PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

SAFETY POLICY DIVISION **Resolution SPD-9**
December 15, 2022

R E S O L U T I O N

RESOLUTION SPD-9. Resolution Ratifying Action of the Office of Energy Infrastructure Safety on Pacific Gas & Electric Company's 2022 Wildfire Mitigation Plan Update Pursuant to Public Utilities Code Section 8386.

This Resolution ratifies the attached decision (Appendix A) of the Office of Energy Infrastructure Safety (Energy Safety) approving Pacific Gas & Electric Company's (PG&E, or electrical corporation) 2022 Wildfire Mitigation Plan (WMP) Update pursuant to Public Utilities Code (Pub. Util. Code) Section 8386.3(a).

This Resolution acts on the WMP Update submitted on February 25, 2022, and revised on July 26, 2022. PG&E's WMP responds to a list of 22 requirements set forth in Pub. Util. Code 8386(c). PG&E submitted a comprehensive WMP in 2020 covering the three-year period 2020-2022. This WMP focused on measures the electrical corporation will take to reduce the risk of, and impact from, a catastrophic wildfire-related to its electrical infrastructure and equipment. PG&E's 2022 WMP Update provides information on PG&E's progress over the past year and updates to its 2021 and 2022 projections. In addition, the 2022 WMP Update responds to additional requirements and metrics approved by the Commission in Resolution M-4860 and the 2022 WMP Guidelines adopted by Energy Safety.

Upon approval of the 2022 WMP Update by Energy Safety, ratification by the Commission is required.

OUTCOME SUMMARY:

- Ratifies the attached decision of Energy Safety to approve the 2022 WMP Update of PG&E.
- Does not approve costs attributable to WMPs, as Pub. Util. Code Section 8386.4(b) requires electrical corporations to seek and prove the legitimacy of all expenditures at a future time in their general rate cases (GRC) or application for cost recovery. Nothing in this Resolution or Energy Safety's Decision should be construed as approval of any WMP-related costs.

- Does not establish a defense to any enforcement action for a violation of a Commission decision, order, or rule.

SAFETY CONSIDERATIONS:

Mitigating catastrophic wildfires in California is among the most important safety challenges the Commission-regulated electrical corporations face. WMPs articulate an electrical corporation's understanding of its utility-related wildfire risk and the proposed actions to reduce that risk and prevent catastrophic wildfires caused by utility infrastructure and equipment.

Utilities work to mitigate the risk of catastrophic wildfire by implementing measures such as vegetation management, system hardening (e.g., insulating overhead lines and removing or upgrading equipment most likely to cause fire ignition), grid topology improvements (e.g., installation and operation of electrical equipment to sectionalize or island portions of the grid), improving asset inspection and maintenance, situational awareness (e.g., cameras, weather stations, and use of data to predict areas of highest fire threat), improving community engagement and awareness, and other measures.

ESTIMATED COST:

- Costs are not considered in this Resolution, as Pub. Util. Code Section 8386.4(b) provides for Commission cost review in a utility GRC or separate application. Therefore, nothing in this Resolution should be construed as approval of the costs associated with the WMP mitigation efforts.
- For illustrative purposes, Table 1 below contains PG&E's actual costs for 2021 and its projected costs for the implementation of its 2022 WMP Update.

Table 1: PG&E's WMP Costs

Proposed 2021 costs (as reported in 2021 WMP)	$4,898,624,000
Actual 2021 costs (as reported in 2022 WMP Update)	$4,797,530,000
Difference between 2021 proposed and actual costs (+/-)	-$101,094,000
Proposed 2022 costs	$5,963,945,000
Proposed total costs 2020-2022 (including actual 2020-2021 costs)	$15,223,039,000

DISCUSSION

1. Summary

This Resolution ratifies the attached Energy Safety decision, issued on November 10, 2022, which approved the 2022 WMP Update initially submitted by Pacific Gas & Electric Company (PG&E) on February 25, 2022, and revised on July 26, 2022 (Appendix A).[1] Pub. Util. Code Section 8386(c) requires that electrical corporations' WMPs contain 22 elements. Energy Safety's approval and the Commission's ratification do not relieve the electrical corporation from any otherwise applicable permitting, ratemaking, or other legal and regulatory obligations.

2. Background

Since several catastrophic wildfires in the San Diego area in 2007, the equipment of large electric utilities the Commission regulates has been implicated in the most devastating wildfires in our state's history. The California Legislature enacted several measures requiring electrical corporations to submit, Energy Safety to review, approve, or otherwise act on, and the Commission to ratify WMPs designed to reduce the risk of utility-related catastrophic wildfires. Catastrophic wildfires in 2017-19 led the California Legislature to pass Senate Bill 901[2] in 2018 and its successors, Assembly Bill (AB) 1054 and AB 111 in 2019.[3]

AB 1054 requires Energy Safety to review and approve or deny electrical corporations' WMPs, with Commission ratification of any approval to follow thereafter. Energy Safety oversees electrical corporations' compliance with the WMP.[4] If Energy Safety determines an electrical corporation is not in compliance with its approved WMP, it may recommend that the Commission pursue an enforcement action against the electrical corporation for noncompliance with its approved plan.[5] In addition, the Commission may assess penalties on electrical corporations for failing to comply with their plans as specified in Pub. Util. Code Section 8386.1.[6]

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[1] PG&E's 2022 WMP Update can be found at https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan.page

[2] Senate Bill 901 (Statutes 2018, Chapter 626). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB901

[3] AB 1054 (Stats. 2019, Ch. 79). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB1054. AB 111 (Stats. 2019, Ch. 81). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB111

[4] Pub. Util. Code Section 8386.3(c). https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?division=4.1.&chapter=6.&lawCode=PUC

[5] Pub. Util. Code Section 8389(g). *Ibid*.

[6] Pub. Util. Code Section 8386.1. *Ibid*.

The 2022 WMP Guidelines adopted by Energy Safety on December 15, 2021 require that each electric corporation have a WMP that contains all elements outlined in Pub Util. Code Section 8386 and further specified in Energy Safety's guidelines.[7] For example, every WMP must contain plans for vegetation management, system hardening, inspections of assets and vegetation, situational awareness, reduction, and management of PSPS events, customer and first responder outreach and coordination, risk analysis, and geographic information system (GIS) data, as well as a short- and long-term vision, an ignition cause analysis, and many other elements.

PG&E submitted its WMP Update for 2022 on February 25, 2022. Comments on the WMPs were due on April 11, 2022, and reply comments were due on April 18, 2022. Comments were provided by the California Department of Fish and Wildlife (CDFW), Green Power Institute (GPI), Mussey Grade Road Alliance (MGRA), Public Advocates Office at the CPUC (Cal Advocates), Rural County Representatives of California (RCRC), The Utility Reform Network (TURN), and William B. Abrams, and reply comments were provided by the Cal Advocates, the Coalition of California Utility Employees (CUE), MGRA, RCRC, William B. Abrams, PG&E, San Diego Gas and Electric Company, and Southern California Edison Company.[8]

Energy Safety issued a Revision Notice on May 26, 2022, requiring PG&E to address critical issues and modify its initial WMP. As a result, PG&E submitted a revised WMP on July 26, 2022. Comments on the revised WMP were provided by Cal Advocates, GPI, and MGRA on August 10, 2022. Reply comments from PG&E were submitted on August 22, 2022. Energy Safety evaluated these comments, concurred with some comments, and in some instances, incorporated stakeholder input into the decision.

On October 6, 2022, Energy Safety released a draft decision approving PG&E's 2022 WMP update for public comment.[9] The comment period ended on October 26, 2022, with comments received from GPI, PG&E, and Cal Advocates. The comments generally call for additional accountability and monitoring of specific issues, such as improvements to inspection quality and timely reduction of PG&E's repair backlog. However, none of the comments called for a rejection of the plan. Reply comments were submitted by PG&E on November 7. PG&E addressed recommendations suggested by GPI and Cal Advocates regarding repair backlog, asset inspections, and the risk modeling and costs of undergrounding, noting that Energy Safety's required improvements for the 2023 WMP

[7] The 2022 WMP Guidelines are available at: https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true

[8] Comments and reply comments are available on the 2022 Wildfire Mitigation Plan Updates docket log at: https://efiling.energysafety.ca.gov/Lists/DocketLog.aspx?docketnumber=2022-WMPs

[9] Energy Safety Draft Decision on PG&E's 2022 WMP update is available at: https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=53094&shareable=true

would resolve these issues. After evaluating the comments, Energy Safety issued its final decision approving PG&E's WMP on November 10, 2022.[10]

3. Notice

In accordance with Pub. Util. Code Section 8386(d), notice of PG&E's 2022 WMP Update was given by posting the WMP Update on Energy Safety's web page at https://energysafety.ca.gov/what-we-do/electrical-infrastructure-safety/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2022-wmp/.

4. Energy Safety Approval of WMP

The Public Utilities Code requires Energy Safety to review, request revision, and approve or deny a utility WMP. Energy Safety has approved the 2022 WMP Update for PG&E pursuant to Public Utilities Code 8386.3 and submitted it to the Commission for ratification. According to Energy Safety's decision, attached hereto as Appendix A, Energy Safety reviewed the WMP and evaluated input from the California Department of Forestry and Fire Protection (CAL FIRE) and stakeholders, PG&E's responses to data requests, and responses to ongoing reporting required in connection with previous WMP submissions and decisions. Energy Safety also applied a "maturity model" to test whether electrical corporations are improving or "maturing" in their responses to catastrophic wildfire over time.

We take official notice that Energy Safety approved PG&E's 2022 WMP Update in its Final decision on PG&E's 2022 WMP Update on November 10, 2022. Pursuant to Commission Rules of Practice and Procedure 13.10 and California Evidence Code Section 452(c), parties may address the propriety of taking such notice in comments on the Draft Resolution.

5. Comments on Energy Safety's Decision

Energy Safety issued a draft decision approving PG&E's 2022 WMP Update on October 6, 2022. GPI, Cal Advocates, and PG&E provided comments to Energy Safety on or before October 26, 2022, and PG&E submitted reply comments on or before November 7, 2022, on Energy Safety's draft decision.[11]

A summary of comments incorporated into Energy Safety's disposition of PG&E's WMP Update can be found in Appendix C of the attached decision (Appendix A to this Resolution).

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[10] Energy Safety Final Decision on PG&E's 2022 WMP Update is available at: https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=53226&shareable=true.

[11] Comments and reply comments are available on the 2022 Wildfire Mitigation Plan Updates (2022-WMPs) docket log at: https://efiling.energysafety.ca.gov/Lists/DocketLog.aspx?docketnumber=2022-WMPs.

6. Ratification

The Commission has reviewed Energy Safety's evaluation of PG&E's 2022 WMP Update, the decision issued by Energy Safety pursuant to Pub. Util. Code Section 8386.3, stakeholder comments served on Energy Safety's 2022 WMP docket, and other public input. Pursuant to Pub. Util. Code Section 8386.3(a), the Commission ratifies Energy Safety's action approving PG&E's 2022 WMP Update.

7. Wildfire Mitigation Costs

Pursuant to statute, an electrical corporation's costs associated with wildfire mitigation activities are not approved as part of its WMP; rather, costs are evaluated in each electrical corporation's GRC or other application for rate recovery.

The Commission will evaluate 2022 wildfire mitigation costs in PG&E's GRC or in a future Application.

8. Conclusion

As required by Pub. Util. Code Section 8386.3(a)[12], the Commission ratifies Energy Safety's decision (Appendix A hereto) approving PG&E's 2022 WMP Update.

COMMENTS

Pub. Util. Code Section 311(g)(1) provides that resolutions must be served to all parties and subject to at least 30 days public review. However, given that this Resolution is issued outside of a formal proceeding, interested stakeholders need not have party status in a Commission proceeding in order to submit comments. Comments are due 20 days from the mailing date of this Resolution, on December 1, 2022. Replies will not be accepted. No comments were received.

This draft Resolution was served on the service list of R.18-10-007 and will be placed on the Commission's agenda no earlier than 30 days from today.

[12] PUC Code § 8386 states, "[Energy Safety] shall approve or deny each wildfire mitigation plan and update submitted by an electrical corporation within three months of its submission, unless the [Energy Safety] makes a written determination, which shall include reasons supporting the determination, that the three-month deadline cannot be met. Each electrical corporation's approved plan shall remain in effect until [Energy Safety] approves the electrical corporation's subsequent plan….. After approval by the [Energy Safety], the commission shall ratify the action of [Energy Safety]."

FINDINGS

1. The Office of Energy Infrastructure Safety reviewed and approved Pacific Gas & Electric Company's 2022 Wildfire Mitigation Plan Update pursuant to Public Utilities Code Section 8386.3(a) (Appendix A hereto).
2. Public Utilities Code section 8386.3(a) requires the Commission to ratify decisions of the Office of Energy Infrastructure Safety approving the Wildfire Mitigation Plans of electrical corporations.

THEREFORE, IT IS ORDERED THAT:

1. The Office of Energy Infrastructure Safety's Decision approving Pacific Gas & Electric Company's (PG&E) 2022 Wildfire Mitigation Plan Update is ratified.
2. Nothing in this Resolution should be construed as approval of the costs associated with the implementation of Pacific Gas & Electric Company's 2022 Wildfire Mitigation Plan.
3. The Commission takes official notice that the Office of Energy Infrastructure Safety approved Pacific Gas & Electric Company's (PG&E) 2022 Wildfire Mitigation Plan (WMP) Update in its Final Decision on PG&E's 2022 WMP Update on November 10, 2022, pursuant to Commission Rules of Practice and Procedure 13.10 and California Evidence Code Section 452(c).
4. Nothing in this Resolution should be construed as a defense to any enforcement action for a violation of a Commission decision, order, or rule.

This Resolution is effective today.

I certify that the foregoing resolution was duly introduced, passed, and adopted at a conference of the Public Utilities Commission of the State of California held on December 15, 2022; the following Commissioners voting favorably thereon:

RACHEL PETERSON
Executive Director

APPENDIX A
OFFICE OF ENERGY INFRASTRUCTURE SAFETY DECISION

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

OFFICE OF ENERGY INFRASTRUCTURE SAFETY
715 P Street, 20th Floor | Sacramento, CA 95814
916.902.6000 | *www.energysafety.ca.gov*
Caroline Thomas Jacobs, Director

November 10, 2022

To: 2022 Wildfire Mitigation Plans docket (#2022-WMPs)
Subject: Decision on Pacific Gas and Electric Company's 2022 Wildfire Mitigation Plan Update

Dear Wildfire Mitigation Plan Stakeholders,

Enclosed is the Office of Energy Infrastructure Safety's (Energy Safety's) Final Decision on Pacific Gas and Electric Company's (PG&E's) 2022 Wildfire Mitigation Plan (WMP) Update.

On October 6, 2022, Energy Safety published a draft of this Decision on its website and served it to Energy Safety's Wildfire Mitigation Plans service list for public review and comment.

Comments on the Draft Decision were due on October 26, 2022, and reply comments were due on November 7, 2022. Energy Safety considered the submitted comments in the final evaluation and made revisions to the Decision where appropriate.

This Decision documents Energy Safety's approval of PG&E's 2022 WMP Update.

Sincerely,

Melissa Semcer
Deputy Director | Electrical Infrastructure Directorate
Office of Energy Infrastructure Safety



OFFICE OF ENERGY INFRASTRUCTURE SAFETY'S

FINAL DECISION ON 2022 WILDFIRE MITIGATION PLAN UPDATE

PACIFIC GAS AND ELECTRIC COMPANY

November 2022

TABLE OF CONTENTS

Executive Summary **8**

Maturity Model Evaluation 8

Areas of Significant Progress 10

Areas for Continued Improvement 11

1. Introduction and Background **15**

1.1 Legal Authority 15

1.1.1 Cost Recovery 16

1.2 Multi-Year Plan Process 16

1.3 2022 Evaluation Process 17

1.3.1 Energy Safety Evaluation Criteria 18

1.3.2 Revision Notices 20

1.3.3 Final Decision 21

2. Energy Safety Decision on PG&E's 2022 Update **22**

3. Public and Stakeholder Comments **23**

4. Energy Safety's Assessment of PG&E's 2022 Update **25**

4.1 Introductory Sections of the WMP 25

4.2 Actuals and Planned Spending for Mitigation Plan 26

4.3 Lessons Learned and Risk Trends 32

4.3.1 Areas for Continued Improvement 39

4.4 Inputs to the Plan and Directional Vision for the WMP 40
4.4.1 Goal, Objectives, and Program Targets 40
4.4.2 Workforce Planning 42
4.5 Metrics and Underlying Data 44
4.6 Mitigation Initiatives and Maturity Evaluation 48
4.6.1 Risk Assessment and Mapping 52
4.6.2 Situational Awareness and Forecasting 67
4.6.3 Grid Design and System Hardening 70
4.6.4 Asset Management and Inspections 83
4.6.5 Vegetation Management and Inspections 104
4.6.6 Grid Operations and Operating Protocols, Including PSPS 120
4.6.7 Data Governance 132
4.6.8 Resource Allocation Methodology 134
4.6.9 Emergency Planning and Preparedness 145
4.6.10 Stakeholder Cooperation and Community Engagement 150
4.7 Public Safety Power Shutoff (PSPS), Including Directional Vision for PSPS 155
4.7.1 Maturity Assessment 156
4.7.2 PG&E Progress 158
4.7.3 Areas for Continued Improvement 168
5. Next Steps 169
5.1 Change Orders 169

6. Consultation with the Office of the State Fire Marshal 170

7. List of PG&E Areas for Continued Improvement and Required Progress..... 171

8. Conclusion 186

Appendices A-1

Appendix A. Status of 2021 WMP Issues A-1

Appendix B. Revision Notices Issued to PG&E in 2022 ..... A-8

Appendix C. Energy Safety Data Request Responses A-44

Appendix D. Comments on the Draft Decision A-234

Appendix E. The Ten Maturity and Mitigation Initiative Categories A-236

Appendix F. Definition of Initiatives by Category A-238

Appendix G. Glossary of Terms A-261

LIST OF FIGURES

Figure 4.2-1: Overview of Total Territory-Wide WMP Expenditures 27

Figure 4.2-2: Overview of Total HFTD-Only WMP Expenditures 27

Figure 4.2-3: Net Change from 2021 to 2022 WMP Reporting Period 30

Figure 4.2-4: PG&E Cumulative Increase in Cost to Ratepayers Due to Utility-Ignited Wildfires and Mitigation Activities 32

Figure 4.5-1: Ignitions per 10,000 Overhead Circuit Miles 46

Figure 4.5-2: Risk Events per Overhead Circuit Mile 46

Figure 4.5-3: Red Flag Warning Overhead Circuit Mile Days per Year 47

Figure 4.5-4: Asset Inspection Findings Normalized by Circuit Miles Inspected 47

Figure 4.6-1: Self-Reported Maturity by Category 50

Figure 4.6-2: PG&E Projected Growth in Maturity throughout Current WMP Cycle 51

Figure 4.6.1-1: Cross-Utility Maturity for Risk Assessment and Mapping.....53

Figure 4.6.1-2: PG&E's Maturity Survey Responses for All Risk Assessment and Mapping Capabilities 54

Figure 4.6.1-3: PG&E's Annual Risk Events 57

Figure 4.6.1-4: PG&E's Annual Ignitions from Risk Events 58

Figure 4.6.1-5: PG&E's Annual Vegetation Contact Ignitions 62

Figure 4.6.1-6: PG&E Wildfire Distribution Risk Model (WDRM) V2 vs. V3 Risk Scores 65

Figure 4.6.1-7: PG&E WDRM V3 Risk Buydown with V2 Risk Scores Overlayed 66

Figure 4.6.2-1: Cross-Utility Maturity Levels for Situational Awareness and Forecasting.....69

Figure 4.6.3-1: Cross-Utility Maturity Comparison for Grid Hardening and System Design 72

Figure 4.6.4-1: Cross-Utility Maturity Comparison for Asset Management and Inspections 84

Figure 4.6.4-2: PG&E's Maturity Survey Responses for All Asset Management and Inspections Capabilities 85

Figure 4.6.4-3: PG&E's Annual Distribution Ignitions from Transformer Damage or Failure 88

Figure 4.6.4-4: PG&E's Annual Distribution Outages from Transformer Damage or Failure 89

Figure 4.6.4-5: Distribution Tags based on Closing Backlogged Tag Goals 93

Figure 4.6.4-6: PG&E's Changes to Projected Distribution Ignitions 99

Figure 4.6.5-1: Cross-Utility Maturity Levels for Vegetation Management and Inspections)...105

Figure 4.6.5-2: PG&E's Maturity Survey Responses for All Vegetation Management and Inspections Capabilities....106

Figure 4.6.5-3: PG&E's Tree-related Outage Data & Trend Line 110

Figure 4.6.5-4: PG&E's Vegetation-Caused Ignitions by HTFD Tier and Outages per 10k Overhead Circuit Mile (OH CM)....111

Figure 4.6.6-1: Cross-Utility Maturity Levels for Grid Operations and Operating Protocols....121

Figure 4.6.6-2: PG&E's Maturity Survey Responses for All Grid Operations and Operating Protocols Capabilities....122

Figure 4.6.6-3: EPSS Outage Causes (January to June 2022)....128

Figure 4.6.7-1: Cross-Utility Maturity Survey Responses for Data Governance....132

Figure 4.6.8-1: Maturity Survey Responses for Resource Allocation Methodology....136

Figure 4.6.8-2: PG&E's Maturity Survey Responses for All Resource Allocation Methodology Capabilities....136

Figure 4.6.8-4: Mitigation Decision Tree for System Hardening (Part 1 of 2)....139

Figure 4.6.8-5: Mitigation Decision Tree for System Hardening (Part 2 of 2)....140

Figure 4.6.9-1: Cross-Utility Maturity Levels for Emergency Planning and Preparedness....146

Figure 4.6.9-2: PG&E's Maturity Survey Responses for All Emergency Planning and Preparedness Capabilities....147

Figure 4.6.10-1: Cross-Utility Maturity Levels for Stakeholder Cooperation and Community Engagement....151

Figure 4.6.10-2: PG&E's Maturity Survey Responses for All Stakeholder Cooperation and Community Engagement Capabilities....153

Figure 4.7-1: Cross-Utility Maturity Levels for PSPS-Related Capabilities....157

Figure 4.7-2: Recent Use of PSPS: Frequency of PSPS events (Total) 159

Figure 4.7-3: Recent Use of PSPS Circuits: Scope of PSPS events by Overhead Circuit Mile .160

Figure 4.7-4: Recent Use of PSPS, Duration of PSPS Events (Total) 160

Figure 4.7-5: Map of Frequently De-energized Circuits 167

LIST OF TABLES

Table 4.2-1: Actual and Planned WMP Expenditures 27

Table 4.2-2: Breakdown of Planned WMP Expenditures by Category 28

Table 4.6-1: Self-Reported Maturity by Category 50

Table 4.6-2: PG&E Projected Growth in Maturity throughout Current WMP Cycle 51

Table 4.6.3-1: PG&E's 2019-2022 System Hardening Plans 83

Table 4.6.4-1: PG&E HFTD Tags Created and Closed 2020-2022 91

Table 4.6.4-2: PG&E's 2022 and 2023 Quantitative Targets for Closing HFTD Backlogged Tags 92

Table 4.6.4-3: PG&E Overdue Distribution Tags by Priority 93

Table 4.6.4-4: PG&E 2022 and 2023 HFTD Ignition Projection Changes 97

Table 4.6.4-5: PG&E 2022 Increases in Ignition Projections, HFTD Tier 2 and 3 97

Table 4.6.4-6: PG&E 2023 Decreases in Ignition Projections, HFTD Tier 2 and 3 98

Table 4.6.4-7: PG&E 2022 QA/QC Actuals and Goals 100

Table 4.6.4-8: PG&E 2021 and 2022 Asset Inspection QC Failure Rates 101

Table 4.6.5-1: Remaining Constrained Miles for PG&E's Enhanced Vegetation Management Program as of August 4, 2022 107

Table 4.6.6-1: Top 10 Circuits Based on 2022 Number of Outages 128

Table 4.6.6-2: Top 10 Circuits Based on 2022 Outage Durations 129

Table 4.6.8-1: Disaggregated System Hardening Program Information 142

Executive Summary

The Office of Energy Infrastructure Safety (Energy Safety) was formed in July 2021 to ensure electrical utilities take effective actions to reduce utility-related wildfire risk. Energy Safety strives to deliver near-term results while promoting a long-term utility vision to reduce wildfire and build cultures of safety.

The California Legislature enacted several measures requiring electrical corporations to reduce risk of utility-caused catastrophic wildfires. Key legislative measures include Assembly Bills 1054 and 111, Public Utilities Code sections 326(b) and 8389, Senate Bills 901 and 1028, and Government Code section 15475 (see Section 1.1, "Legal Authority").

Pursuant to Public Utilities Code section 8386.3(a), this Decision serves as Energy Safety's assessment and approval of Pacific Gas and Electric Company's (PG&E's) Wildfire Mitigation Plan 2022 Update (2022 Update) as submitted on February 25, 2022, and revised on July 26, 2022.

Energy Safety's Decision incorporates comments from the public and other stakeholders.

This Executive Summary includes a high-level summary of Energy Safety's assessment of PG&E's maturity model, progress, and areas in the current plan Energy Safety determined warrant continued improvement. Energy Safety's comprehensive evaluation is included as Section 4, and a detailed list of all areas for continued improvement and required progress can be found in Section 7.

Maturity Model Evaluation

Energy Safety 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 February 2020, the utilities completed a survey that established a baseline for maturity as well as their anticipated progress over the three-year plan period. In 2021 and 2022, the utilities again completed the survey, enabling Energy Safety to monitor progress and ascertain potential improvements to maturity based on self-reported progress to date.

Energy Safety makes the following key findings regarding PG&E's maturity progress in 2022 and over the three-year plan cycle. Detailed explanations of utility maturity are contained in each section of the evaluation.

- PG&E increased in its maturity level in eight categories from 2021 to 2022. These included all categories except asset management and inspections and grid operations and protocols, which both showed a reduction in maturity level.
- PG&E increased its level of maturity during the current WMP cycle in the risk assessment and mapping category from 0.0 in 2020 to 2.6 in 2022. PG&E indicates it increased automation across multiple categories, including the climate scenario tool, the ignition risk calculation tool, the ignition risk estimation process, and its ignition risk reduction impact assessment capability.
- PG&E increased its maturity level during the current WMP cycle in grid design and system hardening from 0.8 in 2020 to 2.6 in 2022. Reported improvements include the fact that PG&E now prioritizes wildfire risk reduction initiatives at the asset level, performs risk estimates and consequence modeling across individual circuits, and takes power delivery with regard to reliability and PSPS into consideration.
- PG&E achieved its highest level of maturity during the current WMP cycle in the emergency planning and preparedness category, improving from 0.4 in 2020 to 3.2 in 2022. PG&E reports that it improved its maturity level in this category by having a wildfire plan integrated with an overall emergency plan, improving its planning to restore service after a wildfire related outage, and implementing processes for continuous improvement after wildfire and PSPS events.
- Per PG&E's assessment on the Maturity Survey in 2022, PG&E remains comparatively below its peers, Southern California Edison Company (SCE) and San Diego Gas & Electric Company (SDG&E), in its maturity level in every category. The categories with the most capabilities at a low maturity level include grid design and system hardening, asset management and inspections, vegetation management and inspections, grid operations and protocols, and resource allocation methodology.
- When looking at PG&E's projected end of cycle maturity level for the end of 2022 compared to its current maturity level status, PG&E is behind schedule on its own expected progress in 11 capabilities. These are in the categories of grid design and system hardening, asset management and inspections, grid operations and protocols, data governance, resource allocation methodology, and stakeholder cooperation and community engagement.
- PG&E's maturity level declined in grid operations and protocols, with three capabilities decreasing by one or more levels.

Areas of Significant Progress

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 has continued to improve its risk assessment and mapping efforts by overhauling and developing new wildfire risk models. These include the Enterprise Risk Model, the Wildfire Distribution Risk Model (WDRM), and the Outage Producing Winds (OPW) model.
- In response to a Revision Notice issued by Energy Safety, PG&E reported initiatives that included the percentage of each type of work being completed in the top-risk circuits as defined by wildfire risk model outputs alone. These initiatives are expulsion fuse replacements, undergrounding, system hardening, remote grids, detailed inspections, enhanced vegetation management, and defensible space related to vegetation management. Previously, PG&E combined risk model output with other criteria, including PSPS-impacted locations, fire rebuild projects, and Public Safety Specialist-identified locations to determine its top-risk circuits.
- PG&E installed an additional 308 weather stations in 2021, meeting its goal of deploying a total of 1,300 weather stations across its service territory. PG&E has improved the functionality of 1,025 of these weather stations with the ability to receive weather observations at 30-second intervals. The increased observation intervals may improve its situational awareness and Public Safety Power Shutoff (PSPS) decision-making process.
- In the area of grid design and system hardening, PG&E increased its expulsion fuse removal target by more than 50 percent from 2021. The 2021 goal of 1,200 removals has increased to a 2022 goal of 3,000.
- PG&E has a goal to install line sensors, a distribution fault anticipation (DFA) system, and early fault detection (EFD) as part of its overall distribution monitoring structure. These technologies may help detect incipient faults, as well as improve the ability to locate faults on circuits. Wide deployment for DFA and EFD technology began in 2021. PG&E's long-term goal is to deploy these sensors on 600 circuits in the California Public Utility Commission's (CPUC) high fire threat district (HFTD) areas, mitigating 28,000 line miles across several WMP cycles. In 2021 PG&E installed 16 additional DFA sensors for a total of 23 units. In 2022 PG&E has a target to install 40 DFA sensors on circuits feeding into the HFTD and EFD sensors on two circuits feeding into the HFTD.

- PG&E has improved its asset management and inspections since its 2021 Update through completion of infrared inspections, supplemental wildfire-related inspections, and efforts to increase recordkeeping and asset inventory information.
- PG&E continues to improve record keeping and cross-business communication using its centralized vegetation management system known as "One VM Tool." In January 2022, the One VM Tool was deployed as a pilot to Routine Maintenance and Tree Mortality programs on distribution lines. PG&E plans to integrate the multiple programs into its One VM Tool by the end of 2025.
- In the area of resource allocation methodology and specifically prioritizing programs by cost effectiveness, PG&E has shown clear growth in the verification of its Risk Spend Efficiency (RSE) estimates. PG&E completed calculations for several RSE estimates, moving from 54 risk mitigation and control programs in 2020 to 286 in 2021. PG&E also plans to consider these when comparing options within an initiative. It also engaged a third-party technical advising group to assess RSE methodologies used in its 2022 Update and provide recommendations for future WMP submissions. By calculating more RSE estimates, PG&E builds additional rigor into its decision-making process and increases the quantitative comparison of cost-effectiveness among mitigation initiatives.
- PG&E has progressed in the development of its emergency planning and preparedness programs and initiatives, including exceeding its hiring goal to increase service restoration personnel. In 2020, PG&E conducted an internal review that assessed its staffing needs and projected a need to hire approximately 40 linemen and 100 apprentices each year for the next five years. PG&E reports meeting its goal in 2020 and exceeding its goal in 2021. In response to a data request, PG&E states that to date in 2022 it hired 15 apprentices and 21 linemen and intends to meet its projected target in 2022.

Areas for Continued Improvement

Energy Safety evaluated 2022 Updates with a particular focus on how each utility is driving down the risk of utility-related ignitions. The evaluation included assessing the utility's progress implementing wildfire mitigation initiatives, evaluating the feasibility of its strategies, and measuring year-to-year trends. As a result of this evaluation, Energy Safety identified areas where the utility should continue to improve its wildfire mitigation capabilities in future plans.

Section 4 contains Energy Safety's detailed assessment and resulting areas for continued improvement. A complete list of all PG&E's areas for continued improvement is included in Section 7.

Selected themes from PG&E's areas for continued improvement are:

- PG&E has a significant backlog of repairs and needs a more aggressive plan to address the poor health of its infrastructure. Since 2020, PG&E has consistently had a growing backlog of work orders. While PG&E committed to backlog reduction targets in its 2022 Update, PG&E did not include quantitative targets for reducing its backlog past 2023. In its 2023 WMP, PG&E must provide quantitative targets for addressing repairs for infractions found during inspections, broken down by severity level of the finding and accounting for the entire backlog.
- PG&E is falling behind on its asset inspection quality assurance and quality control QA/QC goals and does not currently have goals for 2023. In its 2023 WMP, PG&E must provide quantitative goals for asset inspection QA/QC for 2023 and 2024, provide the results of its remaining 2022 asset inspection QA/QC, discuss any additional changes made to its asset inspection program and/or QA/QC process based on continued lessons learned through the 2022 QA/QC program, and provide a description of the progress made to reach its goals.
- According to its 2020 Maturity Survey, PG&E only planned on maturing one of six vegetation management capabilities by 2023. Additionally, PG&E did not have plans to increase maturity in using predictive modeling to inform inspections or ignition and propagation risk modeling to guide clearances. In response to a Revision Notice issued by Energy Safety, PG&E has now identified several initial steps to mature in certain capabilities in its vegetation management program. In its 2023 WMP, PG&E must report on its progress in implementing its initial steps to increase the maturity of its vegetation management program including any resulting plans and timelines.
- PG&E has not provided a plan for undergrounding locations beyond 2023, and it does not adequately demonstrate that it is currently prepared to meet its aggressive undergrounding goals. Furthermore, PG&E has not demonstrated that undergrounding is risk-spend efficient at the project level when compared to other grid hardening efforts. In its 2023 WMP, PG&E must provide the locations and mileage for undergrounding broken out by year from 2024 to 2026, discuss how each project was prioritized based on risk and feasibility, and provide an update on the progress

PG&E has made thus far in meeting its undergrounding targets, both past and future, including any changes made in resources and availability of labor.

- PG&E failed to provide sufficient evidence to support its extensive use of enhanced powerline safety settings (EPSS) and instead relies on the findings of a time-limited pilot deployed in 2021. PG&E has not yet included any data from 2022 in its EPSS reliability impact study. In its 2023 WMP, PG&E must provide the results from an updated 2022 EPSS reliability impact study, including any related safety impacts. PG&E must also provide an updated plan of actions being taken based on the analysis performed in the EPSS reliability impact study to reduce reliability and safety impacts of EPSS.
- PG&E and other utilities are currently pursuing their own research projects on the potential impacts of climate change. PG&E is not actively collaborating with other utilities on these efforts, and it is not taking advantage of the existing climate change models. PG&E must collaborate with other utilities on research efforts to integrate climate change impacts into its planning.
- PG&E has not yet provided goals and timelines for implementing lessons learned from the covered conductor joint effectiveness study. PG&E must provide a list of goals with planned dates of implementation for lessons learned from the study. These goals must include any changes made to initiative selections.
- PG&E would benefit from cross-utility collaboration on new technology explorations and benchmarking. PG&E must collaborate and evaluate the effectiveness of new technologies that support grid hardening and situational awareness. It also needs to share best practices developed and its implementation strategies for these new technologies with other utilities.
- PG&E has struggled to find qualified and competent asset inspectors and has difficulty retaining them. PG&E must benchmark other utilities' qualifications for these workers and explore whether use of different qualifications could improve inspector retention and lead to improved quality control. Furthermore, PG&E must review and amend where appropriate its qualification requirements and hiring practices for recruiting asset inspectors and the measures it takes to retain competent inspectors.
- PG&E, and other utilities have been tasked with conducting a study assessing the effectiveness of enhanced clearances from energized lines. From this study, the utilities must determine whether the correlation between enhanced clearances and

the lower number of tree-caused events is due to other factors beyond clearances, such as the management of hazard trees and the installation of covered conductor.

