Inadequate discussion on impact of RSEs in initiative selection	PG&E does not clearly explain how RSE estimates impact the initiative selection process. RSE estimates provide a pathway to assess the relative benefit provided by the mitigation initiatives and must play an integral role in the selection process. Energy Safety understands the	PG&E must provide an overview of its decision-making framework to include a clear explanation of how RSE estimates impact decision making for initiative selection. The overview must show the rankings of the relative decision-making factors (e.g., planning and execution lead times, resource constraints, etc.) and pinpoint where quantifiable risk reductions and RSE estimates are considered

[232] Pub. Util. Code § 8386.3(c)(5)(A).

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		dynamic nature of initiative selection due to work management efficiencies, operational realities, resource constraints, and other factors. However, a clear description of how RSE estimates impact the selection process must be provided to ensure consistency across initiatives.	in the initiative selection process. Energy Safety recommends a cascading, dynamic "if-then" style flowchart to effectively demonstrate this prioritization process and satisfy this requirement.
PG&E-21-27	Lack of methodology to verify RSE estimates	For capability 41c of the 2021 Maturity Survey, PG&E showed no planned progress by selecting "Utility does not verify RSE estimates" for the years 2020 - 2023. In order to rely on RSEs to select mitigation initiatives, PG&E must have high confidence that the calculated RSEs are accurate. Moreover, for capability 40a of the 2021 Maturity Survey PG&E selected "Utility has accurate relative understanding of cost and effectiveness to produce a reliable risk spend efficiency estimate." Without a verification process, the utility cannot guarantee reliability of RSE estimations. PG&E must develop a methodology to assess the accuracy of its RSE estimates.	PG&E must provide a detailed RSE verification plan with attainable benchmarks and timeline.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		Comparatively SCE and SDG&E can, at a base level, verify their calculated RSEs with historical and experimental pilot data.	
PG&E-21-28	RSE values vary across utilities	Energy Safety raises a concern that there are stark variances in RSE estimates, sometimes on several orders of magnitude, for the same initiatives calculated by different utilities. For example, PG&E's RSE for covered conductor installation was 4.08,[233] SDG&E's RSE was 76.73,[234] and SCE's RSE was 4,192.[235] These drastic differences reveal that there are significant discrepancies between the utilities' inputs and assumptions, which further support the need for exploration and alignment of these calculations.	The utilities[236] must collaborate through a working group facilitated by Energy Safety[237] to develop a more standardized approach to the inputs and assumptions used for RSE calculations. After Energy Safety completes its evaluation of the 2021 WMP Updates, it will provide additional detail on the specifics of this working group. This working group will focus on addressing the inconsistencies between the utilities' inputs and assumptions, used for their RSE calculations, which will allow for: 1. Collaboration among utilities; 2. Stakeholder and academic expert input; and 3. Increased transparency.
PG&E-21-29	PSPS targets and projections set to expire	PG&E states that its PSPS approach will likely change in August 2021. When PG&E updates its	As soon as practicable, and no later than September 30, 2021, PG&E

[233] Value from PG&E's Errata (dated March 17, 2021, accessed May 19, 2021: https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan/2021-Wildfire-Safety-Plan-Errata.pdf

[234] Value from Table 12 of SDGE's 2021 WMP Update submissions under the "Estimated RSE for HFTD Tier 3" column for "Covered Conductor Installation."

[235] Value from Table 12 of SCE's 2021 WMP Update submissions under the "Estimated RSE for HFTD Tier 3" column for "Covered Conductor Installation."

[236] Here "utilities" refers to PG&E, San Diego Gas & Electric (SDG&E), Southern California Edison Company (SCE).

[237] The WSD transitioned to the Office of Energy Infrastructure Safety (Energy Safety) on July 1, 2021.

Utility-#	Issue title	Issue description	Remedies required and alternative timeline if applicable
		approach, the PSPS targets and projections presented in its WMP Update and Revision Notice response will become obsolete.	must submit a Change Order Report:[238] 1. Describing in full and complete detail its updated PSPS protocols. 2. Showing how its updated PSPS protocols affect PSPS projections (Table 11). 3. Showing how its updated PSPS protocols affect all quantitative and qualitative targets for reducing the scale, scope, and frequency of PSPS. Meeting all requirements for a Change Order Report set out in section 7 of this Action Statement.

10.2 Status of 2020 WMP Deficiencies

The 2020 WMP Resolutions for each utility contained a set of "Deficiencies" and associated "Conditions" to remedy those issues. Each issue was categorized into one of the following classes, with Class A being the most serious:

Class A – aspects of the WMP are lacking or flawed;
Class B – insufficient detail or justification provided in the WMP;
Class C – gaps in baseline or historical data, as required in the 2020 WMP Guidelines.

Class A deficiencies were of the highest concern and required a utility to develop and submit to Energy Safety a Remedial Compliance Plan (RCP) to resolve the identified issue within 45 days of Commission ratification of the Resolution. Class B deficiencies were of medium concern and required reporting by the utility to provide missing data or a progress update in its Quarterly Report. Such reporting was either on a one-time basis or ongoing as set forth in each condition. Class C deficiencies required the utility to submit additional detail and information or otherwise come into compliance in its following annual WMP Update. Detailed descriptions of the RCP and quarterly reports are contained in Resolution WSD-002, the Guidance Resolution on Wildfire Mitigation Plans.[239]

[238] This reporting requirements do not replace or amend any reporting or other obligations that may be imposed on PG&E by the CPUC, including CPUC Resolution M-4856 associated with PG&E's new considerations of tree overstrike factors into its PSPS protocols.
[239] Guidance Resolution WSD-002 can be found here (accessed July 23, 2021): https://energysafety.ca.gov/wp-content/uploads/docs/wmp-2020/docs/340859823.pdf

Deficiencies have either been resolved or are folded into 2021 issues, as detailed in the table below.

Deficiency	Description	WSD-003 Determination	Status
Guidance 1, Class B	Lack of risk spend efficiency (RSE) information	Insufficient	Conditions not met, wrapped into a new issue for 2021
Guidance 2, Class B	Lack of alternatives analysis for chosen initiatives	Insufficient	Conditions not met, wrapped into a new issue for 2021
Guidance 3, Class A	Lack of risk modeling to inform decision-making	Insufficient	Conditions met, resolved
Guidance 4, Class B	Lack of discussion on PSPS impacts	Insufficient	Conditions not met, wrapped into a new issue for 2021
Guidance 5, Class B	Aggregation of initiatives into programs	Sufficient	Conditions met, resolved
Guidance 6, Class B	Failure to disaggregate WMP initiatives from standard operations	Sufficient	Conditions met, resolved
Guidance 7, Class B	Lack of detail on effectiveness of “enhanced” inspection programs	Insufficient	Conditions met, resolved
Guidance 8, Class C	Prevalence of Equivocating Language – failure of commitment	Insufficient	Conditions not met, wrapped into a new issue for 2021
Guidance 9, Class B	Insufficient discussion of pilot programs	Insufficient	Conditions met, resolved
Guidance 10, Class B	Data issues - general	Insufficient	Conditions not met, wrapped into a new issue for 2021
Guidance 11, Class B	Lack of detail on plans to address personnel shortages	Insufficient	Conditions met, resolved
Guidance 12, Class B	Lack of detail on long-term planning	Insufficient	Conditions not met, wrapped into a new issue for 2021 (bulleted, not boxed)

Deficiency	Description	WSD-003 Determination	Status
PG&E-1, Class A	PG&E groups initiatives into programs and does not provide granular initiative detail	Insufficient	Conditions met, resolved
PG&E-2, Class B	Equipment failure	Insufficient	Conditions not met, wrapped into a new issue for 2021 (bulleted, not boxed)
PG&E-3, Class A	High incidence of conductor failure	Insufficient	Conditions not met, wrapped into a new issue for 2021
PG&E-4, Class C	Capacitor bank failure	Insufficient	Conditions not met, wrapped into a new issue for 2021 (bulleted, not boxed)
PG&E-5, Class B	PG&E provides little discussion of how it uses the results of relative risk scoring method	Insufficient	Conditions met, resolved
PG&E-6, Class B	Discrepancy between ignition reduction projections	Sufficient	Conditions met, resolved
PG&E-7, Class B	It is not clear if PG&E's line risk scoring sufficiently incorporates all risks that cause ignition and PSPS	Insufficient	Conditions met, resolved
PG&E-8, Class A	Annual risk ranking is quickly out of date	Insufficient	Conditions not met, wrapped into a new issue for 2021
PG&E-9, Class B	How PG&E weighs egress as a risk factor	Insufficient	Conditions not met, progress being monitored
PG&E-10, Class B	PG&E lacks sufficient weather station coverage	Insufficient	Conditions met, resolved
PG&E-11, Class B	Including additional relevant reports	Sufficient	Conditions met, resolved

Deficiency	Description	WSD-003 Determination	Status
PG&E-12, Class B	PG&E's fuse replacement program planned to take 7 years	Insufficient	Conditions not met, wrapped into a new issue for 2021
PG&E-13, Class B	PG&E does not explain how the factors limiting microgrid deployment will impact its microgrid plans	Insufficient	Conditions met, resolved
PG&E-14, Class B	Level 3 findings	Insufficient	Conditions met, resolved
PG&E-15, Class A	It is unclear how PG&E classifies findings at the appropriate level	Insufficient	Conditions met, resolved
PG&E-16, Class C	PG&E's record keeping is deficient	Insufficient	Conditions not met, progress being monitored
PG&E-17, Class B	Effectiveness of inspections using infrared technology	Insufficient	Conditions met, resolved
PG&E-18, Class B	PG&E does not describe in detail how its hazard tree analysis focuses on at-risk trees.	Insufficient	Conditions met, resolved
PG&E-19, Class B	Low pass rate on EVM QA	Insufficient	Conditions met, resolved
PG&E-20, Class B	PG&E is redistributing resources to focus more on transmission clearances	Insufficient	Conditions met, resolved
PG&E-21, Class B	PG&E fails to describe why additional programs for transmission clearances are necessary	Insufficient	Conditions met, resolved
PG&E-22, Class B	Some of PG&E's vegetation management inspectors may lack proper certification	Insufficient	Conditions met, resolved

Deficiency	Description	WSD-003 Determination	Status
PG&E-23, Class B	Vegetation waste and fuel management processes unclear	Insufficient	Conditions met, resolved
PG&E-24, Class B	Improving prioritization	Insufficient	Condition not met, wrapped into a new issue for 2021
PG&E-25, Class A	Lack of details in PG&E's WMP on how to address personnel shortages	Insufficient	Conditions met, resolved
PG&E-26, Class A	Effectiveness of increased vegetation clearances	Insufficient	Condition not met, wrapped into a new issue for 2021
PG&E-27, Class A	Public safety partner coordination	Insufficient	Conditions met, resolved
PG&E-28, Class B	Lack of justification and detail for PG&E's self-assessed stakeholder engagement capabilities	Sufficient	Conditions met, resolved
PG&E-29, Class B	Cooperation and sharing of best practices	Sufficient	Conditions met, resolved

11 ATTACHMENTS

Attachment 1: PG&E's 2021 Maturity Survey

PG&E: Description of Data Sources

Data related to the Maturity Model is based on the latest submitted versions of 2021 Utility Wildfire Mitigation Maturity Survey ("Survey") as of May 5, 2021. Data for the Maturity Model is pulled from Survey responses unless stated otherwise.

All source data (the WMP and the Survey responses) are available at: https://energysafety.ca.gov/what-we-do/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2021-wmp/.