1. Introduction and Background

Pacific Gas and Electric Company (PG&E) submitted a comprehensive Wildfire Mitigation Plan (WMP or Plan) in 2020 covering a three-year term from 2020 through the end of 2022 (the current WMP cycle). PG&E submits annual updates to that Plan for Office of Energy Infrastructure Safety (Energy Safety) approval or denial. This Decision represents Energy Safety's assessment of PG&E's 2022 Update (2022 Update), which PG&E submitted on February 25, 2022, and revised on July 26, 2022, in response to Energy Safety's Final 2022 Update Guidelines[1] (Guidelines).

Energy Safety approves PG&E's 2022 Update.

1.1 Legal Authority

In 2018, following the devastating wildfires in 2016 and 2017, the California Legislature passed several bills increasing regulatory supervision of the electrical corporations' efforts to reduce utility-related wildfires. Assembly Bill (AB) 1054 (Statutes of [Stats.] 2019, Chapter [Ch.] 79) created Energy Safety (initially formed as the Wildfire Safety Division [WSD] at the California Public Utilities Commission [CPUC]) and tasked it with reviewing annual WMPs submitted by electrical corporations.

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 (Stats. 2016, Ch. 598) and further defined in subsequent legislation. Investor-owned electrical corporations[2] 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 (Stats. 2018, Ch. 626) framework in 2019.[3]

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[1] Final 2022 Wildfire Mitigation Plan Update Guidelines (accessed January 26, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true

[2] In this document "utility" should be understood to mean "electrical corporation."

[3] See Rulemaking 18-10-007.

On July 1, 2021, all functions of the CPUC's WSD were transferred to Energy Safety.[4] Energy Safety "is the successor to […] and is vested with, all of the duties, powers, and responsibilities of the Wildfire Safety Division,"[5] including, but not limited to, jurisdiction for evaluating and approving or denying utilities' WMPs and evaluating compliance with the WMPs. Energy Safety must ensure utility wildfire mitigation efforts sufficiently address utility wildfire risk. To support its efforts, Energy Safety developed a long-term strategic roadmap, Reducing Utility-Related Wildfire Risk (2020).[6] This strategic roadmap underpins Energy Safety's evaluation of the WMPs.

1.1.1 Cost Recovery

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 (GRCs) or an appropriate application.[7] Nothing in this Decision should be construed as approval of WMP-related costs.[8]

1.2 Multi-Year Plan Process

In February 2020, the utilities[9] submitted their three-year 2020-2022 WMPs. In 2020, Energy Safety conducted its evaluation and either approved, conditionally approved, or denied the Plans. In the case of conditional approval, Energy Safety identified areas for further improvement in the Plans, assigning these areas different severity levels, and required the utilities to address issues through various mechanisms depending on the designation of severity, Class A, B, or C.

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[4] Public Utilities (Pub. Util.) Code section (§) 326(b).

[5] Government (Gov.) Code § 15475.

[6] Energy Safety's strategic roadmap Reducing Utility-Related Wildfire Risk (2020) (accessed January 26, 2022): https://energysafety.ca.gov/who-we-are/strategic-roadmap/.

[7] Pub. Util. Code § 8386.4(b).

[8] Energy Safety's approval does not relieve the electrical corporation of any and all otherwise applicable permitting, ratemaking, or other legal and regulatory obligations.

[9] Utilities that submitted a WMP in 2020: Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas & Electric Company (SDG&E), PacifiCorp, Bear Valley Electric Service, Inc. (BVES), Liberty Utilities, Trans Bay Cable, LLC, and Horizon West Transmission, LLC.

In 2021, the utilities submitted updates to their 2020 WMPs. Energy Safety evaluated the utilities' WMP Updates and either approved or denied the Plans. If Energy Safety identified a critical issue in a utility's Plan, Energy Safety issued a Revision Notice requiring the utility to remedy the issue prior to completion of Energy Safety's evaluation. (See Section 1.3.2 for more information on Revision Notices.) Upon receipt of the utility's response to the Revision Notice, Energy Safety determined if the response was sufficient to warrant approval of the WMP or insufficient such that denial of the WMP was warranted. Energy Safety approved PG&E's 2021 Update after PG&E satisfactorily addressed issues in its response to a Revision Notice.[10] The 2021 Revision Notice included six critical issues and associated required remedies.

Plan year 2022 is the final year in the first three-year plan cycle. Therefore, Energy Safety's evaluation of PG&E's 2022 Update focuses heavily on the progress the utility made over the three-year plan cycle and whether the utility matured in its understanding of its own wildfire ignition risks and appropriate mitigations to decrease those risks.

1.3 2022 Evaluation Process

Energy Safety issued WMP Update Guidelines (Guidelines) on December 15, 2021. The Guidelines streamline the reporting and evaluation and incorporate the requirements of SB 533 (Stats. 2021, Ch. 244). Pursuant to the adopted Guidelines, PG&E submitted its 2022 Update on February 25, 2022.[11]

Energy Safety begins evaluating WMPs and Updates by reviewing the submittal for completeness. Energy Safety begins evaluating WMPs and Updates by reviewing the submittal for completeness. Energy Safety determines whether the submittal addresses the statutory requirements contained in Public Utilities Code section 8386(c) and the Guidelines.

[10] Revision Notice for Pacific Gas & Electric Company's 2021 Wildfire Mitigation Plan Update: https://energysafety.ca.gov/wp-content/uploads/docs/misc/wmp/2021/utility/pge/pge-wmp-revision-notice-correction-clean.pdf (accessed September 6, 2022)

[11] All references to PG&E's 2022 Update throughout this Decision refer to PG&E's WMP Update submission dated February 25, 2022, PG&E's three Revision Notice responses dated June 27, July 11, and July 26, 2022, and PG&E's Wildfire Mitigation Plan 2022 Update Revised, dated July 26, 2022.

Energy Safety does not conduct a substantive evaluation at that time. If the WMP or Update is not complete, Energy Safety may reject the plan and require the utility to resubmit.

Once Energy Safety determines the WMP or Update is complete, Energy Safety begins its assessment using the criteria listed in Section 1.3.1. The prior year's WMPs or Updates are included in the review to gauge progress and trends.

At any time during the evaluation, Energy Safety may issue a Revision Notice for reasons listed in Section 1.3.2. The utility must respond to the Revision Notice and revise and resubmit the relevant sections of its WMP or Update.

1.3.1 Energy Safety Evaluation Criteria

Energy Safety evaluated 2022 Updates according to the following factors:

- *Completeness:* The utility comprehensively responds to the statutory requirements contained in Public Utilities Code section 8386(c) and Energy Safety's Guidelines.
- *Technical and programmatic feasibility and effectiveness:* The proposed initiatives are technically feasible and effective in addressing the risks that exist in the utility's service territory. The proposed initiatives are programmatically feasible for the specific utility given its maturity and progress to date.
- *Resource use efficiency:* The proposed 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 demonstrates sufficient progress on objectives and program targets reported in its 2021 Update.
- *Forward-looking growth:* The utility demonstrates a clear action plan to continue reducing utility-related ignitions and the scale, scope, and frequency of Public Safety Power Shutoff (PSPS) events.[12] In addition, the utility focuses sufficiently 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 augmented vegetation management.

[12] 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.

- *Progress metrics:* The utility tracks the degree to which its wildfire mitigation activity has changed the conditions of its wildfire risk exposure in terms of drivers of ignition probability.
- *Outcome metrics:* The utility uses outcome metrics to measure its performance and outcomes in 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.
- *Program targets:* The utility uses targets to track its progress toward specific objectives for its wildfire mitigation activities.[13] Program targets track the utility's pace of activity completion as laid out in the WMP but do not track the efficacy of its activities. The primary use of these program targets is to track utility progress with its WMP.

To assess PG&E's 2022 Update, Energy Safety relied on:

- PG&E's WMP and Update submissions
- Input from the California Department of Forestry and Fire Protection (CAL FIRE)
- Comments from stakeholders, including members of the public
- PG&E's responses to Energy Safety's PG&E 2022 WMP Update Revision Notice[14] (see Section 1.3.2)
- PG&E's response to the Utility Wildfire Mitigation Maturity Survey (Maturity Survey)
- PG&E's data submissions
- PG&E's responses to data requests

Energy Safety's assessment of PG&E's 2022 Update is summarized in Section 4.

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[13] Objectives are unique to each utility and reflect the 1-, 3-, and 10-year projections of progress toward the WMP goal.

[14] PG&E 2022 WMP Update Revision Notice (May 26, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52478&shareable=true (accessed September 22, 2022). The three Revision Notice responses from PG&E (dated June 27, July 11, and July 26, 2022) can be found on the 2022 Wildfire Mitigation Plan Updates (2022-WMPs) docket log: https://efiling.energysafety.ca.gov/Lists/DocketLog.aspx?docketnumber=2022-WMPs (accessed September 22, 2022).

1.3.2 Revision Notices

Public Utilities Code section 8386.3(a) states, "Before approval, the division may require modifications of the plan." Energy Safety effectuates this provision by issuing a Revision Notice. The purpose of a Revision Notice is to hold utilities accountable for:

- Submitting a sufficiently detailed 2022 Update
- Addressing issues or improvement requests from the previous year
- Providing adequate data and information to justify proposed mitigation strategies.

Examples of when Energy Safety may choose to issue a Revision Notice include, but are not limited to, the following:

- The utility failed to implement the remedies detailed in the prior year's Decision[15]
- The utility did not provide sufficient information for evaluation
- The utility made a significant shift in its wildfire mitigation strategy without sufficient substantiation
- The utility's submission does not meet evaluation criteria listed in Section 1.3.1
- An element of the WMP that is critical to life-safety or property is unsatisfactory

Energy Safety issued a Revision Notice to PG&E on May 26, 2022.[16] PG&E responded to the Revision Notice on June 27, July 11, and July 26, 2022. Appendix B lists the issues contained in the Revision Notice, a brief overview of the utility's response, and Energy Safety's assessment of the utility's response. Energy Safety considered PG&E's Revision Notice Responses in its comprehensive WMP assessment, as set forth in Section 4. Section 4 includes Energy Safety's evaluation of both PG&E's Revision Notice responses and its 2022 Update.

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[15] Also called an Action Statement (2020, 2021).

[16] PG&E 2022 WMP Update Revision Notice (May 26, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52478&shareable=true (accessed September 22, 2022). The three Revision Notice responses from PG&E (dated June 27, July 11, and July 26, 2022) can be found on the 2022 Wildfire Mitigation Plan Updates (2022-WMPs) docket log: https://efiling.energysafety.ca.gov/Lists/DocketLog.aspx?docketnumber=2022-WMPs (accessed September 22, 2022).

1.3.3 Final Decision

Upon completion of its review, Energy Safety determines whether each utility's 2022 Update will be:

- Approved (approval may include a requirement that the utility demonstrate continued growth in its 2023 WMP), or
- Denied (the utility does not have an approved 2022 Update and must reapply for approval in 2023).

Energy Safety's approval of a WMP or WMP Update does not mean that the utility has reached the highest levels of maturity or has reduced its ignition risk to zero. Rather, approval means the utility has satisfied the evaluation criteria and substantiated its mitigation strategy such that implementation of the plan is appropriate. When Energy Safety approves a WMP or WMP Update, it does so with an eye toward continued improvement. Therefore, in this Decision, Energy Safety lists areas where the utility must continue to mature in its capabilities, known as areas for continued improvement.

2. Energy Safety Decision on PG&E's 2022 Update

Pursuant to Public Utilities Code section 8386.3(a), this Decision is the totality of Energy Safety's review of PG&E's 2022 Update. PG&E's 2022 Update is approved.

3. Public and Stakeholder Comments

Energy Safety invited stakeholders, including members of the public, to provide comments on the utilities' 2022 Updates. WMP comments were due on April 11, 2022, and reply comments were due on April 18, 2022. The following individuals and organizations submitted comments:

- California Department of Fish and Wildlife (CDFW)
- Green Power Institute (GPI)
- Mussey Grade Road Alliance (MGRA)
- Rural County Representatives of California (RCRC)
- The Public Advocates Office (Cal Advocates)
- The Utility Reform Network (TURN)
- William B. Abrams (Abrams)

Comments received on the 2022 Updates can be viewed in the 2022 Wildfire Mitigation Plan Updates (2022-WMPs) docket log.[17]

Energy Safety evaluated these comments and concurred with and in some instances incorporated the following stakeholder input on PG&E's 2022 Update, as reflected in this Decision:

- When implementing wildfire mitigation activities, utilities should consult with CDFW and other responsible agencies as early as possible to complete required environmental documents and discretionary reviews (CDFW).
- PG&E should reduce the long-term need for extensive tree trimming and slash production (GPI).

[17] 2022 Wildfire Mitigation Plan Updates (2022-WMPs) docket log: https://efiling.energysafety.ca.gov/Lists/DocketLog.aspx?docketnumber=2022-WMPs (accessed April 14, 2022).

- PG&E's WMP activities and mitigations should address drivers that resulted in utility-caused wildfires (GPI, Abrams).
- PG&E and its peer utilities should conduct a more thorough assessment of the potential change in wildfire risks, both probability of ignition (POI) and consequence, associated with climate change in the near and long-term planning horizons (GPI).
- PG&E and its peer utilities should address aeolian vibration wear and tear on covered conductor (GPI).
- PG&E and its peer utilities should expand their collaboration to share lessons learned on system hardening practices beyond covered conductor (Cal Advocates).
- PG&E should delay any major roll-out of undergrounding until the effectiveness of alternatives have been evaluated (MGRA).
- PG&E should include the potential for wildfire smoke exposure when estimating risks and benefits from power shutoff (MGRA).
- PG&E and its peer utilities should participate in a rapid earth fault current limiter (REFCL) working group with the goal of identifying design configurations that would be most appropriate for California utilities, expanding potential pilot sites and goals, and identifying and solving potential problems and pitfalls (MGRA).
- PG&E and its peer utilities should quantify the impacts associated with Enhanced Powerline Safety Settings (EPSS) and compare them to those associated with a PSPS event (MGRA).
- PG&E and its peer utilities should provide the required information in Table 12 (Mitigation Initiatives Financials) for each initiative and not provide combined information that aggregates multiple rows (TURN).
- PG&E and its peer utilities should include a program to evaluate the root causes of equipment-caused ignitions (Cal Advocates).
- PG&E should describe measures to reduce the number, duration, and scope of fast-trip outages on circuits frequently subject to fast-trip outages (Cal Advocates).
- PG&E and its peer utilities should be more specific in modeling inputs, outputs, and assumptions when calculating PSPS risk to customers (Cal Advocates).

In addition to the above, Energy Safety's review benefited from the discovery materials generated by data requests submitted to PG&E by the stakeholders named above, in particular GPI, Cal Advocates, and MGRA.

4. Energy Safety's Assessment of PG&E's 2022 Update

The following sections present Energy Safety's comprehensive evaluation of PG&E's 2022 Update, including Energy Safety's assessment of progress over the past year and throughout the current WMP cycle. Energy Safety looks at PG&E's past and current WMP and Update submissions to assess year-over-year trends and track Energy Safety's past requirements as well as the utility's own projections. In addition to comparing PG&E's initiatives from year to year, Energy Safety also assesses any new programs, plans, or technologies PG&E is proposing in its 2022 Update. The sections below assess past progress, encourage growth through new initiatives or approaches, and identify areas for continued improvement following up on 2021 requirements.

Before commencing its evaluation, Energy Safety found PG&E's 2022 Update to be complete.

4.1 Introductory Sections of the WMP

The introductory sections of the Guidelines[18] 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, Section 1 requires inclusion of the name and relevant background and credentials for all experts consulted in preparation of the 2022 Update. Contact information and names may be submitted in a redacted file.

Section 2 requires the utility to specify the location of the information required by Public Utilities Code section 8386(c). Each utility must affirm that the WMP Update addresses each statutory requirement AND cite the section and page number(s) where each statutory requirement is addressed.

[18] Final 2022 Wildfire Mitigation Plan Update Guidelines, Attachment 2.1 and 2.2 pp. 25-35 (accessed February 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

PG&E provides the required information in Section 1 and 2 of its 2022 Update, including all information required by Public Utilities Code section 8386(c).

4.2 Actuals and Planned Spending for Mitigation Plan

The actuals and planned spending section of the Guidelines[19] requires utilities to report a summary of WMP expenditures, actual and planned, for the current WMP cycle. This summary must include an estimated annual increase in costs to the ratepayer due to utility-related ignitions and wildfire mitigation activities. The Guidelines require that ratepayer impact calculations be clearly shown to demonstrate how the utility derived each value.[20]

PG&E provides all required information regarding expenditures.

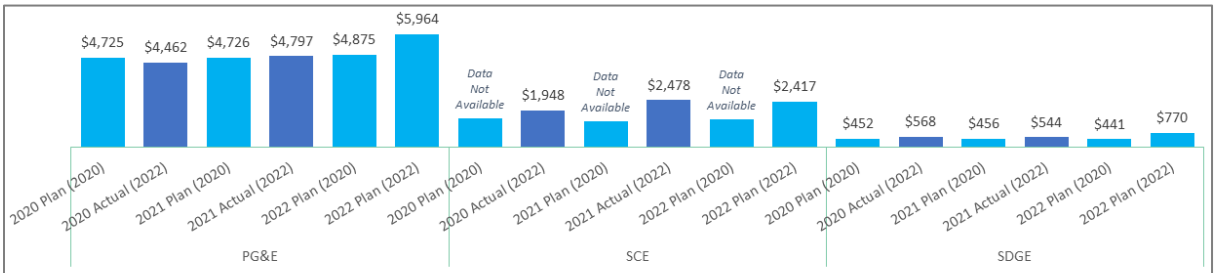
Energy Safety monitors expenditure data for accuracy and consistency. See Table 4.2-1 below for a comparison of the WMP actual and planned expenditures of the three large investor-owned utilities (large IOUs)[21] and Table 4.2-2 for a comparison of IOU expenditures by initiative category. Figure 4.2-1 compares large IOUs' territory-wide expenditures and Figure 4.2-2 compares their expenditures in the HFTD.

[19] Final 2022 Wildfire Mitigation Plan Update Guidelines, Attachment 2.3 pp. 37-40 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[20] Nothing in the request for such information should be construed as approval of any such expenditure, which is left to the CPUC pursuant to Public Utilities Code section 8386.4(b).

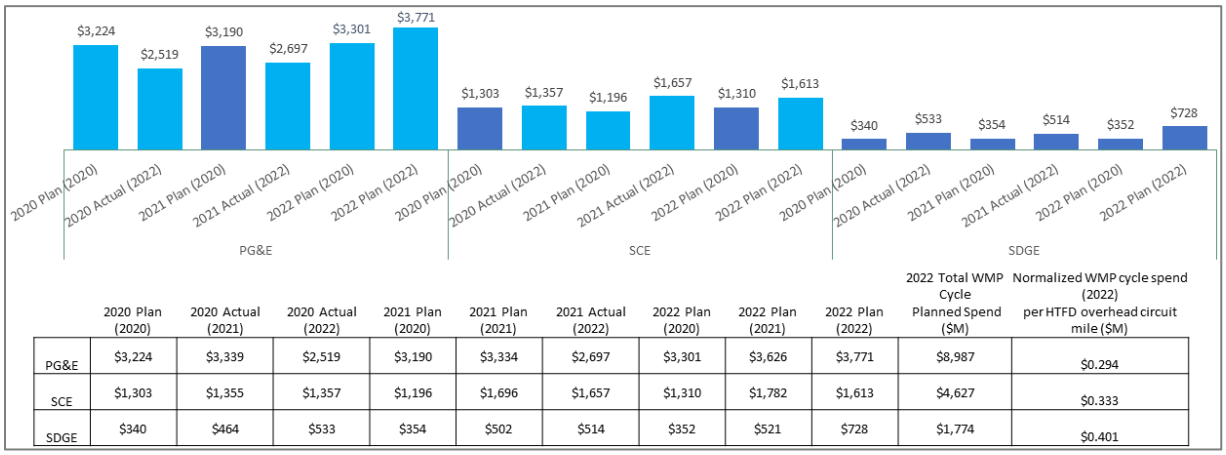
[21] In this document, the term "large investor-owned utilities" (or "large IOUs") refers to Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE).

Figure 4.2-1: Overview of Total Territory-Wide WMP Expenditures – Large IOUs (2020-2022)



	2020 Plan (2020)	2020 Actual (2021)	2020 Actual (2022)	2021 Plan (2020)	2021 Plan (2021)	2021 Actual (2022)	2022 Plan (2020)	2022 Plan (2021)	2022 Plan (2022)	2022 Total WMP Cycle Planned Spend ($M)	Normalized WMP cycle spend (2022) per overhead circuit mile ($M)
PG&E	$4,725	$4,821	$4,462	$4,726	$4,894	$4,797	$4,875	$5,117	$5,964	$15,223	0.154
SCE*	-	$1,847	$1,948	-	$2,405	$2,478	-	$2,504	$2,417	$6,843	0.135
SDGE	$452	$569	$568	$456	$646	$544	$441	$670	$770	$1,883	0.234

Figure 4.2-2: Overview of Total HFTD-Only WMP Expenditures – Large IOUs (2020-2022)



	2020 Plan (2020)	2020 Actual (2021)	2020 Actual (2022)	2021 Plan (2020)	2021 Plan (2021)	2021 Actual (2022)	2022 Plan (2020)	2022 Plan (2021)	2022 Plan (2022)	2022 Total WMP Cycle Planned Spend ($M)	Normalized WMP cycle spend (2022) per HTFD overhead circuit mile ($M)
PG&E	$3,224	$3,339	$2,519	$3,190	$3,334	$2,697	$3,301	$3,626	$3,771	$8,987	$0.294
SCE	$1,303	$1,355	$1,357	$1,196	$1,696	$1,657	$1,310	$1,782	$1,613	$4,627	$0.333
SDGE	$340	$464	$533	$354	$502	$514	$352	$521	$728	$1,774	$0.401

Table 4.2-1: Actual and Planned WMP Expenditures - Large IOUs (2020-2022)

Utility	2020 Actual	2021 Actual	2022 Planned	Total WMP Cycle as Reported in 2022
PG&E	$4,461,563,000	$4,797,530,000	$5,963,945,000	$15,223,039,000
SCE	$1,948,054,000	$2,478,208,000	$2,416,740,000	$6,843,003,000
SDG&E	$568,420,000	$543,911,000	$770,393,000	$1,882,724,000

Table 4.2-2: Breakdown of Planned WMP Expenditures by Category - Large IOUs, Ranked by Total Category Expenditure (2020-2022)

Category	PGE Plan Total	SCE Plan Total	SDGE Plan Total
Grid design and system hardening	$7,876 B (52%)	$3,991 B (58%)	$1,153 B (61%)
Vegetation management and inspections	$5,153 B (34%)	$1,518 B (22%)	$210 M (11%)
Asset management and inspections	$857 M (6%)	$943 M (14%)	$243 M (13%)
Grid operations and operating protocols	$458 M (3%)	$156 M (2%)	$77 M (4%)
Situational awareness and forecasting	$248 M (2%)	$66 M (1%)	$21 M (1%)
Data governance	$251 M (2%)	$22 M (0.33%)	$42 M (2%)
Stakeholder cooperation and community engagement	$166 M (1%)	$71 M (1%)	$46 M (2%)
Emergency planning and preparedness	$165 M (1%)	$19 M (0.28%)	$71 M (4%)
Resource allocation methodology	$27 M (0.18%)	$56 M (1%)	$14 M (1%)
Risk assessment and mapping	$23 M (0.15%)	$0 M (0%)	$7 M (0.38%)
Total Planned Spend for WMP Cycle	**$15,223 B**	**$6,843 B**	**$1,883 B**

PG&E Expenditure Trends

According to its 2022 Update, [22] PG&E spent $1.237 billion less than planned in 2020 and $0.101 billion more than planned in 2021. Its 2022 planned spend of $5.963 billion is higher than its actual spending for the previous two years, exceeding its 2021 actual spend by 24 percent, or $1.166 billion. PG&E's planned 2022 spend is $0.846 billion more than the $5.117 it projected it would spend in 2022 in its 2021 Update.[23]

[22] PG&E's 2022 Update, p. 39: Table 3-1.1, Summary of WMP Expenditures – Total.

[23] PG&E's 2021 Update (Revised June 4, 2021), p. 37.

The bulk of PG&E's spending for the WMP Cycle (92 percent) is within three initiative categories: grid design and system hardening, vegetation management and inspections, and asset management and inspections. From 2021 to 2022, spending is expected to increase across all initiative categories except for three: stakeholder cooperation and community engagement, resource allocation methodology, and risk assessment and mapping.

Initiative Category Expenditure Changes

Energy Safety requested additional information about the largest changes in mitigation category spending when comparing expenditures included within PG&E's 2022 Update to expenditures projected for 2022 in PG&E's 2021 Update, as shown in Figure 4.2-3. Energy Safety asked about the following category expenditure changes:

- An increase of $529 million in vegetation management and inspections initiatives[24]
- An increase of $197 million in grid design and system hardening initiatives[25]
- A decrease of $52 million in data governance initiatives[26]

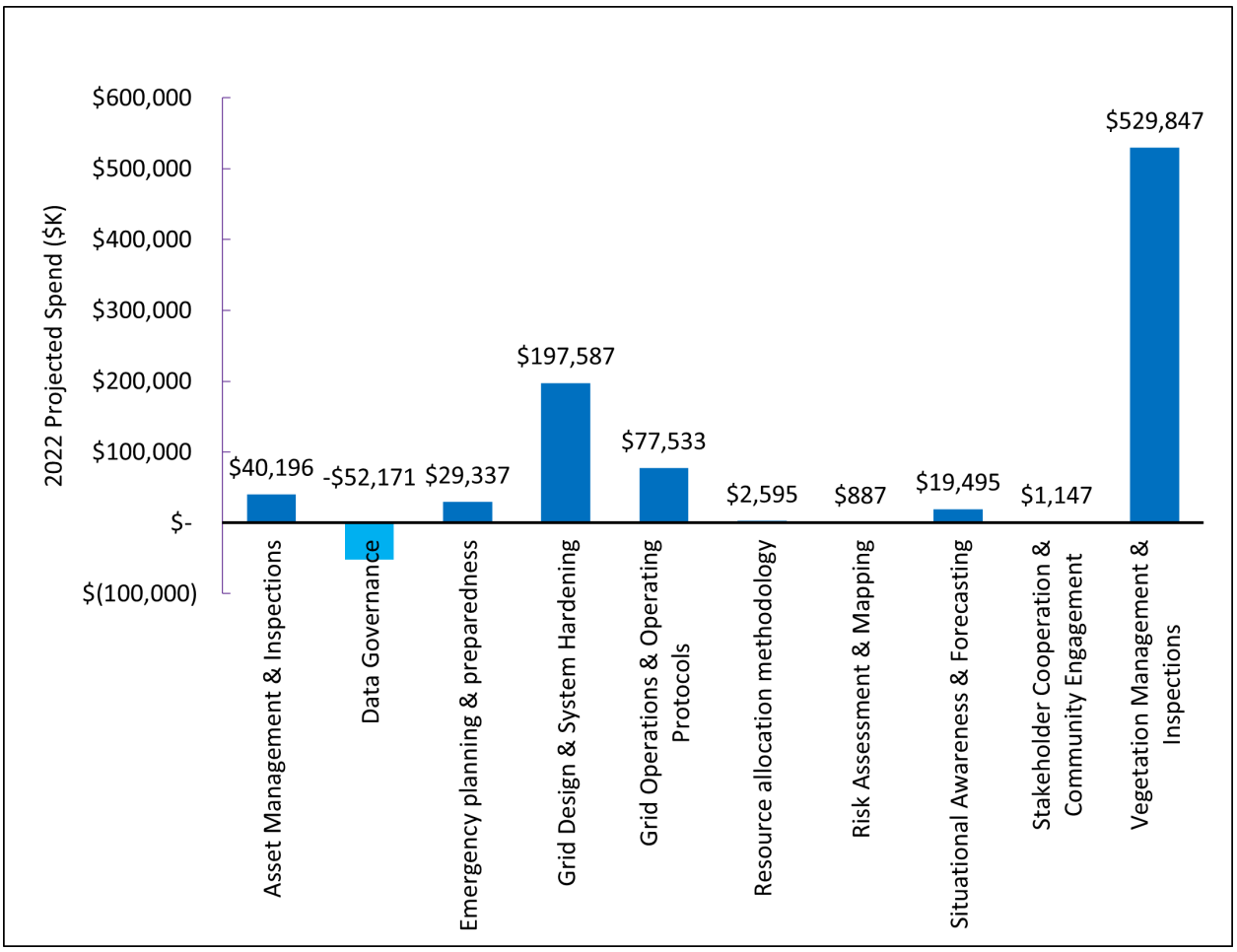
Energy Safety also asked PG&E to clarify whether spending went up in the grid design and system hardening category because of increased undergrounding miles.

[24] Data Request 2022_DR_OEIS_009-2022 WMP, Question 1.

[25] Data Request 2022_DR_OEIS_005-2022 WMP, Question 2.

[26] Data Request 2022_DR_OEIS_009-2022 WMP, Question 5.

Figure 4.2-3: Net Change from 2021 to 2022 WMP Reporting Period ($ Thousands)



PG&E responded that the increases in spending in the vegetation management category initiatives in the 2022 WMP are greater than the forecast in the 2021 WMP in order to account for updated estimates of work required in 2022. This included the need to address an increased volume of dead trees (attributed to the current drought impacting the Tree Mortality, Enhanced Vegetation Management (EVM), Transmission, and One Vegetation Management Programs.

PG&E responded that the grid design and system hardening increases are due to increased unit/work volume, inclusion and remapping of certain Maintenance Activity Types (MAT) to better align with 2022 WMP initiatives, and new programs and projects. In its 2021 Update, PG&E's forecast assumed more overhead hardening miles versus underground miles, while its 2022 Update forecasts more undergrounding. Underground costs per mile are higher than overhead hardening costs per mile.

In response to data requests, PG&E provided additional information regarding the spending breakdown of these initiatives. The undergrounding portion of the forecast is $611 million out of the $977 million total forecast for initiative 7.3.3.17.1, "Updates to grid topology to minimize risk of ignition in HFTDs, System Hardening, Distribution."[27] The overhead hardening portion of the forecast is $366 million out of the $977 million total forecast for initiative 7.3.3.17.1.[28]

The decrease in spend in the data governance category is mainly driven by initiative 7.3.7.5, "Other, Information Technology." In its 2021 Update, PG&E forecast a 2022 spend of $146.8 million; PG&E has since revised the target to $94.4 million based on its understanding of current needs and projects.[29]

PG&E WMP Expenditures Relative to Electric Rates

When comparing ratepayer electric costs for wildfire mitigation activities and ignitions across the large IOUs' 2022 Updates,[30] PG&E's increase in electric costs to ratepayers over the 2017-2022 period (Figure 4.2-4) is markedly steeper than the increase for SCE and SDG&E for the same period. Energy Safety asked PG&E to explain the large discrepancy in electric costs to ratepayers due to wildfire mitigation activities as compared to its peer utilities. In response, PG&E indicated vegetation management and inspections and grid design and system hardening are the major cost drivers of the current WMP cycle. PG&E also indicated that some of the differences in costs may be related to regulatory timing for cost recovery. Thus, SCE's

[27] Data Request 2022_DR_OEIS_009-2022 WMP, Question 3.

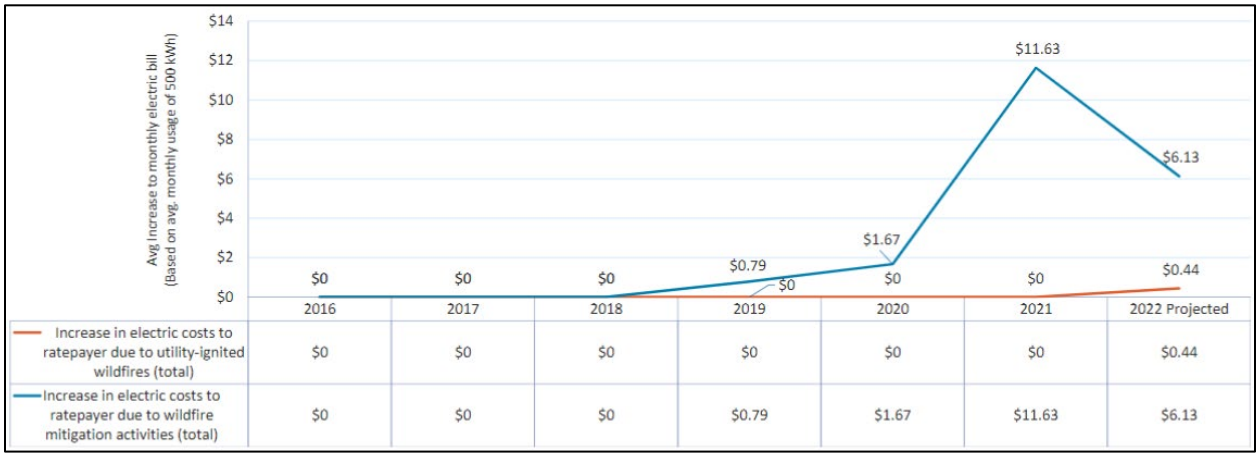
[28] Data Request 2022_DR_OEIS_009-2022 WMP, Question 4.

[29] Data Request 2022_DR_OEIS_009-2022 WMP, Question 5.

[30] PG&E's 2022 Update, p. 42, SCE's 2022 Update, p. 27-28, SDG&E's 2022 Update, p. 17: Table 3.2-1, Summary of Ratepayer Impact.

and SDG&E's actual costs for earlier periods may be higher once the CPUC completes its review of these costs.[31]

Figure 4.2-4: PG&E Cumulative Increase in Cost to Ratepayers Due to Utility-Ignited Wildfires and Mitigation Activities (Average Increase to Monthly Electricity Bill in Dollars, 2020-2022)



4.3 Lessons Learned and Risk Trends

The lessons learned and risk trends section of the Guidelines[32] requires utilities to report how their plans have evolved since 2021 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.

The utility must describe how it assesses wildfire risk in terms of ignition probability and estimated wildfire consequence using, at a minimum, CPUC-adopted risk assessment requirements (for large electrical corporations) from the General Rate Case (GRC) Risk-Based Decision-Making Framework Proceeding (formerly the Safety Model and Assessment

[31] Data Request 2022_DR_OEIS_005-2022 WMP, Question 9: Specifically, the 2020 GRC Decision (D.20-12-005) authorized PG&E to establish a vegation management (VM) balancing account and wildfire mitigation balancing account (WMBA). System hardening activities are tracked and recorded in the WMBA. PG&E is authorized to amortize the approved VM and WMBA costs incurred in 2020 beginning March 2021 through 2023. As a result, the customer impact of $11.63 for 2021 includes a portion of the 2020 spending. A utility's revenue requirement is within the California Public Utilities Commission's (CPUC) jurisdiction. Energy Safety defers to the CPUC regarding the accuracy of PG&E's response as it relates to ratepayer electric costs of other utilities.

[32] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.4 pp. 41-50 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

Proceeding [S-MAP]) and the Risk Assessment Mitigation Phase (RAMP) Proceeding. The utility may additionally include other assessments of wildfire risk. The utility must:

- Describe how it monitors and accounts for the contribution of weather and fuel to ignition probability and wildfire consequence.
- Identify any areas where the CPUC's HFTD should be modified.
- Identify any areas classified by the utility as "high fire threat" that differ from the CPUC's HFTD and explain why these areas are so classified.
- Rank trends anticipated to have the greatest impact on ignition probability and wildfire consequence.

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

Lessons Learned

PG&E categorizes its lessons learned into three high-level areas of focus: safety, coordination, and improvement of core mitigation programs. Examples of lessons learned include the following:

- In 2021, PG&E used the Wildfire Distribution Risk Model (WDRM) Version 2 (V2), LiDAR, and inspection data to develop its EVM Scope of Work. This resulted in 98 percent of EVM work being performed in 2021 on the top 20 percent of the highest risk circuit segments.[33] This was a significant improvement over prior years where PG&E was required to submit a corrective plan because of "insufficient progress with risk driven mitigation efforts," specifically with regards to EVM.[34] Building on this achievement, PG&E is using this same 2021 EVM prioritization list for work in 2022.
- Moving forward in 2022 and after, routine vegetation management (VM) of EVM clearances will preserve the clearances achieved over the course of 2019 and 2020.[35]

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[33] PG&E's 2022 Update, p. 52.

[34] Enhanced Oversight and Enforcement Process Corrective Action Plan (EVM CAP), submitted May 6, 2021: https://www.cpuc.ca.gov/-/media/cpuc-website/industries-and-topics/documents/pge/oversight-and-enforcement/pge-corrective-action-plan_050621.pdf (accessed September 15, 2022).

[35] PG&E's 2022 update, p. 638.

- The implementation of a tree training program in conjunction with a group of California community colleges has raised the profile of PG&E in the VM industry and enabled PG&E to access a larger pool of much needed potential employees and thus will be continued in 2023.[36]
- PG&E increased contract and internal employee resources to validate the quality of vegetation management work, creating a quality control (QC) group in 2021. The Group focuses on active field observations and acts as Senior Vegetation Management Inspectors (SVMI) addressing real-time safety and compliance support in the field.[37] Lessons learned are:
    - This re-organizational alignment is initially showing a reduction in re-work and re-inspection.[38]
    - The QC group can provide active observation as VM inspection work is being performed, resulting in alignment with program standards and procedures.[39]
    - The increase in SVMI workforce allows PG&E to better support VM by ensuring all contracts, standards, and specifications are being adhered to with respect to the project in question.[40]
- PG&E continued to improve its risk model in 2021. It implemented automated data intake, applied improved code execution, and incorporated upgraded model spatial views. It also used the model to develop the 2022 WMP workplan.[41] PG&E learned that these improvements provide a repeatable and more transparent set of tools with which to use and review model results. Additionally, improved data has refined the predictive power of the wildfire risk models.[42]
- PG&E has made updates to its modeling to reflect lessons learned regarding risk drivers. PG&E reports that it substantially updated its wildfire risk modeling and risk

[36] PG&E's 2022 Update, p. 674.
[37] PG&E's 2022 Update, p. 52.
[38] PG&E's 2022 Update, p. 652.
[39] PG&E's 2022 Update, p. 653.
[40] PG&E's 2022 Update, p. 653.
[41] PG&E's 2022 Update, p. 148.
[42] PG&E's 2022 Update, p. 53.

assessment tools as described in its 2021 Update and intends to continue to make improvements in 2022.

- PG&E implemented new PSPS protocols and processes in 2021 that changed the scoping of PSPS events. Furthermore, PG&E continued to implement programs that reduce the customer impacts of PSPS events. Overall, these improvements resulted in better balancing of the benefits of mitigating wildfire risks against the customer impacts from a PSPS event as experienced in 2021 and anticipated in 2022.[43]
- PG&E is implementing several additional lessons learned regarding PSPS implementation, including those associated with process, infrastructure, and systems.[44] These lessons and related areas for continued improvement are discussed in Section 4.7.
- In 2021, the Independent Evaluator[45] identified pole inspection errors (discrepancies between recorded observations and photos from the field). As a result, PG&E found that some of the prepopulated data in its forms was incorrect. In 2022, PG&E is in the process of correcting its forms. Additionally, PG&E is updating the application inspectors use on their mobile devices to provide the inspectors with a more efficient way to correct inaccurate prepopulated data.
- PG&E implemented a protective equipment and devices settings program called Enhanced Powerline Safety Settings (EPSS) in July 2021. PG&E learned through its initial 2-month implementation that this program could provide an 80 percent reduction in CPUC Reportable Ignitions[46] on EPSS-enabled circuits as compared to its

[43] PG&E's 2022 Update, p. 53.

[44] PG&E's 2022 Update, p. 867.

[45] Pursuant to P.U. Section 8386.3(c)(2)(B)(i), Bureau Veritas North America, Inc. (BVNA) was selected as an Independent Evaluator (IE) to review and assess Pacific Gas and Electric Corporation (PG&E) 2020 Wildfire Mitigation Plan (WMP). In carrying out the stipulations of Resolution WSD-012 and WSD's Final Independent Evaluator Scope of Work for the Review of Compliance with 2020 WMP, dated April 21, 2021 (See Appendix B, Item 56), BVNA evaluated PG&E's compliance with its 2020 WMP, validated PG&E's quality assurance and quality control (QA/QC) programs outlined for support of WMP initiatives and reviewed its WMP funding activities.

[46] Per the CPUC's Emergency Reporting Requirements, electric utilities must report any incident within two hours during working hours and four hours outside of working hours that is attributable or allegedly attributable to utility-owned facilities and which results in any of a specific set of problems described by the CPUC's web page on emergency reporting (see https://www.cpuc.ca.gov/regulatory-services/safety/emergency-reporting, accessed September 6, 2022).

3-year average. However, implementation also resulted in more frequent and longer outages for customers, including increasing outage duration and frequency for certain customers on some circuits.[47] PG&E reports some specific lessons learned from its initial EPSS program implementation, including that it must:

- Define risk-informed criteria for where and when to enable EPSS
- Establish more localized thresholds for activation and shut-off of EPSS devices
- Develop more optimized circuit settings
- Improve outage response times
- Centralize data and reporting across enabled processes, systems, and tools
- Provide proactive customer engagement and outreach regarding EPSS

Provide ongoing and regular reporting regarding EPSS impacts[48]

Risk Drivers

In its 2022 Update, PG&E discusses risk trends related to ignition probability drivers, as summarized below.

- Climate change trends are influencing variable periods of extreme wildfire risks, significantly increasing wildfire ignition risks around utility networks. Warmer winters are leading to a decrease in snowpack, stressing vegetation and increasing available fuels. This risk is compounded by dry periods following summer months that extend deeper into fall when northeast winds are more common. Additionally, shifts in plant communities and other climate-related changes have increased the likelihood that fires will start more often and burn more intensely and extensively.
- Invasive species are creating landscape level concerns that have significant potential to impact areas within, adjacent to, and beyond utility rights of way (ROW) making effective mitigation challenging for utilities without more holistic engagement and support from surrounding landowners and stakeholders.
- Fuel density is increasing while available moisture in critical wildfire risk periods is decreasing. This has been accompanied by increases in large tree mortality (partially

[47] PG&E's 2022 Update, pp. 736-737.

[48] PG&E's 2022 Update, p. 55.

due to bark beetles) and overall changes in forest structure. Extreme fire weather is potentially contributing to conversion of shrublands to grasslands.

- Population growth is increasing the number of customers in previously undeveloped, fire prone areas within or bordering the HFTD. Estimates are that 25 percent of California's residents live in areas subject to significant wildfire risk. It is unlikely that populations in these areas will decrease. PG&E notes that this issue is compounded by lack of affordable housing in lower wildfire risk urban areas.

PG&E provides its prioritized list of wildfire risks and drivers as required.[49] For transmission, PG&E lists "vegetation" as the top cause of ignitions, followed by "equipment/facility failure." For distribution, the top category of ignition cause was "equipment/facility failure" followed by "vegetation," then "contact from object."

Research

PG&E continues to work on eight research projects and reports the following in its 2022 Update:

- A project is underway on climatological analysis to better understand wildland fire behavior by studying fire-atmospheric interactions through partnership with the San Jose State University (SJSU) Fire Weather Research Lab. There are currently no results as the research is ongoing.
- A project titled "Review of Dynamically Downscaled Climate Projections for the Pacific Gas and Electric Service Area" developed simulations for PG&E to help quantify future impacts from climate change. Results show large variabilities for future environmental and atmospheric variables, implying high uncertainty regarding the specifics of future wildfire-relevant conditions. No direct follow-up is planned at this time given the lack of conclusive agreement between projections generated by the study models.
- "Electrical Assets Probabilistic Risk Assessment Model" is a risk model in an exploratory phase that could potentially add value to each of the initiatives directed at reducing potential ignitions, reducing ignition consequence, reducing the frequency of outages, reducing the duration of outages, and reducing the impact of outages. The

[49] PG&E's 2022 Update, p. 61: Table PG&E-4.2-2: Wildfire Risk Drivers.

model was compared to other risk models that were used for decision making during the 2021 fire season. In 2022, the model will continue to be tested and calibrated.

- PG&E initiated an "Open Innovation Challenge" to identify novel technologies that could potentially reduce PG&E-caused wildfire risk. PG&E lists a description of the seven finalists, the first two of which PG&E continues to pursue for pilots: Smart Conductor and Pole-Mounted Multi-Sensor for Predictive and Real-Time Failure Reporting.
- PG&E is leading a Targeted Tree Species Study, supported by a vendor, to identify species that are more likely to fail near PG&E facilities, thereby creating potential wildfire ignitions. PG&E will use the information obtained through the study to evaluate the performance of the species risk rating component of its Tree Assessment Tool (TAT).
- The "Independent, External Review of 2021 Proposed Modifications to PG&E's HFRA [High Fire Risk Area] Map by the B. John Garrick Institute for Risk Sciences at UCLA (GIRSRT)" evaluates PG&E's HFRA map and proposed incremental changes to the HFTD map. PG&E proposes adding regions where the risk of utility triggered catastrophic wildfire from an offshore wind event is high and removing regions where it is not. GIRSRT recommended that some areas proposed for addition or removal be expanded or contracted based on its analysis. PG&E intends to continue using GIRSRT for external review of additional proposed HFRA map modifications in 2022.
- PG&E is leading a research effort entitled "Lab Testing to Understand Ignition Behaviors Associated with Electric and Magnetic Field Induction." The purpose of this research is to understand potential ignition risks associated with deenergized power lines with induced voltages and currents. PG&E conducted lab testing to determine the fire ignition potential of induced voltages and currents at relatively low energy level associated with deenergized power lines near other energized lines. Based on the findings from the testing, PG&E determined that grounding and sectionalizing de-energized lines, where feasible, to reduce induced voltages and currents may be the best way to minimize ignition risk. PG&E is working on determining the feasibility and PSPS procedural impact of this requirement and establishing revised guidance.
- A research proposal with Cal Poly FIRE Institute is in initial stages. The proposal is to contribute to solving the the wildland urban interface (WUI) fire problem through integrated and applied research and education that innovates, informs policy, disseminates information, and educates students and professionals.

4.3.1 Areas for Continued Improvement

In addition to progress made, PG&E must continue to improve in the following areas:

Prioritized List of Wildfire Risks and Drivers

In its 2023 WMP, PG&E must further refine its prioritized list of wildfire risks and drivers[50] by weighting each risk driver by its likelihood of causing a catastrophic wildfire. For example, the utility must factor in whether ignition caused by each driver tends to happen in high wildfire risk areas as identified by PG&E's risk models, including the HFTD.

Collaboration and Research in Best Practices in Integrating Climate Change Impacts and Wildfire Risk and Consequence Modeling

PG&E and the other large IOUs are currently pursuing their own efforts at integrating the potential impacts of climate change on their risk and consequence modeling. They are not actively collaborating with each other on these efforts and are not taking advantage of the existing climate change modeling expertise of state agencies and academic institutions. In its 2023 WMP, PG&E must report on its progress in collaborating with the other IOUs and state agencies in estimating climate change impacts and integrating the existing climate change impacts into their risk and consequence modeling.

Additional areas for continued improvement regarding lessons learned, risk trends, risk drivers, and research are included in Section 4.6, "Mitigation Initiatives and Maturity Evaluation."

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

[50] PG&E's 2022 Update, Table 4.2-1, p. 61.

4.4 Inputs to the Plan and Directional Vision for the WMP

The inputs and directional vision section of the Guidelines[51] requires the utility to rank and discuss trends it anticipates may have 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, utilities must report the current and planned qualifications of their workforce to meet these objectives.

4.4.1 Goal, Objectives, and Program Targets

The goal of the WMP is to ensure the utilities are sufficiently planning to reduce the number of ignitions caused by utility actions or equipment and minimize the societal consequences (with specific consideration of the impact on access and functional needs [AFN] populations and marginalized communities) of both wildfires and PSPS events.

This subsection of the Guidelines[52] requires utilities to provide their objectives, which are unique to each utility and reflect their 1, 3, and 10-year projections of progress toward the abovementioned goal. The Guidelines also require utilities to report their unique program targets, which are quantifiable measurements of activities identified in WMPs and Updates to show the utility's progress toward reaching its objectives.

PG&E states that its over-arching objective for the 2022 Update is to reduce the risk and consequences of wildfires associated with utility electrical equipment, thereby avoiding catastrophic wildfires across central and northern California. It plans to achieve this through reducing wildfire potential, reducing impacts of PSPS and EPSS, and improving situational awareness.[53]

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[51] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.5 pp. 52-57 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[52] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.5.1-2.5.3 pp. 53-54 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[53] PG&E's 2022 Update, p. 247-248

PG&E presents its 3-year and 10-year objectives for reducing the risk of catastrophic fires in Table PG&E-5.2-1.[54]

PG&E lists and describes its program metrics and targets in 2022 Update Table PG&E-5.3-1(A) Table PG&E-5.3-1(A): List and Description of Quantitative Program Targets, Last Five Years[55] and Table PG&E-5.3-1(B): List and Description of Qualitative Program Targets, Last Five Years.[56]

PG&E provides all required information for this section. Areas for continued improvement are described below.

4.4.1.1 Areas for Continued Improvement

Areas for continued improvement related to PG&E's WMP Goal, Objectives, and Program Targets are discussed in Section 4.6. These include the following.

- PG&E reports meeting its targeted goal of deploying 1,300 weather stations. However, comparing weather station density to peer utilities, PG&E has fewer weathers stations installed per circuit mile than its peers. The need for PG&E to justify its weather station network density is discussed in Section 4.6.2, "Situational Awareness and Forecasting."
- PG&E has not yet provided goals and timelines for implementing lessons learned from the covered conductor joint effectiveness study. Applying joint lessons learned concerning covered conductor is discussed in Section 4.6.3, "Grid Design and System Hardening."
- PG&E is falling behind on its asset inspection QA/QC goals and does not currently have set goals for 2023. Asset inspection QA/QC is discussed in Section 4.6.4, "Asset Management and Inspections."
- PG&E decreased its transmission hardening targets from 2021 to 2022 due to project lead time and delays from changing prioritization based on risk model output.

[54] PG&E's 2022 Update, p. 250-251

[55] PG&E's 2022 Update, p. 255-286

[56] PG&E's 2022 Update, p. 287

Decreased transmission hardening targets are discussed in Section 4.6.3, "Grid Design and System Hardening."

- PG&E decreased its targets for installing additional sectionalization devices on both the distribution and transmission systems. Decreased transmission/distribution sectionalization device targets are discussed in Section 4.6.3, "Grid Design and System Hardening."
- PG&E's increased inspections (performed to exceed existing General Order [GO] requirements and better address wildfire risk) resulted in a backlog of repairs. While PG&E committed to backlog reduction targets; PG&E did not meet timelines set by Energy Safety. Inspection findings targets are discussed in Section 4.6.4, "Asset Management and Inspections."
- PG&E has created a Constraints Resolution Team and expanded access to "ProjectWise" to address vegetation management (VM) constraints. Nevertheless, PG&E must continue to make efforts to decrease constrained miles for VM programs. External engagement for VM is discussed in Section 4.6.5, "Vegetation Management and Inspections."

Additionally, Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.4.2 Workforce Planning

This subsection of the Guidelines[57] requires utilities to report their worker qualifications and training practices regarding utility-related ignitions and PSPS mitigation for workers in mitigation-related roles including:

- Vegetation inspections
- Vegetation management projects
- Asset inspections
- Grid hardening

[57] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.5.4 pp. 56-57 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

- Risk event inspection

PG&E provides all required information regarding worker qualifications and training practices within each listed role. For each target role, PG&E provides minimum qualifications, special qualifications, the percentage of full-time employees in the roles with relevant job titles, the percentage of its workforce that meets listed qualifications and plans to improve the qualifications of its workforce.

4.4.2.1 PG&E Progress

To increase the pool of qualified personnel available for vegetation inspections and management, PG&E has partnered with the International Brotherhood of Electrical Workers and educational institutions to create a training program that provides the skills and knowledge needed to successfully perform tree crew work. In August 2021, PG&E began implementing knowledge assessments on specific courses (i.e., VEGM-0110, VEGM-0410, VEGM-0411, and VEGM-0450). PG&E allows an employee or contractor three attempts to pass the required training courses; if failed, the employee or contractor will be placed in a "cooling off period" before being allowed to retake the training course.[58] For additional discussion on workforce planning specific to vegetation management, see Section 4.6.5, "Vegetation Management and Inspection," Critical Issue RN-PG&E-22-11.

PG&E plans to develop new or modified training as needed to improve worker qualifications in the areas of asset inspections, grid hardening, and risk event inspection. Training enhancements will be based on changes to processes and procedures in response to lessons learned,or to address identified gaps.

4.4.2.2 Areas for Continued Improvement

A number of areas for continued improvement related to PG&E's workforce planning are discussed in Section 4.6. These include the following.

- PG&E lacks specific directives for inspection procedures and practice regarding covered conductor inspection and maintenance. The topic of covered conductor inspection and maintenance is discussed in Section 4.6.3, "Grid Design and System Hardening."

[58] PG&E 2022 Update, p. 291.

- PG&E does not currently have a defined plan to increase asset inspector employee retention, which may be affecting the quality of inspections being completed. PG&E also primarily relies on contractors to complete asset inspection work. Retainment of inspectors and internal workforce development is discussed in Section 4.6.4, "Asset Management and Inspections."
- PG&E may require asset inspectors with a different set of qualifications as compared to other utilities, potentially inhibiting continued availability of qualified and competent inspectors. Benchmarking with other utilities on inspector qualifications is discussed in Section 4.6.4, "Asset Management and Inspections."
- PG&E is falling behind on its asset inspection Quality Assurance and Quality Control (QA/QC) goals and does not currently have set goals for 2023. Asset inspection QA/QC is discussed in Section 4.6.4, "Asset Management and Inspections."
- PG&E has hired 108 internal pre-inspectors. PG&E's Quality Assurance and Quality Verification (QA/QV) scope currently does not apply to internal pre-inspectors. Auditing of internal pre-inspectors is discussed in Section 4.6.5, "Vegetation Management and Inspections."

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.5 Metrics and Underlying Data

The metrics and underlying data section of the Guidelines[59] requires utilities to report metrics and program targets as follows:

- *Progress metrics* that track how much utility wildfire mitigation activity has changed 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

[59] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.6 pp. 58-69 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

direct and indirect consequences of wildfire and PSPS, including the potential unintended consequences of wildfire mitigation work.

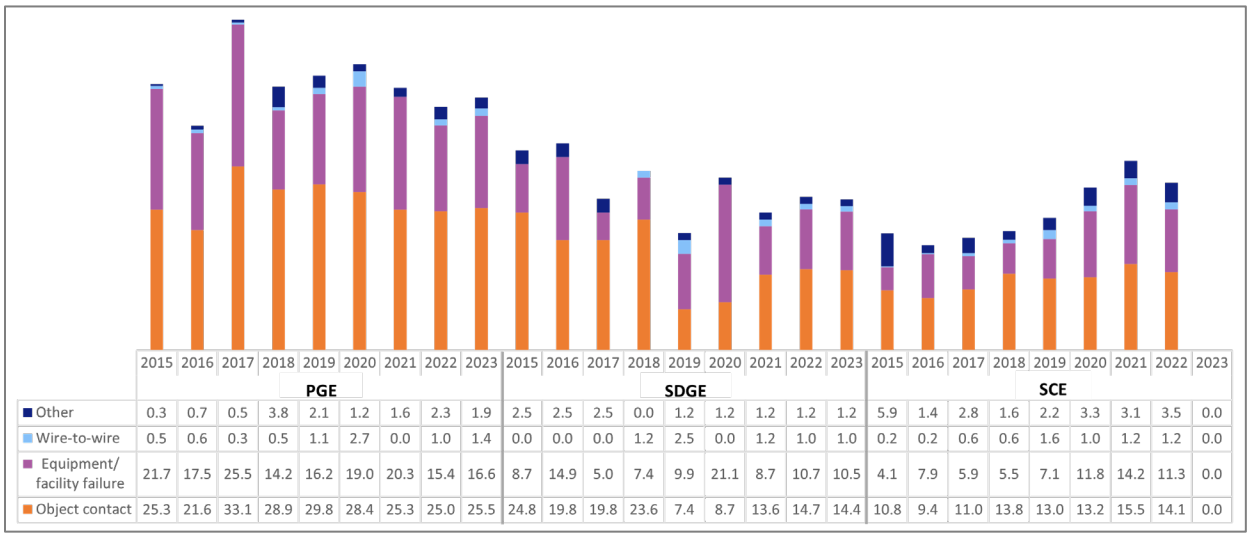
- *Program targets* that track the utility's pace of completing proposed wildfire mitigation activities to show progress toward a utility's specific objectives. Program targets do not track the efficacy of wildfire mitigation activities. The primary use of these program targets in 2022 is to assess the progress the utility made over the three-year plan cycle and whether the utility matured in its understanding of its own wildfire ignition risks and appropriate mitigations to decrease those risks.

This section also requires utilities to provide several 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 Section 4.6.7, "Data Governance," for a detailed review of the utility's progress and areas for continued improvement in this topic area.

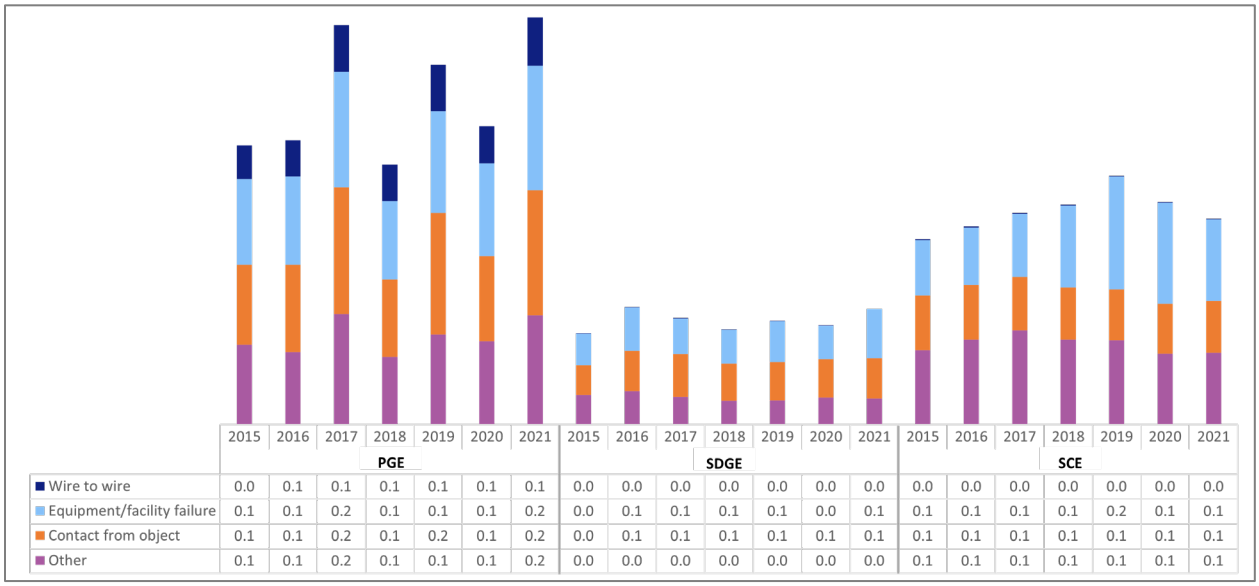
The figures below provide information on how the three large IOUs compare over the period 2015-2021 in actual numbers and 2022-2023 in projected numbers in terms of reported ignitions (Figure 4.5-1), risk events (Figure 4.5-2), Red Flag Warning circuit mile days per year (Figure 4.5-3), and asset inspection findings normalized by circuit miles inspected (Figure 4.5-4).

Figure 4.5-1: Ignitions per 10,000 Overhead Circuit Miles – Large IOUs (2015-2021 Actual, 2022-2023 Projected)[60]



	PGE									SDGE									SCE								
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2015	2016	2017	2018	2019	2020	2021	2022	2023	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	0.3	0.7	0.5	3.8	2.1	1.2	1.6	2.3	1.9	2.5	2.5	2.5	0.0	1.2	1.2	1.2	1.2	1.2	5.9	1.4	2.8	1.6	2.2	3.3	3.1	3.5	0.0
Wire-to-wire	0.5	0.6	0.3	0.5	1.1	2.7	0.0	1.0	1.4	0.0	0.0	0.0	1.2	2.5	0.0	1.2	1.0	1.0	0.2	0.2	0.6	0.6	1.6	1.0	1.2	1.2	0.0
Equipment/ facility failure	21.7	17.5	25.5	14.2	16.2	19.0	20.3	15.4	16.6	8.7	14.9	5.0	7.4	9.9	21.1	8.7	10.7	10.5	4.1	7.9	5.9	5.5	7.1	11.8	14.2	11.3	0.0
Object contact	25.3	21.6	33.1	28.9	29.8	28.4	25.3	25.0	25.5	24.8	19.8	19.8	23.6	7.4	8.7	13.6	14.7	14.4	10.8	9.4	11.0	13.8	13.0	13.2	15.5	14.1	0.0

Figure 4.5-2: Risk Events per Overhead Circuit Mile – Large IOUs (2015-2021 Actual)



	PGE							SDGE							SCE						
	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
Wire to wire	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Equipment/facility failure	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1
Contact from object	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1

[60] SCE did not report any projected numbers for ignitions in 2023.

Figure 4.5-3: Red Flag Warning Overhead Circuit Mile Days per Year – Large IOUs (2015-2021 Actual)

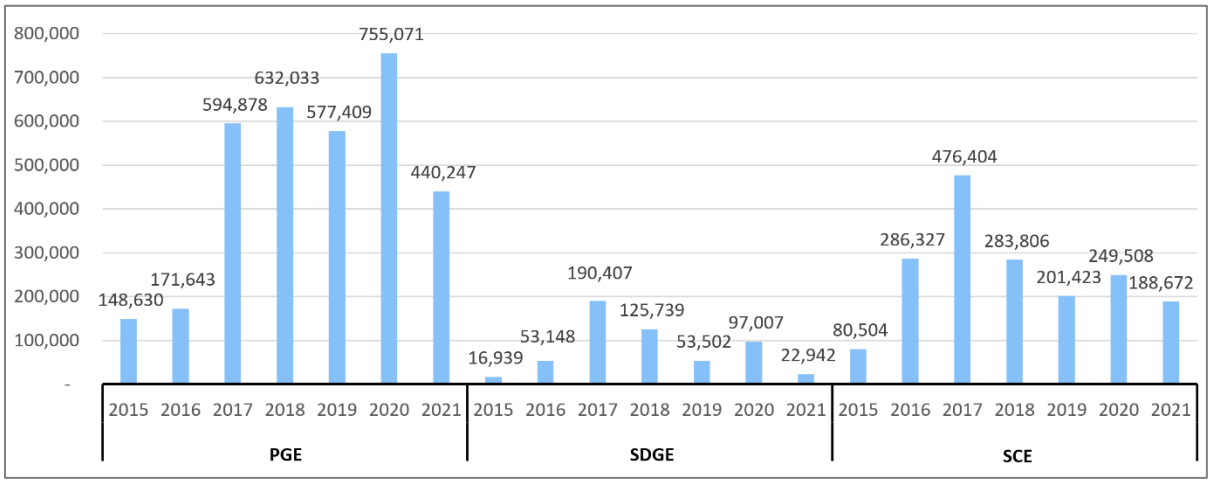
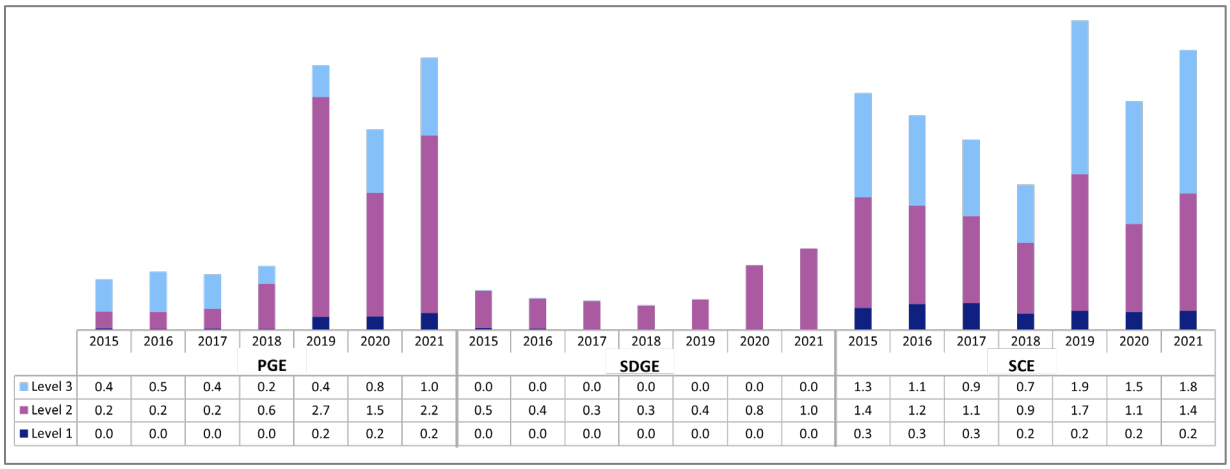


Figure 4.5-4: Asset Inspection Findings Normalized by Circuit Miles Inspected – Large IOUs (2015-2021 Actual)[61]



	PGE							SDGE							SCE						
	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
Level 3	0.4	0.5	0.4	0.2	0.4	0.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.1	0.9	0.7	1.9	1.5	1.8
Level 2	0.2	0.2	0.2	0.6	2.7	1.5	2.2	0.5	0.4	0.3	0.3	0.4	0.8	1.0	1.4	1.2	1.1	0.9	1.7	1.1	1.4
Level 1	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.2	0.2	0.2	0.2

[61] Levels 1, 2, and 3 correlate to the priority levels outlined in General Order 95 Rule 18. Level 1 is of the highest priority, requiring immediate action; Level 2 is non-immediate high to low risk; and Level 3 is of acceptable risk.

4.6 Mitigation Initiatives and Maturity Evaluation

The mitigation initiatives and maturity evaluation section of the Guidelines[62] requires the utility to describe in its WMP Update each mitigation initiative it will undertake to reduce the risk of catastrophic wildfire. The Guidelines require the utility to self-report its current wildfire risk mitigation capabilities and plans for improvement in those capabilities.[63, 64] The utility's self-reported capability level is referred to in this Decision as "maturity" and measured by Energy Safety's Utility Wildfire Mitigation Maturity Model (Maturity Model). Maturity levels range from zero to four, with four being the most mature. The utility reports on its maturity levels and mitigation initiatives using the same 10 categories, allowing Energy Safety to evaluate a utility's reported and projected maturity in wildfire mitigation in the context of its corresponding current and planned initiatives. The 10 maturity and mitigation initiative categories are listed below, with further details in Appendix E:

- Risk assessment and mapping
- Situational awareness and forecasting
- Grid design and system hardening
- Asset management and inspections
- Vegetation management and inspections

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[62] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7 pp. 70-77 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[63] The 2020 WMP Guidelines introduced the Utility Wildfire Mitigation Maturity Assessment as one of the four "key elements of the 2020 WMP submission and review process" (accessed April 29, 2022): https://energysafety.ca.gov/wp-content/uploads/docs/misc/docket/322133494.pdf.
The 2022 WMP Guidelines further defines the assessment process in Attachment 4: 2022 Maturity Model (accessed April 29, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true. From that document (p. 3): "Energy Safety requires each utility to complete an annual Maturity Survey to report on its current capabilities and plans for improvement in those capabilities."

[64] Utilities that submitted a WMP were required to complete a survey (the Maturity Survey) in which they answered specific questions that 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 10 categories identified for mitigation initiatives. The most recent survey for each utility, including SDG&E, can be found on the Energy Safety website here: https://energysafety.ca.gov/what-we-do/electrical-infrastructure-safety/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2022-wmp/ (accessed February 15, 2022).

- Grid operations and operating protocols
- Data governance
- Resource allocation methodology
- Emergency planning and preparedness
- Stakeholder cooperation and community engagement

Figure 4.6-1 and Table 4.6-1 depict the self-reported maturity of the large IOUs by initiative category for 2022. Figure 4.6-2 and Table 4.6-2 depict PG&E's projected growth in maturity by category for the current WMP cycle. Maturity is measured on a scale from zero to four, with four being the highest.

Note that Figure 4.6-1 includes a "PSPS" category, which is not in the original Maturity Model. PSPS-related questions in the Maturity Survey are found under capabilities in various categories. The PSPS category in Figure 4.6-1 includes PSPS-related capabilities from the categories of situational awareness and forecasting, grid operations and operating protocols, and emergency planning and preparedness. It is calculated in the same way as the other categories.