All the analysis and corresponding tables presented in this appendix rely upon data that is self-reported by the utilities. By using and presenting this self-reported data in this appendix, Energy Safety is not independently validating that all data elements submitted by utilities are accurate. Energy Safety will continue to evaluate utility data, conduct data requests, and conduct additional compliance activities to ensure that data provided is accurate.

PG&E: Introduction to Maturity Model Scoring[240]

In order to determine "maturity" in any one capability, Energy Safety assigned levels to each aspect of the electrical corporations' wildfire mitigation efforts. Each capability was assigned a level, from 0 – 4 range, with 0 being the lowest and 4 the highest. Energy Safety calculated a maturity level, in accordance with the required elements to achieve each level, as outlined in the Maturity Model rubric.

The levels were calculated using an "all or nothing" binary approach. That is, levels are reported as whole numbers only.[241] Thus, in order to reach a specific maturity level, an electrical corporation would have to meet 100 percent of the threshold requirements for that level, as detailed in the maturity model rubric. In general, the Maturity Model rubric outlines numerous elements that are required to be met to achieve a given level, and the sophistication of requirements to reach a level typically increases with each successively higher maturity level.

For example, to obtain a level of 1 in capability 24 of the 52 total capabilities, titled "Vegetation grow-in mitigation," the electrical corporation (or utility) must demonstrate

[240] From WSD-002 p. 10-11
[241] Note: The category averages shown in 11.1.3 (below) average the capability scores and may include decimals.

the following: “[u]tility maintains vegetation around lines and equipment according to minimum statutory and regulatory clearances. Utility: i) removes vegetation waste along right of ways and ii) within 1 week of cutting vegetation across entire grid.”

Thus, in order to receive a maturity level of 1 for capability 24, an electrical corporation would not only have to maintain minimum regulatory clearances around its overhead lines but also remove the vegetation waste along its right of ways within one week of conducting vegetation clearance work. If an electrical corporation meets only one of these requirements, then it would be assigned the next lowest level. In this example, a level of 0 would be assigned and the electrical corporation would not receive “partial credit” toward a level of 1.

PG&E: Maturity detail by capability

Legend: *Maturity Model Scores*

0 | 1 | 2 | 3 | 4

Category A. Risk Assessment and Mapping

	Avg cycle start maturity: 0	Avg current maturity: 0	Avg projected cycle end maturity: 1.2
Capability 1. Climate scenario modeling			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
1a: How sophisticated is utility's ability to estimate the risk of weather scenarios?	i. No clear ability to understand incremental risk under various weather scenarios	i. No clear ability to understand incremental risk under various weather scenarios	ii. Wildfire risk can be reliably determined based on weather and its impacts
1b: How are scenarios assessed?	i. No formal assessment process	i. No formal assessment process	ii. Independent expert assessment
1c: How granular is utility's ability to model scenarios?	ii. Regional	ii. Regional	iii. Circuit-based
1d: How automated is the tool?	i. Not automated	i. Not automated	i. Not automated
1e: What additional information is used to estimate model weather scenarios and their risk?	i. None	ii. Weather, how weather effects failure modes and propagation	iv. Weather measured at the circuit level, how weather effects failure modes and propagation, existing hardware

1f: To what extent is future change in climate taken into account for future risk estimation?	i. Future climate change not accounted for in estimating future weather and resulting risk	i. Future climate change not accounted for in estimating future weather and resulting risk	ii. Future risk estimates take into account generally higher risk across entire service territory due to changing climate

Capability 2. Ignition risk estimation			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
2a: How is ignition risk calculated?	ii. Tools and processes can reliably categorize the risk of ignition across the grid into at least two categories based on characteristics and condition of lines, equipment, surrounding vegetation, and localized weather patterns	ii. Tools and processes can reliably categorize the risk of ignition across the grid into at least two categories based on characteristics and condition of lines, equipment, surrounding vegetation, and localized weather patterns	iii. Tools and processes can quantitatively and accurately assess the risk of ignition across the grid based on characteristics and condition of lines, equipment, surrounding vegetation, and localized weather patterns
2b: How automated is the ignition risk calculation tool?	i. Not automated	i. Not automated	ii. Partially (<50%)
2c: How granular is the tool?	iii. Circuit-based	iii. Circuit-based	iii. Circuit-based
2d: How is risk assessment confirmed? Select all that apply.	i. By experts ii. By historical data	i. By experts ii. By historical data	i. By experts ii. By historical data iii. Through real-time learning
2e: What confidence interval, in percent, does the utility use in its wildfire risk assessments?	>60%, or no quantified confidence interval	>60%, or no quantified confidence interval	>60%, or no quantified confidence interval

Capability 3. Estimation of wildfire consequences for communities			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
3a: How is estimated consequence of ignition relayed?	ii. Ignition events categorized as low or high risk to communities	iv. Consequence of ignition events quantitatively, accurately, and precisely estimated	iv. Consequence of ignition events quantitatively, accurately, and precisely estimated
3b: What metrics are used to estimate the consequence of ignition risk?	i. As a function of at least one of the following: structures burned, potential fatalities, or area burned	i. As a function of at least one of the following: structures burned, potential fatalities, or area burned	ii. As a function of at least potential fatalities, and one or both of structures burned, or area burned
3c: Is the ignition risk impact analysis available for all seasons?	ii. Yes	ii. Yes	ii. Yes
3d: How automated is the ignition risk estimation process?	i. Not automated	i. Not automated	ii. Partially (<50%)
3e: How granular is the ignition risk estimation process?	iii. Circuit-based	iii. Circuit-based	iii. Circuit-based
3f: How are the outputs of the ignition risk impact assessment tool evaluated?	i. Outputs not evaluated	ii. Outputs independently assessed by experts	iii. Outputs independently assessed by experts and confirmed by historical data
3g: What other inputs are used to estimate impact?	i. Level and conditions of vegetation and weather	i. Level and conditions of vegetation and weather	i. Level and conditions of vegetation and weather

Capability 4. Estimation of wildfire and PSPS risk-reduction impact			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 2 (projected)

Responses to survey questions
Survey questions and the utility's responses are shown below

Question	Start of cycle	By end of year 1 (current)	Planned state by end of cycle
4a: How is risk reduction impact estimated?	i. No clear estimation of risk reduction potential across most initiatives	i. No clear estimation of risk reduction potential across most initiatives	iii. Approach reliably estimates risk reduction potential of initiatives, on an ordinal scale (e.g. 1-5)
4b: How automated is your ignition risk reduction impact assessment tool?	i. Not automated	i. Not automated	ii. Partially (<50%)
4c: How granular is the ignition risk reduction impact assessment tool?	i. Less granular than regional, or no tool at all	iii. Circuit-based	iii. Circuit-based
4d: How are ignition risk reduction impact assessment tool estimates assessed?	i. No or limited formal evidence or support for estimates	ii. With evidence and logical reasoning	iii. Independent expert assessment
4e: What additional information is used to estimate risk reduction impact?	ii. Existing hardware type and condition	iv. Existing hardware type and condition, including operating history; level and condition of vegetation; weather	v. Existing hardware type and condition, including operating history; level and condition of vegetation; weather; and combination of initiatives already deployed

Capability 5. Risk maps and simulation algorithms			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 1 (projected)

Responses to survey questions
Survey questions and the utility's responses are shown below

Question	Start of cycle	By end of year 1 (current)	Planned state by end of cycle
5a: What is the protocol to update risk mapping algorithms?	i. No defined process for updating risk mapping algorithms	ii. Risk mapping algorithms updated based on detected deviations of risk model to ignitions and propagation	ii. Risk mapping algorithms updated based on detected deviations of risk model to ignitions and propagation
5b: How automated is the mechanism to determine whether to update algorithms based on deviations?	ii. Partially (<50%)	ii. Partially (<50%)	ii. Partially (<50%)
5c: How are deviations from risk model to ignitions and propagation detected?	i. Not currently calculated	i. Not currently calculated	ii. Manually
5d: How are decisions to update algorithms evaluated?	i. Not currently evaluated	ii. Independently evaluated by experts	iii. Independently evaluated by experts and historical data
5e: What other data is used to make decisions on whether to update algorithms?	i. Historic ignition and propagation data	i. Historic ignition and propagation data	iii. Current and historic ignition and propagation data; near-miss data

Category B. Situational Awareness and Forecasting

	Avg cycle start maturity: 1.4	Avg current maturity: 1.6	Avg projected cycle end maturity: 1.8
Capability 6. Weather variables collected			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
6a: What weather data is currently collected?	ii. Wind being measured accurately enough along the grid to estimate ignition probability	iii. Range of accurate weather variables (e.g. humidity, precipitation, surface and atmospheric wind conditions) that impact probability of ignition and propagation from utility assets	iii. Range of accurate weather variables (e.g. humidity, precipitation, surface and atmospheric wind conditions) that impact probability of ignition and propagation from utility assets
6b: How are measurements validated?	ii. Manual field calibration measurements	ii. Manual field calibration measurements	ii. Manual field calibration measurements
6c: Are elements that cannot be reliably measured in real time being predicted (e.g., fuel moisture content)?	ii. Yes	ii. Yes	ii. Yes
6d: How many sources are being used to provide data on weather metrics being collected?	iii. More than one	iii. More than one	iii. More than one

Capability 7. Weather data resolution			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
7a: How granular is the weather data that is collected?	iii. Weather data has sufficient granularity to reliably measure weather conditions in HFTD areas, and along the entire grid and in all areas needed to predict weather on the grid	iii. Weather data has sufficient granularity to reliably measure weather conditions in HFTD areas, and along the entire grid and in all areas needed to predict weather on the grid	iv. Weather data has sufficient granularity to reliably measure weather conditions in HFTD areas, and along the entire grid and in all areas needed to predict weather on the grid. Also includes wind estimations at various atmospheric altitudes relevant to ignition risk
7b: How frequently is data gathered	iv. At least six times per hour	iv. At least six times per hour	iv. At least six times per hour
7c: How granular is the tool?	ii. Regional	ii. Regional	iii. Circuit-based
7d: How automated is the process to measure weather conditions?	iv. Fully	iv. Fully	iv. Fully

Capability 8. Weather forecasting ability			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
8a: How sophisticated is the utility's weather forecasting capability?	iii. Utility has the ability to use a combination of accurate weather stations and external weather data to make accurate forecasts	iii. Utility has the ability to use a combination of accurate weather stations and external weather data to make accurate forecasts	iii. Utility has the ability to use a combination of accurate weather stations and external weather data to make accurate forecasts
8b: How far in advance can accurate forecasts be prepared?	i. Less than two weeks in advance	i. Less than two weeks in advance	i. Less than two weeks in advance
8c: At what level of granularity can forecasts be prepared?	iii. Circuit-based	iii. Circuit-based	iii. Circuit-based
8d: How are results error-checked?	iii. Criteria for option (ii) met, and forecasted results are subsequently error checked against measured weather data	iii. Criteria for option (ii) met, and forecasted results are subsequently error checked against measured weather data	iii. Criteria for option (ii) met, and forecasted results are subsequently error checked against measured weather data
8e: How automated is the forecast process?	iii. Mostly (>=50%)	iii. Mostly (>=50%)	iii. Mostly (>=50%)

Capability 9. External sources used in weather forecasting			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
9a: What source does the utility use for weather data?	iii. Utility uses a combination of accurate weather stations and external weather data	iii. Utility uses a combination of accurate weather stations and external weather data	iii. Utility uses a combination of accurate weather stations and external weather data
9b: How is weather station data checked for errors?	ii. Mostly manual processes for error checking weather stations with external data sources	ii. Mostly manual processes for error checking weather stations with external data sources	ii. Mostly manual processes for error checking weather stations with external data sources
9c: For what is weather data used?	iii. Weather data is used to create a single visual and configurable live map that can be used to help make decisions	iii. Weather data is used to create a single visual and configurable live map that can be used to help make decisions	iii. Weather data is used to create a single visual and configurable live map that can be used to help make decisions