Figure 4.6-1: Self-Reported Maturity by Category - Large IOUs (2022)

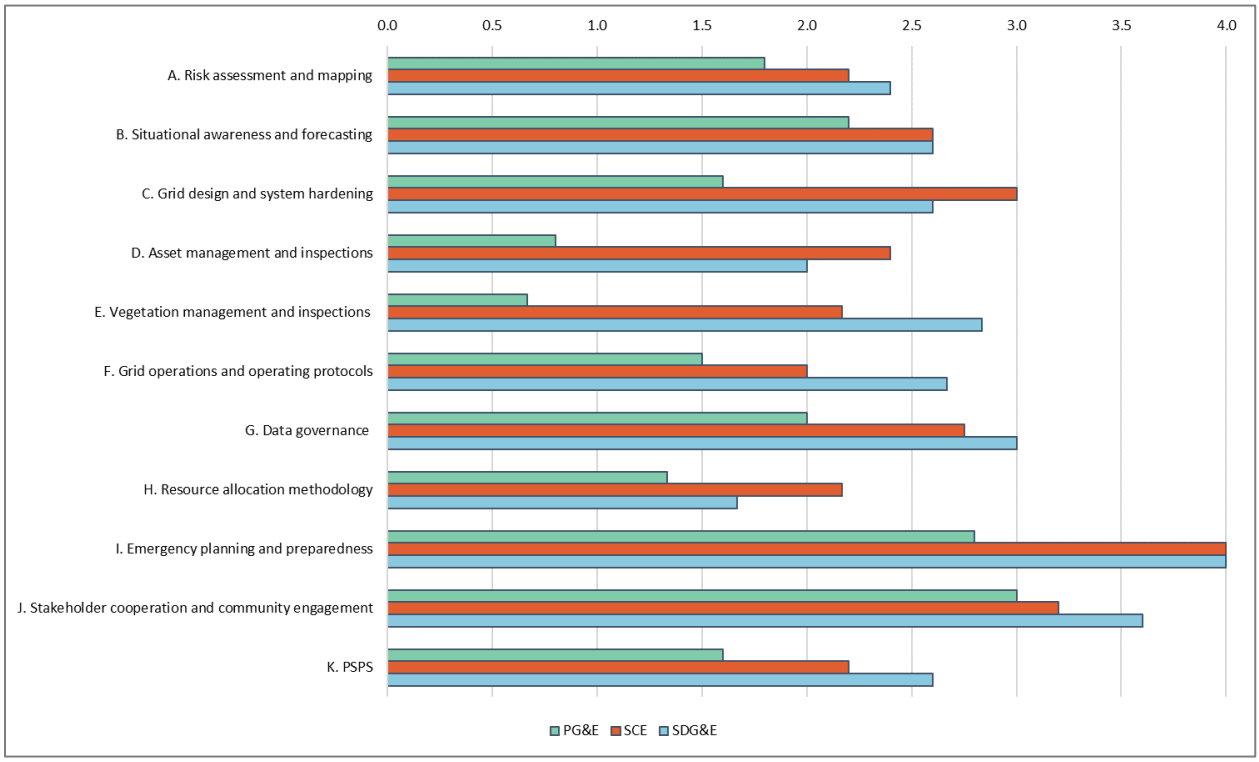

Table 4.6-1: Self-Reported Maturity by Category - Large IOUs (2022)

Category	PGE	SCE	SDGE
A. Risk assessment and mapping	2.00	2.20	2.40
B. Situational awareness and forecasting	2.20	2.60	2.60
C. Grid design and system hardening	1.60	3.00	2.60
D. Asset management and inspections	0.80	2.40	2.00
E. Vegetation management and inspections	1.17	2.17	2.83
F. Grid operations and operating protocols	1.50	2.00	2.67
G. Data governance	2.00	2.75	3.00
H. Resource allocation methodology	1.33	2.17	1.67
I. Emergency planning and preparedness	3.60	4.00	4.00
J. Stakeholder cooperation and community engagement	3.00	3.20	3.60

Figure 4.6-2: PG&E Projected Growth in Maturity throughout Current WMP Cycle by Category (Feb. 2020-Jan. 1, 2023)

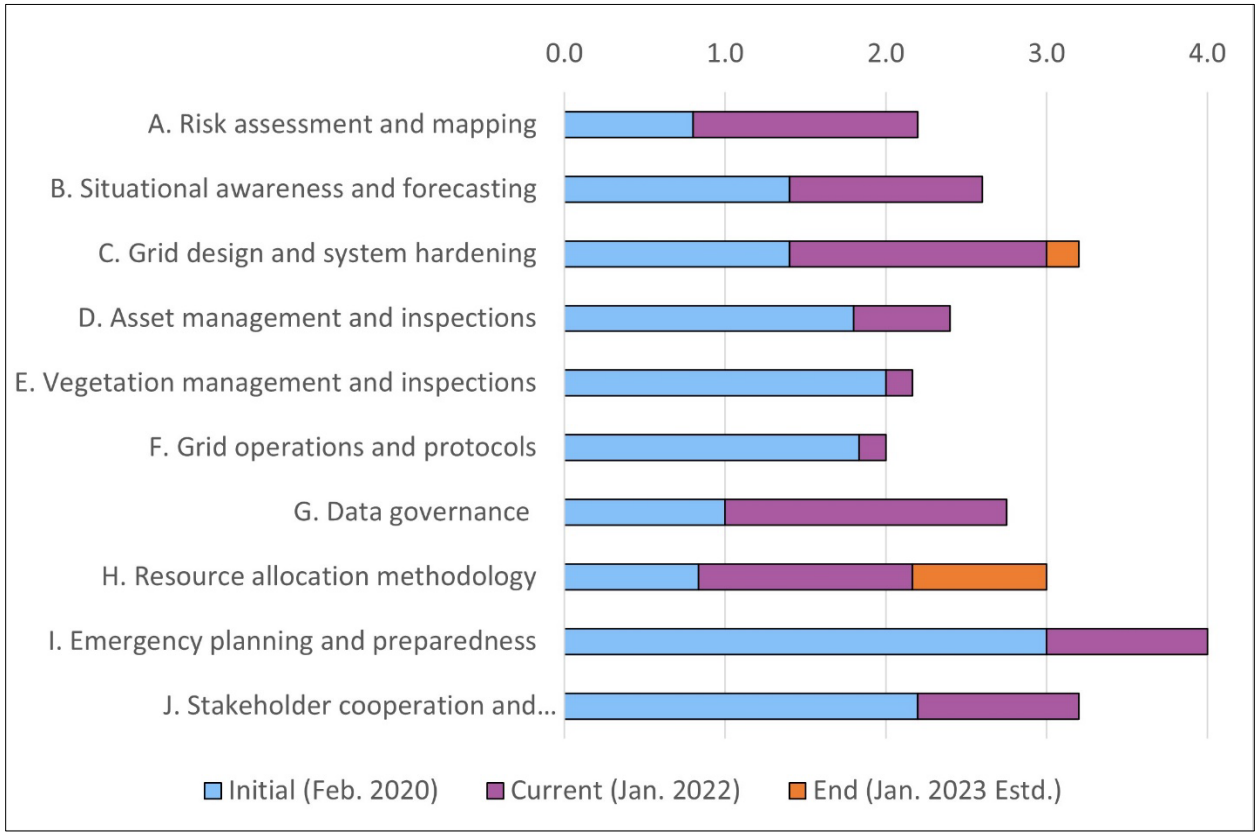

Table 4.6-2: PG&E Projected Growth in Maturity throughout Current WMP Cycle by Category (Feb. 2020-Jan. 1, 2023) [65]

Category	Initial	Current	End
A. Risk assessment and mapping	0.00	1.80	2.60
B. Situational awareness and forecasting	1.40	2.20	2.20
C. Grid design and system hardening	0.80	1.60	2.40
D. Asset management and inspections	0.60	0.80	1.20

[65] Note: Figures represent PG&E's "post data request responses" (i.e., no benchmarking, representative of their responses in previous years).

Category	Initial	Current	End
E. Vegetation management and inspections	0.70	0.70	1.50
F. Grid operations and operating protocols	1.30	1.50	1.50
G. Data governance	0.30	2.00	2.80
H. Resource allocation methodology	0.20	1.30	1.70
I. Emergency planning and preparedness	0.40	2.80	3.20
J. Stakeholder cooperation and community engagement	1.40	3.00	3.20

Below, Energy Safety evaluates PG&E's initiatives across the 10 categories in terms of the utility's Maturity Survey responses. Energy Safety discusses the utility's maturity progress for each category within the relevant wildfire mitigation initiative section.

4.6.1 Risk Assessment and Mapping

The risk assessment and mapping section of the Guidelines[66] requires the utility to discuss the risk assessment and mapping initiatives implemented to minimize the risk of utility-related ignitions. Utilities must describe initiatives related to equipment maps and modeling of overall wildfire risk, ignition probability, wildfire consequence, risk reduction impact, match-drop simulations,[67] and climate/weather-driven risks.

The parameters of risk assessment (discussed here) and resource allocation (discussed later in Section 4.6.8) to reduce wildfire risk derive from the CPUC's Risk-Based Decision-Making Framework (formerly S-MAP) and RAMP proceedings.[68]

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[66] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 p. 74 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[67] 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.

[68] The risk-based decision-making framework was adopted in the CPUC's D. 18-12-014 and refined in D. 21-11-009. An open CPUC proceeding R. 20-07-013 is addressing further developments to the risk-based decision-making framework. See the docket for this proceeding here: https://apps.cpuc.ca.gov/apex/f?p=401:56:0::NO:RP,57,RIR:P5_PROCEEDING_SELECT:R2007013 (accessed February 16, 2022).

The utility's risk modeling should ultimately inform the utility of the highest risk areas in order to inform its decision-making processes, along with the risk-spend efficiency (RSE) analyses discussed in Section 4.6.8.

4.6.1.1 Maturity Assessment

PG&E has shown significant increases in its self-assessed maturity level in the risk assessment and mapping category through the current WMP cycle, both from 2020 to 2021 and from 2021 to 2022. However, PG&E's maturity level in 2022 in this category remains lower than that of both SCE and SDG&E, as seen in Figures 4.6.1-1 and 4.6.1-2.

Figure 4.6.1-1: Cross-Utility Maturity for Risk Assessment and Mapping - Large IOUs (2020-2022 Actual, 2023 Estimated)

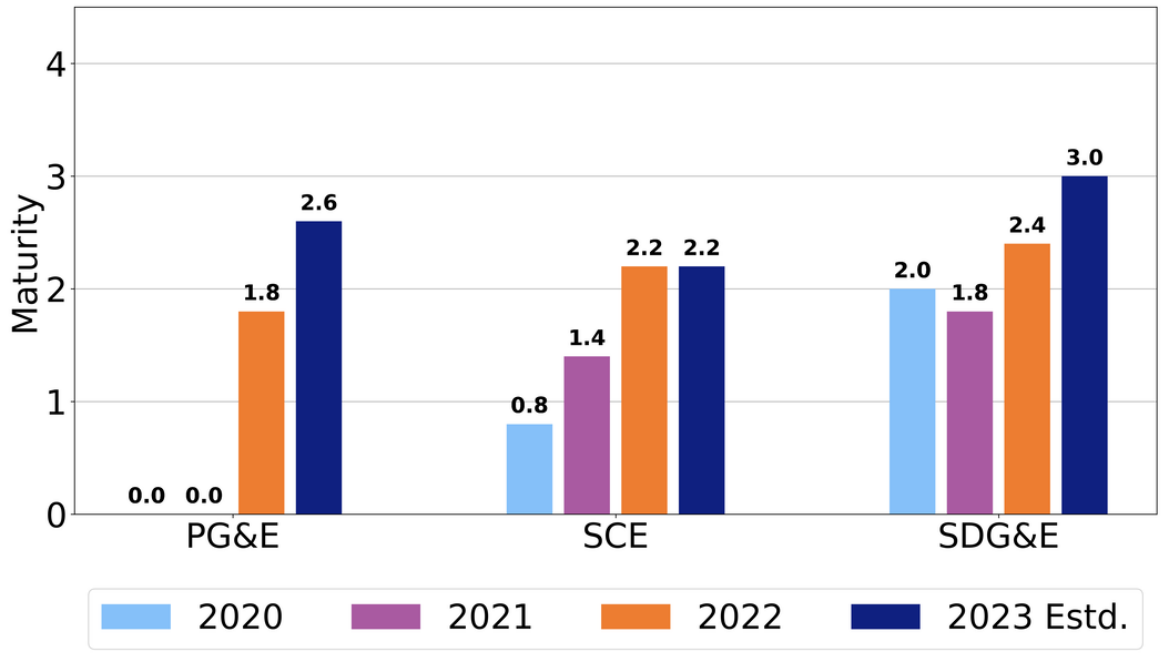
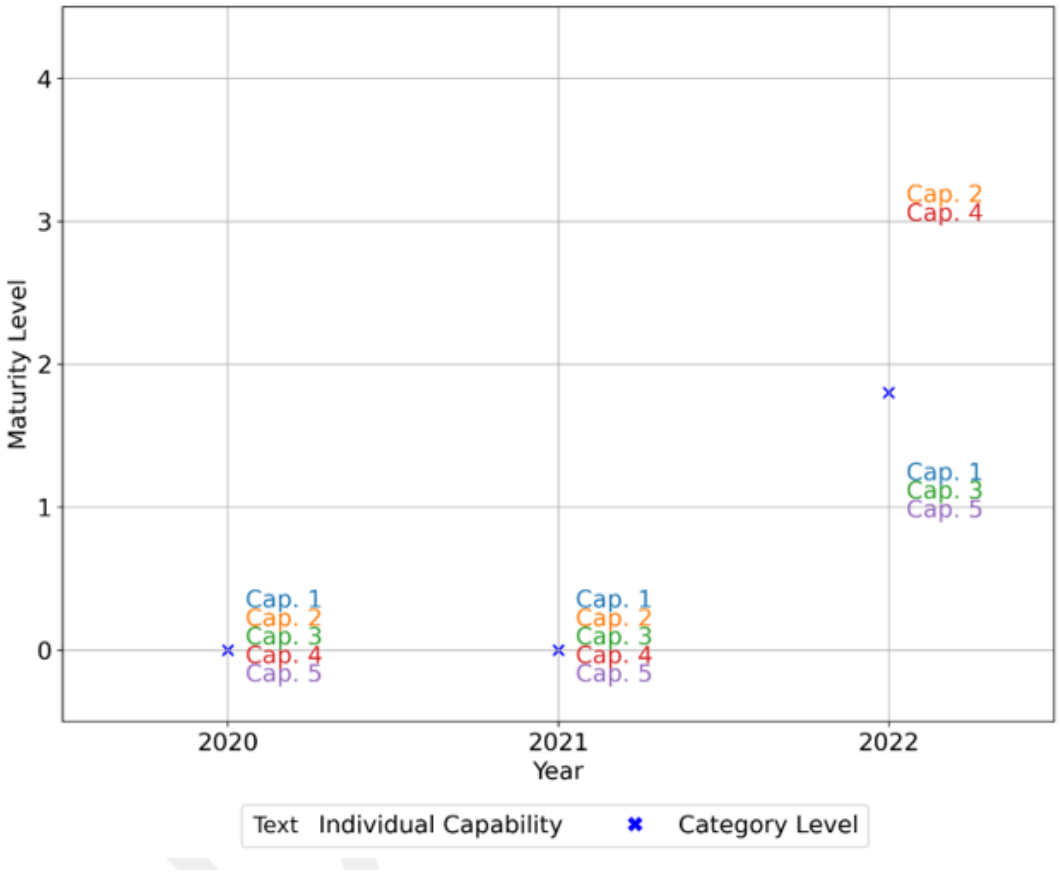


Figure 4.6.1-2: PG&E's Maturity Survey Responses for All Risk Assessment and Mapping Capabilities (2020-2022)



The following improvements since 2021 have contributed to PG&E's increase in maturity level as reported in January 2022 in PG&E's maturity survey:

- PG&E now calculates incremental risk accurately and quantitatively, whereas before PG&E had no clear ability to understand incremental risk under various weather scenarios.[69]
- PG&E's climate scenarios, risk reduction impact assessment, risk map and simulation algorithm updates are now independently assessed by outside experts and supported by historical data.[70]

[69] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.I.a.

[70] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.I.b, A.IV.d, and A.V.d.

- PG&E's risk modeling has increased in granularity for multiple aspects. These include moving from regional-based to span-based climate scenarios and from circuit-based to asset-based for its ignition risk estimation process. [71]
- PG&E now includes the level of vegetation when modeling weather scenarios and their associated risk.[72]
- PG&E's ignition risk modeling can now quantitatively and accurately assess the risk of ignition, as opposed to only reliably categorizing the risk of ignition.[73]
- PG&E increased automation across multiple categories, including the climate scenario tool, the ignition risk calculation tool, the ignition risk estimation process, and the ignition risk reduction impact assessment.[74]
- PG&E increased in its wildfire risk assessment confidence interval from greater than 60 percent to greater than 80 percent.[75]
- PG&E includes up-to-date moisture content and local weather patterns as part of ignition consequence impact inputs.[76]

Areas limiting PG&E's progress in maturity include the following:

- PG&E does not currently include monetary damages, impact on air quality, or impact on greenhouse gas reduction goals as part of its ignition risk consequence metrics.[77]
- PG&E's risk mapping algorithms are not updated continuously in real-time and are instead updated based on perceived differences between modeled and actual ignitions and propagation data.[78]

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[71] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.I.c, A.II.c, and A.III.e.

[72] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.I.e.

[73] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.II.a.

[74] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.I.d, A.II.b. and A.IV.b.

[75] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.II.e.

[76] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.III.g.

[77] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.III.b.

[78] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.V.a.

4.6.1.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle:

Throughout the current WMP cycle, PG&E has continued to improve its risk assessment and mapping efforts by overhauling and developing new wildfire risk models. These include the Enterprise Risk Model, the Wildfire Distribution Risk Model (WDRM), and the Outage Producing Winds (OPW) models. Since PG&E submitted its 2021 Update, the utility has improved its risk assessment and mapping as follows.

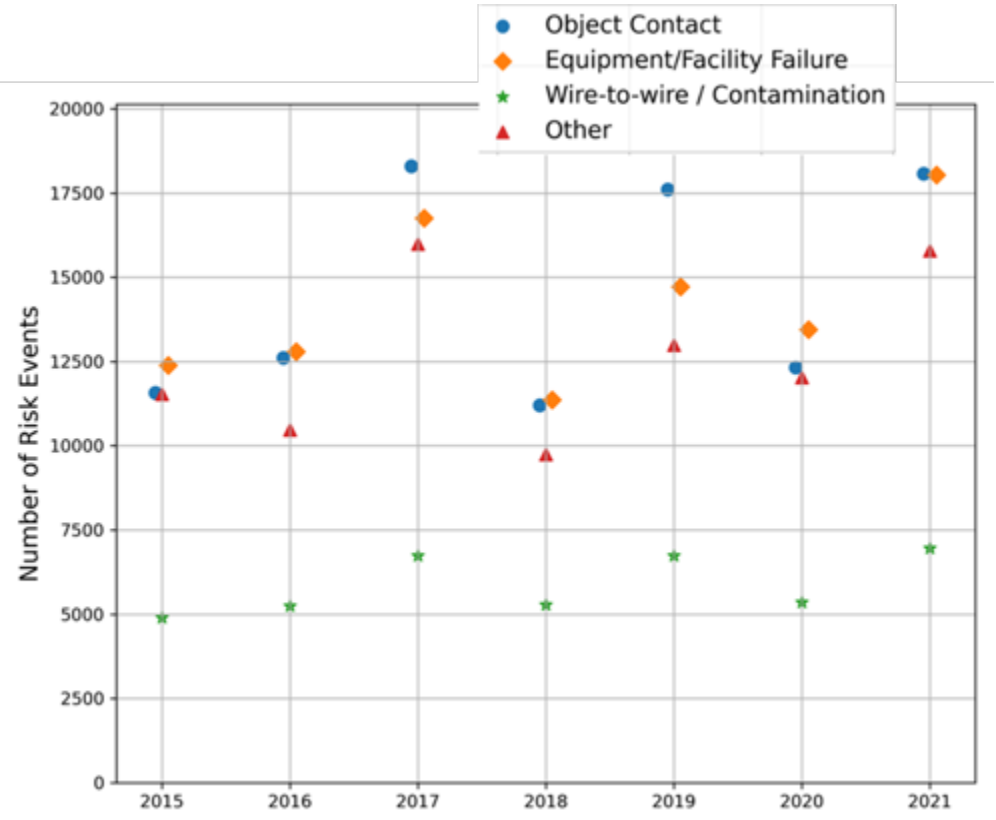
- PG&E reports it has improved the Fire Potential Index (FPI) model, initially developed in 2015. It is leveraging the model to evaluate when and where to implement both Electric Power Safety Settings (EPSS) and PSPS risk. PG&E's 2021 FPI model includes weather, fuel moisture, topography, and fuel type as data inputs.
- PG&E has developed its latest version for its WDRM. Notably, PG&E is still using output from its 2021 WDRM while updating and developing the third version of its model. Third-party review of the third version of PG&E's WDRM was completed in May 2022.[79] Changes to the new WDRM include adding risk determinations for transformers and support structures instead of only for conductors, using outage and PSPS-damage data instead of only using ignition data,[80] and improving granularity to the asset-level to understand the impacts specific mitigations may have at particular locations.[81] Given that the review of this third version of the model shows adequate improvement and output based on PG&E's changes to the WDRM, PG&E will use the new risk model output from the WDRM to inform where to perform future work based on risk.
- In 2021, the probability of an event leading to an ignition due to object contact was at an all-time low, as seen in Figures 4.6.1-3 and 4.6.1-4. While PG&E reported a higher number of risk events due to object contact, the percentage in which those risk events led to an ignition decreased.

[79] CalAdvocates-PGE-2022WMP-15 Question 8 and Data Request OEIS-PG&E-22-007 Question 9.

[80] Data Request MGRA-PGE-WMP22-DataRequest2 Question 06.

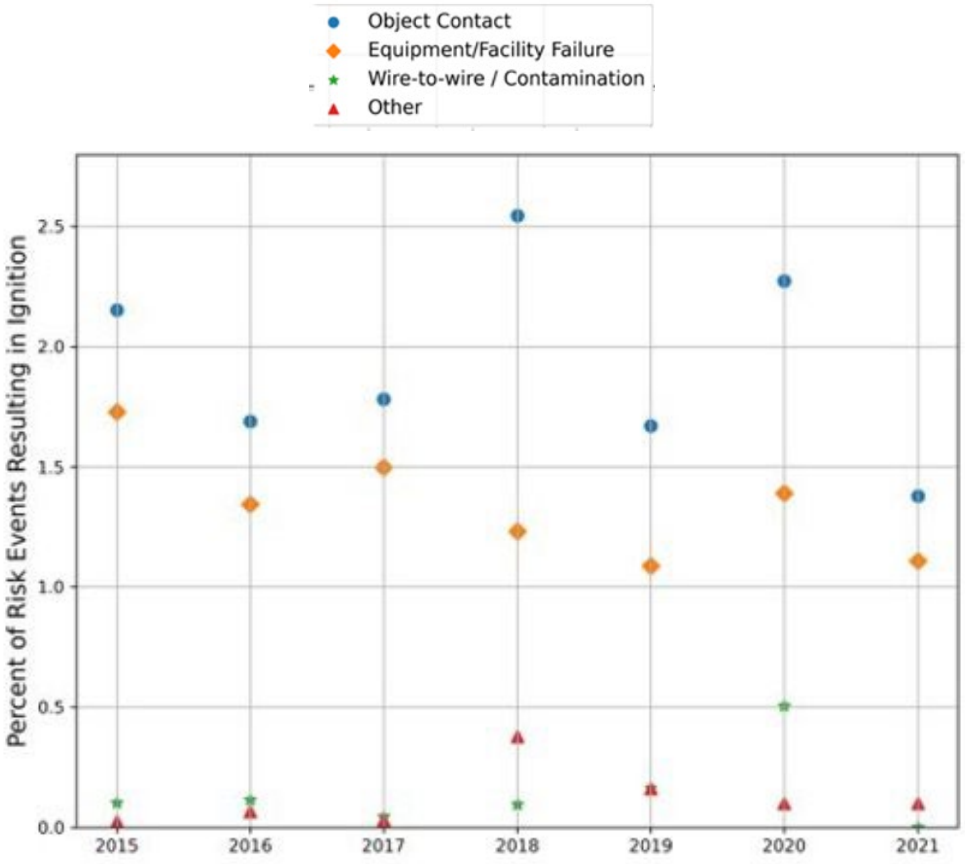
[81] PG&E's 2022 Update, p. 128.

Figure 4.6.1-3: PG&E's Annual Risk Events (2015-2021)[82]



[82] PG&E's 2022 Update, Table 7.1.

Figure 4.6.1-4: PG&E's Annual Ignitions from Risk Events (2015-2021)[83]



- As discussed in Section 4.6.1.1, PG&E improved its automation capability across multiple categories for risk assessment and modeling, as required by Energy Safety in the 2021 WMP Action Statement.[84] Some of the increase in automation capability is due to PG&E's use of new software to create a more replicable and auditable modeling environment.[85]
- By the end of 2021, PG&E developed an egress model pilot, which it plans on completing by the end of 2022. PG&E uses the town of Paradise and the Camp Fire to help calibrate the model pilot. The pilot uses required and available evacuation time

[83] PG&E's 2022 Update, Table 7.2.

[84] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 48 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[85] PG&E's 2022 Update, Section 4.6 Attachment 2, p. 3-4.

data, as well as the fire spread speed to reach a community.[86] PG&E plans to further integrate its egress model based on pilot results moving forward.

- PG&E completed the reportable ignitions report in April 2022 that evaluated the accuracy of its ignition data.
- Since its 2021 Update, PG&E has participated in the Energy Safety-led Wildfire Risk Modeling Working Group established on the basis of Energy Safety's 2021 Action Statements. The Wildfire Risk Modeling Working Group is ongoing, and guidance is still pending. Energy Safety anticipates that guidance for modeling will impact PG&E's 2023 WMP and/or 2024 Update. At this time, PG&E has not applied any changes to its risk modeling methodologies as a result of the working group but plans to do so in future WMP submissions.

4.6.1.3 PG&E Revision Notice

As described in Section 1.3.2, Energy Safety issued PG&E a Revision Notice in response to its 2022 Update submitted on February 25, 2022. PG&E submitted its responses to the revision notice on June 27, July 11, and July 26, 2022. This section evaluates that response as it relates to risk assessment and mapping.[87]

Critical Issue RN-PG&E-22-01: PG&E Has Not Adequately Documented the Causes of, or Direct Lessons Learned from, PG&E-Ignited Catastrophic Wildfires

For each PG&E-ignited catastrophic wildfire greater than 500 acres since 2017 Energy Safety required PG&E to:

- List the cause(s) of each catastrophic wildfire and any associated lessons learned, and
- Detail the specific measures PG&E is taking to i) directly mitigate the causes of past PG&E-ignited catastrophic wildfires, and ii) integrate lessons learned from past PG&E-ignited wildfires into its wildfire mitigation strategy.

[86] PG&E's 2022 Update, Section 4.6 Attachment 2, p. 5-6.

[87] PG&E's Revision Notice Response, June 27, 2022.

RN-PG&E-22-01: PG&E Response Summary

In PG&E's response, it listed catastrophic fires that have occurred since 2017 in a table, identifying the date of ignition, cause based on available information, lessons learned, measures to mitigate cause, and integration of lessons learned into wildfire strategy. As part of this response, PG&E included the Railroad Fire, October 2017 Wildfires, Airline Fire, Camp Fire, Lonoak Fire, Kincade Fire, Grizzly Fire, Drum/Lompoc Fire, Zogg Fire, and Dixie Fire. PG&E noted that the tables are not exhaustive in description, instead pointing to the relevant 2022 WMP sections and providing a brief description of the associated programs.

RN-PG&E-22-01: Energy Safety Evaluation

In its Revision Notice Response, PG&E provided an explanation of how the lessons learned associated with each catastrophic fire have been integrated into its wildfire strategy. For instance, for the Zogg Fire, PG&E is piloting performing inspections of all sides of potential strike trees, which may have prevented the vegetation contact leading to ignition that day. Within PG&E's Revision Notice Response, some lessons learned were more detailed than others.

Better Application of Specific Lessons Learned from Utility-Caused Fires

Going forward, PG&E must provide a more complete explanation to tie lessons learned with related mitigation measures. For example, in terms of the Kincade Fire, PG&E acknowledges in its Revision Notice Response that it did not include some targeted lessons such as addressing low cycle fatigue.[88] Additionally, in relation to the Dixie Fire, PG&E does not include the initiation of its targeted undergrounding program, which was included previously in response to a data request.[89] The Dixie Fire response also does not include any discussion of lessons learned regarding vegetation practices, even though the ignition was due to vegetation contact.

PG&E must demonstrate an understanding of the underlying causes of each catastrophic fire, identify lessons learned and the measures to mitigate cause and then integrate these into its wildfire strategy. Identifying and implementing specific and targeted lessons learned are key

[88] PG&E 2022 WMP Update Revision Notice, p. 4.

[89] Data Request OEIS-PG&E-22-004, Question 4.

to addressing weaknesses in PG&E's existing programs and preventing similarly caused fires in the future. PG&E must also extrapolate and explain how the cause of any specific fire may warrant a systemic change. For example, a fire caused by a failed piece of equipment should not limit PG&E to only monitor that specific type of equipment going forward. Instead, it could lead PG&E to change its practice of run to failure or require PG&E to reconsider the use of that type of equipment entirely.[90] Finally, it is important that PG&E prioritizes the implementation of mitigation measures according to risk. PG&E must, therefore, consider the implementation of lessons learned associated with previous wildfires alongside the implementation of other measures to reduce wildfire risk and prioritize those that mitigate the highest risk.

PG&E has de-escalated the critical issue described in RN-PG&E-22-01 in its Revision Notice response, however it still rises to the level of an area for continued improvement.

Given the need to demonstrate more tailored lessons learned and associated analysis, Energy Safety sets forth specific areas for improvement stemming from this de-escalated Revision Notice issue and associated required progress in Section 7.

4.6.1.4 Areas for Continued Improvement

PG&E must continue to improve in the following areas. Areas for continued improvement in this section are in addition to areas for continued improvement resulting from PG&E's Revision Notice Response.

Inclusion of Community Vulnerability in Consequence Modeling

While PG&E accounts for vulnerable communities, namely access and functional needs (AFN) populations, within its PSPS risk models,[91] the company does not currently evaluate community vulnerability as part of its wildfire consequence risk modeling. Factors such as income disparity, disability, and age diversity population ratios are vital in understanding communal impacts of wildfire risk. Socially vulnerable areas could face more devastating impacts with fewer resources available for recovery. PG&E must evaluate and incorporate

[90] This example is not meant to indicate Energy Safety's direction to PG&E on any specific fire. It is illustrative only.

[91] PG&E's 2022 Update, p. 205-209.

such factors as part of wildfire consequence risk modeling and must work with other utilities to determine best practices.

Fire Suppression Considerations

PG&E's wildfire spread modeling does not currently account for suppression efforts, such as from fire departments. Without accounting for fire suppression in the modeling, PG&E's efforts may lose granularity in the highest risk areas, given the ease with which unsuppressed spread can occur and the lack of real-world impacts suppression efforts may have (such as fire containment or other secondary impacts of firefighting response). PG&E must coordinate with other utilities to evaluate and integrate suppression within consequence and spread modeling.

Eight-Hour Fire Spread Simulations

PG&E's current wildfire consequence simulations use a fire spread period of eight hours.[92] Many catastrophic fires burn longer than eight hours, with much of the fire growth occurring after the eight-hour mark. Limiting model simulations to an eight-hour time period may limit the ability of the wildfire consequence model to accurately determine the risk of catastrophic wildfire. PG&E must evaluate how to incorporate risk of wildfires that burn longer than eight hours.

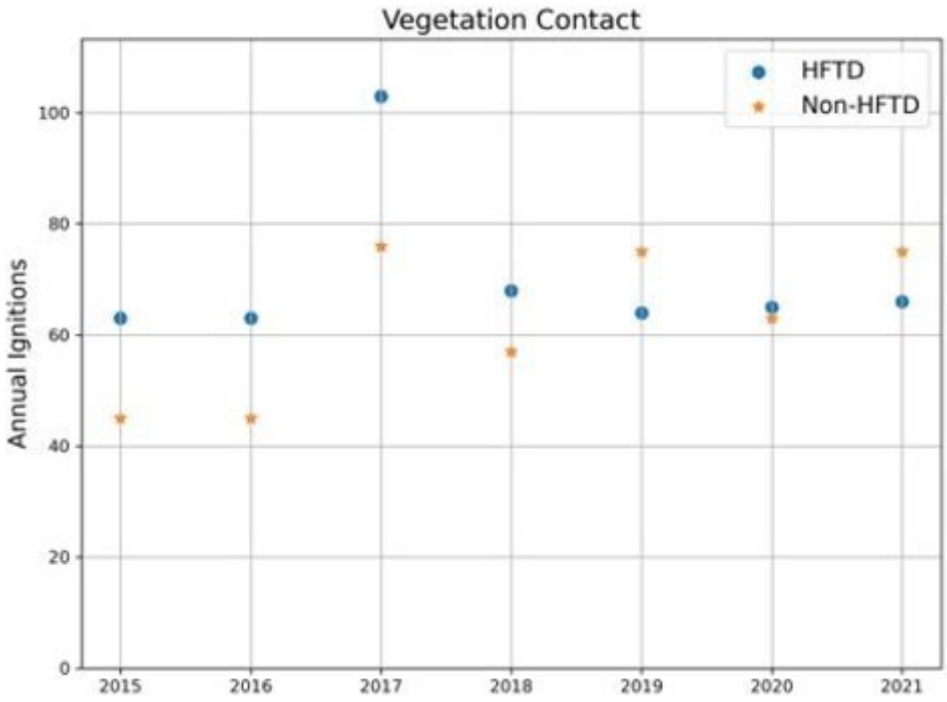
Addressing Increase in Risk Events

PG&E experienced an increase in overall risk events from 2020 to 2021, as seen in Figure 4.6.1-3. Particularly, ignitions caused by vegetation contact increased in both non-HFTD and HFTD areas in 2021, as seen in Figure 4.6.1-5. Moving forward PG&E must undertake and provide a more detailed evaluation demonstrating direct ties of causes to lessons learned to address the specific root causes of risk events and identify measures that will mitigate the likelihood of these risk events taking place in the future.

Figure 4.6.1-5: PG&E's Annual Vegetation Contact Ignitions (2015-2021)[93]

[92] PG&E's 2022 Update, p. 159.

[93] PG&E's 2022 Update, Table 7.2 of Attachment 3.