Capability 10. Wildfire detection processes and capabilities			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
10 : Are there well-defined procedures for detecting ignitions along the grid?	ii. Yes	ii. Yes	ii. Yes
10b: What equipment is used to detect ignitions?	iv. Well-defined equipment for detecting ignitions along grid, including remote detection equipment including cameras, and satellite monitoring	iv. Well-defined equipment for detecting ignitions along grid, including remote detection equipment including cameras, and satellite monitoring	iv. Well-defined equipment for detecting ignitions along grid, including remote detection equipment including cameras, and satellite monitoring
10 : How is information on detected ignitions reported?	iii. Procedure exists for notifying suppression forces and key stakeholders	iii. Procedure exists for notifying suppression forces and key stakeholders	iii. Procedure exists for notifying suppression forces and key stakeholders
10d: What role does ignition detection software play in wildfire detection?	ii. Ignition detection software in cameras used to augment ignition detection procedures	ii. Ignition detection software in cameras used to augment ignition detection procedures	ii. Ignition detection software in cameras used to augment ignition detection procedures

Category C. Grid design and system hardening

	Avg cycle start maturity: 0.8	Avg current maturity: 0.8	Avg projected cycle end maturity: 2
Capability 11. Approach to prioritizing initiatives across territory			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
11a: How are wildfire risk reduction initiatives prioritized?	ii. Plan prioritizes risk reduction initiatives to within only HFTD areas	ii. Plan prioritizes risk reduction initiatives to within only HFTD areas	iii. Plan prioritizes wildfire risk reduction initiatives based on local geography and conditions within only HFTD areas

Capability 12. Grid design for minimizing ignition risk			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
12a: Does grid design meet minimum G095 requirements and loading standards in HFTD areas?	ii. Yes	ii. Yes	iii. Grid topology exceeds design requirements, designed based on accurate understanding of drivers of utility ignition risk
12b: Does the utility provide micro grids or islanding where traditional grid infrastructure is impracticable and wildfire risk is high?	ii. Yes	ii. Yes	ii. Yes
12c: Does routing of new portions of the grid take wildfire risk into account?	i. Yes	i. Yes	i. Yes
12d: Are efforts made to incorporate the latest asset management strategies and new technologies into grid topology?	ii. Yes, some effort made in HFTD areas	ii. Yes, some effort made in HFTD areas	iii. Yes, across the entire service area

Capability 13. Grid design for resiliency and minimizing PSPS			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 0 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
13a: What level of redundancy does the utility's transmission architecture have?	i. Many single points of failure	i. Many single points of failure	i. Many single points of failure
13b: What level of redundancy does the utility's distribution architecture have?	i. Many single points of failure	i. Many single points of failure	i. Many single points of failure
13c: What level of sectionalization does the utility's distribution architecture have?	ii. Switches in HFTD areas to individually isolate circuits	ii. Switches in HFTD areas to individually isolate circuits	ii. Switches in HFTD areas to individually isolate circuits
13d: How does the utility consider egress points in its grid topology?	ii. Egress points used as an input for grid topology design	i. Does not consider	ii. Egress points used as an input for grid topology design

Capability 14. Risk-based grid hardening and cost efficiency			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
14a: Does the utility have an understanding of the risk spend efficiency of hardening initiatives?	ii. Utility has an accurate understanding of the relative cost and effectiveness of different initiatives	ii. Utility has an accurate understanding of the relative cost and effectiveness of different initiatives	ii. Utility has an accurate understanding of the relative cost and effectiveness of different initiatives
14b: At what level can estimates be prepared?	iii. Circuit-based	iii. Circuit-based	iii. Circuit-based
14c: How frequently are estimates updated?	ii. Less frequently than annually	ii. Less frequently than annually	iii. Annually or more frequently
14d: What grid hardening initiatives does the utility include within its evaluation?	ii. Some	ii. Some	iii. Most
14e: Can the utility evaluate risk reduction synergies from combination of various initiatives?	i. No	i. No	ii. Yes

Capability 15. Grid design and asset innovation			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
15 : How are new hardening solution initiatives evaluated?	ii. New initiatives evaluated based on installation into grid and measuring direct reduction in ignition events	ii. New initiatives evaluated based on installation into grid and measuring direct reduction in ignition events	iii. New initiatives evaluated based on installation into grid and measuring direct reduction in ignition events, and measuring reduction impact on near-miss metrics
15b: 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?	i. No	i. No	ii. Yes, with a limited set of partners
15 : Is performance of new initiatives independently audited?	i. No	i. No	i. No

Category D. Asset management and inspections

	Avg cycle start maturity: 0.6	Avg current maturity: 0.8	Avg projected cycle end maturity: 1.2
Capability 16. Asset inventory and condition assessments			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 0 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
16a: What information is captured in the equipment inventory database?	ii. There is an accurate inventory of equipment that may contribute to wildfire risk, including age, state of wear, and expected lifecycle	ii. There is an accurate inventory of equipment that may contribute to wildfire risk, including age, state of wear, and expected lifecycle	iii. 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
16 : How frequently is the condition assessment updated?	ii. Annually	ii. Annually	ii. Annually
16c: Does all equipment in HFTD areas have the ability to detect and respond to malfunctions?	ii. A system and approach are in place to reliably detect incipient malfunctions likely to cause ignition	ii. A system and approach are in place to reliably detect incipient malfunctions likely to cause ignition	ii. A system and approach are in place to reliably detect incipient malfunctions likely to cause ignition
16 : How granular is the inventory?	iii. At the asset level	iii. At the asset level	iii. At the asset level

Capability 17. Asset inspection cycle			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
17a: How frequent are your patrol inspections?	ii. Consistent with minimum regulatory requirements	ii. Consistent with minimum regulatory requirements	iii. Above minimum regulatory requirements, with more frequent inspections for highest risk equipment
17b: How are patrol inspections scheduled?	i. Based on annual or periodic schedules	i. Based on annual or periodic schedules	ii. Based on up-to-date static maps of equipment types and environment
17c: What are the inputs to scheduling patrol inspections?	i. At least annually updated or verified static maps of equipment and environment	i. At least annually updated or verified static maps of equipment and environment	i. At least annually updated or verified static maps of equipment and environment
17d: How frequent are detailed inspections?	iii. Above minimum regulatory requirements, with more frequent inspections for highest risk equipment	iii. Above minimum regulatory requirements, with more frequent inspections for highest risk equipment	iii. Above minimum regulatory requirements, with more frequent inspections for highest risk equipment
17e: How are detailed inspections scheduled?	i. Based on annual or periodic schedules	i. Based on annual or periodic schedules	ii. Based on up-to-date static maps of equipment types and environment
17f: What are the inputs to scheduling detailed inspections?	i. At least annually updated or verified static maps of equipment and environment	i. At least annually updated or verified static maps of equipment and environment	i. At least annually updated or verified static maps of equipment and environment
17g: How frequent are your other inspections?	ii. Consistent with minimum regulatory requirements	ii. Consistent with minimum regulatory requirements	ii. Consistent with minimum regulatory requirements
17h: How are other inspections scheduled?	i. Based on annual or periodic schedules	i. Based on annual or periodic schedules	ii. Based on up-to-date static maps of equipment types and environment
17i: What are the inputs to scheduling other inspections?	i. At least annually updated or verified static maps of equipment and environment	i. At least annually updated or verified static maps of equipment and environment	i. At least annually updated or verified static maps of equipment and environment

Capability 18. Asset inspection effectiveness			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
18a: What items are captured within inspection procedures and checklists?	ii. Patrol, detailed, enhanced, and other inspection procedures and checklists include all items required by statute and regulations	ii. Patrol, detailed, enhanced, and other inspection procedures and checklists include all items required by statute and regulations	iii. Patrol, detailed, enhanced, and other inspection procedures and checklists include all items required by statute and regulations, and includes lines and equipment typically responsible for ignitions and near misses
18b: How are procedures and checklists determined?	i. Based on statute and regulatory guidelines only	i. Based on statute and regulatory guidelines only	i. Based on statute and regulatory guidelines only
18c: At what level of granularity are the depth of checklists, training, and procedures customized?	i. Across the service territory	i. Across the service territory	i. Across the service territory

Capability 19. Asset maintenance and repair			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
19a: What level are electrical lines and equipment maintained at?	i. Electric lines and equipment not consistently maintained at required condition over multiple circuits	i. Electric lines and equipment not consistently maintained at required condition over multiple circuits	ii. Electrical lines and equipment maintained as required by regulation
19b: How are service intervals set?	i. Based on wildfire risk in relevant area	i. Based on wildfire risk in relevant area	ii. Based on wildfire risk in relevant circuit
19c: What do maintenance and repair procedures take into account?	i. Wildfire risk	i. Wildfire risk	ii. Wildfire risk, performance history, and past operating conditions

Capability 20. QA/QC for asset management			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
20a: How is contractor activity audited?	ii. Through an established and functioning audit process to manage and confirm work completed by subcontractors	ii. Through an established and functioning audit process to manage and confirm work completed by subcontractors	iii. Through an established and demonstrably functioning audit process to manage and confirm work completed by subcontractors, where contractor activity is subject to semi-automated audits using technologies capable of sampling the contractor's work (e.g., LiDAR scans, photographic evidence)
20b: Do contractors follow the same processes and standards as utility's own employees?	ii. Yes	ii. Yes	ii. Yes
20c: How frequently is QA/QC information used to identify deficiencies in quality of work performance and inspections performance?	iii. On an ad hoc basis	iv. Regularly	iv. Regularly
20d: How are work and inspections that do not meet utility-prescribed standards remediated?	ii. QA/QC information is used to identify systemic deficiencies in quality of work and inspections	ii. QA/QC information is used to identify systemic deficiencies in quality of work and inspections	iii. QA/QC information is used to identify systemic deficiencies in quality of work and inspections, and recommend training based on weaknesses
20e: Are workforce management software tools used to manage and confirm work completed by subcontractors?	ii. Yes	ii. Yes	ii. Yes

Category E. Vegetation management and inspections

	Avg cycle start maturity: 0.7	Avg current maturity: 0.7	Avg projected cycle end maturity: 1
Capability 21. Vegetation inventory and condition assessments			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
21a: What information is captured in the inventory?	ii. Centralized inventory of vegetation clearances based on most recent inspection	ii. Centralized inventory of vegetation clearances based on most recent inspection	iii. Centralized inventory of vegetation clearances, including predominant vegetation species and individual high risk-trees across grid
21b: How frequently is inventory updated?	ii. Annually	ii. Annually	iii. Within 1 month of collection
21c: Are inspections independently verified by third party experts?	ii. Yes	ii. Yes	ii. Yes
21d: How granular is the inventory?	iv. Asset-based	iv. Asset-based	iv. Asset-based

Capability 22. Vegetation inspection cycle			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
22a: How frequent are all types of vegetation inspections?	ii. Consistent with minimum regulatory requirements	ii. Consistent with minimum regulatory requirements	iii. Above minimum regulatory requirements, with more frequent inspections for highest risk areas
22b: How are vegetation inspections scheduled?	i. Based on annual or periodic schedules	i. Based on annual or periodic schedules	i. Based on annual or periodic schedules
22c: What are the inputs to scheduling vegetation inspections?	i. At least annually-updated static maps of vegetation and environment	i. At least annually-updated static maps of vegetation and environment	i. At least annually-updated static maps of vegetation and environment

Capability 23. Vegetation inspection effectiveness			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
23a: What items are captured within inspection procedures and checklists?	ii. Patrol, detailed, enhanced, and other inspection procedures and checklists include all items required by statute and regulations	ii. Patrol, detailed, enhanced, and other inspection procedures and checklists include all items required by statute and regulations	iii. Patrol, detailed, enhanced, and other inspection procedures and checklists include all items required by statute and regulations, and includes vegetation types typically responsible for ignitions and near misses
23b: How are procedures and checklists determined?	i. Based on statute and regulatory guidelines only	i. Based on statute and regulatory guidelines only	i. Based on statute and regulatory guidelines only
23c: At what level of granularity are the depth of checklists, training, and procedures customized?	i. Across the service territory	i. Across the service territory	i. Across the service territory

Capability 24. Vegetation grow-in mitigation			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 0 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
24a: How does utility clearance around lines and equipment perform relative to expected standards?	ii. Utility meet minimum statutory and regulatory clearances around all lines and equipment	ii. Utility meet minimum statutory and regulatory clearances around all lines and equipment	ii. Utility meet minimum statutory and regulatory clearances around all lines and equipment
24b: Does utility meet or exceed minimum statutory or regulatory clearances during all seasons?	ii. Yes	ii. Yes	ii. Yes
24c: What modeling is used to guide clearances around lines and equipment?	iii. None of the above	iii. None of the above	iii. None of the above
24d: What biological modeling is used to guide clearance around lines and equipment	iii. None of the above	iii. None of the above	iii. None of the above
24e: Are community organizations engaged in setting local clearances and protocols?	i. No	i. No	i. No
24f: Does the utility remove vegetation waste along its right of way across the entire grid?	i. No	i. No	i. No
24g: How long after cutting vegetation does the utility remove vegetation waste along right of way?	ii. Longer than 1 week	ii. Longer than 1 week	ii. Longer than 1 week
24h: Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?	i. No	i. No	i. No

24i: Does the utility work with partners to identify new cost-effective uses for vegetation, taking into consideration environmental impacts and emissions of vegetation waste?	ii. Yes	ii. Yes	ii. Yes

Capability 25. Vegetation fall-in mitigation			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
25a: Does the utility have a process for treating vegetation outside of right of ways?	iii. Utility systematically removes vegetation outside of right of way	iii. Utility systematically removes vegetation outside of right of way	iv. Utility systematically removes vegetation outside of right of way, informing relevant communities of removal
25b: How is potential vegetation that may pose a threat identified?	ii. Based on the height of trees with potential to make contact with electric lines and equipment	ii. Based on the height of trees with potential to make contact with electric lines and equipment	ii. Based on the height of trees with potential to make contact with electric lines and equipment
25c: Is vegetation removed with cooperation from the community?	ii. Yes	ii. Yes	ii. Yes
25d: Does the utility remove vegetation waste outside its right of way across the entire grid?	i. No	i. No	i. No
25e: How long after cutting vegetation does the utility remove vegetation waste outside its right of way?	ii. Longer than 1 week	ii. Longer than 1 week	ii. Longer than 1 week

25f: Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?	i. No	i. No	i. No
25g: Does the utility work with partners to identify new cost-effective uses for vegetation, taking into consideration environmental impacts and emissions of vegetation waste?	ii. Yes	ii. Yes	ii. Yes

Capability 26. QA/QC for vegetation management			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
26a: How is contractor and employee activity audited?	ii. Through an established and functioning audit process to manage and confirm work completed by subcontractors	ii. Through an established and functioning audit process to manage and confirm work completed by subcontractors	ii. Through an established and functioning audit process to manage and confirm work completed by subcontractors
26b: Do contractors follow the same processes and standards as utility's own employees?	ii. Yes	ii. Yes	ii. Yes
26c: How frequently is QA/QC information used to identify deficiencies in quality of work performance and inspections performance?	iv. Regularly	iv. Regularly	iv. Regularly
26d: How is work and inspections that do not meet	ii. QA/QC information is used to identify systemic deficiencies in quality of work and inspections	ii. QA/QC information is used to identify systemic deficiencies in quality of work and inspections	ii. QA/QC information is used to identify systemic deficiencies in quality of work and inspections

utility-prescribed standards remediated?			
26e: Are workforce management software tools used to manage and confirm work completed by subcontractors?	i. No	i. No	ii. Yes

Category F. Grid operations and protocols

	Avg cycle start maturity: 1.3	Avg current maturity: 2.2	Avg projected cycle end maturity: 2.3
Capability 27. Protective equipment and device settings			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 3	By end of year 1 (current): 3	Planned state by end of cycle: 3 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
27a: How are grid elements adjusted during high threat weather conditions?	iv. Utility increases sensitivity of risk reduction elements during high threat weather conditions based on risk mapping and monitors near misses	iv. Utility increases sensitivity of risk reduction elements during high threat weather conditions based on risk mapping and monitors near misses	iv. Utility increases sensitivity of risk reduction elements during high threat weather conditions based on risk mapping and monitors near misses
27b: Is there an automated process for adjusting sensitivity of grid elements and evaluating effectiveness?	ii. Partially automated process	ii. Partially automated process	ii. Partially automated process
27c: Is there a predetermined protocol driven by fire conditions for adjusting sensitivity of grid elements?	ii. Yes	ii. Yes	ii. Yes

Capability 28. Incorporating ignition risk factors in grid control			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 1	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
28a: Does the utility have a clearly explained process for determining whether to operate the grid beyond current or voltage designs?	ii. Yes	ii. Yes	ii. Yes
28b: 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. No	ii. Yes	ii. Yes
28c: 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. Modeling is used, but not evaluated by external experts	i. Modeling is not used	i. Modeling is not used
28d: When does the utility operate the grid above rated voltage and current load?	ii. Only in conditions that are unlikely to cause wildfire	i. During any conditions	i. During any conditions

Capability 29. PSPS op. model and consequence mitigation			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 3	Planned state by end of cycle: 3 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
29a: How effective is PSPS event forecasting?	iv. PSPS event generally forecasted accurately with fewer than 25% of predictions being false positives	iv. PSPS event generally forecasted accurately with fewer than 25% of predictions being false positives	iv. PSPS event generally forecasted accurately with fewer than 25% of predictions being false positives
29b: What share of customers are communicated to regarding forecasted PSPS events?	ii. PSPS event are communicated to >95% of affected customers and >99% of medical baseline customers in advance of PSPS action	iv. PSPS event are communicated to >99% of affected customers and >99.9% of medical baseline customers in advance of PSPS action	iv. PSPS event are communicated to >99% of affected customers and >99.9% of medical baseline customers in advance of PSPS action
29c: During PSPS events, what percent of customers complain?	iii. Less than 0.5%	iii. Less than 0.5%	iii. Less than 0.5%
29d: During PSPS events, does the utility's website go down?	ii. Yes	i. No	i. No
29e: During PSPS events, what is the average downtime per customer?	v. Less than 0.1 hours	v. Less than 0.1 hours	v. Less than 0.1 hours
29f: Are specific resources provided to all affected customers to alleviate the impact of the power shutoff (e.g., providing backup generators, supplies, batteries, etc.)?	ii. Yes	ii. Yes	ii. Yes

Capability 30. Protocols for PSPS initiation			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
30a: Does the utility have explicit thresholds for activating a PSPS?	ii. Utility has explicit policies and explanation for the thresholds above which PSPS is activated as a measure of last resort	ii. Utility has explicit policies and explanation for the thresholds above which PSPS is activated as a measure of last resort	ii. Utility has explicit policies and explanation for the thresholds above which PSPS is activated as a measure of last resort
30b: Which of the following does the utility take into account when making PSPS decisions? Select all that apply	ii. A partially automated system which recommends circuits for which PSPS should be activated and is validated by SMEs	ii. A partially automated system which recommends circuits for which PSPS should be activated and is validated by SMEs	ii. A partially automated system which recommends circuits for which PSPS should be activated and is validated by SMEs
30c: Under which circumstances does the utility de-energize circuits? Select all that apply.	i. Upon detection of damaged conditions of electric equipment ii. When circuit presents a safety risk to suppression or other personnel iii. When equipment has come into contact with foreign objects posing ignition risk iv. Additional reasons not listed	i. Upon detection of damaged conditions of electric equipment ii. When circuit presents a safety risk to suppression or other personnel iii. When equipment has come into contact with foreign objects posing ignition risk iv. Additional reasons not listed	i. Upon detection of damaged conditions of electric equipment ii. When circuit presents a safety risk to suppression or other personnel iii. When equipment has come into contact with foreign objects posing ignition risk iv. Additional reasons not listed
30d: Given the condition of the grid, with what probability does the utility expect any large scale PSPS events affecting more than 10,000 people to occur in the coming year?	ii. Greater than 5% - Grid condition paired with risk indicates that PSPS may be necessary in 2020 in some areas	ii. Greater than 5% - Grid condition paired with risk indicates that PSPS may be necessary in 2020 in some areas	ii. Greater than 5% - Grid condition paired with risk indicates that PSPS may be necessary in 2020 in some areas

Capability 31. Protocols for PSPS re-energization			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
31a: Is there a process for inspecting de-energized sections of the grid prior to re-energization?	ii. Existing process for accurately inspecting de-energized sections of the grid prior to re-energization	ii. Existing process for accurately inspecting de-energized sections of the grid prior to re-energization	ii. Existing process for accurately inspecting de-energized sections of the grid prior to re-energization
31b: How automated is the process for inspecting de-energized sections of the grid prior to re-energization?	i. Manual process, not automated at all	i. Manual process, not automated at all	ii. Partially automated (<50%)
31c: 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. Within 24 hours	iv. Within 12 hours	iv. Within 12 hours
31d: What level of understanding of probability of ignitions after PSPS events does the utility have across the grid?	ii. Some probability estimates exist	iii. Utility has accurate quantitative understanding of ignition risk following re-energization, by asset, validated by historical data and near misses	iii. Utility has accurate quantitative understanding of ignition risk following re-energization, by asset, validated by historical data and near misses

Capability 32. Ignition prevention and suppression

Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 3	Planned state by end of cycle: 3 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
32a: Does the utility have defined policies around the role of workers in suppressing ignitions?	iii. Utilities have explicit policies about the role of crews, including contractors and subcontractors, at the site of ignition	iii. Utilities have explicit policies about the role of crews, including contractors and subcontractors, at the site of ignition	iii. Utilities have explicit policies about the role of crews, including contractors and subcontractors, at the site of ignition
32b: What training and tools are provided to workers in the field?	iii. All criteria in option (ii) met; In addition, suppression tools and training to suppress small ignitions caused by workers or in immediate vicinity of workers are provided	0	0
32c: In the events where workers have encountered an ignition, have any Cal/OSHA reported injuries or fatalities occurred in in the last year?	i. No	i. No	i. No
32d: Does the utility provide training to other workers at other utilities and outside the utility industry on best practices to minimize, report and suppress ignitions?	i. No	i. No	i. No

Category G. Data governance

	Avg cycle start maturity: 0.3	Avg current maturity: 0.8	Avg projected cycle end maturity: 2.8
Capability 33. Data collection and curation			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
33a: Does the utility have a centralized database of situational, operational, and risk data?	i. No	i. No	ii. Yes
33b: Is the utility able to use advanced analytics on its centralized database of situational, operational, and risk data to make operational and investment decisions?	i. No	i. No	iii. Yes, for both short term and long-term decision making
33c: Does the utility collect data from all sensored portions of electric lines, equipment, weather stations, etc.?	ii. Yes	ii. Yes	ii. Yes
33d: Is the utility's database of situational, operational, and risk data able to ingest and share data using real-time API protocols with a wide variety of stakeholders?	i. No	i. No	i. No
33e: Does the utility identify highest priority additional data sources to improve decision making?	ii. Yes	ii. Yes	iii. Yes, with plans to incorporate these into centralized database of situational, operational and risk data