Vegetation Contact
HFTD
Non-HFTD
Annual Ignitions
0
20
40
60
80
100
2015
2016
2017
2018
2019
2020
2021

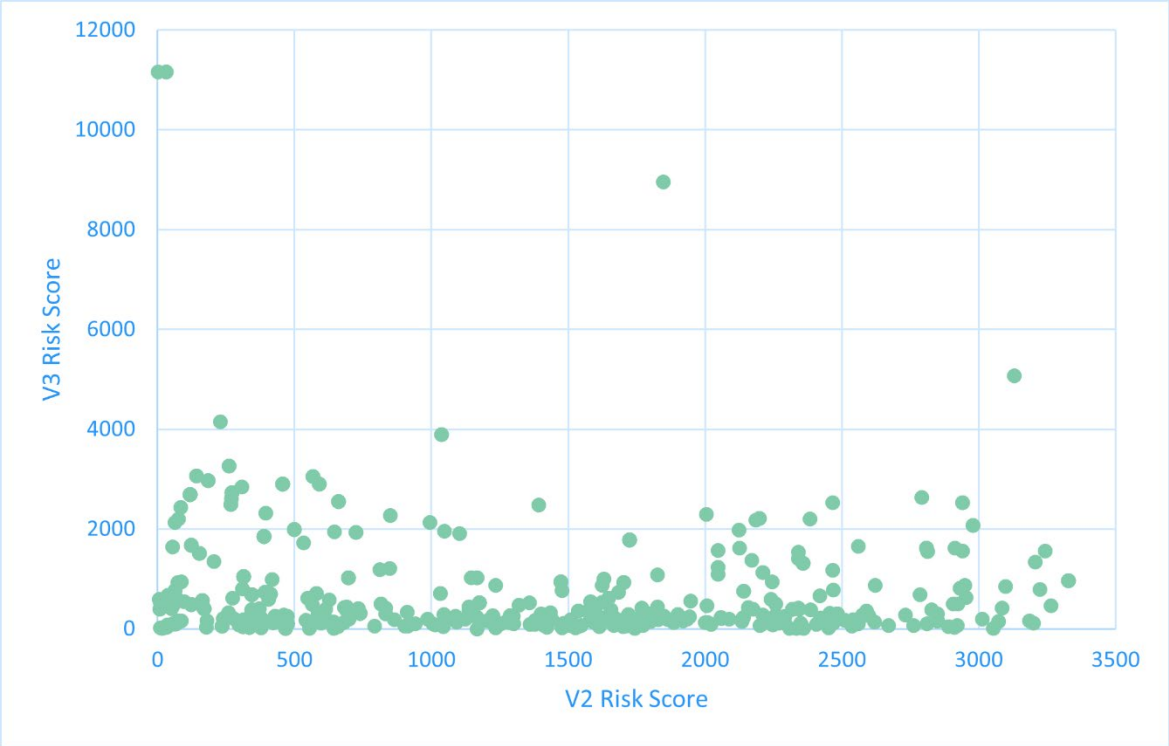
Evaluation of Model Reprioritization and Fire Rebuild in High-Risk Areas

PG&E moved from Version 2 (V2) of the WDRM to Version 3 (V3). While prioritization shifts were not as drastic as those seen when adopting V2 of the WDRM, this transition did lead to a distinctive shift in prioritization. For the undergrounding projects from 2024 to 2026, no observable correlation between the V2 and V3 risk scores can be seen, as shown in Figure 4.6.1-6.[94] Additionally, when looking at all Circuit Protection Zone (CPZ)[95] risk scores, it is clear that the V2 scores lie throughout the cumulative V3 risk, with few being in the top 60 percent of cumulative risk, as shown in Figure 4.6.1-7. While Energy Safety supports improvements being made to PG&E's risk models, it is concerning that the output of risk scores continues to change in relatively drastic ways, leaving open the question of the validity not only of past models, but the current one given anticipated additional future improvements. PG&E must demonstrate an understanding of the impact of the changes made between its V2 and V3 models in order to further validate continued confidences in the risk model outputs, particularly relating to projects that may be stranded due to changes in prioritization.

[94] If scores had remained similar a positive trendline would be discernable.

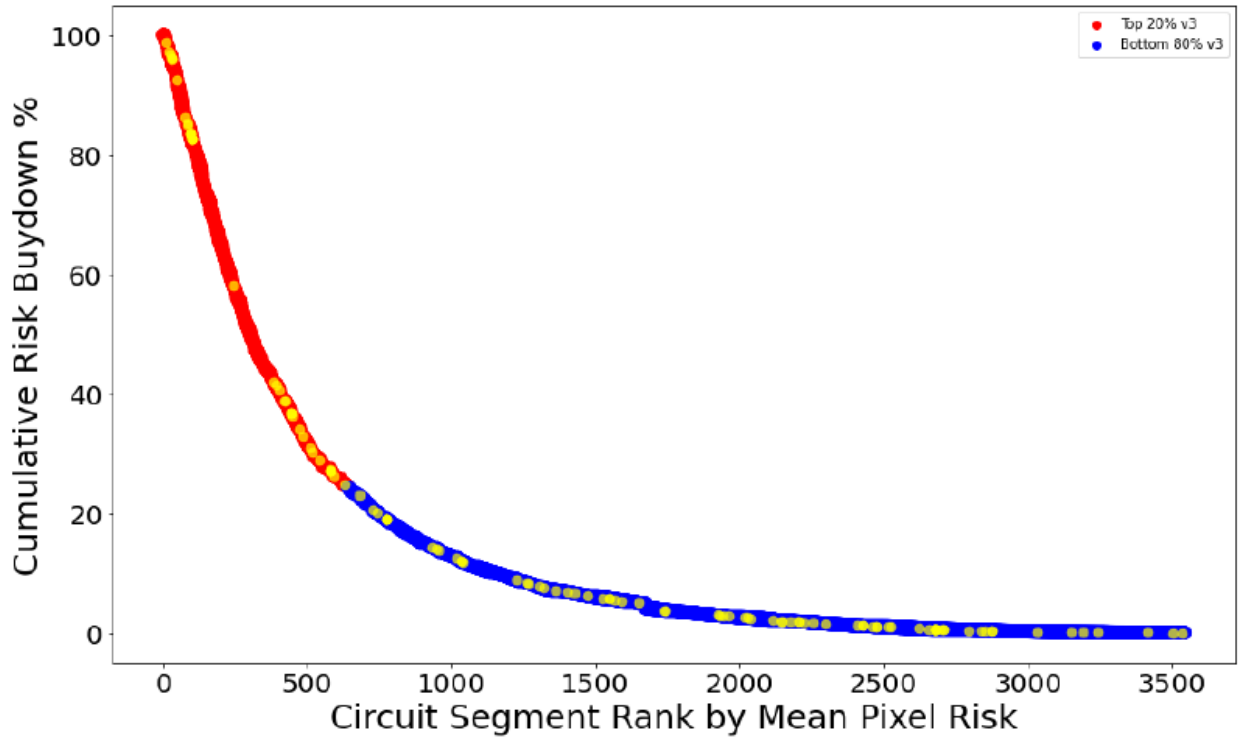
[95] PG&E's 2022 Update, p. 1033. PG&E Glossary of Additional Defined Terms: A Circuit Protection Zone (CPZ) is a segment of a distribution circuit between two protection devices. CPZs are also sometimes referred to as Circuit Segments.

Figure 4.6.1-6: PG&E Wildfire Distribution Risk Model (WDRM) V2 vs. V3 Risk Scores[96]



[96] PG&E's Revision Notice Response, June 27, 2022.

Figure 4.6.1-7: PG&E WDRM V3 Risk Buydown with V2 Risk Scores Overlayed (Source: PG&E)[97]



One of the shifts in methodology from V2 to V3 is the use of future vegetation projections, as opposed to the current 2020 vegetation model data. In particular, PG&E reports that it is accounting for vegetation regrowth based on observations and pre-fire vegetation for any burn scars. While this can help predict long-term risk, by increasing the consequence risk in areas that have undergone recent fires, PG&E is increasing the likelihood that its fire rebuild projects accrue higher risk scores. When asked about the overlap between where fire regrowth of fire scars was implemented into the model and the resulting prioritization of undergrounding based on V3 output, PG&E stated that fire regrowth only overlaps with fire rebuild projects at this time.[98] Given the relative unpredictability of future vegetation growth, PG&E must to provide vetting of the accuracy of its future vegetation projections.

[97] Provided by PG&E in Data Request OEIS-PG&E-22-016, Question 1.

[98] Data Request OEIS-PG&E-22-016, Question 2.

Applying Modeling Lessons-Learned from Third-Party Review

A third-party review identified areas where PG&E could improve PG&E's V3 of the WDRM. This included standardizing and documenting the relationship for how subject matter experts (SMEs) impact model inputs, establishing a data quality control process, a roadmap for model direction, and exploring further use cases of the model.[99] PG&E must provide updates on the steps it is taking to address these recommendations and demonstrate continual evolvement and improvement to its future models.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.2 Situational Awareness and Forecasting

A strong weather monitoring and situational awareness system is an essential ignition risk reduction strategy: it mobilizes a utility's response to potentially dangerous fire weather conditions and informs its decisions on PSPS implementation, grid design, and system hardening. It is also one of the least expensive risk reduction strategies.

The situational awareness and forecasting section of the Guidelines[100] 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 Guidelines refer to key situational awareness measures, including:

- 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

[99] E3 Review of PG&E's Wildfire Risk Model Version 3, p. 4.

[100] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 p. 74 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

- Installation of high-definition cameras throughout a utility's service territory, with the ability to control the camera's direction and magnification remotely
- Use of continuous-monitoring sensors that can provide near-real-time information on grid conditions
- Use of a fire risk or fire potential index that takes numerous data points in given weather conditions and predicts the likelihood of wildfire
- Use of personnel to physically monitor areas of electric lines and equipment in elevated fire risk conditions.

4.6.2.1 Maturity Assessment

PG&E has shown a rise in its maturity level in the situational awareness and forecasting category across the current WMP cycle. PG&E has shown maturity growth in its weather data collection capability as well as increased resolution and other improvements in its weather forecasting. In comparison to peer utilities, PG&E's maturity level is slightly lower due to its level of system automation processes.

According to its responses to the Maturity Survey, PG&E's maturity is limited in situational awareness and forecasting in the following areas:

- PG&E does not collect additional weather data to measure the physical impact of weather on the grid (e.g., sway in lines, sway in vegetation).[101]
- PG&E does not have the ability to prepare weather forecasts to the asset level.[102]
- PG&E does not forecast weather more than two weeks in advance.[103]
- PG&E has not completely automated its weather forecasting processes, field calibrations, and error checking weather stations.[104]

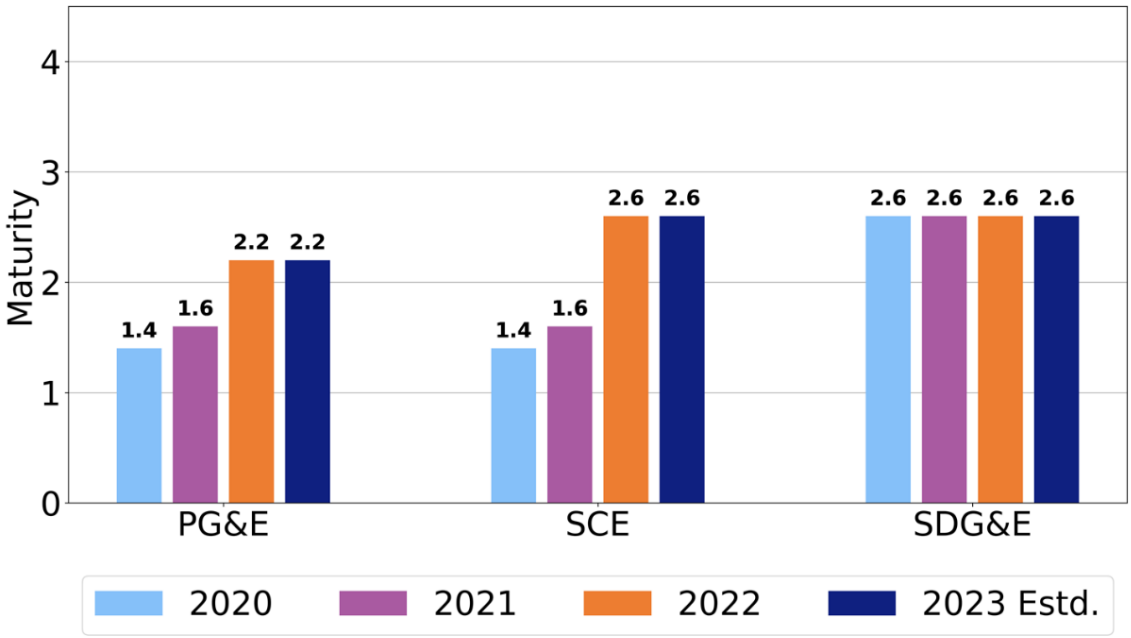
[101] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to B.I.a.

[102] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to B.III.c.

[103] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to B.III.b.

[104] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to B.III.d, B.III.e, B.IV.b.

Figure 4.6.2-1: Cross-Utility Maturity Levels for Situational Awareness and Forecasting - Large IOUs (2020-2022 Actual, 2023 Estimated)



4.6.2.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle to enhance its situational awareness and forecast abilities across its service territory:

- PG&E installed 308 weather stations in 2021, meeting its goal of deploying 1,300 weather stations across its service territory by the end of 2022. PG&E has improved the functionality of 1,025 of these weather stations with the ability to receive weather observations at 30-second intervals. PG&E reports the increased observation intervals may improve its situational awareness and its PSPS decision making.
- An ensemble weather forecast approach is incorporated into PG&E's Operational Mesoscale Modeling System (POMMS). This includes the Global Forecasting System (GFS) and the European Centre for Medium Range Weather Forecasting (ECMWF) models. PG&E expects this will improve its weather forecasting accuracy, increasing the forecasting by an additional 24 hours, and enhance its Fire Potential Index (FPI), fuel modeling, and Ignition Probability Weather (IPW) model to improve PSPS decision making.
- PG&E continues working towards its goal of installing 600 high definition (HD) cameras, which will provide 90 percent visual coverage of its HFTD. In 2021, PG&E installed 153 HD cameras, for a total of 502. In 2022 PG&E plans to complete its goal of

600 HD cameras and pilot artificial intelligence (AI) and machine learning (ML) capabilities to enable earlier fire detection using its camera network.

- PG&E plans to add 22 full-time employees to its Safety and Infrastructure Protection Teams (SIPT) in 2022. This would increase the number of its SIPT engines to a total of 45, up from 40 in 2021. PG&E expects these resources, coupled with its satellite fire detection ability, HD camera network, and Hazardous Awareness & Warning Center (HAWC), to improve its ability to detect and respond to address any utility-related sparks.
- PG&E has a goal to install line sensors, distribution fault anticipation (DFA), and early fault detection technology as part of an overall distribution monitoring structure. PG&E reports these technologies may help detect incipient faults as well as improve the ability to locate faults on circuits with EPSS. Some of these capabilities are also discussed in Section 4.6.3.4, under "Grid Design and System Hardening."

4.6.2.3 Areas for Continued Improvement

In addition to progress made, PG&E must continue to improve in the following areas.

Justification of Weather Station Network Density

In comparison to peer utilities' weather station density, PG&E has fewer weather stations installed per circuit mile. It is unclear if its weather station network provides sufficient granularity to address microclimates within its service territory. In its 2023 WMP, PG&E must explain how its long-term goal of 1300 weather stations was determined and how the goal provides sufficient granularity, including how spatial gaps in its network have been identified.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.3 Grid Design and System Hardening

The grid design and system hardening section of the Guidelines[105] 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 utility-related ignitions resulting in

[105] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 pp. 74-75 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

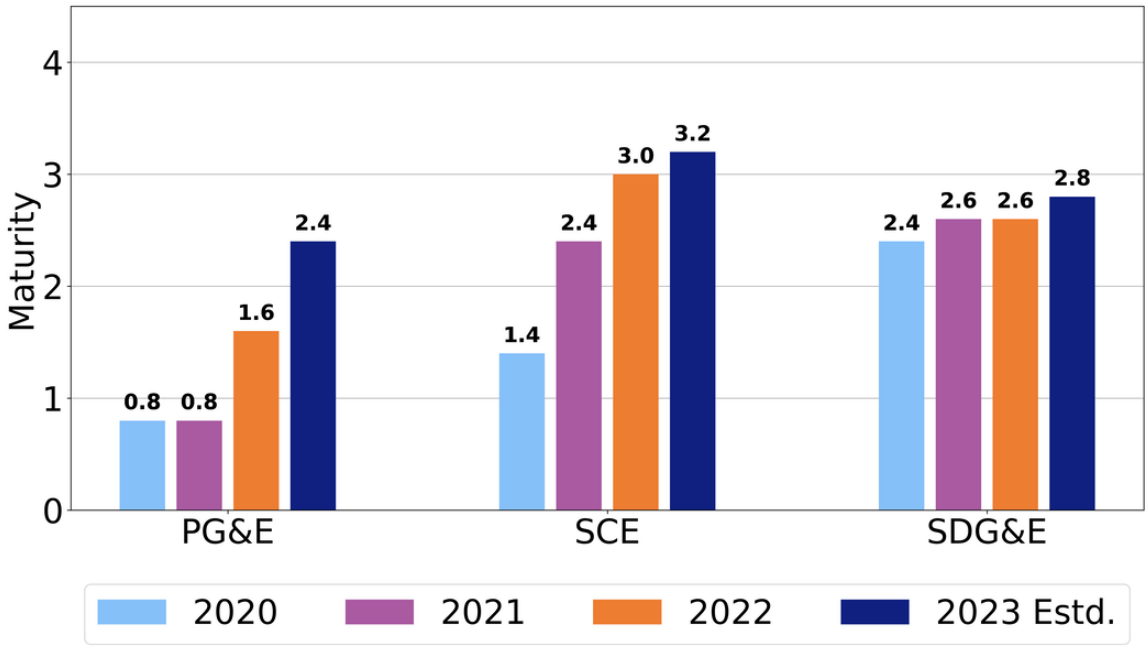
catastrophic wildfires. This section also requires discussion of routine and non-routine maintenance programs, including whether the utility replaces or upgrades infrastructure proactively rather than running facilities to failure. Programs in this category, which are often the most expensive aspects 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:

- Capacitor maintenance and replacement
- Circuit breaker maintenance and installation to de-energize lines upon detecting a fault
- Covered conductor installation
- Covered conductor maintenance
- Crossarm maintenance, repair, and replacement
- Distribution pole replacement and reinforcement, including with composite poles
- Expulsion fuse replacement
- Grid topology improvements to mitigate or reduce PSPS events
- Installation of system automation equipment
- Maintenance, repair, and replacement of connectors, including hotline clamps
- Mitigation of impact on customers and other residents affected during PSPS events
- Other corrective action
- Pole loading infrastructure hardening and replacement program based on pole loading assessment program
- Transformer maintenance and replacement
- Transmission tower maintenance and replacement
- Undergrounding of electric lines and equipment
- Updates to grid topology to minimize risk of ignition in the HFTD
- Other areas if an initiative cannot feasibly be classified within those listed above

4.6.3.1 Maturity Assessment

PG&E improved its maturity level for grid hardening and system design, with a steady increase over the current WMP cycle. However, PG&E still has a lower maturity level compared to SCE and SDG&E, as seen in Figure 4.6.3-1.

Figure 4.6.3-1: Cross-Utility Maturity Comparison for Grid Hardening and System Design – Large IOUs (2020-2022 Actual, 2023 Estimated)



PG&E made improvements in the following areas:

- In 2021, PG&E prioritized wildfire risk reduction initiatives at the asset level, performed risk estimates and consequence modeling across individual circuits, and took power delivery (such as reliability and PSPS) into consideration. In 2020, PG&E only prioritized initiatives based on HFTD areas.[106]

[106] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.I.a.

- PG&E updates risk-spend efficiency calculations for grid hardening initiatives annually or more frequently, whereas it was previously updating risk-spend efficiency calculations less than annually.[107]
- PG&E measures reduction impacts based on near-miss metrics for evaluating effectiveness of hardening solutions.[108]

Areas limiting PG&E from further maturity include:

- PG&E has many single points of failure across its transmission system; therefore, it has limited redundancy for all PSPS circuits.[109]
- PG&E's distribution system only has at least 50 percent redundancy for HFTD customers, as opposed to 70 percent or 85 percent.[110]
- PG&E does not meet the capability goal of having less than 2,000 customers per switch when considering sectionalizations and instead is only able to individually isolate entire circuits.[111]
- PG&E does not currently consider egress as part of its grid topology design, although PG&E has a pilot in progress to include egress as a consideration for mitigation selection.[112]
- PG&E is currently only able to prepare estimates for risk-spend efficiency of hardening initiatives at a circuit-based level, as opposed to span- or asset-based.[113]

[107] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.IV.c.

[108] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.V.a.

[109] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.a.

[110] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.b.

[111] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.c.

[112] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.d, and Data Request OEIS-PG&E-22-002, Question 7.

[113] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.IV.c.

- PG&E only considers "some" grid hardening initiatives within its evaluations, with a plan to increase to "most" by 2023.[114]
- PG&E does not have independent audits conducted to evaluate the performance of new initiatives.[115]

4.6.3.2 PG&E Progress

Throughout the current WMP cycle, PG&E has continued to improve its grid design and system hardening programs. Since PG&E submitted its 2021 Update, the utility has improved its grid design and system hardening section as follows.

- PG&E increased its expulsion fuse removal target by more than 50 percent from 2021. The 2021 goal of 1,200 removals has increased to a 2022 goal of 3,000. This is partially in response to a finding in Energy Safety's Action Statement on PG&E's 2021 WMP Update, which required PG&E to increase its expulsion fuse removal program to better match similar removal rates reported by peer utilities.
- In response to a finding in Energy Safety's Action Statement on PG&E's 2021 WMP Update,[116] PG&E provided more details on how it is prioritizing its aluminum conductor replacements. PG&E clarified that aluminum conductor replacements are being prioritized over the system hardening program within the HFTD. Aluminum conductor replacements are a supplemental program based on evaluation of factors such as past wires down, corrosion, and splice count to determine replacement needs of copper and aluminum conductors in high corrosion zones.

4.6.3.3 PG&E Revision Notice

As described in Section 1.3.2, Energy Safety issued PG&E a Revision Notice in response to its 2022 Update submitted on February 25, 2022. PG&E submitted its responses to the revision

[114] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.IV.d.

[115] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.V.c.

[116] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 61 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

notice on June 27, July 11, and July 26, 2022. This section evaluates that response as it relates to grid design and system hardening.[117]

Critical Issue RN-PG&E-22-02: PG&E Did Not Report on the Amount of Work Being Completed in Top-Risk Areas

Energy Safety required PG&E to provide an update of Table 5.3- 1(A) with top-risk percentages based solely on risk model output. The revised table was required to specifically provide the percentage of each type of work being completed in the top-risk circuits defined by risk model outputs. This was required to be done without conflating the percentages of top-risk circuits with other criteria, including PSPS-impacted locations, fire rebuild projects, and Public Safety Specialist (PSS)-identified locations.

Separate from Table 5.3-1(A), PG&E was required to provide information to demonstrate that PSPS impacted locations are correlated with the top risk.

RN-PG&E-22-02: PG&E Response Summary

PG&E refiled Table 5.3-1(A) with percentages based only on wildfire risk modeling output. However, since many of the initiatives were not determined or prioritized based off the wildfire risk model outputs at this time, many (36 out of 43) had "N/A" filled in for the top risk percentages. The categories that included top risk percentages were:

- Expulsion fuse replacements
- Undergrounding
- System hardening
- Remote grids
- Detailed inspections
- Enhanced vegetation management
- Defensible space (related to vegetation management)

Additionally, PG&E provided more information on the overlap between wildfire risk and PSPS risk. This included providing side-by-side maps showing the areas of risk each presented, as

[117] PG&E's Revision Notice Response, July 11, 2022, and PG&E's Revision Notice Response, July 26, 2022.

well as a risk buydown curve showing how Circuit Protection Zones (CPZs) ranked on PSPS risk and wildfire risk consecutively.

RN-PG&E-22-02: Energy Safety Evaluation

PG&E satisfied each required remedy for RN-PG&E-22-02, and PG&E has resolved the critical issue. PG&E adequately refiled the table to reflect risk model output and associated PSPS risk analysis.

While only a small percentage (29 percent) of undergrounding work is occurring within the top 20 percent of risk for 2022, 73 percent of PG&E's overall system hardening distribution work is occuring within the top 20 percent of risk. PG&E demonstrated further prioritization for undergrounding in future years, as discussed further in Section 4.6.4. Other initiatives, such as remote grids, distribution and transmission sections, have 100 percent of their targets occurring within the top 20 percent of risk.

Although many "N/A" values were provided, PG&E indicated that these initiatives were prioritized based on locations within the HFTD or high fire risk area (HFRA), as opposed to using the results from the risk model.

Critical Issue RN-PG&E-22-03: PG&E is Not Adequately Focusing Grid Hardening Work, Particularly Undergrounding, on Highest-Risk Areas Based on Risk Model Output

Energy Safety required PG&E to revise its system hardening plan to adequately demonstrate prioritization based on highest-risk areas. PG&E was required to provide details of, and commit to, a more aggressive 2022–2024 goal of locating undergrounding in its top 20 percent of risk-ranked circuits, on par with its peers. Energy Safety directed PG&E to exclude any undergrounding associated with fire rebuild miles within its undergrounding goal.

If PG&E took additional risks into account when developing this more aggressive undergrounding goal, aside from those already considered as part of the risk model output, Energy Safety requested that PG&E:

- Identify the percentage of undergrounding work that will be driven by these additional risk categories (i.e., PSPS, open work tags,[118] Public Safety Specialist (PSS) selected, etc.).
- Explain why PG&E's existing risk model output does not sufficiently cover these additional risks.

RN-PG&E-22-03: PG&E Response Summary

PG&E provided its additional workplans for 2024 to 2026, which demonstrate an increase in prioritization of projects that will address the top 20 percent riskiest areas based on risk model output. This includes more than 90 percent of undergrounding work being completed in the top-risk areas, prior to adding PSPS, Public Safety Specialist-identified, and fire rebuild projects. In total, PG&E estimated 88 percent of its undergrounding projects to be within the top 20 percent risk-ranked circuit segments from 2022 to 2026.

PG&E also included further discussion of Public Safety Specialist-identified locations, as PG&E's current WDRM itself does not account for the following:

- Ingress/egress
- Resistance to control
- Critical infrastructure
- Community factors
- Fire history

Two percent of PG&E's 2022 to 2026 grid hardening projects fell under the category of Public Safety Specialist-identified projects, with zero percent included in 2024 to 2026.

RN-PG&E-22-03: Energy Safety Evaluation

While PG&E demonstrated that it aims to complete a much greater percentage of underground projects in order to address top risk in the future, PG&E asserted that fire rebuild projects should be considered as helping address the highest risk. PG&E's modeling counters the assumption of reduced long-term risk in fire rebuild areas. While fires may not occur in burn scars in the near-term due to the time it will take for vegetation fuels to grow

[118] Work tags are synonymous with work orders, maintenance tags, and remediations.

back, the fact that a wildfire has occurred in a burn-scarred area in the first place indicates an inherent long-term risk of wildfire due to pre-existing, contributing factors. By modeling the increasing risk of wildfire in areas where vegetation is growing back, a higher risk may be assigned to fire scars. This therefore increases the risk scores for fire rebuild projects according to the approach adopted by PG&E. PG&E must further evaluate and explain changes made in its risk model, such as vegetation changes, as well as model outputs and associated changes in prioritization. Although its WDRM does not currently capture several factors, some are planned for inclusion within the Risk Model Working Group, or are discussed further in Section 4.6.1.

PG&E has resolved the critical issue described in RN-PG&E-22-03 because PG&E demonstrated that it is primarily prioritizing its future grid hardening projects in areas deemed highest risk based on model outputs.

Critical Issue RN-PG&E-22-04: PG&E Does Not Provide Planned Undergrounding Locations Beyond 2023 and Does Not Adequately Demonstrate That It Is Currently Prepared to Meet Its Ambitious Undergrounding Goals

Energy Safety required PG&E to provide an update of its planned undergrounding projects in 2024, following the format Energy Safety required in PG&E's response to a key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 WMP Update, PG&E-21-14, Inadequate Transparency of System Hardening Plan.[119] Energy Safety required this response to be in the form of a spreadsheet with the following information:

- Location
- Status of the project (scoping, design permitting, etc.)
- Relevant Circuit Protection Zones (CPZs)/Risk Score
- Circuit ranking based on 2021, 2022, and 2023 risk model output
- Measured effectiveness of ignition risk reduction projected to result from undergrounding at that circuit segment

[119] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 59 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

- Planned length
- 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, or combination of the proceeding)

Energy Safety required PG&E to include a timeline extending beyond 2024 for the frequency with which it will determine undergrounding mileage and locations based on updated risk model output, factoring in the RSE comparison with other initiatives.[120] If the above information for the targeted 400 miles in 2023 and 800 miles in 2024 was not available, Energy Safety requested that PG&E justify why this information is unavailable and provide a timeline for when the information will be available.

RN-PG&E-22-04: PG&E Response Summary

PG&E's response included a resource plan, as well as the required spreadsheet with information on projects from 2024 to 2026. The spreadsheet aggregated the three years together instead of breaking out mileage per individual year. PG&E included risk rankings and risk scores from both V2 and V3 of PG&E's risk model.

RN-PG&E-22-04: Energy Safety Evaluation

When asked about aggregating data projections prioritizing undergrounding projects for 2024 to 2026, PG&E stated that it had not yet determined which projects will be completed within each individual year, as it had only identified locations and not project timing. However, PG&E also stated in its response that the selection of undergrounding projects is based on feasibility. To factor feasibility in, PG&E used a "Feasibility Cost Multiplier" as part of a simplified RSE calculation, which then informed the scope and prioritization of PG&E's undergrounding work.

PG&E must weigh a multitude of factors for its evaluation of system hardening alternatives and demonstrate that it has not primarily defaulted to undergrounding. In PG&E's 2023 WMP, it must provide further analysis of its decision-making process, demonstrating a full

[120] Revision Notice for PG&E's 2022 Wildfire Mitigation Plan Update, p. 10.

evaluation of system hardening alternatives including considering combinations of system hardening initiatives. This is discussed further in Section 4.6.8.

Additionally, PG&E indicated in its spreadsheet that prioritization of undergrounding projects between the V2 and V3 modeling outputs has shifted. Although the change in outputs in the transition to V3 does not appear as drastic as it did in the transition from V1 to V2, where there was little overlap between the top 20 percent riskiest circuits for each model, the significant shifts in prioritization occurring between model versions are concerning.[121] This is discussed further in Section 4.6.1. Energy Safety has not completed a full evaluation of V3, given that it was neither fully completed nor in use during PG&E's initial submission of the 2022 Update.

PG&E has resolved the critical issue described in RN-PG&E-22-04. PG&E provides its future undergrounding plans with the associated required criteria.

4.6.3.4 Areas for Continued Improvement

PG&E must continue to improve in the following areas. Areas for continued improvement in this section are in addition to areas for continued improvement resulting from PG&E's Revision Notice Response.

Covered Conductor Effectiveness Lessons Learned

The joint covered conductor effectiveness study[122] clarified the differences in covered conductor installation across utilities. However, PG&E has not committed to applying the lessons learned from the joint covered conductor effectiveness study. Instead, many sections of the joint study report include equivocating language with no commitments to changes. For example, PG&E makes commitments such as continuing to perform studies, collect documentation, or conduct discussion, rather than committing to specific measurable changes to its covered conductor installation program. Additionally, many of the "next steps" described in the study do not include concrete commitments (e.g., the report states that utilities are "continuing these efforts in 2022 and providing an update in their 2023-2025

[121] "2021 Wildfire Mitigation Plan Workshop Grid Design and System Hardening" presented February 23, p. 4.

[122] The joint covered conductor effectiveness study resulted from a directive in PG&E's 2021 WMP Action Statement.

WMPs"). PG&E must apply lessons learned from the joint covered conductor effectiveness study to its assessments of covered conductor and show that it is progressing.

Covered Conductor Inspection and Maintenance

PG&E does not have a separate maintenance or training program for covered conductor inspections. Instead, PG&E relies on current routine inspection practices with modified checklists that include some covered conductor specific infractions.[123] However, the joint covered conductor study described in PG&E's 2022 Update[124] found the following:

> *Several covered-conductor-specific failure modes exist that require operators to consider additional personnel training, augmented installation practices, and adoption of new mitigation strategies (e.g., additional lightning arrestors, conductor washing programs, etc.).*

PG&E must evaluate its existing covered conductor maintenance practices to ensure that failure modes specific to covered conductor are being properly evaluated and that new equipment specific to covered conductor is being appropriately maintained, including providing updated training to employees and contractors as necessary.

New Technologies Evaluation and Implementation

PG&E had a failure with its rapid earth fault current limiter (REFCL) pilot in Calistoga in 2021, including the failure of REFCL equipment within a substation. PG&E had difficulty replacing the equipment due to supply chain issues.[125] This led to a setback in PG&E's ability to observe how REFCL could be used for wildfire prevention. PG&E continues performing analysis of the pilot but reports that given the setback it has no future targets set for expanding REFCL.

Utilities have completed pilots or are at different stages for implementing and observing promising new technologies, including PG&E's exploration of distribution fault anticipation (DFA), early fault detection (EFD), other line sensor devices, and Sensor IQ technology. Some of these capabilities are discussed in Section 4.6.2, "Situational Awareness and Forecasting."

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[123] Data Request OEIS-PG&E-22-007, Question 12.

[124] PG&E's 2022 Update, Section 4.6, Attachment 1, p. 20.

[125] PG&E's 2022 Update, p. 556.

PG&E must collaborate with other utilities to further explore the benefits of other system hardening and situational awareness technologies, including their combined effectiveness against wildfire risk, particularly in combination with other initiatives such as covered conductor.

Decreased Transmission Hardening Targets

PG&E has decreased its system hardening target objectives at the transmission level from 92 miles in 2021 to 32 miles in 2022, as seen in Table 4.6.3-1. The decrease is partially due to the lead time needed to perform transmission projects, as well as the time needed to reprioritize based on risk model output from V1 to V2.[126] PG&E must continue to improve and increase targets to address the risk that still exists along its system at the transmission level.

Decreased Transmission/Distribution Sectionalization Device Targets

Although PG&E continues adding sectionalization devices along both its distribution and transmission circuits, PG&E's targets for installing sectionalization devices decreased from 2021 to 2022, as seen in Table 4.6.3-1. According to its 2022 Maturity Survey responses, PG&E reports a maturity level of below 1. A maturity level of 1 means PG&E is focused on reducing the number of customers to 2,000 per switch, while the highest maturity level has a goal of 200 customers per switch.[127] When asked why PG&E was decreasing its targets, PG&E stated that it was reaching capacity in its ability to receive meaningful risk reduction when installing additional sectionalization devices.[128] PG&E must demonstrate the lack of additional risk reduction for adding additional sectionalization devices, particularly as it relates to PSPS risk, or increase its targets moving forward to minimize customer impacts.