33f: Does the utility share best practices for database management and use with other utilities in California and beyond?	i. No	i. No	ii. Yes

Capability 34. Data transparency and analytics			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
34a: Is there a single document cataloguing all fire-related data and algorithms, analyses, and data processes?	i. No	i. No	ii. Yes
34b: Is there an explanation of the sources, cleaning processes, and assumptions made in the single document catalog?	i. No	i. No	ii. Yes
34c: Are all analyses, algorithms, and data processing explained and documented?	ii. Analyses, algorithms, and data processing are documented	ii. Analyses, algorithms, and data processing are documented	iii. Analyses, algorithms, and data processing are documented and explained
34d: Is there a system for sharing data in real time across multiple levels of permissions?	iii. System is capable of sharing across at least three levels of permissions, including a.) utility-regulator permissions, b.) first responder permissions, and c.) public data sharing	iii. System is capable of sharing across at least three levels of permissions, including a.) utility-regulator permissions, b.) first responder permissions, and c.) public data sharing	iii. System is capable of sharing across at least three levels of permissions, including a.) utility-regulator permissions, b.) first responder permissions, and c.) public data sharing

34e: Are the most relevant wildfire related data algorithms disclosed?	iii. Yes, disclosed publicly in WMP upon request	iii. Yes, disclosed publicly in WMP upon request	iii. Yes, disclosed publicly in WMP upon request

Capability 35. Near-miss tracking			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 2	Planned state by end of cycle: 3 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
35a: Does the utility track near miss data for all near misses with wildfire ignition potential?	i. No	ii. Yes	ii. Yes
35b: 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. No	ii. Yes	ii. Yes
35c: Does the utility capture data related to the specific mode of failure when capturing near-miss data?	i. No	ii. Yes	ii. Yes
35d: Is the utility able to predict the probability of a near miss in causing an ignition based on a set of event characteristics?	i. No	i. No	ii. Yes
35e: Does the utility use data from near misses to change grid operation protocols in real time?	i. No	i. No	i. No

Capability 36. Data sharing with research community

Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
36a: Does the utility make disclosures and share data?	ii. Utility makes required disclosures, but does not share data beyond what is required	ii. Utility makes required disclosures, but does not share data beyond what is required	iii. Utility makes required disclosures and shares data beyond what is required
36b: Does the utility in engage in research?	iii. Utility funds and participates in both independent and collaborative research	iv. Utility funds and participates in both independent and collaborative research, and ensures that research, where possible, is abstracted and applied to other utilities	iv. Utility funds and participates in both independent and collaborative research, and ensures that research, where possible, is abstracted and applied to other utilities
36c: What subjects does utility research address?	ii. Utility ignited wildfires and risk reduction initiatives	ii. Utility ignited wildfires and risk reduction initiatives	ii. Utility ignited wildfires and risk reduction initiatives
36d: Does the utility promote best practices based on latest independent scientific and operational research?	i. No	ii. Yes	ii. Yes

Category H. Resource allocation methodology

	Avg cycle start maturity: 0.2	Avg current maturity: 0.8	Avg projected cycle end maturity: 1.5
Capability 37. Scenario analysis across different risk levels			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
37a: For what risk scenarios is the utility able to provide projected cost and total risk reduction potential?	i. Utility does not project proposed initiatives or costs across different levels of risk scenarios	i. Utility does not project proposed initiatives or costs across different levels of risk scenarios	iii. Utility provides an accurate high-risk reduction and low risk reduction scenario, in addition to their proposed scenario, and the projected cost and total risk reduction potential
37b: For what level of granularity is the utility able to provide projections for each scenario?	i. Territory-level or greater	i. Territory-level or greater	iii. Circuit level
37c: Does the utility include a long term (e.g., 6-10 year) risk estimate taking into account macro factors (climate change, etc.) as well as planned risk reduction initiatives in its scenarios?	ii. Yes	ii. Yes	ii. Yes
37d: Does the utility provide an estimate of impact on reliability factors in its scenarios?	i. No	i. No	ii. Yes

Capability 38. Presentation of relative risk spend efficiency for portfolio of initiatives			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
38a: Does the utility present accurate qualitative rankings for its initiatives by risk spend efficiency?	ii. Yes	ii. Yes	ii. Yes
38b: What initiatives are captured in the ranking of risk spend efficiency?	i. Common commercial initiatives	i. Common commercial initiatives	iii. All commercial initiatives and emerging initiatives
38c: 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. No	i. No	ii. Yes
38d: Does the utility provide an explanation of their investment in each particular initiative?	ii. Yes, including the expected overall reduction in risk	ii. Yes, including the expected overall reduction in risk	iii. Yes, including the expected overall reduction in risk and estimates of impact on reliability factors
38e: At what level of granularity is the utility able to provide risk efficiency figures?	i. Territory-level or greater	iii. Circuit level	iii. Circuit level

Capability 39. Process for determining risk spend efficiency of vegetation management initiatives			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
39a: How accurate of a risk spend efficiency calculation can the utility provide?	i. Utility has no clear understanding of the relative risk spend efficiency of various clearances and types of vegetation management initiatives	ii. Utility has an accurate relative understanding of the cost and effectiveness to produce a reliable risk spend efficiency estimate	iii. Utility has accurate quantitative understanding of cost and effectiveness to produce a reliable risk spend efficiency estimate
39b: At what level can estimates be prepared?	i. Less granular than regional, or not at all	iii. Circuit-based	iii. Circuit-based
39c: How frequently are estimates updated?	iii. Annually or more frequently	iii. Annually or more frequently	iii. Annually or more frequently
39d: What vegetation management initiatives does the utility include within its evaluation?	iii. Most	iii. Most	iv. All
39e: Can the utility evaluate risk reduction synergies from combination of various initiatives?	i. No	i. No	ii. Yes

Capability 40. Process for determining risk spend efficiency of system hardening initiatives			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
40a: How accurate of a risk spend efficiency calculation can the utility provide?	ii. Utility has accurate relative understanding of cost and effectiveness to produce a reliable risk spend efficiency estimate	ii. Utility has accurate relative understanding of cost and effectiveness to produce a reliable risk spend efficiency estimate	iii. Utility has accurate quantitative understanding of cost and effectiveness to produce a reliable risk spend efficiency estimate
40b: At what level can estimates be prepared?	i. Less granular than regional, or not at all	iii. Circuit-based	iii. Circuit-based
40c: How frequently are estimates updated?	iii. Annually or more frequently	iii. Annually or more frequently	iii. Annually or more frequently
40d: What grid hardening initiatives are included in the utility risk spend efficiency analysis?	ii. Some commercially available grid hardening initiatives	ii. Some commercially available grid hardening initiatives	iv. All commercially available grid hardening initiatives
40e: Can the utility evaluate risk reduction effects from the combination of various initiatives?	i. No	i. No	ii. Yes

Capability 41. Portfolio-wide initiative allocation methodology			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
41a: To what extent does the utility allocate capital to initiatives based on risk-spend efficiency (RSE)?	i. Utility does not base capital allocation on RSE	i. Utility does not base capital allocation on RSE	ii. Utility considers estimates of RSE when allocating capital
41b: What information does the utility take into account when generating RSE estimates?	i. Average estimate of RSE by initiative category	i. Average estimate of RSE by initiative category	ii. Specific information by initiative, including state of equipment and location where initiative will be implemented
41c: How does the utility verify RSE estimates?	i. Utility does not verify RSE estimates	i. Utility does not verify RSE estimates	i. Utility does not verify RSE estimates
41d: Does the utility take into consideration impact on safety, reliability, and other priorities when making spending decisions?	ii. Yes	ii. Yes	ii. Yes

Capability 42. Portfolio-wide innovation in new wildfire initiatives			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 1	By end of year 1 (current): 1	Planned state by end of cycle: 1 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
42a: How does the utility develop and evaluate the efficacy of new wildfire initiatives?	ii. Utility uses pilots and measures direct reduction in ignition events	ii. Utility uses pilots and measures direct reduction in ignition events	iii. Utility uses pilots and measures direct reduction in ignition events and near-misses.
42b: How does the utility develop and evaluate the risk spend efficiency of new wildfire initiatives?	i. No program in place	i. No program in place	i. No program in place
42c: At what level of granularity does the utility measure the efficacy of new wildfire initiatives?	ii. Entire territory	ii. Entire territory	iii. Circuit
42d: Are the reviews of innovative initiatives audited by independent parties?	i. No	i. No	i. No
42e: Does the utility share the findings of its evaluation of innovative initiatives with other utilities, academia, and the general public?	ii. Yes	ii. Yes	ii. Yes

Category I. Emergency planning and preparedness

	Avg cycle start maturity: 0.4	Avg current maturity: 2	Avg projected cycle end maturity: 3.6
Capability 43. Wildfire plan integrated with overall disaster/ emergency plan			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
43a: Is the wildfire plan integrated with overall disaster and emergency plans?	iii. Wildfire plan is an integrated component of overall plan	iii. Wildfire plan is an integrated component of overall plan	iii. Wildfire plan is an integrated component of overall plan
43b: Does the utility run drills to audit the viability and execution of its wildfire plans?	i. No	i. No	ii. Yes
43c: Is the impact of confounding events or multiple simultaneous disasters considered in the planning process?	i. No	ii. Yes	ii. Yes
43d: Is the plan integrated with disaster and emergency preparedness plans of other relevant stakeholders (e.g., CAL FIRE, Fire Safe Councils, etc.)?	i. No	ii. Yes	ii. Yes
43e: Does the utility take a leading role in planning, coordinating, and integrating plans across stakeholders?	i. No	i. No	ii. Yes

Capability 44. Plan to restore service after wildfire related outage			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 2	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
44a: Are there detailed and actionable procedures in place to restore service after a wildfire related outage?	ii. Yes	ii. Yes	ii. Yes
44b: Are employee and subcontractor crews trained in, and aware of, plans?	ii. Yes	ii. Yes	ii. Yes
44c: To what level are procedures to restore service after a wildfire-related outage customized?	i. Territory-wide	0	0
44d: Is the customized procedure to restore service based on topography, vegetation, and community needs?	ii. Yes	ii. Yes	ii. Yes
44e: Is there an inventory of high risk spend efficiency resources available for repairs?	i. No	i. No	ii. Yes
44f: Is the wildfire plan integrated with overall disaster and emergency plans?	iii. Wildfire plan is an integrated component of overall plan	iii. Wildfire plan is an integrated component of overall plan	iii. Wildfire plan is an integrated component of overall plan

Capability 45. Emergency community engagement during and after wildfire			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 2	Planned state by end of cycle: 2 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
45a: Does the utility provide clear and substantially complete communication of available information relevant to affected customers?	ii. Yes	iii. Yes, along with referrals to other agencies	iii. Yes, along with referrals to other agencies
45b: What percent of affected customers receive complete details of available information?	ii. >95% of customers	iii. >98% of customers	iv. >99% of customers
45c: What percent of affected medical baseline customers receive complete details of available information?	i. <=99%	iii. >99.5% of medical baseline customers	iii. >99.5% of medical baseline customers
45d: How does the utility assist where helpful with communication of information related to power outages to customers?	iii. None of the above	ii. Through availability of relevant evacuation information and links on website and toll-free telephone number, and assisting disaster response professionals as requested	ii. Through availability of relevant evacuation information and links on website and toll-free telephone number, and assisting disaster response professionals as requested
45e: How does the utility with engage other emergency management agencies during emergency situations?	ii. Utility engages with other agencies in an ad hoc manner	ii. Utility engages with other agencies in an ad hoc manner	iii. Utility has detailed and actionable established protocols for engaging with emergency management organizations
45f: Does the utility communicate and coordinate resources to communities during emergencies (e.g., shelters, supplies, transportation etc.)?	ii. Yes	ii. Yes	ii. Yes

Capability 46. Protocols in place to learn from wildfire events			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 4	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
46a: Is there a protocol in place to record the outcome of emergency events and to clearly and actionably document learnings and potential process improvements?	ii. Yes	ii. Yes	ii. Yes
46b: Is there a defined process and staff responsible for incorporating learnings into emergency plan?	i. No	ii. Yes	ii. Yes
46c: Once updated based on learnings and improvements, is the updated plan tested using "dry runs" to confirm its effectiveness?	i. No	ii. Yes	ii. Yes
46d: 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. No	ii. Yes	ii. Yes

Capability 47. Processes for continuous improvement after wildfire and PSPS			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 2	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
47a: Does the utility conduct an evaluation or debrief process after a wildfire?	ii. Yes	ii. Yes	ii. Yes
47b: Does the utility conduct a customer survey and utilize partners to disseminate requests for stakeholder engagement?	i. No	iii. Both	iii. Both
47c: In what other activities does the utility engage?	iii. Debriefs with partners	iv. Public listening sessions, debriefs with partners, and others	iv. Public listening sessions, debriefs with partners, and others
47d: Does the utility share with partners findings about what can be improved?	i. No	ii. Yes	ii. Yes
47e: Are feedback and recommendations on potential improvements made public?	i. No	ii. Yes	ii. Yes
47f: Does the utility conduct proactive outreach to local agencies and organizations to solicit additional feedback on what can be improved?	i. No	ii. Yes	ii. Yes
47g: Does the utility have a clear plan for post-event listening and incorporating lessons learned from all stakeholders?	i. No	ii. Yes	ii. Yes

47h: Does the utility track the implementation of recommendations and report upon their impact?	i. No	i. No	ii. Yes
47i: 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. No	ii. Yes	ii. Yes

Category J. Stakeholder cooperation and community engagement

	Avg cycle start maturity: 1.4	**Avg current maturity: 2.4**	**Avg projected cycle end maturity: 2.8**
Capability 48. Cooperation and best practice sharing with other utilities			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 3	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
48a: Does the utility actively work to identify best practices from other utilities through a clearly defined operational process?	i. No	iii. Yes, from other global utilities	iii. Yes, from other global utilities
48b: Does the utility successfully adopt and implement best practices identified from other utilities?	ii. Yes	ii. Yes	ii. Yes
48c: Does the utility seek to share best practices and lessons learned in a consistent format?	ii. Yes	ii. Yes	ii. Yes

48d: Does the utility share best practices and lessons via a consistent and predictable set of venues/media?	ii. Yes	ii. Yes	ii. Yes
48e: Does the utility participate in annual benchmarking exercises with other utilities to find areas for improvement?	ii. Yes	ii. Yes	ii. Yes
48f: Has the utility implemented a defined process for testing lessons learned from other utilities to ensure local applicability?	i. No	i. No	ii. Yes

Capability 49. Engagement with communities on utility wildfire mitigation initiatives			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 3	By end of year 1 (current): 3	Planned state by end of cycle: 3 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
49a: Does the utility have a clear and actionable plan to develop or maintain a collaborative relationship with local communities?	ii. Yes	ii. Yes	ii. Yes
49b: Are there communities in HFTD areas where meaningful resistance is expected in response to efforts to mitigate fire risk (e.g. vegetation clearance)?	ii. Yes	ii. Yes	ii. Yes

49c: What percent of landowners are non-compliant with utility initiatives (e.g., vegetation management)?	v. Less than 0.5%	v. Less than 0.5%	v. Less than 0.5%
49d: What percent of landowners complain about utility initiatives (e.g., vegetation management)?	iv. Less than 1 %	iv. Less than 1 %	iv. Less than 1 %
49e: Does the utility have a demonstratively cooperative relationship with communities containing >90% of the population in HFTD areas (e.g. by being recognized by other agencies as having a cooperative relationship with those communities in HFTD areas)?	i. No	i. No	ii. Yes
49f: Does utility have records of landowners throughout communities containing >90% of the population in HFTD areas reaching out to notify of risks, dangers or issues in the past year?	ii. Yes	ii. Yes	ii. Yes

Capability 50. Engagement with LEP and AFN populations			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 4	Planned state by end of cycle: 4 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
50a: Can the utility provide a plan to partner with organizations representing Limited English Proficiency (LEP) and Access & Functional Needs (AFN) communities?	ii. Yes	ii. Yes	ii. Yes
50b: Can the utility outline how these partnerships create pathways for implementing suggested activities to address the needs of these communities?	ii. Yes	ii. Yes	ii. Yes
50c: 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. No	ii. Yes	ii. Yes
50d: Does the utility have a specific annually-updated action plan further reduce wildfire and PSPS risk to LEP & AFN communities?	i. No	ii. Yes	ii. Yes

Capability 51. Collaboration with emergency response agencies			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 2	By end of year 1 (current): 2	Planned state by end of cycle: 3 (projected)
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
51a: What is the cooperative model between the utility and suppression agencies?	ii. Utility cooperates with suppression agencies by notifying them of ignitions	iii. Utility cooperates with suppression agencies by working cooperatively with them to detect ignitions, in addition to notifying them of ignitions as needed	iii. Utility cooperates with suppression agencies by working cooperatively with them to detect ignitions, in addition to notifying them of ignitions as needed
51b: In what areas is the utility cooperating with suppression agencies	iii. Throughout utility service areas	iii. Throughout utility service areas	iii. Throughout utility service areas
51c: Does the utility accurately predict and communicate the forecasted fire propagation path using available analytics resources and weather data?	i. No	i. No	ii. Yes
51d: Does the utility communicate fire paths to the community as requested?	i. No	i. No	i. No
51e: Does the utility work to assist suppression crews logistically, where possible?	ii. Yes	ii. Yes	ii. Yes

Capability 52. Collaboration on wildfire mitigation planning with stakeholders			
Capability maturity level based on Maturity Rubric (0 - 4)	Start of cycle: 0	By end of year 1 (current): 0	
Responses to survey questions Survey questions and the utility's responses are shown below			
Question	**Start of cycle**	**By end of year 1 (current)**	**Planned state by end of cycle**
52a: Where does the utility conduct substantial fuel management?	i. Utility does not conduct fuel management	i. Utility does not conduct fuel management	i. Utility does not conduct fuel management
52b: Does the utility engage with other stakeholders as part of its fuel management efforts?	i. Utility does not coordinate with broader fuel management efforts by other stakeholders	i. Utility does not coordinate with broader fuel management efforts by other stakeholders	iii. Utility shares fuel management plans with other stakeholders and works with other stakeholders conducting fuel management concurrently
52c: Does the utility cultivate a native vegetative ecosystem across territory that is consistent with lower fire risk?	i. No	i. No	i. No
52d: Does the utility fund local groups (e.g., fire safe councils) to support fuel management?	ii. Yes	ii. Yes	ii. Yes

- **PG&E: Numerical maturity summary**

Please reference the Guidance Resolution for the Maturity Rubric and for necessary context to interpret the levels shown below. **All levels are based solely on the Maturity Rubric and on PG&E's responses to the Utility Wildfire Mitigation Maturity Survey ("Survey").**

Start: Score reported in February 2020; **Current:** Score reported in February 2021; **End:** Score reported in February 2021 projected for February 2023

Category	Capability 1	Capability 2	Capability 3	Capability 4	Capability 5	Capability 6
A. Risk Assessment and Mapping	1. Climate scenario modeling	2. Ignition risk estimation	3. Estimation of wildfire consequences for communities	4. Estimation of wildfire and PSPS risk-reduction impact	5. Risk maps and simulation algorithms	
	Start: 0 Current: 0 End: 1	Start: 0 Current: 0 End: 1	Start: 0 Current: 0 End: 1	Start: 0 Current: 0 End: 2	Start: 0 Current: 0 End: 1	
B. Situational Awareness and Forecasting	6. Weather variables collected	7. Weather data resolution	8. Weather forecasting ability	9. External sources used in weather forecasting	10. Wildfire detection processes and capabilities	
	Start: 1 Current: 2 End: 2	Start: 1 Current: 1 End: 2	Start: 1 Current: 1 End: 1	Start: 2 Current: 2 End: 2	Start: 2 Current: 2 End: 2	
C. Grid design and system hardening	11. Approach to prioritizing initiatives across territory	12. Grid design for minimizing ignition risk	13. Grid design for resiliency and minimizing PSPS	14. Risk-based grid hardening and cost efficiency	15. Grid design and asset innovation	
	Start: 1 Current: 1 End: 2	Start: 1 Current: 1 End: 4	Start: 0 Current: 0 End: 0	Start: 1 Current: 1 End: 2	Start: 1 Current: 1 End: 2	
D. Asset management and inspections	16. Asset inventory and condition assessments	17. Asset inspection cycle	18. Asset inspection effectiveness	19. Asset maintenance and repair	20. QA/QC for asset management	
	Start: 0 Current: 0 End: 0	Start: 1 Current: 1 End: 2	Start: 1 Current: 1 End: 1	Start: 0 Current: 0 End: 1	Start: 1 Current: 2 End: 2	
E. Vegetation management and inspections	21. Vegetation inventory and condition assessments	22. Vegetation inspection cycle	23. Vegetation inspection effectiveness	24. Vegetation grow-in mitigation	25. Vegetation fall-in mitigation	26. QA/QC for vegetation management
	Start: 0 Current: 0 End: 2	Start: 1 Current: 1 End: 1	Start: 1 Current: 1 End: 1	Start: 0 Current: 0 End: 0	Start: 0 Current: 0 End: 0	Start: 2 Current: 2 End: 2
F. Grid operations and protocols	27. Protective equipment and device settings	28. Incorporating ignition risk factors in grid control	29. PSPS op. model and consequence mitigation	30. Protocols for PSPS initiation	31. Protocols for PSPS re-energization	32. Ignition prevention and suppression
	Start: 3 Current: 3 End: 3	Start: 0 Current: 1 End: 1	Start: 0 Current: 3 End: 3	Start: 2 Current: 2 End: 2	Start: 1 Current: 1 End: 2	Start: 2 Current: 3 End: 3
G. Data governance	33. Data collection and curation	34. Data transparency and analytics	35. Near-miss tracking	36. Data sharing with research community		
	Start: 0 Current: 0 End: 2	Start: 0 Current: 0 End: 2	Start: 0 Current: 2 End: 3	Start: 1 Current: 1 End: 4		
H. Resource allocation methodology	37. Scenario analysis across different risk levels	38. Presentation of relative risk spend efficiency for portfolio of initiatives	39. Process for determining risk spend efficiency of vegetation management initiatives	40. Process for determining risk spend efficiency of system hardening initiatives	41. Portfolio-wide initiative allocation methodology	42. Portfolio-wide innovation in new wildfire initiatives
	Start: 0 Current: 0 End: 2	Start: 0 Current: 0 End: 2	Start: 0 Current: 2 End: 2	Start: 0 Current: 2 End: 2	Start: 0 Current: 0 End: 0	Start: 1 Current: 1 End: 1
I. Emergency planning and preparedness	43. Wildfire plan integrated with overall disaster/ emergency plan	44. Plan to restore service after wildfire related outage	45. Emergency community engagement during and after wildfire	46. Protocols in place to learn from wildfire events	47. Processes for continuous improvement after wildfire and PSPS	
	Start: 0 Current: 0 End: 4	Start: 2 Current: 2 End: 4	Start: 0 Current: 2 End: 2	Start: 0 Current: 4 End: 4	Start: 0 Current: 2 End: 4	
J. Stakeholder cooperation and community engagement	48. Cooperation and best practice sharing with other utilities	49. Engagement with communities on utility wildfire mitigation initiatives	50. Engagement with LEP and AFN populations	51. Collaboration with emergency response agencies	52. Collaboration on wildfire mitigation planning with stakeholders	
	Start: 0 Current: 3 End: 4	Start: 3 Current: 3 End: 3	Start: 2 Current: 4 End: 4	Start: 2 Current: 2 End: 3	Start: 0 Current: 0 End: 0	