[126] Data Request OEIS-PG&E-22-008, Question 2. V3 was not finalized as of PG&E's 2022 Update submission, thus did not yet inform grid hardening decisions.

[127] PG&E 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.c.

[128] Data Request OEIS-PG&E-22-011, Question 2.

Table 4.6.3-1: PG&E's 2019-2022 System Hardening Plans [129]

Program Target	2019	2020	2021	2022
Transmission System Hardening	40 miles	103 miles	92 miles	32 miles
Distribution Line Sectionalizing	241 switches	604 switches	250 switches	100 switches
Transmission Line Sectionalizing	0 switches	54 switches	29 switches	15 switches

Progress and Updates on Undergrounding and Risk Prioritization

Instead of primarily focusing on effectiveness against specific risk drivers present at particular locations, PG&E's current decision-making process for grid hardening appears focused on first selecting undergrounding as an initiative based on project feasibility. PG&E's decision-making flowchart considers risk model output and RSE evaluations further along in the process. This is concerning given that risk must be driving PG&E's decisions for mitigation. The flowchart and PG&E's decision-making is discussed further in Section 4.6.8.4, under "Resource Allocation Methodology."

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.4 Asset Management and Inspections

The asset management and inspections section of the Guidelines[130] requires the utility to discuss power line and infrastructure inspections for distribution and transmission assets

[129] PG&E 2022 Update, Table PG&E-5.3-1(A). 2019-2020 shows actual performance, whereas 2021-2022 shows PG&E's targets.

[130] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 p. 75 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

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.

4.6.4.1 Maturity Assessment

While PG&E has improved its overall maturity in the past three years, moving from 0.6 to 1.2, PG&E still remains behind its peers, as seen in Figure 4.6.4-1. Quality assurance and quality control (QA/QC) is the primary asset management and inspections capability in which PG&E is improving, as seen in Figure 4.6.4-2.

Figure 4.6.4-1: Cross-Utility Maturity Comparison for Asset Management and Inspections - Large IOUs (2020-2022 Actual, 2023 Estimated)

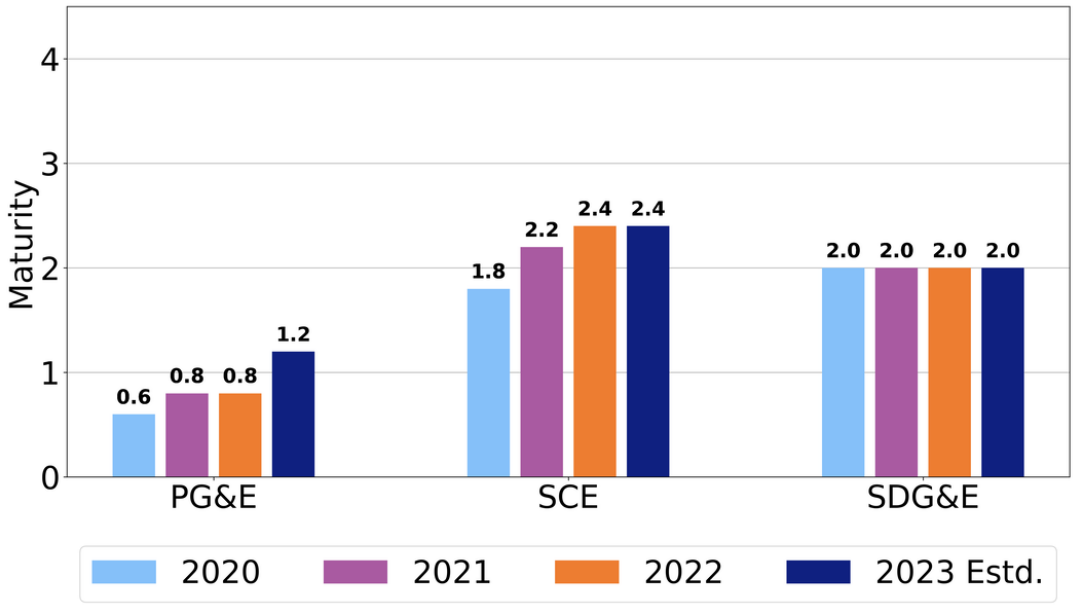
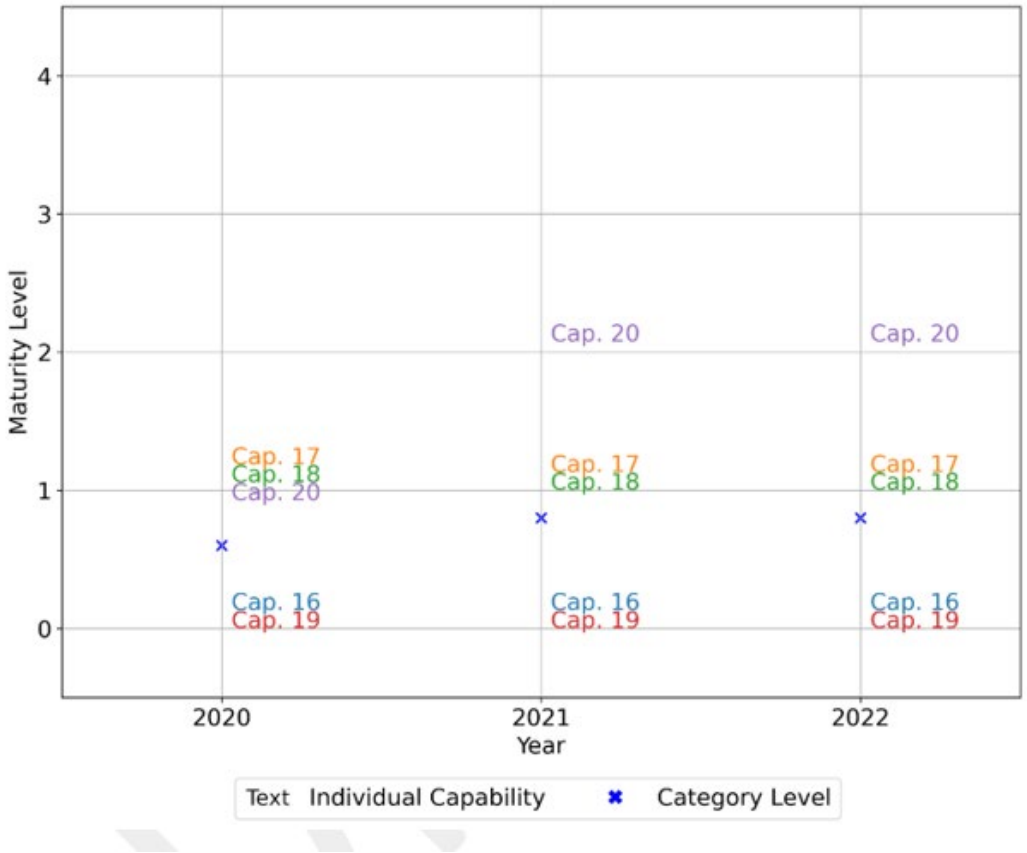


Figure 4.6.4-2: PG&E's Maturity Survey Responses for All Asset Management and Inspections Capabilities (2020-2022)



For the one asset management and inspections capability where PG&E grew in maturity since 2021, relating to QA/QC, it improved in the following areas:

- PG&E now uses up to date static maps instead of period schedules for its inspection schedules.[131]
- PG&E increased its granularity on checklists, trainings, and procedures from service territory to asset-level.[132]

[131] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, responses to D.II.e and D.II.h.

[132] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.III.c.

- PG&E's service intervals went from being set based on wildfire risk within an area to a relevant circuit granularity.[133]
- PG&E now uses QA/QC information to recommend training based on deficiencies and weaknesses identified.[134]

Areas limiting PG&E from maturing further include:

- PG&E moved from having an "accurate inventory of equipment" to "no service territory-wide inventory."[135] PG&E indicates this is due to its reinterpreting the granularity of its inventory database from structure-level to asset-level.[136]
- PG&E updates its asset condition only annually (as opposed to quarterly, monthly, or hourly).[137] PG&E indicates this is due to version control for inputting asset data as well as change management.[138]
- PG&E has not implemented continuous monitoring equipment, nor does it have the ability to automatically de-activate electric lines and equipment when failures are detected.[139]
- PG&E schedules its patrols based on periodic schedules, as opposed to static maps or risk modeling, with inputs based on static maps rather than risk modeling.[140]
- PG&E's procedures and checklists are only based on statute and regulatory guidelines and are not based on modeling, validated by independent experts, nor adjusted in real-time based on deficiencies found during inspections.[141]

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[133] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.IV.b.

[134] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.V.d.

[135] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.I.a.

[136] Data Request OEIS-PGE-22-002, Question 9.

[137] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.I.b.

[138] Data Request OEIS-PGE-22-002, Question 10.

[139] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.I.c.

[140] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, responses to D.II.b and D.II.c.

[141] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.III.b.

- PG&E still indicates on the survey that it is not consistently maintaining its electric lines and equipment as required by regulation,[142] due to the continued backlog of Wildfire Safety Inspection Program (WSIP) tags.
- PG&E is not using automated technologies (such as LiDAR, photographic scans, etc.) to audit and monitor contractor work, and no longer plans to do so by 2023.[143]

4.6.4.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle:

PG&E has improved its asset management and inspections through completion of infrared inspections, supplemental wildfire-related inspections, and efforts to increase recordkeeping and asset inventory information. PG&E has improved its asset management and inspections since its 2021 Update through the following:

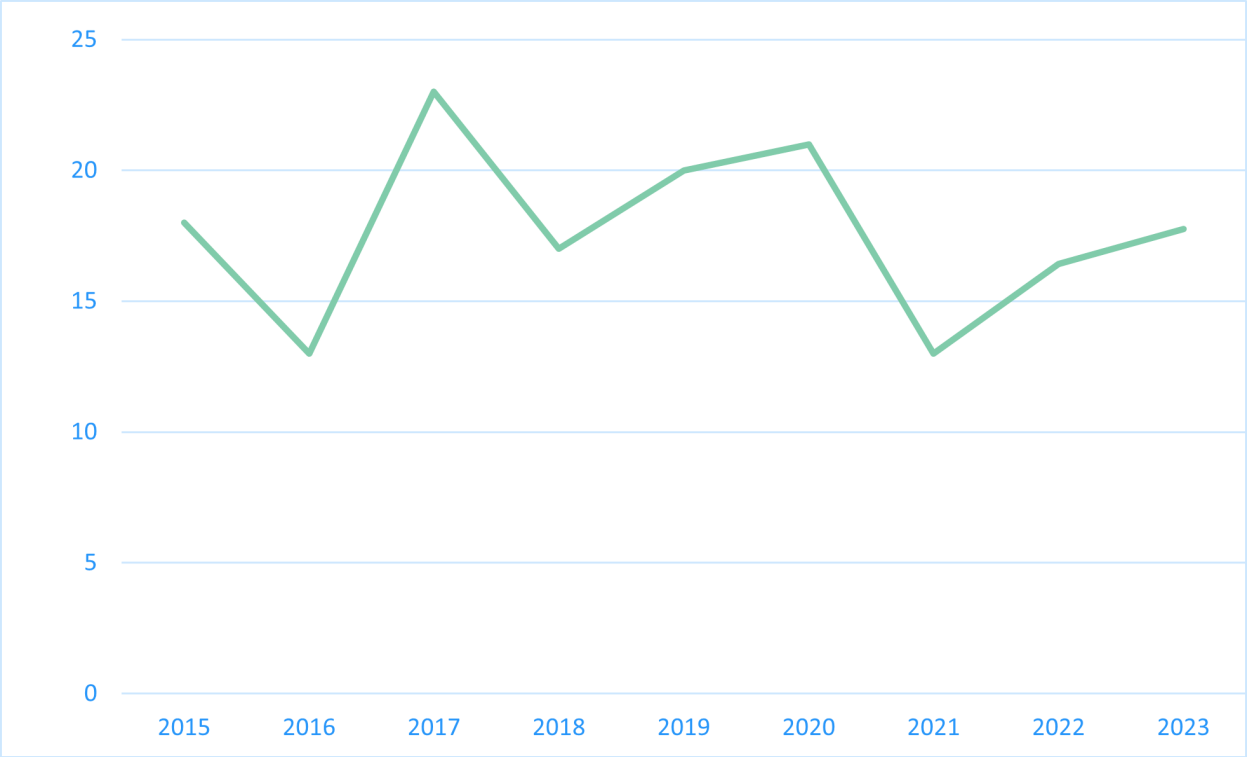
- PG&E is taking a more proactive approach to monitor transformer failures, as opposed to a practice of run-to-failure on this equipment. PG&E has made improvements that include monitoring oil temperature and using machine learning on SmartMeter data to evaluate device degradation over time.[144] Potentially due to the increased inspection and maintenance efforts, PG&E saw a decrease in distribution transformer-related ignitions from 2020 to 2021, despite an increase in outages, as seen in Figures 4.6.4-3 and 4.6.4-4.

[142] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.IV.a.

[143] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to D.V.a.

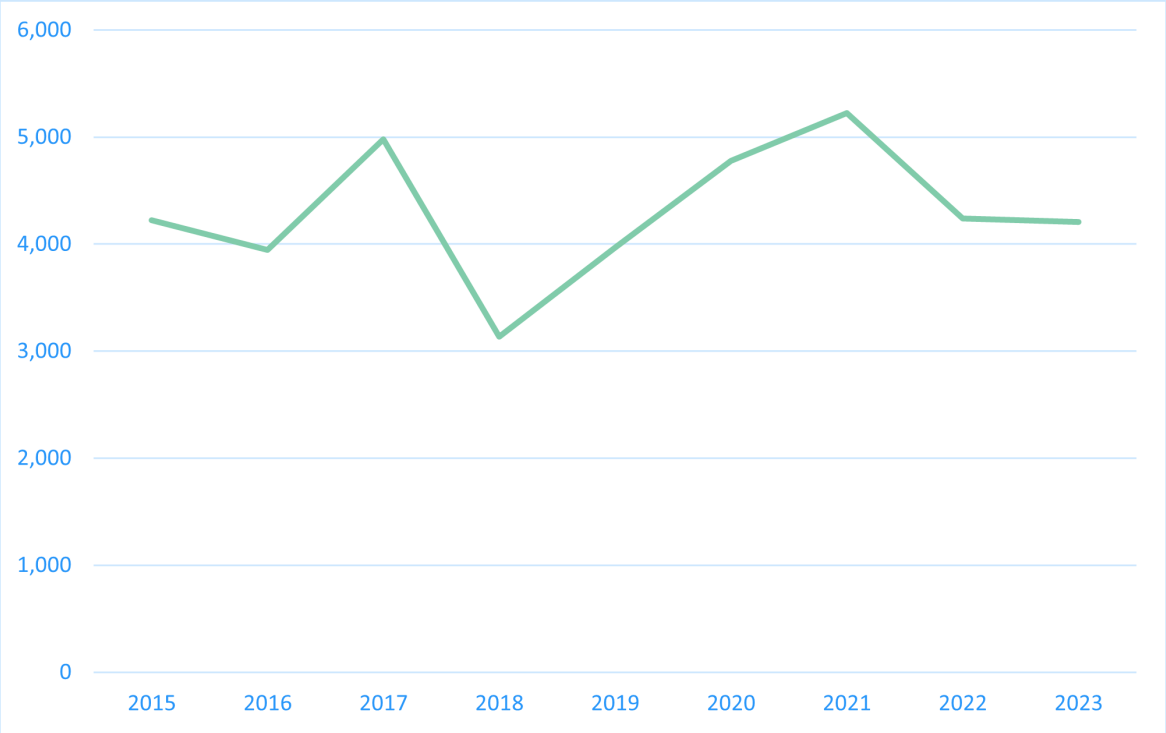
[144] Data Request OEIS-PG&E-22-004, Question 5.

Figure 4.6.4-3: PG&E's Annual Distribution Ignitions from Transformer Damage or Failure (2015-2021 Actual, 2022-2023 Estimated]) [145]



[145] PG&E's 2022 Update, Quarterly Data Report, Table 7.2

Figure 4.6.4-4: PG&E's Annual Distribution Outages from Transformer Damage or Failure (2015-2021 Actual, 2022-2023 Estimated)[146]



- Although PG&E has had a continual backlog of work orders, as discussed further below, PG&E developed a plan to use its consequence risk modeling output to prioritize completing higher risk work orders.[147] However, this prioritization only accounted for consequences and lacks analysis on specific failure modes and associated ignitions to which work orders may pertain. For instance, PG&E is not currently using similar risk modeling analysis to determine the likelihood of ignition based on equipment failure.
- Based on PG&E's historical higher equipment failure rate (in comparison to SCE and SDG&E), PG&E conducted studies to investigate causes for ignitions within the HFTD and determine associated corrective actions. These studies included contamination tracking in locations identified with multiple tracking events as well as modeling

[146] PG&E's 2022 Update, Quarterly Data Report, Table 7.2.

[147] PG&E's 2022 Update, p. 316.

spans at high risk for wire-to-wire contact.[148] PG&E also continues to benchmark with other utilities, although it presents no additional lessons learned related to equipment failures in its 2022 Update.

4.6.4.3 PG&E Revision Notice

As described in Section 1.3.2, Energy Safety issued PG&E a Revision Notice in response to its 2022 Update submitted on February 25, 2022. PG&E submitted its responses to the revision notice on June 27, July 11, and July 26, 2022. This section evaluates that response as it relates to asset management and inspections.[149]

Critical Issue RN-PG&E-22-05: PG&E Has a Significant Backlog of Repairs and Needs a More Aggressive Plan to Address the Poor Health of Its Infrastructure

Energy Safety required PG&E to create a plan that demonstrates consistent progress on reducing the number of open work tags and improves the health of its infrastructure. To ensure that PG&E is reducing its backlog of work tags, Energy Safety required PG&E to develop a plan to remediate more work tags than it creates.[150]

Energy Safety required PG&E to provide a resource plan, including timeline and quantitative targets for either a number or percentage of work tags PG&E plans to remediate per quarter for the remainder of 2022 as well as 2023. Energy Safety required that the plan include a description of how PG&E prioritizes completion based on risk analysis and modeling and where resources are being diverted from other efforts, if applicable.

Energy Safety also required PG&E to provide a spreadsheet of all work tags open as of the date of its response that were generated in the HFTD as well as all remediations in the HFTD that PG&E completed in 2021. Energy Safety required these data to include:

- The date the work order was generated
- The priority of the work order
- The HFTD tier

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[148] PG&E's 2022 Update Section 4.6, Attachment 2, p. 14.

[149] PG&E's Revision Notice Response, June 27, 2022, and PG&E's Revision Notice Response, July 11, 2022.

[150] Note: The work tag shows that remediation is needed. The remediation is resolving and closing the work tag.

- The remediation due date
- The date the remediation was completed (if applicable)
- Latitude
- Longitude

RN-PG&E-22-05: PG&E Response Summary

PG&E provided a chart (Figure RN-PG&E-22-05-01) describing the discrepancy between newly created and closed HFTD work tags from Q1 2020 to Q1 2022. This chart clearly depicts a much larger number of work tags being created than closed, as shown in Table 4.6.4-1. To address the backlog, PG&E discussed its plans to prioritize the open work tags that present the highest risk based off consequence risk modeling, with the goal to reduce the estimated risk by 48 percent by the end of 2023. PG&E stated that after January 1, 2023, all new ignition risk work tags in the HFTD will comply with General Order (GO) timelines. However, PG&E indicated that Priority A and B tags already comply with GO 95. PG&E later identified its "steady-state" to mean that tags are in accordance with GO requirements.

Table 4.6.4-1: PG&E HFTD Tags Created and Closed 2020-2022, including Routine and Backlog

Year	Tags Created	Tags Closed	Difference
2020 as of Q1	371,906	160,680	211,226
2021 as of Q1	396,797	208,566	188,231
2022 as of Q1	514,934	317,939	196,995

PG&E stated in its response that up until recently, Field Safety Reassessments (FSRs) were used to reprioritize tags either to accelerate or extend dates for completing the repair. PG&E confirmed that in future, FSRs will be used to elevate tag priority to an A-tag or a B-tag if the condition has degraded.

PG&E provided timelines and quantitative goals for each remaining quarter in 2022 and 2023, as shown in Table 4.6.4-2. PG&E did not include transmission work tag goals for 2023, but stated that it plans on maintaining a "steady-state" for ignition-related transmission work tags. Table 4.6.4-2 differs from Table 4.6.4-1 as it only includes the backlogged work tags, while Table 4.6.4-1 includes routine tags being closed out.

Table 4.6.4-2: PG&E's 2022 and 2023 Quantitative Targets for Closing HFTD Backlogged Tags

Quarter	Distribution	Transmission
Q3 2022	12,700	3,800
Q4 2022	4,700	3,500
Q1 2023	8,300	-
Q2 2023	26,700	-
Q3 2023	40,000	-
Q4 2023	8,300	-

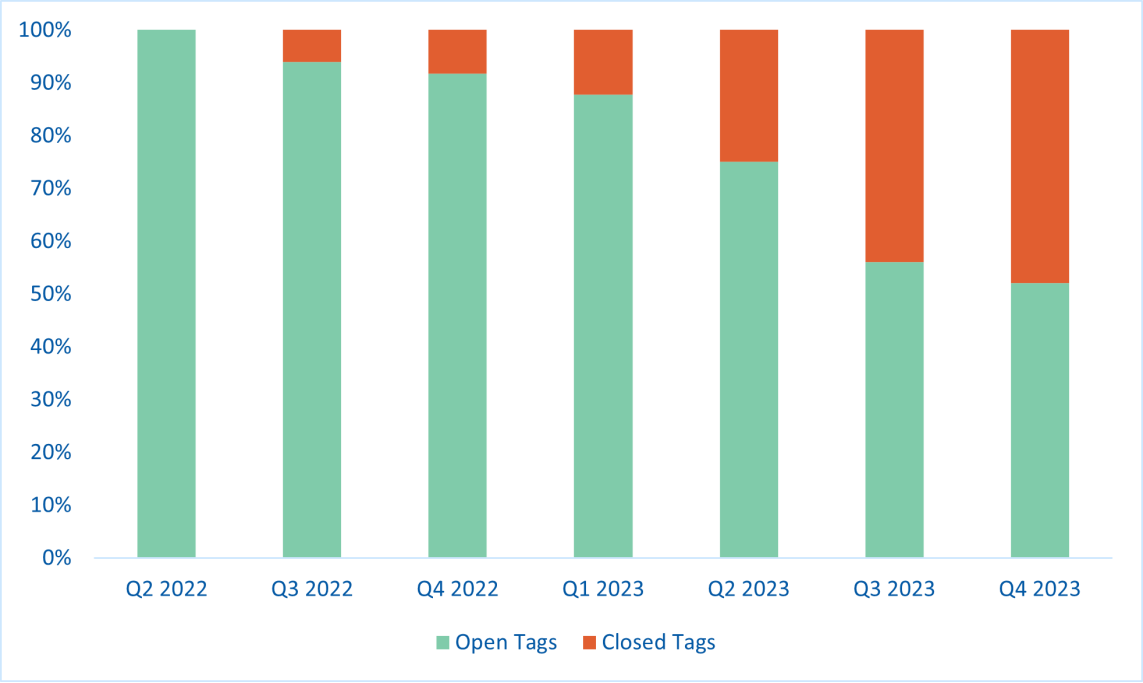
PG&E attached multiple spreadsheets with information on open work orders as of June 7, 2022, in its Revision Notice Response.

RN-PG&E-22-05: Energy Safety Evaluation

PG&E's commitment to restructuring FSRs to focus on elevating tag priority as needed as opposed to extending due dates is major progress in bringing transparency to its backlog of work tags as well as developing a better understanding of the issue of not meeting GO requirements. PG&E also demonstrated a significant step forward by committing to numeric targets specific to reducing the existing backlog in 2022 and 2023. These targets reflect commitments to reducing the backlog while taking into consideration existing resource constraints, particularly when considering the scale on which PG&E is working and the need to keep routine maintenance a priority.

Despite providing quantitative goals to address the work tag backlog, PG&E is still creating more work tags than it is closing, as shown in Table 4.6.4-1. In the Revision Notice, Energy Safety discussed addressing the backlog by setting targets in which PG&E closes more work tags than it opens. Even with the goals provided in PG&E's Revision Notice Response, 52 percent of the open work tags for distribution will still be open at the end of 2023.

Figure 4.6.4-5: Distribution Tags based on Closing Backlogged Tag Goals



Because of its backlog, PG&E is not currently complying with relevant GOs. As seen in Table 4.6.4-3, over 54 percent of the distribution tags that were open on June 7, 2022, were overdue.

Table 4.6.4-3: PG&E Overdue Distribution Tags by Priority

Priority	# Total	# Overdue	% Overdue
A	60	4	6.67%
B	3,203	471	14.70%
E	153,539	104,072	67.78%
F	44,976	9,572	21.28%
H	8,457	N/A[151]	N/A

[151] Priority H designates Priority E tags delayed to be included within a planned distribution system hardening project.

Priority	# Total	# Overdue	% Overdue
Total	210,235	114,119	54.28%

Progress on Meeting Asset Inspection Regulatory Requirements

PG&E must come into compliance with the relevant General Order (GO) work order backlog requirements by the end of 2023. PG&E indicates it intends to reach this as a "steady-state" goal. However, PG&E must provide a plan describing its progress on closing work orders to eventually reach a functional capability whereby more work orders are being closed than are being opened.

PG&E has de-escalated the critical issue RN-PG&E-22-05. PG&E provided a spreadsheet with the required information, as well as quantitative targets for 2022 and 2023. PG&E's targets for distribution are shown in further detail in Figure 4.6.4-5. It should be noted that the total number of work tags used in this figure is static based on the number of open distribution tags. Although PG&E still has a long way to go to come into compliance with GO 95 requirements and to reduce its backlog to a steady state, by committing to firm reduction targets and dispensing with the practice of continually re-starting the clock on repairs, PG&E's response to its Revision Notice is a significant step in the right direction. It should also be noted that this is not indicative of the additional tags that will be opened per quarter.

PG&E has de-escalated the critical issue described in RN-PG&E-22-05; however, the issue still rises to the level of requiring an area for continued improvement.

Given PG&E's need to further demonstrate GO compliance in the future, Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

Critical Issue RN-PG&E-22-06: PG&E Does Not Sufficiently Explain Its Increase in Distribution-Level Ignitions from Equipment Failure, Nor Provide a Remediation Plan

Energy Safety required PG&E to provide a plan to address increases in ignitions from equipment failures categorized by equipment type, to include the following:

- Conductors
- Switches
- Crossarms
- Reclosers

- Connection devices

Energy Safety required PG&E to provide its plan to include additional efforts, if any, it will undertake that are informed by a root cause analysis outside those efforts PG&E completes as part of its routine maintenance program or as part of program-level WMP initiatives. As applicable, Energy Safety required PG&E to include descriptions of root cause analyses by equipment type and explain any trends that inform changes to its inspections and maintenance programs. If such root cause analyses had not already been performed, PG&E needed to explain why, as well as how it has otherwise identified trends and reoccurring issues.

Energy Safety required PG&E to explain why it does not predict decreases in ignitions for equipment failures from 2022 to 2023, broken down by equipment type. Energy Safety also required PG&E to explain how its mitigations for all equipment types affect predicted ignition rates.

RN-PG&E-22-06: PG&E Response Summary

In the first part of its response, PG&E included background data on equipment failures in relation to ignition trends. It also provided its overarching programmatic plans to mitigate equipment-related ignitions, broken down by equipment type. In the second part of its response, PG&E provided more context on its various ignition investigation teams and examples of specific actions taken for discrete ignitions. For example, for a conductor ignition with the index of 418, PG&E conducted a Safety Condition Assessment Review to evaluate the incident location and mitigate associated risk. In the third part of its response, PG&E provided revised projections for equipment failures based on EPSS and mitigation program implementation. For the last part of its response, PG&E described how its various mitigation programs reduce ignitions.

RN-PG&E-22-06: Energy Safety Evaluation

PG&E's programs addressing increases in ignitions from equipment failures categorized by equipment types demonstrate measures to move toward more proactive maintenance. For instance, for capacitors, reclosers, and regulators, PG&E discussed testing the functionality of

these types of equipment beyond GO 165 inspection requirements.[152] PG&E also discussed its Enhanced Ignition Analysis program to evaluate various aspects of ignition events and identify failure mode-specific corrective actions. PG&E expects this program to help reduce similar causes of ignitions moving forward. Given that PG&E initiates investigations for each ignition through its Corrective Action Plans (CAP) and adjusts its programs accordingly based on specific root cause issues. PG&E's response is adequate at this time and does not have an associated area for continued improvement. Energy Safety will continue to monitor PG&E's progress in reducing ignitions rates due to equipment failures over the coming years.

PG&E has resolved the critical issue described in RN-PG&E-22-06: it provided adequate responses to each of the requirements. In particular, PG&E's examples of actions taken for specific ignitions helped demonstrate that PG&E undertakes active investigations into the underlying causes of individual ignitions and mitigates associated risks, although the examples were not exhaustive and provided only high level descriptions.

Critical Issue RN-PG&E-22-07: PG&E's Ignition Projections Do Not Account for Its Ignition Mitigation Measures

Energy Safety required PG&E to revise and resubmit its 2022 Update Table 7.2 to project 2022 and 2023 ignitions, factoring in risk reduction benefits of mitigation measures, including (but not limited to) EPSS, undergrounding, and covered conductor.

Energy Safety also required PG&E to provide a narrative description of the factors it considered when calculating ignition projections, inclusive of WMP mitigation measure implementation, the weights of such factors, and their effects on projected ignitions.

RN-PG&E-22-07: PG&E Response Summary

PG&E provided a table that included updated ignition projections based on Table 7.2 from PG&E's 2022 Update. PG&E also included associated explanations on how it calculated the new projections, which detailed the changes accounted for including EPSS.

[152] GO 165 only includes requirements for timing of cycles of distribution, patrol, and instrusive inspections. PG&E's testing of the functionality of these types of equipment is in addition to these inspections.

RN-PG&E-22-07: Energy Safety Evaluation

PG&E reported an increase in HFTD ignition projections in 2022, as seen in Table 4.6.4-4. However, PG&E expected an overall decrease in ignitions of nine percent for 2022 and six percent for 2023. The 2022 HFTD increase from its original projection for 2022 is based on observed ignitions from January to May 2022. PG&E explained that new ignition projections include 2021 and 2022 ignitions, factor in additional impact from EPSS, and account for variations seen from EPSS implementation in 2022.

Table 4.6.4-4: PG&E 2022 and 2023 HFTD Ignition Projection Changes

Year	Original Projection	New Projection	Percent Change
2022	101.9	107	4.98%
2023	102	80.8	-20.81%

While PG&E adjusted ignition projections accordingly, with most categories decreasing or remaining the same (248 out of 260 for 2022 and 252 out of 260 for 2023), PG&E projected a few increases in ignitions within the HFTD, as seen in Tables 4.6.4-5 and 4.6.4-6. This is primarily due to factoring in an increase in realized third-party and animal contact ignitions that occured between January and May 2022. Given that the projected increase is not due to equipment ignitions, PG&E is still primarily projecting decreases in ignitions associated with drivers where it is implementing other mitigation measures.

Table 4.6.4-5: PG&E 2022 Increases in Ignition Projections, HFTD Tier 2 and 3

Ignition Type	Voltage Level	HFTD Tier	Original 2022 Projection	New 2022 Projection
Vegetation Contact	Distribution	Tier 2	28.4	32.9
Animal Contact	Distribution	Tier 2	5.7	7.5
Animal Contact	Distribution	Tier 3	0.7	1
Animal Contact	Transmission	Tier 2	1.7	3
Animal Contact	Transmission	Tier 3	0.7	1.2
Vehicle Contact	Distribution	Tier 2	5	6.3
Vehicle Contact	Distribution	Tier 3	0.7	3.3

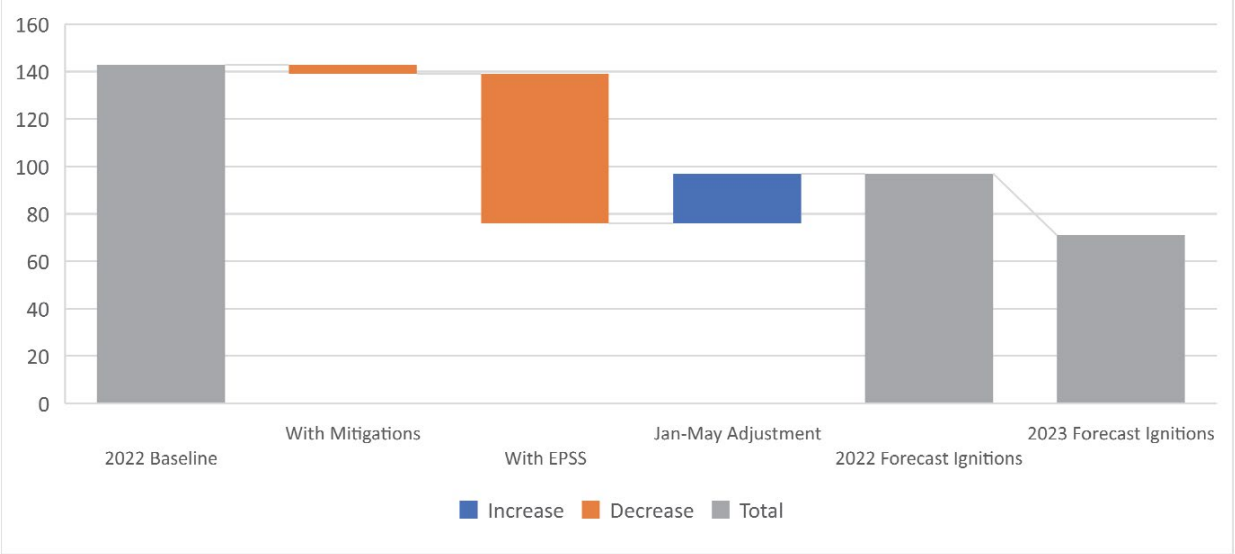
Ignition Type	Voltage Level	HFTD Tier	Original 2022 Projection	New 2022 Projection
Other CFO	Distribution	Tier 2	1.4	2.2
Insulator and brushing	Distribution	Tier 3	0.7	1.1
Utility Work/Op	Distribution	Tier 3	0.7	1.1
Unknown	Distribution	Tier 3	0.7	0.8
Unknown	Transmission	Tier 2	0.3	0.4

Table 4.6.4-6: PG&E 2023 Decreases in Ignition Projections, HFTD Tier 2 and 3

Ignition Type	Voltage Level	HFTD Tier	Original 2023 Projection	New 2023 Projection
Animal Contact	Distribution	Tier 3	0.7	1.1
Animal Contact	Transmission	Tier 2	1.9	3
Animal Contact	Transmission	Tier 3	0.9	1.2
Vehicle Contact	Distribution	Tier 3	0.7	1.5
Other CFO	Distribution	Tier 2	0.1	0.3
Unknown	Distribution	Tier 2	2.1	2.3
Unknown	Distribution	Tier 3	0.7	0.9
Unknown	Transmission	Tier 2	0.1	0.4

As shown in Figure 4.6.4-6, most of the decreases in the 2022 baseline ignitions are due to EPSS implementation, with minimal decrease from additional initiatives outside of EPSS. PG&E stated that, excluding EPSS, it expects ignitions to decrease by 3 percent from 2021 to 2022, and by approximately 7.4 percent from 2022 to 2023.