- **Attachment 2: Definition of Initiatives by Category**

Category	Initiative activity	Definition
A. Risk mapping and simulation	A summarized risk map that shows the overall ignition probability and estimated wildfire consequence along the electric lines and equipment	Development and use of tools and processes to develop and update risk map and simulations and to estimate risk reduction potential of initiatives for a given portion of the grid (or more granularly, e.g., circuit, span, or asset). May include verification efforts, independent assessment by experts, and updates.
	Climate-driven risk map and modeling based on various relevant weather scenarios	Development and use of tools and processes to estimate incremental risk of foreseeable climate scenarios, such as drought, across a given portion of the grid (or more granularly, e.g., circuit, span, or asset). May include verification efforts, independent assessment by experts, and updates.
	Ignition probability mapping showing the probability of ignition along the electric lines and equipment	Development and use of tools and processes to assess the risk of ignition across regions of the grid (or more granularly, e.g., circuits, spans, or assets).
	Initiative mapping and estimation of wildfire and PSPS risk-reduction impact	Development of a tool to estimate the risk reduction efficacy (for both wildfire and PSPS risk) and risk-spend efficiency of various initiatives.
	Match drop simulations showing the potential wildfire consequence of ignitions that occur along the electric lines and equipment	Development and use of tools and processes to assess the impact of potential ignition and risk to communities (e.g., in terms of potential fatalities, structures burned, monetary damages, area burned, impact on air quality and greenhouse gas, or GHG, reduction goals, etc.).
B. Situational awareness and forecasting	Advanced weather monitoring and weather stations	Purchase, installation, maintenance, and operation of weather stations. Collection, recording, and analysis of weather data from weather stations and from external sources.
	Continuous monitoring sensors	Installation, maintenance, and monitoring of sensors and sensorized equipment used to monitor the condition of electric lines and equipment.
	Fault indicators for detecting faults on electric lines and equipment	Installation and maintenance of fault indicators.
	Forecast of a fire risk index, fire potential index, or similar	Index that uses a combination of weather parameters (such as wind speed, humidity, and temperature), vegetation and/or fuel conditions, and other factors to judge current fire risk and to create a forecast indicative of fire risk. A sufficiently

		granular index shall inform operational decision-making.
	Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions	Personnel position within utility service territory to monitor system conditions and weather on site. Field observations shall inform operational decisions.
	Weather forecasting and estimating impacts on electric lines and equipment	Development methodology for forecast of weather conditions relevant to utility operations, forecasting weather conditions and conducting analysis to incorporate into utility decision-making, learning and updates to reduce false positives and false negatives of forecast PSPS conditions.
C. Grid design and system hardening	Capacitor maintenance and replacement program	Remediation, adjustments, or installations of new equipment to improve or replace existing capacitor equipment.
	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault	Remediation, adjustments, or installations of new equipment to improve or replace existing fast switching circuit breaker equipment to improve the ability to protect electrical circuits from damage caused by overload of electricity or short circuit.
	Covered conductor installation	Installation of covered or insulated conductors to replace standard bare or unprotected conductors (defined in accordance with GO 95 as supply conductors, including but not limited to lead wires, not enclosed in a grounded metal pole or not covered by: a "suitable protective covering" (in accordance with Rule 22.8), grounded metal conduit, or grounded metal sheath or shield). In accordance with GO 95, conductor is defined as a material suitable for: (1) carrying electric current, usually in the form of a wire, cable or bus bar, or (2) transmitting light in the case of fiber optics; insulated conductors as those which are surrounded by an insulating material (in accordance with Rule 21.6), the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture; and suitable protective covering as a covering of wood or other non-conductive material having the electrical insulating efficiency (12kV/in. dry) and impact strength (20ft.-lbs) of 1.5 inches of redwood or other material meeting the requirements of Rule 22.8-A, 22.8-B, 22.8-C or 22.8-D.
	Covered conductor maintenance	Remediation and adjustments to installed covered or insulated conductors. In accordance with GO 95, conductor is defined as a material suitable for: (1)

		carrying electric current, usually in the form of a wire, cable or bus bar, or (2) transmitting light in the case of fiber optics; insulated conductors as those which are surrounded by an insulating material (in accordance with Rule 21.6), the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture; and suitable protective covering as a covering of wood or other non-conductive material having the electrical insulating efficiency (12kV/in. dry) and impact strength (20ft.-lbs) of 1.5 inches of redwood or other material meeting the requirements of Rule 22.8-A, 22.8-B, 22.8-C or 22.8-D.
	Crossarm maintenance, repair, and replacement	Remediation, adjustments, or installations of new equipment to improve or replace existing crossarms, defined as horizontal support attached to poles or structures generally at right angles to the conductor supported in accordance with GO 95.
	Distribution pole replacement and reinforcement, including with composite poles	Remediation, adjustments, or installations of new equipment to improve or replace existing distribution poles (i.e., those supporting lines under 65kV), including with equipment such as composite poles manufactured with materials reduce ignition probability by increasing pole lifespan and resilience against failure from object contact and other events.
	Expulsion fuse replacement	Installations of new and CAL FIRE-approved power fuses to replace existing expulsion fuse equipment.
	Grid topology improvements to mitigate or reduce PSPS events	Plan to support and actions taken to mitigate or reduce PSPS events in terms of geographic scope and number of customers affected, such as installation and operation of electrical equipment to sectionalize or island portions of the grid, microgrids, or local generation.
	Installation of system automation equipment	Installation of electric equipment that increases the ability of the utility to automate system operation and monitoring, including equipment that can be adjusted remotely such as automatic reclosers (switching devices designed to detect and interrupt momentary faults that can reclose automatically and detect if a fault remains, remaining open if so).
	Maintenance, repair, and replacement of connectors, including hotline clamps	Remediation, adjustments, or installations of new equipment to improve or replace existing connector equipment, such as hotline clamps.

	Mitigation of impact on customers and other residents affected during PSPS event	Actions taken to improve access to electricity for customers and other residents during PSPS events, such as installation and operation of local generation equipment (at the community, household, or other level).
	Other corrective action	Other maintenance, repair, or replacement of utility equipment and structures so that they function properly and safely, including remediation activities (such as insulator washing) of other electric equipment deficiencies that may increase ignition probability due to potential equipment failure or other drivers.
	Pole loading infrastructure hardening and replacement program based on pole loading assessment program	Actions taken to remediate, adjust, or install replacement equipment for poles that the utility has identified as failing to meet safety factor requirements in accordance with GO 95 or additional utility standards in the utility's pole loading assessment program.
	Transformers maintenance and replacement	Remediation, adjustments, or installations of new equipment to improve or replace existing transformer equipment.
	Transmission tower maintenance and replacement	Remediation, adjustments, or installations of new equipment to improve or replace existing transmission towers (e.g., structures such as lattice steel towers or tubular steel poles that support lines at or above 65kV).
	Undergrounding of electric lines and/or equipment	Actions taken to convert overhead electric lines and/or equipment to underground electric lines and/or equipment (i.e., located underground and in accordance with GO 128).
	Updates to grid topology to minimize risk of ignition in HFTDs	Changes in the plan, installation, construction, removal, and/or undergrounding to minimize the risk of ignition due to the design, location, or configuration of utility electric equipment in HFTDs.
D. Asset management and inspections	Detailed inspections of distribution electric lines and equipment	In accordance with GO 165, careful visual inspections of overhead electric distribution lines and equipment where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded.
	Detailed inspections of transmission electric lines and equipment	Careful visual inspections of overhead electric transmission lines and equipment where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and

		if useful information can be so gathered) opened, and the condition of each rated and recorded.
	Improvement of inspections	Identifying and addressing deficiencies in inspections protocols and implementation by improving training and the evaluation of inspectors.
	Infrared inspections of distribution electric lines and equipment	Inspections of overhead electric distribution lines, equipment, and right-of-way using infrared (heat-sensing) technology and cameras that can identify "hot spots," or conditions that indicate deterioration or potential equipment failures, of electrical equipment.
	Infrared inspections of transmission electric lines and equipment	Inspections of overhead electric transmission lines, equipment, and right-of-way using infrared (heat-sensing) technology and cameras that can identify "hot spots," or conditions that indicate deterioration or potential equipment failures, of electrical equipment.
	Intrusive pole inspections	In accordance with GO 165, intrusive inspections involve movement of soil, taking samples for analysis, and/or using more sophisticated diagnostic tools beyond visual inspections or instrument reading.
	LiDAR inspections of distribution electric lines and equipment	Inspections of overhead electric distribution lines, equipment, and right-of-way using LiDAR (light detection and ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	LiDAR inspections of transmission electric lines and equipment	Inspections of overhead electric transmission lines, equipment, and right-of-way using LiDAR (light detection and ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations	Inspections of overhead electric distribution lines, equipment, and right-of-way that exceed or otherwise go beyond those mandated by rules and regulations, including GO 165, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.
	Other discretionary inspection of transmission electric lines and equipment, beyond inspections mandated by rules and regulations	Inspections of overhead electric transmission lines, equipment, and right-of-way that exceed or otherwise go beyond those mandated by rules and regulations, including GO 165, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems

		identified, or other aspects of inspection or records kept.
	Patrol inspections of distribution electric lines and equipment	In accordance with GO 165, simple visual inspections of overhead electric distribution lines and equipment that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.
	Patrol inspections of transmission electric lines and equipment	Simple visual inspections of overhead electric transmission lines and equipment that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.
	Pole loading assessment program to determine safety factor	Calculations to determine whether a pole meets pole loading safety factor requirements of GO 95, including planning and information collection needed to support said calculations. Calculations shall consider many factors including the size, location, and type of pole; types of attachments; length of conductors attached; and number and design of supporting guys, per D.15-11-021.
	Quality assurance / quality control of inspections	Establishment and function of audit process to manage and confirm work completed by employees or subcontractors, including packaging QA/QC information for input to decision-making and related integrated workforce management processes.
	Substation inspections	In accordance with GO 175, inspection of substations performed by qualified persons and according to the frequency established by the utility, including record-keeping.
E. Vegetation management and inspection	Additional efforts to manage community and environmental impacts	Plan and execution of strategy to mitigate negative impacts from utility vegetation management to local communities and the environment, such as coordination with communities to plan and execute vegetation management work or promotion of fire-resistant planting practices
	Detailed inspections of vegetation around distribution electric lines and equipment	Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.
	Detailed inspections of vegetation around transmission electric lines and equipment	Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.
	Emergency response vegetation management	Plan and execution of vegetation management activities, such as trimming or removal, executed

	due to Red Flag Warning or other urgent conditions	based upon and in advance of forecast weather conditions that indicate high fire threat in terms of ignition probability and wildfire consequence.
	Fuel management and reduction of "slash" from vegetation management activities	Plan and execution of fuel management activities that reduce the availability of fuel in proximity to potential sources of ignition, including both reduction or adjustment of live fuel (in terms of species or otherwise) and of dead fuel, including "slash" from vegetation management activities that produce vegetation material such as branch trimmings and felled trees.
	Improvement of inspections	Identifying and addressing deficiencies in inspections protocols and implementation by improving training and the evaluation of inspectors.
	LiDAR inspections of vegetation around distribution electric lines and equipment	Inspections of right-of-way using LiDAR (light detection and ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	LiDAR inspections of vegetation around transmission electric lines and equipment	Inspections of right-of-way using LiDAR (light detection and ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	Other discretionary inspections of vegetation around distribution electric lines and equipment	Inspections of rights-of-way and adjacent vegetation that may be hazardous, which exceeds or otherwise go beyond those mandated by rules and regulations, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.
	Other discretionary inspections of vegetation around transmission electric lines and equipment	Inspections of rights-of-way and adjacent vegetation that may be hazardous, which exceeds or otherwise go beyond those mandated by rules and regulations, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.
	Patrol inspections of vegetation around distribution electric lines and equipment	Visual inspections of vegetation along rights-of-way that is designed to identify obvious hazards. Patrol inspections may be carried out in the course of other company business.
	Patrol inspections of vegetation around transmission electric lines and equipment	Visual inspections of vegetation along rights-of-way that is designed to identify obvious hazards. Patrol inspections may be carried out in the course of other company business.
	Quality assurance / quality control of vegetation inspections	Establishment and function of audit process to manage and confirm work completed by employees or subcontractors, including packaging