Figure 4.6.4-6: PG&E's Changes to Projected Distribution Ignitions[153]



PG&E has resolved the critical issue described in RN-PG&E-22-08, satisfying each required remedy.

Critical Issue RN-PG&E-22-08: PG&E Has High Find and Failure Rates in Its Quality Assurance and Quality Control of Asset Inspections

Energy Safety required PG&E to explain actions taken to improve its quality control processes. Specifically, Energy Safety required PG&E to:

- Increase the quality of its asset inspections and provide an update on progress and timeline for implementation for all actions PG&E expects to undertake to improve the quality of its asset inspections.[154]
- Provide quarterly quantitative asset management QA/QC goals for both findings and reducing failure rates for the remainder of 2022 and 2023.
- Explain whether there is a failure rate threshold at which PG&E will take remedial (e.g., training) or disciplinary action in response to an inspector's failure rate. If so, provide

[153] Provided in RN-PG&E-22-07.

[154] PG&E's Reply Comments to the 2022 WMP, pp. 39-40.

that threshold and describe the action that PG&E takes to address inspectors with high failure rates.

- Provide a detailed description of how PG&E escalates non-adherence to asset inspections' processes and procedures.
- Provide actions to improve training for both internal inspectors and contractors in PG&E's asset inspection and management program based on repeat QA/QC findings.
- Provide an update on PG&E's QA/QC findings and failure rates for asset inspections completed since the 2022 Update submission.

RN-PG&E-22-08: **PG&E Response Summary**

PG&E provided an additional list of actions being taken to improve the quality of its asset inspections, such as improving training, increasing QA/QC activities, and holding poorly performing personnel accountable. PG&E also included a table describing these actions, updates on progress, and timelines for implementation, with six actions being completed and three being implemented by the end of 2022. PG&E also provided concrete QA and QC goals: 90 percent for distribution and 95.5 percent for transmission inspections. PG&E provided a list of specific actions it is taking if inspectors do not meet these pass rates, such as further management intervention, training, and potential termination. Lastly, PG&E provided its QC and QA rates observed so far in 2022, as seen in Table 4.6.4-7.

Table 4.6.4-7: PG&E 2022 QA/QC Actuals and Goals

Inspection Type	QA or QC Pass Rate	QA or QC Goal
Transmission Field	35%	95.5%
Transmission Desktop	36%	95.5%
Distribution Field	45%	90%
Distribution Desktop	66%	90%
Transmission QA	96.95%	95.5%
Distribution QA	77.84%	90%

RN-PG&E-22-08: Energy Safety Evaluation

PG&E is already behind on its 2022 goals, as seen in Table 4.6.4-7, with only one inspection type surpassing PG&E's goal. PG&E's failure rates have increased for each QC inspection type from 2021 to 2022, as seen in Table 4.6.4-8. PG&E must show improvement in its QA/QC to demonstrate that the actions it is taking are making a difference in improving the quality of asset inspections.

Table 4.6.4-8: PG&E 2021 and 2022 Asset Inspection QC Failure Rates[155]

Inspection Type	2021 Failure Rate	2022 Failure Rate
Transmission Field	8.5%	65%
Transmission Desktop	33%	64%
Distribution Field	20%	55%
Distribution Desktop	13%	34%

Future Quantitative Targets to Reduce the Backlog of Repairs

PG&E states that it has not yet established its quantitative 2023 QA/QC goals, as it will use the 2022 results to inform these values. PG&E must commit to future quantitative goals based on desired outcomes and not actual results in order to track its progress on improving QA/QC as well as establish thresholds for which additional action is required.

Asset Inspections Quality Assurance and Quality Control

PG&E's list of actions being taken to improve its QA/QC process lacks quantitative means to measure performance moving forward, with little explanation as to how PG&E is measuring the success of each action. It is difficult to discern which actions will lead to improvements given that PG&E is implementing multiple actions at once. Therefore, PG&E must develop a process to evaluate which actions are benefiting the performance of its asset inspections.

[155] 2021 numbers from Data Request CalAdvocates-PGE-2022WMP-12, Questions 2-10.

PG&E does not state that it plans to re-inspect any inspections completed by poor performing inspectors. Re-inspection is critical to ensure inspections are accurately identifying and catching needed repairs and replacements.

PG&E must demonstrate continued improvement and further evaluation of enhancements to its asset inspections moving forward. PG&E provided specific numeric goals for 2022 along with actions being taken to meet those goals, but PG&E must demonstrate actual improvement and progress towards meeting goals in the future.

PG&E has de-escalated the critical issue described in RN-PG&E-22-08, however based on PG&E's response, it still rises to the level of requiring an area for continued improvement.

Given the above outstanding issues, Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.4.4 Areas for Continued Improvement

PG&E must continue to improve in the following areas. Areas for continued improvement in this section are in addition to areas for continued improvement resulting from PG&E's Revision Notice Response.

Retainment of Inspectors and Internal Workforce Development

One factor contributing to the quality of inspections may be the difficulty in retaining qualified and experienced inspectors. PG&E must analyze its internal asset inspector retention rate for qualified and experienced inspectors. The analysis must, at a minimum, include collating data on the length of time an inspector is contracted or employed, capturing the reasons an inspector leaves their position, and understanding inspector employment satisfaction. PG&E must evaluate this information to determine the key challenges associated with retaining inspectors. PG&E must then develop and implement targeted measures to retain quality asset inspectors.

Additionally, PG&E does not have a plan to increase its internal workforce of asset inspectors.[156] The majority of inspectors are employed through contractors, with 84% of transmission ground inspections and 87% of distribution ground inspections being

[156] Data Request OEIS-PGE-22-016, Question 6.

completed by contractors in 2021.[157] PG&E must evaluate the benefits of having more inspectors in-house, therefore gaining more familiarity with PG&E's procedures and equipment, as well as providing continuity toward long-term goals and objectives.

Benchmarking with Other Utilities on Inspector Qualifications

PG&E requires that its distribution asset inspectors be Journeymen,[158] while other utilities only require such inspectors to be Qualified Electrical Workers (QEW).[159] While it seems logical to assume that inspectors with higher qualifications would produce higher quality inspections, PG&E has continually had lower QA/QC pass rates in comparison to other utilities. This may be in part due to the high turnover rates of Journeymen-level inspectors. PG&E must benchmark its inspector retention rate and minimum qualifications against SCE and SDG&E and explore whether use of different qualifications could improve inspector retention and lead to improved quality control.

Asset Inspection Drone Program Pilot

PG&E launched a PSPS-related drone pilot initiative at the end of 2021 in response to an issue identified in Energy Safety's Action Statement on PG&E's 2021 WMP Update.[160] PG&E plans to continue developing more aerial distribution inspection pilot in 2022 with a view to launching further drone inspections in 2023 pending pilot results. Given the success of drone piloting use by other utilities in identifying issues , PG&E must progress in this area by continuing to actively collaborate with other utilities to gain the benefits in using additional technology to augment and aid inspections. PG&E must hasten the current timeframe for expanding its drone inspections in 2022.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

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[157] Data Request OEIS-PG&E-22-008, Question 3.

[158] Data Request OEIS-PGE-22-016, Question 4.

[159] SDG&E 2022 Upate, Table 5-6, and SCE 2022 Update, Table 5-5.

[160] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 68 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

4.6.5 Vegetation Management and Inspections

The vegetation management and inspections section of the Guidelines[161] requires utilities to discuss vegetation management inspections. The discussion must include inspections that go beyond existing regulation, as well as remote sensing inspections, and patrol inspections of vegetation around distribution and transmission lines and equipment. Utilities must also discuss quality control of those inspections and limitations on the availability of workers. In addition, they must 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 (e.g., erosion, flooding).

4.6.5.1 Maturity Assessment

PG&E continues to have the lowest maturity level among the large IOUs in vegetation management and inspections, with a level of 0.7 (Figure 4.5.4-1).[162] PG&E's individual capability levels in vegetation management (VM) remained static from 2020 to 2022.

A key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update, PG&E-21-18, Minimally Planned Maturity of VM Program, required PG&E to "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."[163] If PG&E meets its estimated projections for 2023, it will reach maturity level of one in these two capabilities by 2023.

[161] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 pp. 75-76 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[162] Data Request OEIS-PG&E-22-002, Question 1.

[163] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 78 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

Figure 4.6.5-1: Cross-Utility Maturity Levels for Vegetation Management and Inspections - Large IOUs (2020-2022 Actual, 2023 Estimated)

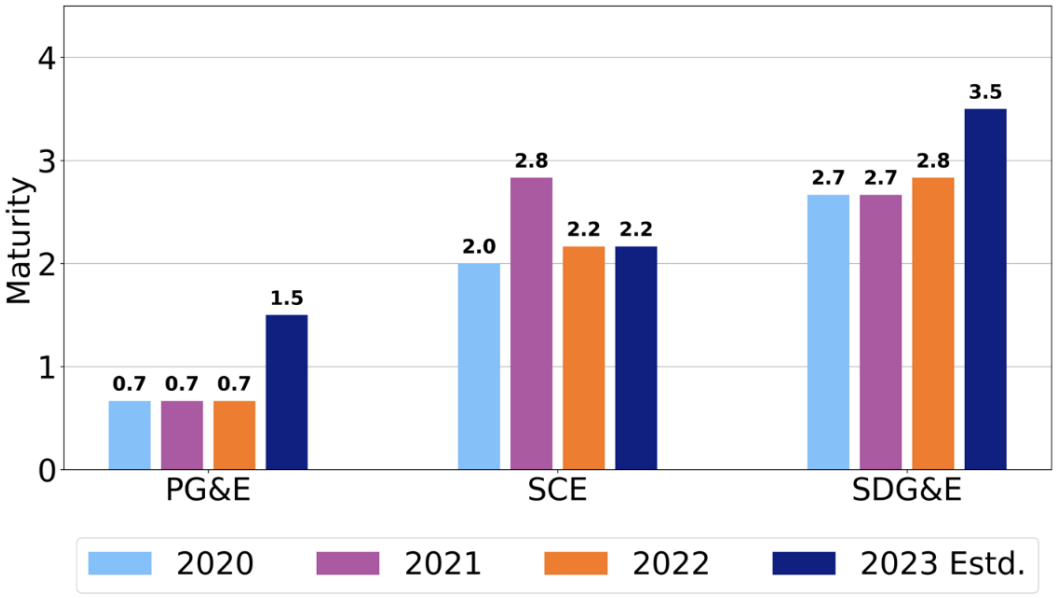
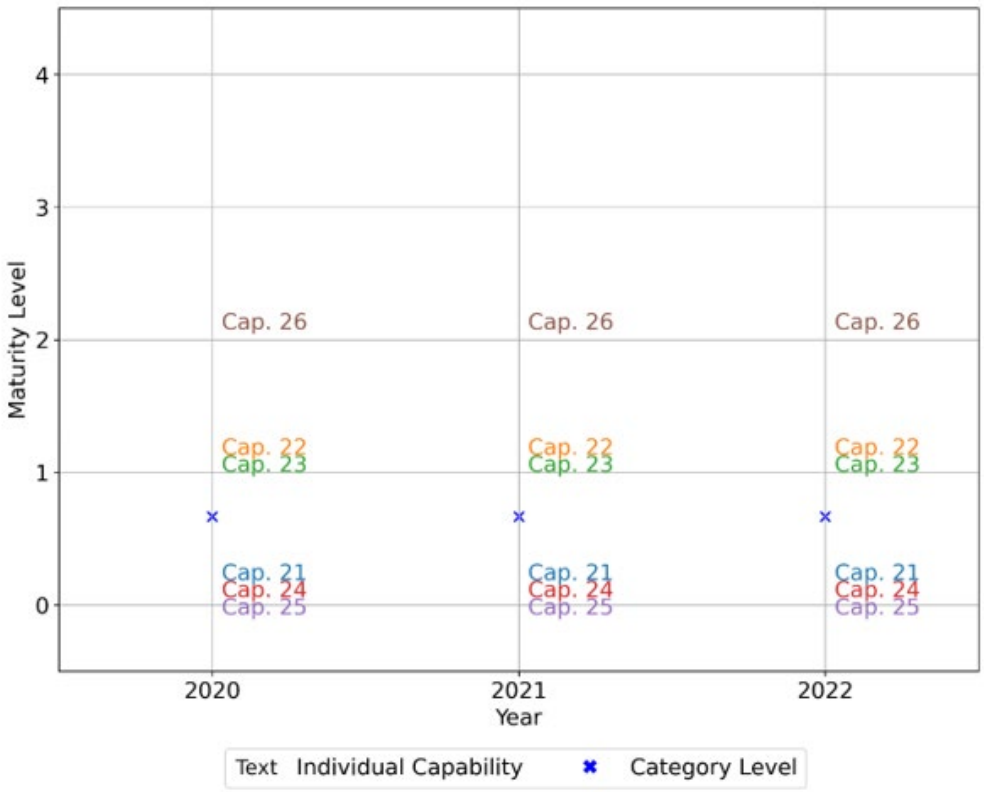


Figure 4.6.5-2: PG&E's Maturity Survey Responses for All Vegetation Management and Inspections Capabilities (2020-2022)



4.6.5.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle:

External Communication

To improve customer communication, in 2021, PG&E created its Constraints Resolution Team, which works with local governments, agencies, and landowners to address permitting or access to property limitations that temporarily prevent or delay enhanced vegetation management (EVM) work from being performed.[164] This team may be helpful in remedying

[164] PG&E's 2022 Update, page 631.

the 970.5 constrained[165] EVM miles PG&E reported to Energy Safety on August 4, 2022 (Table 4.6.5-1).[166]

Table 4.6.5-1: Remaining Constrained Miles for PG&E's Enhanced Vegetation Management Program as of August 4, 2022[167]

Category	Miles
Customer Refusals or Non-Contacts	405.7
Land or Environmental Hold	481.8
Both Customer & Environmental Holds	83.0
Total	**970.5**

Additionally, PG&E expanded its use of a file transfer program, "ProjectWise," to share monthly look-ahead VM workplans with opted-in counties and Regional Water Quality Control Board representatives.[168] These efforts, as well as additional new and external outreach approaches, are well illustrated by two flowcharts[169] PG&E provided to Energy Safety in response to a 2021 Additional Area for Improvement.[170]

[165] Constraints for EVM may include permitting requirements, landowner refusals to perform work, and access issues from wildfire impacts, weather, or other unsafe field conditions – Enhanced Oversight and Enforcement Process Corrective Action Plan, 90-Day Report, Pursuant to Resolution M-4852, February 2, 2022.

[166] From Energy Safety's Compliance Division and PG&E's biweekly meeting: Slides for PG&E & Energy Safety Bi-Weekly Check-In, August 9, 2022.

[167] From Energy Safety's Compliance Division and PG&E's biweekly meeting: Slides for PG&E and Energy Safety Bi-Weekly Check-In, August 9, 2022.

[168] PG&E's 2022 Update, p. 632.

[169] Flow charts are found in PG&E's 2022 Update, Attachment "2022-02-25_PGE_2022_WMP-Update_R0_Section 4.6_Remedy 5.5D_Atch01.pdf."

[170] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 85.

See Section 7 for an area for continued improvement related to PG&E's Constraints Resolution Team and external engagement.

Quality Assurance

To improve its auditing of vegetation management activities, PG&E in 2021, established a Quality Assurance and Quality Verification (QA/QV) Team. At the start of 2021, PG&E hired and trained 35 Senior Vegetation Management Inspectors (SVMI). The SMVI training program includes PG&E's Structured Learning Pathway (SLP) and additional training in record and information management. SVMI's are then audited four times over the course of their first year.[171] As of December 2021, PG&E had 100 SVMIs, including internal employee resources and contract partners.[172] PG&E states that the "increase in [the] SVMI workforce allows PG&E to better support VM by ensuring all contracts, standards, and specifications are being adhered to with respect to the project in question."[173]

Record Keeping

PG&E continues to improve record keeping and cross-business communication using its centralized vegetation management system known as "One VM Tool." In 2021, for the One VM Tool, PG&E completed six of six planned development "sprints" and demonstrated user functionality to operations subject matter experts. In January 2022 the One VM Tool was deployed as a pilot to Routine Maintenance and Tree Mortality programs on distribution lines.[174] PG&E plans to integrate the following programs into its One VM Tool by the end of 2025:[175]

- EVM
- Work Verification
- Wood Management

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[171] PG&E's 2022 Update, p. 651.

[172] PG&E's 2022 Update, p. 653.

[173] PG&E's 2022 Update, p. 653.

[174] PG&E's 2022 Update, p. 697.

[175] Data Request OEIS-PGE-22-012, Question 4.

- LiDAR
- Vegetation Control (Pole Clearing)
- Wildfire Response
- Utility Defensible Space
- Routine Maintenance (Transmission)
- Transmission Programs (Orchards, IVM, ROWX)
- System Hardening VM Work/Estimating Arborist (EA)
- Vegetation Management Inspections (VMI)

PG&E had internally proposed integrating all listed VM programs into its One VM Tool by the end of 2023.[176] However, PG&E has not adopted this proposed schedule because the "[t]he complexities of IT development on multiple integrated systems, subsequent user feedback, scope of the project, and leadership decision making has resulted in a more extended schedule than originally anticipated."[177] Energy Safety considers PG&E's effort to centralize its vegetation related record-keeping into its One VM Tool essential. Energy Safety encourages PG&E to integrate all VM programs into its One VM Tool as rapidly as possible.

Effectiveness of Enhanced Clearances

A key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update was PG&E-21-23, Effectiveness of Enhanced Clearances, which required PG&E to partner in a multi-year vegetation clearance study with SCE and SDG&E.[178] Since the publication of Energy Safety's Action Statements on the utilities' 2021 WMP Updates, the large IOUs have focused on standardizing definitions and reviewing options for creating a cross-utility database for tree-related risk events. Each utility performed an initial analysis studying the relationship between line clearance and vegetation related outages on its systems.

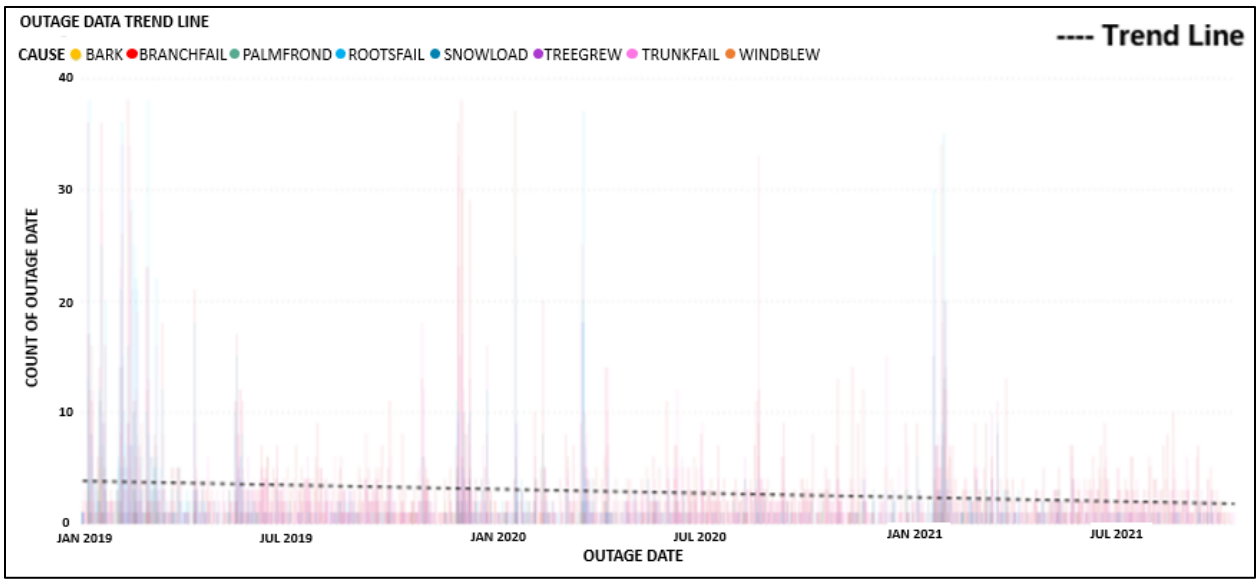
[176] Data Request OEIS-PGE-22-012, Question 4.

[177] Data Request OEIS-PGE-22-017, Question 1.

[178] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 83 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

PG&E examined outage data confirmed as tree-related events and the distinct causes[179] of the outages since the inception of its EVM program in January 2019. PG&E's analysis shows a decrease in tree-related events over the three-year period (Figure 4.6.5-3). PG&E acknowledges that "this data is preliminary and the decreases in tree-related causes cannot be attributed solely to enhanced clearances without further examination."[180] Energy Safety's analysis of the data it receives on a quarterly basis from PG&E does not show any trend (decrease or increase) in the number of vegetation-caused outages and ignitions on PG&E's grid (Figure 4.6.5-4). Energy Safety's analysis does not negate PG&E's, nor does PG&E's analysis negate Energy Safety's.

Figure 4.6.5-3: PG&E's Tree-related Outage Data and Trend Line[181]

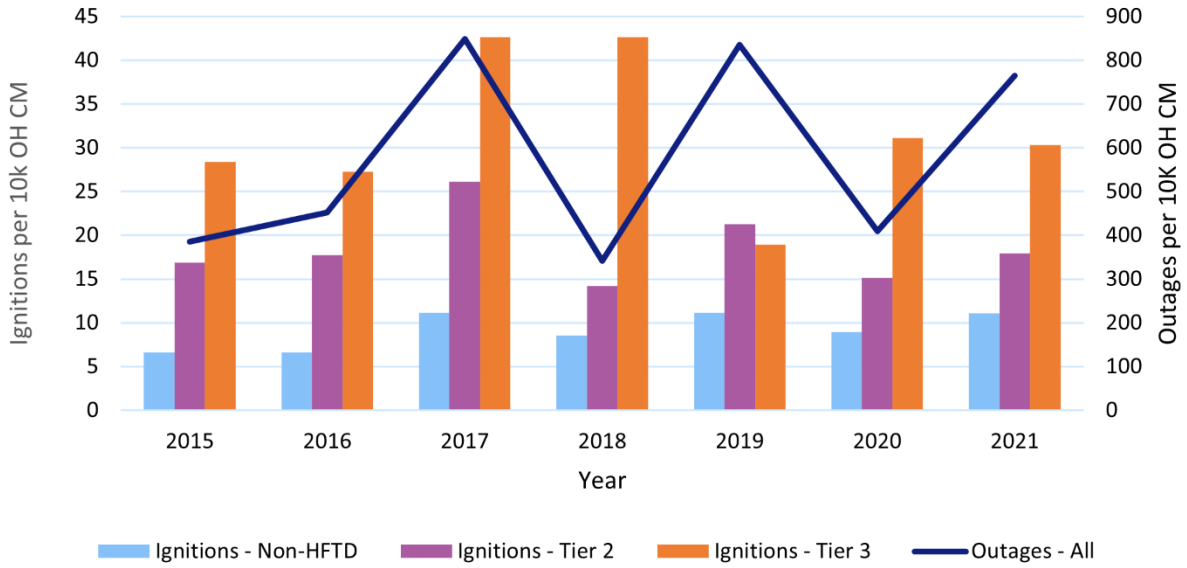


[179] Outage cause codes included were Bark, BranchFail, PalmFrond, RootsFail, TreeGrew, and WindBlew.

[180] PG&E's 2022 Update, Section 4.6, Attachment 1, p. 102.

[181] PG&E's 2022 Update, Section 4.6, Attachment 1, p. 102.

Figure 4.6.5-4: PG&E's Vegetation-Caused Ignitions by HTFD Tier and Outages per 10k Overhead Circuit Mile (OH CM)



The large IOUs have set several objectives for 2022 for the multi-year vegetation clearance study:

- Hiring a third party to help achieve and validate the objectives of their study.
- Standardizing data collection for tree-caused risk events and creating a cross-utility database of these events.
- Examining whether the correlation between enhanced clearances and fewer tree-caused outage events may be attributable to other factors, such as the management of hazard trees and the installation of covered conductor.

Because the study spans multiple years, Energy Safety expects PG&E, SCE, and SDG&E to show progress as they continue the study year to year. See Section 7, "List of PG&E Areas for Continued Improvement and Required Progress," for Energy Safety's requirements related to the effectiveness of the enhanced clearances joint study.

Need for Quantified VM Compliance Targets

PG&E now includes 10 quantified VM compliance targets compared to 2021, when it included only two. This was in response to a key area for improvement cited in Energy Safety's Action

Statement on PG&E's 2021 Update, PG&E-21-24, Need for Quantified VM Compliance Targets,[182] and per Energy Safety's 2022 Update Guidelines requirements.[183]

4.6.5.3 PG&E Revision Notice

As described in Section 1.3.2, Energy Safety issued PG&E a Revision Notice in response to its 2022 Update submitted on February 25, 2022. PG&E submitted its responses to the revision notice on June 27, July 11, and July 26, 2022. This section evaluates that response as it relates to vegetation management and inspections.[184]

Critical Issue RN-PG&E-22-09: PG&E Has Failed to Provide Plans to Mature in Certain Vegetation Management Capabilities

Energy Safety required PG&E to benchmark its use of predictive and risk modeling in VM with SCE and SDG&E and to consider benchmarking with at least one electric utility outside California.[185]

Energy Safety also required PG&E to report on practices learned from benchmarking regarding the use of predictive and risk modeling in VM and discuss the initial steps that it will take to incorporate those practices into its VM programs.

RN-PG&E-22-09: PG&E Response Summary

PG&E benchmarked 1) scheduling vegetation inspections, 2) creating procedures and checklists, and 3) using modeling to guide clearances around lines and equipment with SCE, SDG&E, and Portland General Electric.

PG&E found alignment among its California peers in the:

- Use of LiDAR to identify areas of concern as a modeling input

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[182] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 84 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[183] These targets include those required by RN-PG&E-22-10. Energy Safety considers PG&E's Quality Assurance and Quality Verification (QA/QV) targets as one target with seven components.

[184] PG&E's Revision Notice Response, June 27, 2022, and PG&E's Revision Notice Response, July 26, 2022.

[185] Ideally, this other utility would have vegetation management challenges that are similar to those faced by PG&E (e.g., density of vegetation).

- Evaluation of fire footprints for target patrols or additional patrols
- Evaluation of ignitions and PSPS events to minimize events through additional patrols
- Use of annual and mid-cycle field inspections within Tier 2 and Tier 3 areas of the HFTD
- Use of risk modeling on the enhanced vegetation management programs for an annual scope of work based on highest risk ranked circuits[186]

PG&E made numerous observations during benchmarking, highlighting various approaches taken by PG&E and its peer utilites:

Scheduling Inspections

- SDG&E and SCE have developed processes of review that inform and influence their inspection cycles beyond regulatory or statutory requirements.
- SCE, SDG&E, and Portland General have developed tree inventories at varying levels of maturity that guide the additional inspections or mid-cycle inspections variations.
- SDG&E has the most comprehensive approach to inspections and SCE is developing an approach similar to SDG&E's.

Checklist and Procedures

- PG&E's and Portland General's procedures and guidance are primarily based on regulatory requirements.
- SDG&E has mature processes and checklists that support inspections. This is driven by historical data collection and inventory over the last 10 years for each tree.
- SCE includes equipment information in its checklists and has created a checklist for field inspections, guided by tree species.

Modeling for Clearances

[186] PG&E Revision Notice Response, July 26, 2022, pp. 7-8

- SCE uses LiDAR, inspections, tree growth data, and "Areas of Concern"[187] to determine clearances and does not have a predictive modeling input.
- SDG&E divides its approach to guide clearances. Inspections determine which trees require pruning and recommend clearances. The tree crews determine how a tree is to be pruned and the tree clearance based on species and the tree's health to survive additional clearances.
- PG&E uses its Tree Assessment Tool (TAT) to guide decisions on strike tree potential for the EVM program. PG&E uses a risk model to identify and prioritize its EVM work and focuses mid-cycle patrols on the HFTD and high fire risk area (HFRA), as well as State Responsibility Area, wildland urban interface areas , and Fire Hazard Severity Zones. PG&E does not use risk modeling to determine clearances for its Routine or Tree Mortality programs.

As a result of the benchmarking, PG&E has identified initial steps to mature in certain capabilities in its vegetation management program:

- Identify one or two of the highest risk regions in PG&E's service territory to implement a pilot process for inspections and to guide clearances. The pilot would use PG&E's Targeted Tree Species Study to identify "at-risk" species. It would then use that information to guide clearances and inventory "at-risk" individuals. PG&E proposes to implement this pilot in Q2 2023.
- Develop a collaborative, cross-functional team similar to SCE in creating "Areas of Concern"[188] to develop guidelines to inform inspections.
- Review the process and procedures for collecting and enhancing checklists for field inspections and current clearance guidance.
- Develop a process to guide optimal clearance beyond statutory requirements by species and region.

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[187] Areas of Concern (AOC) "are areas that posed increased fuel-driven and wind- driven fire risk primarily due to elevated dry fuel levels" identified by SCE's Fire Science team (SCE's 2022 Update, p. 365).

[188] Areas of Concern (AOC) "are areas that posed increased fuel-driven and wind- driven fire risk primarily due to elevated dry fuel levels" identified by SCE's Fire Science team (SCE's 2022 Update, p. 365).

- Evaluate how the sequencing of mid-cycle inspections can be adjusted to align with Areas of Concern in highest risk regions.
- Evaluate the feasibility of developing a multi-year historical tree data set.

RN-PG&E-22-09: Energy Safety Evaluation

PG&E has resolved the critical issue described in RN-PG&E-22-09, satisfying each required remedy.

Progression of Vegetation Management Maturity

Now that PG&E has identified initital steps to mature in certain capabilities in its vegetation management, PG&E must report on its implementation of these steps in its 2023 WMP.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

Critical Issue RN-PG&E-22-10: PG&E Does Not Report Targets for Its Vegetation Management Quality Assurance and Quality Verification Program or for Poles Brushed

Energy Safety required PG&E to provide targets in accordance with a key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update, PG&E-21-24, Need for Quantified VM Compliance Targets,[189] and the 2022 WMP Guidelines for its QA/QV program and number of poles brushed per Public Resources Code section 4292. For the QA/QV targets, PG&E could have provided either the percentage of vegetation inspections audited (as prescribed by the Guidelines) or the number of audits/reviews it plans to perform (as described in Data Request OEIS-PG&E-22-005, Answer 6, and reiterated in Table 8 of its 2022 Update).

[189] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 84 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

Energy Safety required PG&E to establish an acceptable quality level (AQL) for performance for each QA/QV program listed in Table 8. The AQL for each program could be no lower than 95 percent.[190]

Energy Safety required PG&E to present targets and associated AQLs in a revised WMP Table 5.3-1.

RN-PG&E-22-10: PG&E Response Summary

PG&E provided targets for its QA/QV program and number of poles brushed per Public Resources Code section 4292. For the QA/QV targets, PG&E provided the number of audits/reviews it plans to perform in 2022, which match internal targets described in Data Request OEIS-PG&E-22-005, Answer 6, and reiterated in Table 8 of PG&E's Revision Notice.

PG&E established an acceptable quality level (AQL) for performance for each QA/QV program and set the AQL for each program at 95 percent.

PG&E provided these targets and associated AQLs in its revised 2022 Update, Table 5.3-1.

RN-PG&E-22-10: Energy Safety Evaluation

For distribution audits, PG&E reported that it targets performing 43 QA audits and 1,522 QV reviews for a group of four programs: Routine, Tree Mortality, EVM, and Pole Clearing. In future years, Energy Safety recommends that PG&E set distinct targets for each distribution VM program rather than grouping programs together; this would allow for further transparency into how VM programs are being audited and reviewed.

PG&E has satisfied each required remedy described in RN-PG&E-22-10. PG&E has resolved this critical issue.

Critical Issue RN-PG&E-22-11: PG&E Has Failed to Implement the Vegetation Management Refresher Curriculum It Committed to Implement in Its 2021 WMP Update

Energy Safety required PG&E to provide a progress update, a summary of the curriculum, and a timeline for the completion of its VM refresher training in 2022.

[190] An AQL of 95% or greater is in line with PG&E's peer utilities.

RN-PG&E-22-11: PG&E Response Summary

PG&E provided a progress update, a summary of the curriculum, and a timeline for the completion of its VM refresher training in 2022.

PG&E contended that it "has not failed to follow through on the statements made in its 2021 WMP as the Critical Issue title implies. Rather, PG&E started the process of creating a refresher curriculum in 2021."[191]

PG&E then described milestones for developing its VM refresher training curriculum, including:

1. Technology Updates (training on PG&E's One VM Tool)
2. Strike Tree Identification
3. Environmental Training
4. Tree Crew Pre-Qualification Program

RN-PG&E-22-11: Energy Safety Evaluation

PG&E has satisfied each required remedy described in RN-PG&E-22-11. PG&E has resolved this critical issue.

4.6.5.4 Areas for Continued Improvement

PG&E must continue to improve in the following areas. Areas for continued improvement in this section are in addition to areas for continued improvement resulting from PG&E's Revision Notice Response.

Reduce Necessity for the Utility Defensible Space Program

In Section 7.3.5.20 of its 2022 Update, PG&E details its Utility Defensible Space (UDS) program and sets a target to work 7,000 distribution poles in the HFTD. Energy Safety inquired to what standard PG&E works these poles. PG&E responded it "clears poles to a 50 [foot] horizontal radial distance around poles, and a minimum vertical clearance of understory vegetation 6 [feet] from the ground." PG&E clarified that UDS is not a bare-ground program, rather UDS reduces ladder fuels with the goal of modifying the vertical and horizontal continuity of fuels.

[191] PG&E's Revision Notice Response, June 27, 2022, p. 47.

PG&E further stated that it benchmarked clearances against other California utilities. PG&E considers a suite of other mitigation measures to complement, reduce, or eliminate the need to perform UDS treatment. For example, EVM, system hardening, retardant application, EPSS, and undergrounding.[192] While Energy Safety believes UDS is effective, Energy Safety does not consider this activity as a long-term solution. Energy Safety would like to see PG&E decrease its UDS program over time as it implements other mitigations, such as system hardening and undergrounding. PG&E must report on any progress made to reduce the need for the UDS program and provide a plan for achieving progress that extends through the 2023 -2025 WMP cycle.

External Engagement for Vegetation Management

As discussed in PG&E's progress regarding VM, in 2021 PG&E created a constraints resolution team and has expanded access to its file transfer program, "ProjectWise." Energy Safety expects to see continued progress in engaging customers, communities, governments, and agencies in part by reporting on how it is addressing and reducing the number of constrained miles for VM programs, including metrics.