		QA/QC information for input to decision-making and related integrated workforce management processes.
	Recruiting and training of vegetation management personnel	Programs to ensure that the utility is able to identify and hire qualified vegetation management personnel and to ensure that both full-time employees and contractors tasked with vegetation management responsibilities are adequately trained to perform vegetation management work, according to the utility's wildfire mitigation plan, in addition to rules and regulations for safety.
	Remediation of at-risk species	Actions taken to reduce the ignition probability and wildfire consequence attributable to at-risk vegetation species, such as trimming, removal, and replacement.
	Removal and remediation of trees with strike potential to electric lines and equipment	Actions taken to remove or otherwise remediate trees that could potentially strike electrical equipment, if adverse events such as failure at the ground-level of the tree or branch breakout within the canopy of the tree, occur.
	Substation inspection	Inspection of vegetation surrounding substations, performed by qualified persons and according to the frequency established by the utility, including record-keeping.
	Substation vegetation management	Based on location and risk to substation equipment only, actions taken to reduce the ignition probability and wildfire consequence attributable to contact from vegetation to substation equipment.
	Vegetation inventory system	Inputs, operation, and support for centralized inventory of vegetation clearances updated based upon inspection results, including (1) inventory of species, (2) forecasting of growth, (3) forecasting of when growth threatens minimum right-of-way clearances (“grow-in” risk) or creates fall-in/fly-in risk.
	Vegetation management to achieve clearances around electric lines and equipment	Actions taken to ensure that vegetation does not encroach upon the minimum clearances set forth in Table 1 of GO 95, measured between line conductors and vegetation, such as trimming adjacent or overhanging tree limbs.
F. Grid operations and protocols	Automatic recloser operations	Designing and executing protocols to deactivate automatic reclosers based on local conditions for ignition probability and wildfire consequence.
	Crew-accompanying ignition prevention and	Those firefighting staff and equipment (such as fire suppression engines and trailers, firefighting hose, valves, and water) that are deployed with

	suppression resources and services	construction crews and other electric workers to provide site-specific fire prevention and ignition mitigation during on-site work
	Personnel work procedures and training in conditions of elevated fire risk	Work activity guidelines that designate what type of work can be performed during operating conditions of different levels of wildfire risk. Training for personnel on these guidelines and the procedures they prescribe, from normal operating procedures to increased mitigation measures to constraints on work performed.
	Protocols for PSPS re-energization	Designing and executing procedures that accelerate the restoration of electric service in areas that were de-energized, while maintaining safety and reliability standards.
	PSPS events and mitigation of PSPS impacts	Designing, executing, and improving upon protocols to conduct PSPS events, including development of advanced methodologies to determine when to use PSPS, and to mitigate the impact of PSPS events on affected customers and local residents.
	Stationed and on-call ignition prevention and suppression resources and services	Firefighting staff and equipment (such as fire suppression engines and trailers, firefighting hose, valves, firefighting foam, chemical extinguishing agent, and water) stationed at utility facilities and/or standing by to respond to calls for fire suppression assistance.
G. Data governance	Centralized repository for data	Designing, maintaining, hosting, and upgrading a platform that supports storage, processing, and utilization of all utility proprietary data and data compiled by the utility from other sources.
	Collaborative research on utility ignition and/or wildfire	Developing and executing research work on utility ignition and/or wildfire topics in collaboration with other non-utility partners, such as academic institutions and research groups, to include data-sharing and funding as applicable.
	Documentation and disclosure of wildfire-related data and algorithms	Design and execution of processes to document and disclose wildfire-related data and algorithms to accord with rules and regulations, including use of scenarios for forecasting and stress testing.
	Tracking and analysis of near miss data	Tools and procedures to monitor, record, and conduct analysis of data on near miss events.
H. Resource allocation methodology	Allocation methodology development and application	Development of prioritization methodology for human and financial resources, including application of said methodology to utility decision-making.
	Risk reduction scenario development and analysis	Development of modeling capabilities for different risk reduction scenarios based on wildfire

		mitigation initiative implementation; analysis and application to utility decision-making.
	Risk spend efficiency analysis	Tools, procedures, and expertise to support analysis of wildfire mitigation initiative risk-spend efficiency, in terms of MAVF and/ or MARS methodologies.
I. Emergency planning and preparedness	Adequate and trained workforce for service restoration	Actions taken to identify, hire, retain, and train qualified workforce to conduct service restoration in response to emergencies, including short-term contracting strategy and implementation.
	Community outreach, public awareness, and communications efforts	Actions to identify and contact key community stakeholders; increase public awareness of emergency planning and preparedness information; and design, translate, distribute, and evaluate effectiveness of communications taken before, during, and after a wildfire, including Access and Functional Needs populations and Limited English Proficiency populations in particular.
	Customer support in emergencies	Resources dedicated to customer support during emergencies, such as website pages and other digital resources, dedicated phone lines, etc.
	Disaster and emergency preparedness plan	Development of plan to deploy resources according to prioritization methodology for disaster and emergency preparedness of utility and within utility service territory (such as considerations for critical facilities and infrastructure), including strategy for collaboration with Public Safety Partners and communities.
	Preparedness and planning for service restoration	Development of plans to prepare the utility to restore service after emergencies, such as developing employee and staff trainings, and to conduct inspections and remediation necessary to re-energize lines and restore service to customers.
	Protocols in place to learn from wildfire events	Tools and procedures to monitor effectiveness of strategy and actions taken to prepare for emergencies and of strategy and actions taken during and after emergencies, including based on an accounting of the outcomes of wildfire events.
J. Stakeholder cooperation and community engagement	Community engagement	Strategy and actions taken to identify and contact key community stakeholders; increase public awareness and support of utility wildfire mitigation activity; and design, translate, distribute, and evaluate effectiveness of related communications. Includes specific strategies and actions taken to address concerns and serve needs of Access and

		Functional Needs populations and Limited English Proficiency populations in particular.
	Cooperation and best practice sharing with agencies outside CA	Strategy and actions taken to engage with agencies outside of California to exchange best practices both for utility wildfire mitigation and for stakeholder cooperation to mitigate and respond to wildfires.
	Cooperation with suppression agencies	Coordination with CAL FIRE, federal fire authorities, county fire authorities, and local fire authorities to support planning and operations, including support of aerial and ground firefighting in real-time, including information-sharing, dispatch of resources, and dedicated staff.
	Forest service and fuel reduction cooperation and joint roadmap	Strategy and actions taken to engage with local, state, and federal entities responsible for or participating in forest management and fuel reduction activities; and design utility cooperation strategy and joint stakeholder roadmap (plan for coordinating stakeholder efforts for forest management and fuel reduction activities).

- **Attachment 3: Glossary of Terms**

Term	Definition
AB	Assembly Bill
AFN	Access and Functional Needs
ALJ	Administrative Law Judge
BVES	Bear Valley Electric Service
CAISO	California Independent System Operator
Cal Advocates	Public Advocate's Office
CAL FIRE	California Department of Forestry and Fire Protection
CEJA	California Environmental Justice Alliance
CNRA	California Natural Resources Agency
D.	Decision
DFA	Distribution Fault Attribution
DR	Data Request
EBMUD	East Bay Municipal Utility District
EFD	Early Fault Detection
EPIC	Electric Program Investment Charge
EPUC	Energy Producers and Users Coalition
EVM	Enhanced Vegetation Management
FERC	Federal Energy Regulatory Commission
FGDC	Federal Geographic Data Committee
FIRIS	Fire Integrated Real Time Intelligence System
FMEA	Failure Modes and Effects Analysis
FPI	Fire Potential Index
GIS	Geographic Information Systems
GO	General Order

Term	Definition
GPI	Green Power Institute
GRC	General Rate Case
HFRA	High Fire Risk Area
HFTD	High Fire Threat District
Horizon West	Horizon West Transmission
HWT	Horizon West Transmission
I.	Investigation
ICS	Incident Command System
ICS	Incident Command Structure
IOU	Investor-Owned Utility
ISA	International Society of Arboriculture
ITO	Independent Transmission Operator
IVM	Integrated Vegetation Management Plan
IVR	Interactive Voice Response
JIS	Joint Information System
kV	Kilovolt
Liberty	Liberty Utilities / CalPeco Electric
LiDAR	Light Detection and Ranging
LTE	Long-Term Evolution
Maturity Model	Utility Wildfire Mitigation Maturity Model
MAVF	Multi-Attribute Value Function
MGRA	Mussey Grade Road Alliance
MMAA	Mountain Mutual Aid Association
NERC	North American Electric Reliability Corporation
NFDRS	National Fire Danger Rating System
OCFA	Orange County Fire Authority
OEIS (Energy Safety)	Office of Energy Infrastructure Safety
OP	Ordering Paragraph
OPW	Outage Producing Winds

Term	Definition
PG&E	Pacific Gas and Electric Company
PLP	Pole Loading Assessment Program
PMO (PacifiCorp)	Project Management Office
PMO (SCE)	Public Safety Program Management Office
PMU	Phasor Measurement Unit
POC	Protect Our Communities Foundation
PRC	Public Resources Code
PSPS	Public Safety Power Shutoff
QA	Quality Assurance
QC	Quality Control
R.	Rulemaking
RAMP	Risk Assessment and Management Phase
RAR	Remote Automatic Reclosers
RBDM	Risk-Based Decision Making
RCP	Remedial Compliance Plan
RCRC	Rural County Representatives of California
REFCL	Rapid Earth Fault Current Limiter
RFW	Red Flag Warning
RSE	Risk-Spend Efficiency
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SCE	Southern California Edison Company
SDG&E	San Diego Gas & Electric Company
S-MAP	Safety Model Assessment Proceeding
SMJU	Small and Multijurisdictional Utility

Term	Definition
SUI	Wildland-Urban Interface
SWATI	Santa Ana Wildfire Threat Index
TAT	Tree Assessment Tool
TBC	Trans Bay Cable
TURN	The Utility Reform Network
USFS	United States Forest Service
WMP	Wildfire Mitigation Plan
WRRM	Wildfire Risk Reduction Model
WSAB	Wildfire Safety Advisory Board
WSD	Wildfire Safety Division
WSIP	Wildfire Safety Inspection Program