Auditing of Internal Pre-Inspectors

PG&E noted during the 2022 Update workshop[193] that it has hired pre-inspectors as employees. As SCE and SDG&E exclusively use contracted pre-inspectors,[194] Energy Safety asked PG&E to provide QA/QV findings demonstrating performance categorized by inspector type (i.e., contractor vs. PG&E employee). PG&E did not provide QA/QV findings stating, "the QA/QV scope is currently focused on contract pre-inspectors and does not evaluate the performance of PG&E pre-inspector employees."[195] Energy Safety acknowledges that hiring internal pre-inspectors is relatively new and internal pre-inspectors account for 6.7 percent of

[192] Data Request OEIS-PG&E-22-07, Question 18.

[193] Energy Safety's 2022 Wildfire Mitigation Plan Workshop for Large Electrical Corporations: https://energysafety.ca.gov/events-and-meetings/events/2022-wildfire-mitigation-plan-workshop-for-large-electrical-corporations/ (accessed Sept. 22, 2022).

[194] 2022 Wildfire Mitigation Plan Workshop for Large Electrical Corporations and Data Request OEIS-SDGE-005, Question 10, respectively.

[195] Data Request OEIS-PG&E-005, Answer 3.

all PG&E's pre-inspectors. Nevertheless, all pre-inspectors must be subject the QA/QV audits "ensuring all contracts, standards, and specifications are being adhered to with respect to the project in question."[196]

Vegetation Management Wildfire Inspection Guide – Stakeholder Engagement

In response to a key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update, PG&E-21-20, Non-inclusion of Fire Damage Attributes in Hazard Tree Assessments,[197] PG&E states it has been using its 2019 Wildfire Response Guidance[198] document to assess hazard trees post-fire and is currently in the process of developing a VM Wildfire Inspection Guide. PG&E intends to finalize this Inspection Guide by the third quarter of 2022.[199] Energy Safety expects PG&E to include objective post-fire hazard tree assessment criteria in its Inspection Guide, using a tool similar to its Tree Assessment Tool (TAT), if appropriate. Considering the scant details PG&E provides on its upcoming Inspection Guide, PG&E must engage with Energy Safety, CAL FIRE, the Wildfire Safety Advisory Board, and other stakeholders to receive feedback on the guide. In its 2023 WMP, PG&E must attach the finalized guide, provide a summary of stakeholder input, and report on any input given by stakeholders that was integrated into the guide.

Progression of Effectiveness of Enhanced Clearances Joint Study

As discussed in PG&E's progress regarding VM, the large IOUs have jointly made progress addressing the requirement of a key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update, PG&E-21-23, Effectiveness of Enhanced Clearances.[200]

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[196] PG&E's 2022 Update, p. 653.

[197] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 79 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[198] Pacific Gas and Electric Company Progress Report Response to Energy Safety Remedies PG&E-21-01 through PG&E-21-28, November 1, 2021, Attachment "2021WMP_OEISRemedy_PGE-21-20_Atch01_Redacted.pdf" (accessed September 26, 2022): https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan/2021WMP-OEISRemedies-PGE-2021-11-01-Attachments.zip.

[199] PG&E's 2022 Update, Section 4.6, Attachment 1, p. 92.

[200] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 83 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

Energy Safety expects the large IOUs to continue their efforts and meet their self-identified objectives by the submission of the 2023 WMPs. Specifically, Energy Safety requires marked progress on development of data standards for the cross-utility tree-caused risk event database and creation of that database. Energy Safety also requires continuation of the effectiveness of enhanced clearances joint study through at least 2025.

Participation in Vegetation Management Best Management Practices Scoping Meeting

Additionally, through analysis of all current and past WMPs, Energy Safety has identified the need for a scoping meeting to discuss how utilities would best learn vegetation management best management practices from each other. This scoping meeting may result in additional meetings, workshops, or the formation of a working group. This scoping meeting is part of the effort to clarify the current differences between electrical corporations' vegetation management programs and allow for collaboration among the electrical corporations, stakeholders, and academic experts. PG&E must participate and collaborate with its peers and Energy Safety in this scoping meeting.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.6 Grid Operations and Operating Protocols, Including PSPS

The grid operations and operating protocols section of the Guidelines[201] requires discussion of ways the utility operates its system to reduce wildfire risk. For example, disabling the reclosing function of automatic reclosers[202] during periods of high fire danger (e.g., Red Flag Warning conditions) can reduce utility ignition potential by minimizing the energy released and the duration of the release when there is a fault. This section also requires discussion of work procedures in conditions of elevated fire risk and protocols to reduce the frequency and

[201] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 p. 76 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

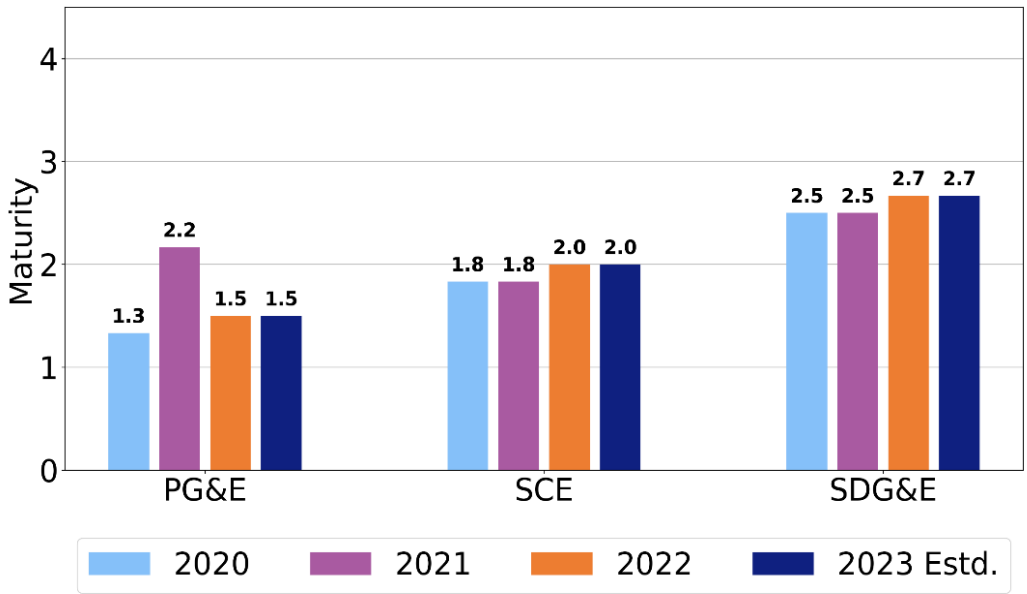
[202] A recloser is a switching device that is designed to detect and interrupt momentary fault conditions. The device can reclose automatically and reopen if a fault condition is still detected. However, if a recloser closes a circuit that poses the risk of ignition, wildfire may be the result. For 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.

scope of de-energization, including PSPS events (e.g., through sectionalization). Further, this section requires the utility to report whether it has stationed and/or on-call ignition prevention and suppression resources and services.

4.6.6.1 Maturity Assessment

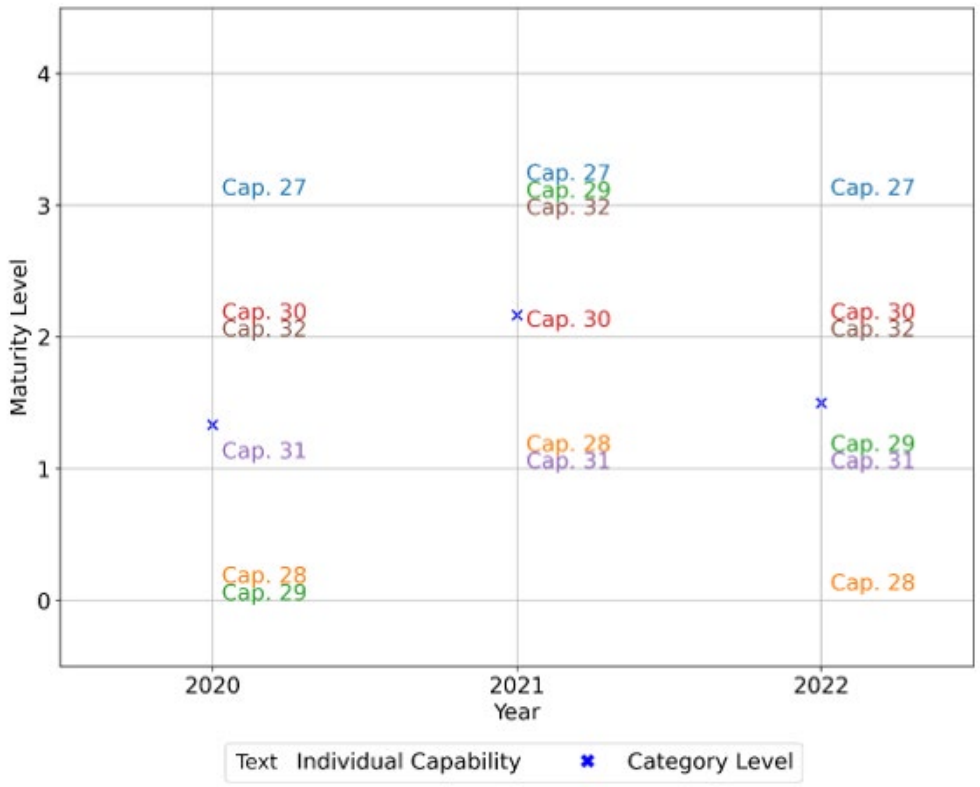
According to its responses to the 2022 Maturity Survey, PG&E reports a 2022 maturity level of 1.5 in the grid operations and protocols category, a decrease from its 2021 maturity level (2.2) and close to the same level as it reported in 2020 (1.3) at the start of the current WMP cycle. This is despite its reported increase in maturity level from 2020 to 2021, from maturity level 1.3 to 2.2. Compared to peer utilities, PG&E's 2022 maturity in this category is more than one maturity level lower than that of SDG&E, and slightly lower than that of SCE. See Figure 4.6.6-1 below. According to its responses on the 2022 Maturity Survey, PG&E's individual capability maturity levels in this category generally remained the same or increased, as seen in Figure 4.6.6-2, with some exceptions that are discussed below.[203]

Figure 4.6.6-1: Cross-Utility Maturity Levels for Grid Operations and Operating Protocols – Large IOUs (2020-2022 Actual, 2023 Estimated)



[203] Maturity levels range from zero to four, with four being the most mature.

Figure 4.6.6-2: PG&E's Maturity Survey Responses for All Grid Operations and Operating Protocols Capabilities (2020-2022)[204]



Based on its 2022 Maturity Survey responses, PG&E improved in the following areas since 2021:

- PG&E increased the sensitivity of its grid risk reduction elements during high threat weather conditions based on risk mapping and monitors near misses.[205]
- PG&E is using predictive modeling for equipment maintenance, rebuild, or replacement decisions based on grid operating history, with the model externally reviewed and evaluated with historical data verification.[206]

[204] Titles of capabilities and PG&E's levels can be found in PG&E's 2022 Utility Wildfire Mitigation Maturity Survey.

[205] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.I.a.

[206] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.II.c.

- PG&E moved from operating its grid above rated voltage and current load from "during any conditions" to "never."[207]

PG&E decreased in maturity since 2021 in the following areas:

- PG&E does not automatically track operation history throughout the grid at a circuit level.[208] Last year, PG&E responded that it was doing so; however, PG&E stated that the 2021 response "Yes" was potentially incorrect and that its records show a consistent survey response of "No" in 2020 and 2021. PG&E reports that it currently has systems in place to track operation history and that it plans to expand its tracking of operation history but does not anticipate having a fully automated process by 2023.[209]
- PG&E decreased the percentage of customers notified regarding forecasted PSPS events, moving from greater than 99 percent notified to greater than 95 percent notified.[210]
- PG&E reported that the percentage of customers who complained during PSPS events increased from less than 0.5 percent to greater than one percent.[211]
- PG&E no longer predicts that its inspection process prior to re-energization will be partially automated by 2023, which was what it projected in 2021. Instead, the process remains manual and not automated at all.[212]
- PG&E no longer meets all criteria for training and tools for contractors and workers in the field. It indicated that this is because cell reception and communication tools have posed challenges throughout PG&E's service territory.[213]

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[207] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.II.d.

[208] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.II.b.

[209] Data Request OEIS-PG&E-22-001, Question 2.

[210] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.III.b.

[211] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.III.c.

[212] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.V.b.

[213] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.VI.b, and Data Request OEIS-PG&E-22-008, Question 7.

4.6.6.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle:

In its 2021 WMP Action Statement on PG&E's 2021 Update, Energy Safety identified two issues and corresponding remedies in the Grid Operations and Operating Protocols section.[214] These proposed remedies addressed how system hardening affects operational protocols and PSPS thresholds. PG&E's actions taken on these remedies is described in Section 4.6.6.4.

In 2021, Energy Safety also required PG&E to provide details on the evaluation behind its decision to increase its fixed-wing fleet.[215] In its 2022 Update, PG&E states that it currently has no plans to increase its company-owned fixed-wing fleet for WMP-related activities.[216]

PG&E has progressed in the development of its grid operations programs and initiatives in the following areas:

- As it did in 2020, PG&E disabled its automatic reclosers within Tier 2 and 3 HFTD areas prior to fire season in 2021 following Utility Procedure TD-1464P-01 (Fire Index Patrol and Non-Reclose Procedure), which outlines recloser settings during fire season. In 2022, PG&E plans to continue following the same procedures. PG&E states that 99 percent of distribution reclosing devices and 95 percent of transmission line devices are enabled with Supervisory Control and Data Acquisition (SCADA); the remaining are disabled manually.[217]
- In 2020, PG&E developed "SafetyNet observation cards" that allowed PG&E personnel to submit comments about the safety of activities being performed and demonstrate adherence to Utility Standard TD-1464S (Preventing and Mitigating Fires While Performing PG&E Work). In 2021, PG&E adjusted its quality control (QC) program for following Standard TD-1464S based on its 2020 lessons learned and findings. PG&E

[214] Energy Safety's Action Statement on PG&E's 2021 WMP Update, pp. 91-92 (accessed April 22, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[215] Energy Safety's Action Statement on PG&E's 2021 WMP Update, pp. 91-92 (accessed April 22, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[216] PG&E 2022 Update, p. 241.

[217] PG&E 2022 Update, p. 706.

states that it began implementation of its QC program pilot with Safety and Infrastructure Protection Team (SIPT) leads. However, SIPT availability to perform QC observations was limited during fire season due to fire response activities.[218] As a result, PG&E states that its Field Safety Specialist Team now performs wildfire mitigation QC observations to confirm adherence to Standard TD-1464S.

- In 2021, PG&E implemented "all clear zones" to identify PSPS-impacted transmission and distribution assets approved for service restoration at a more granular level. PG&E states that it incorporated these improvements into its PSPS guidance procedure (PSPS-1000P-01).[219]

4.6.6.3 PG&E Revision Notice

As described in Section 1.3.2, Energy Safety issued PG&E a Revision Notice in response to its 2022 Update submitted on February 25, 2022. PG&E submitted its responses to the revision notice on June 27, July 11, and July 26, 2022. This section evaluates that response as it relates to grid operations and protocols, including PSPS.[220]

Critical Issue RN-PG&E-22-12: PG&E Has Failed to Provide Sufficient Evidence to Support Its Extensive Use Of Enhanced Powerline Safety Settings and Instead Relies On the Findings Of a Time-Limited Pilot Deployed in 2021

PG&E failed to provide sufficient evidence to support its extensive use of Enhanced Powerline Safety Settings (EPSS). PG&E relied on the findings of a time limited EPSS pilot deployed in 2021 to support the widespread deployment of EPSS. While PG&E reported ignition reductions over the period of the pilot, there was no clear evidence that all of these ignition reductions can be directly attributable to EPSS settings. Energy Safety was concerned that PG&E is hastily deploying this strategy across its system based on minimal data and without fully understanding the public safety impacts that may result from widespread application.

Energy Safety required PG&E to take action in the following areas: 1) explain how it will analyze EPSS deployment and modify settings; 2) reassess customer impacts associated with

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[218] PG&E 2022 Update, p. 711.

[219] PG&E 2022 Update, p. 716.

[220] PG&E's Revision Notice Response, July 11, 2022.

more widespread use of EPSS; 3) explain its EPSS customer impact mitigation plan; 4) detail its customer outreach plan; 5) present an EPSS staffing and resourcing plan; 6) detail an EPSS benchmarking plan; and 7) submit monthly EPSS data reports through the end of 2022.

RN-PG&E-22-12: Response Summary

In response, PG&E provided the following:

1. PG&E discussed collecting and analyzing data for EPSS through several methods and sources. These included the following:
    a. Using controlled laboratory testing
    b. Re-engineering devices and circuit settings based on 2021 lessons learned
    c. Continuing to review said device settings based on ignitions and outages (including examples of specific remediations and corrective actions taken for certain circuits, such as transferring customer load to a non-EPSS circuit)
    d. Using SCADA enablement based on EPSS criteria
    e. Identifying highly impacted circuit protection zones to install additional devices
2. PG&E reported the completion of an additional customer reliability study following the preliminary one completed in January 2022. This study will be completed by the end of the year, after more data are collected based on 2022 performance. PG&E reported that it has also been completing vegetation management on EPSS circuits, as well as asset repairs on circuits with EPSS enabled.
3. PG&E discussed six reliability measures being taken to improve system reliability, including targeting equipment repairs on the top 50 EPSS circuits and installing settings on distribution line devices, working on routine and EVM programs, proactive EPSS circuit vegetation management on 12 primary circuits, forming vegetation strike teams during emergency work, and targeting equipment repairs on EPSS circuits.
4. PG&E listed multiple different outreach programs and community engagement to inform customers about EPSS impacts, with particular focus on AFN and Medical Baseline customers. PG&E also expanded its portable battery program, updated its generator and battery rebate program, and plans to launch its backup power transfer meter program which allows customers to more quickly connect to backup power.
5. PG&E provided multiple venues for restoration response and resourcing, including discussing its standard outage response protocols and drawing resources from

neighboring divisions, monitoring Customer Average Interruption Duration Index (CAIDI) targets for shortfalls to adjust workplans and resources, using a Storm Outage Prediction Model (SOPP) that predicts transformer level and above sustained outages and incorporates EPSS data, using rapid response patrol helicopters, and supplementing field resources with system inspection staff.

6. PG&E provided details on how it has benchmarked with other utilities monthly, which includes SDG&E, SCE, and NV Energy. PG&E also discussed biannual full day deep dives with SDG&E and SCE, ad-hoc discussions with utilities outside of California, and participation in industry working groups and conferences.
7. PG&E attached its first monthly report with the required data on EPSS outages.[221] PG&E is required to continue providing EPSS reports on a monthly basis. [222]

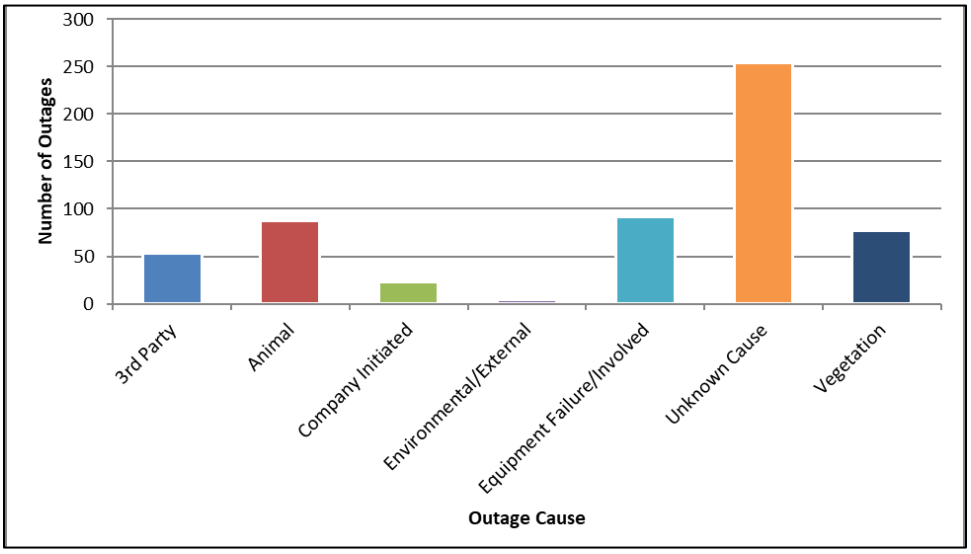
RN-PG&E-22-12: Energy Safety Evaluation

Within the first monthly EPSS report, PG&E provided a list of 12 ignitions that have occurred on EPSS circuits, with an average response time of 71.71 minutes, although five of the provided ignitions lack response time data. Two of the ignitions led to a fire greater than ten acres. It should be noted that any single ignition has the potential to cause a catastrophic wildfire. The data show a total of 590 outages from January through June 2022, affecting a total of 511,500 customers, with 490 of those outages occurring in June. The majority of causes for the outages are unknown, as seen in Figure 4.6.6-3, with 254 outages designated as "Unknown Cause."

[221] PG&E's Revision Notice Response, July 11, 2022.

[222] Pacific Gas and Electric Company - July Outages Monthly Report – EPSS: https://efiling.energysafety.ca.gov/Search.aspx?docket=2022-WMPs (accessed September 16, 2022).

Figure 4.6.6-3: EPSS Outage Causes (January to June 2022)



The data show the importance of tracking the sum of customer minutes without power from outages in comparison to only tracking the highest number of outages on the circuit, as seen in Tables 4.6.6-1 and 4.6.6-2. While there are some consistencies with the connection between outages and the total sum of customer minutes without power, such as with Madison 2101 and Apple Hill 2102, these data demonstrate that the number of outages, the number of customers affected, and outage duration are all important data sets when measuring and analyzing the impacts of EPSS.

Table 4.6.6-1: Top 10 Circuits Based on 2022 Number of Outages

Circuit	Outages	Sum of Customers Affected	Sum of Customer Minutes
SAN LUIS OBISPO 1107	10	12561	939348
MADISON 2101	9	6267	2629711
POSO MOUNTAIN 2101	9	578	294609
APPLE HILL 2102	7	10578	3318440
NARROWS 2105	6	9218	2142037
CAMP EVERS 2105	6	6288	3254192
CORRAL 1101	6	3730	581719

Circuit	Outages	Sum of Customers Affected	Sum of Customer Minutes
DUNLAP 1102	6	962	459713
HALF MOON BAY 1103	5	6113	988547
SILVERADO 2104	5	5872	2583799

Table 4.6.6-2: Top 10 Circuits Based on 2022 Outage Durations

Circuit	Outages	Customers Affected	Customer Minutes
APPLE HILL 2102	7	10578	3318440
CAMP EVERS 2105	6	6288	3254192
MADISON 2101	9	6267	2629711
SILVERADO 2104	5	5872	2583799
FAIRVIEW 2207	4	11342	2402693
NARROWS 2105	6	9218	2142037
MORGAN HILL 2111	2	3081	1947320
NORTH DUBLIN 2103	2	9843	1772221
VINEYARD 2108	1	3026	1675677
RINCON 1101	1	2381	1603636

Updates on EPSS Reliability Study

In response to Data Request OEIS-2022–05, Q01, PG&E stated with regard to its preliminary EPSS Reliability Study, "Note we may adopt, update, or augment the results of this study with additional data or insights…" PG&E must provide an updated reliability impacts study similar to the preliminary one completed in January 2022. PG&E must ensure that this study accounts for factors beyond the number of customers experiencing sustained outages, since this paints an incomplete picture on the scope of reliability and safety impacts faced. PG&E must also include outage durations, types of customers impacted (e.g., AFN and Medical Baseline customers), asset health and open work tags, known vegetation issues, and possible

resource constraints (such as access issues, staffing numbers, etc.). PG&E must also report on impacts to community values at risk as specified in the 2023-2025 WMP Guidelines. [223] Community values at risk from wildfires are often defined in terms of life safety, buildings, and critical infrastructure. However, values can also include human health, natural resources, sensitive species, cultural and historical resources, and other intangibles (e.g., social capital, community culture, livelihood). PG&E must include results based on 2021 and 2022 data.

PG&E must not rely primarily on its existing and routine programs to address reliability, and must analyze how to decrease reliability and safety impacts when overlapping with existing wildfire risk. PG&E must continue to develop programs to evaluate and address EPSS impacts based on the updated and completed reliability impacts study.

Through its responses that set out the different measures being taken to increase reliability and safety related to EPSS usage. PG&E has made changes to the sensitivity settings for 2022 based on 2021 lessons learned and the lab testing completed to determine impact on reliability moving forward. This is anticipated to reduce impacts on reliability and on public safety in 2022.

PG&E has de-escalated the critical issue described in RN-PG&E-22-12; however, it still rises to the level of an area for continued improvement.

Given the above outstanding issues, Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.6.4 Areas for Continued Improvement

PG&E must continue to improve in the following areas. Areas for continued improvement in this section are in addition to areas for continued improvement resulting from PG&E's Revision Notice Response.

[223] 2023-2025 Draft Wildfire Mitigation Plan Guidelines, Sections 5.4.1–5.4.4 "Community Values at Risk" (accessed November 3, 2022).

PSPS Wind Threshold Change Evaluations

In its 2021 WMP Progress Report,[224] PG&E states that it is changing PSPS thresholds for covered conductor based on changes observed through reduced ignition trends in those areas over time as well as using modeling output for PSPS threshold determinations. This differs from SCE, where wind speed thresholds are adjusted in areas where covered conductor has been installed across an entire segment. SDG&E is still in the process of considering how to adjust its PSPS thresholds based on covered conductor installation.

To minimize reliability impacts, as well as maximize output from system hardening and mitigation implementation, utilities must collaborate to explore and determine PSPS threshold changes resulting from grid hardening measures. The utilities must consider covered conductor as well as other mitigation measures, such as vegetation management or continuous line monitoring. Utilities must cross compare the implementation of threshold changes and required criteria for setting new thresholds, as well as benefits of reducing thresholds based on diminished ignition risk over time from mitigation impacts.

Response Operations to Potential Fault/Outages in its Highest Risk Areas

In its 2022 Update, PG&E does not discuss in detail its response plan for known faults and outages as they are detected. As part of its response to RN-PG&E-22-01, PG&E discussed how it has modified its outage response times as a result of lessons learned from the Dixie Fire.[225] PG&E acknowledged the importance of response time to minimize ignition risk, although PG&E's current plan only accounts for reducing outage response time to 60 minutes within the HFTD. PG&E must discuss how it is using fault and outage locations in real-time to locate, prioritize, and respond to faults/outages in its highest risk areas. In its 2023 WMP, PG&E must discuss changes to response protocols to prioritize faults and outages in its highest risk areas as they occur.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

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[224] Pacific Gas and Electric Company Progress Report Response to Energy Safety Remedies PG&E-21-01 through PG&E-21-28, November 1, 2021 (accessed August 29, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51852&shareable=true.

[225] PG&E's Revision Notice Response, July 11, 2022, p. 12.

4.6.7 Data Governance

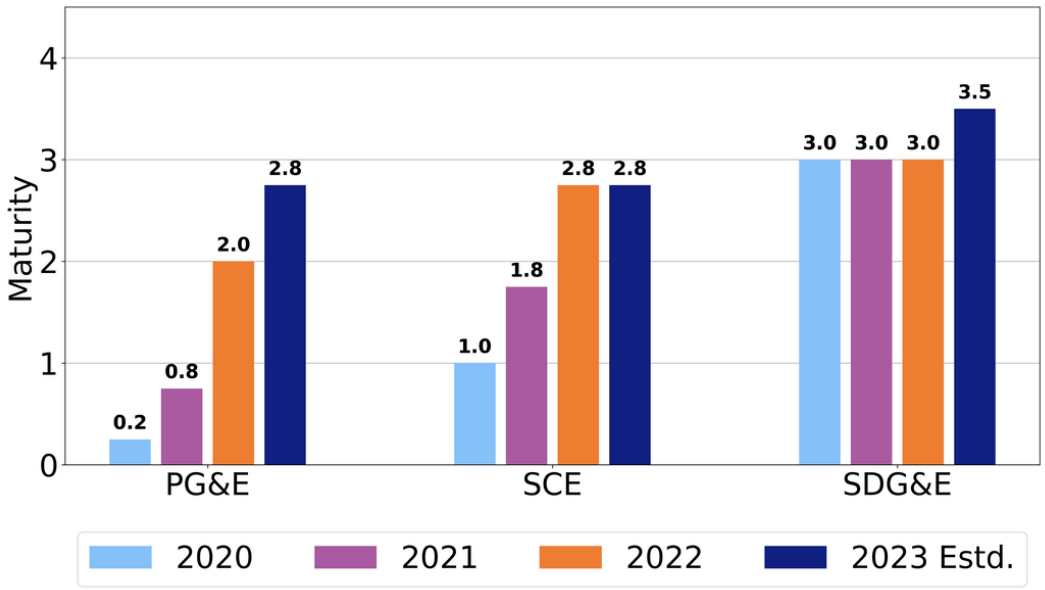
The data governance section of the Guidelines[226] requires the utility to report information on its initiatives to create a centralized wildfire-related data repository, conduct collaborative research on utility ignition and wildfire, document and share wildfire-related data and algorithms, and track and analyze near-miss data.

4.6.7.1 Maturity Assessment

PG&E's reported maturity has increased over the WMP cycle in all four data governance categories. Since the previous WMP update, its maturity has increased in data collection and curation, data transparency and analytics, and near-miss tracking categories. PG&E's reported maturity has remained the same in data sharing with the research community category. By the end of the year, PG&E projects an increase in this last category (data sharing with the research community) to the highest maturity level. PG&E's maturity for data governance is on par with the other large IOUs.

Figure 4.6.7-1: Cross-Utility Maturity Survey Responses for Data Governance - Large IOUs (2020-2022 Actual, 2023 Estimated)

[226] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 pp. 76-77 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.



4.6.7.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle:

Since its 2021 Update, PG&E reports that it has connected over 50 data sources to its centralized data platform, defined and implemented a process to govern the flow of data from source systems to "ontology objects," and created and staffed an information technology team consisting of seven developers to develop these objects. PG&E also reports that it instituted a new common framework for risk models that enables model results to be composited across risk types.

PG&E has conducted an audit of multiple work tracking databases to identify reportable ignitions that had been missed. This ignition audit discovered 318 reportable ignitions between 2014-2022 that had not been reported.[227] In response to a request for more information on this audit (DR-OEIS-008 Question #6), PG&E reported that it took the following corrective actions resulting from lessons learned from its ignition audit:

- Revised its Field Automation System (FAS)
- Communicated to field staff regarding use of its FAS

[227] Data Request OEIS -PG&E-22-008, Question 6.

- Conducted a pilot for improving data collection in the field
- Implemented an annual ignition reporting training requirement
- Incorporated a review of all potential ignition-related FAS tags into the scope of its Ignitions Investigations Team

4.6.7.3 Areas for Continued Improvement

In addition to progress made and considering its responses to the Revision Notice critical issues, PG&E must continue to improve in the following areas.

Progress on Filling Asset Inventory Data Gaps

From 2021 to 2022, PG&E increased the granularity of its understanding of missing data within the asset inventory. Before 2022, PG&E based incomplete data status on the percent of equipment missing from the inventory as opposed to the age and expected lifecycle data missing. When accounting for missing equipment data, about 65 percent of PG&E's transmission line SCADA switches are missing installation dates, as opposed to nine percent of transmission steel towers.[228] PG&E discusses several steps it is taking to improve its asset inventory, such as asset information collection and updates to GIS, although these are not set to be completed by 2023. PG&E must provide further details on its efforts to improve data collection, quality, and reduction of missing data. It must also provide the status and expected timelines of completion of any such efforts.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.8 Resource Allocation Methodology

The resource allocation methodology section of the Guidelines[229] requires the utility to describe its methodology for prioritizing programs by cost effectiveness. Utilities must discuss their risk reduction scenario analysis and provide a risk-spend efficiency (RSE) analysis for each aspect of the plan.

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[228] Data Request OEIS-PG&E-22-002, Question 9.

[229] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 p. 77 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

4.6.8.1 Maturity Assessment

PG&E has exhibited a gradually increasing maturity level in the resource allocation methodology category over the current WMP cycle, with a smaller increase in maturity level from 2021 to 2022 compared to 2020 to 2021, as seen in Figure 4.6.8-1. This year PG&E has taken steps to improve the verification of its RSE estimates. It anticipates reaching the highest level of maturity in this area following a third-party technical advisory group review of RSE estimates by independent experts and working with other California utilities by 2023. PG&E remains particularly limited in its maturity levels in the "scenario analysis across different risk levels" and "portfolio-wide initiative allocation methodology" capabilities, as seen in Figure 4.6.8-2.

Figure 4.6.8-1: Maturity Survey Responses for Resource Allocation Methodology - Large IOUs (2020-2022 Actual, 2023 Estimated)

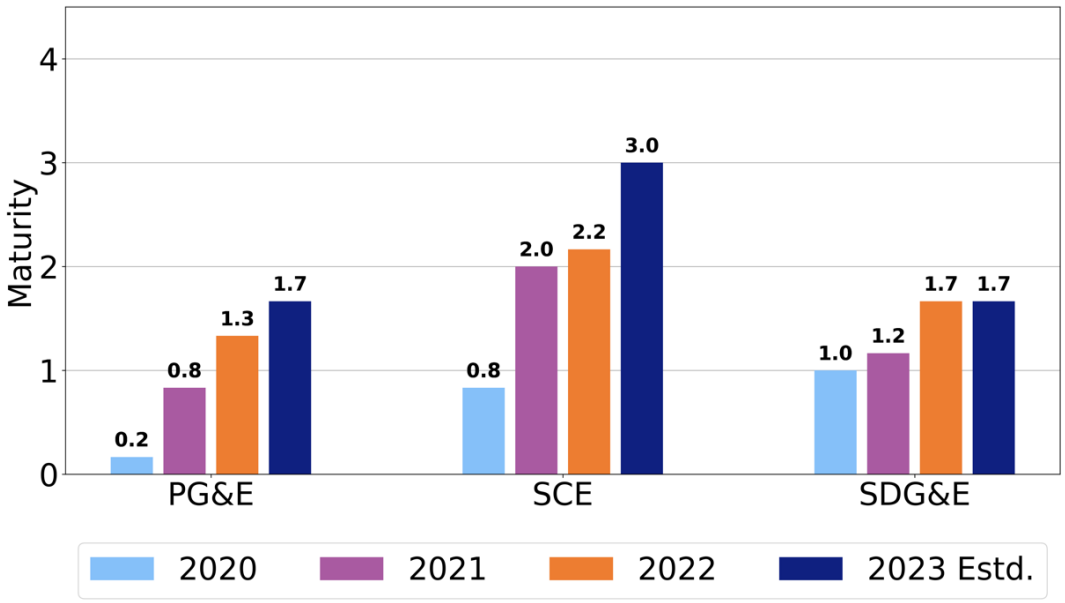
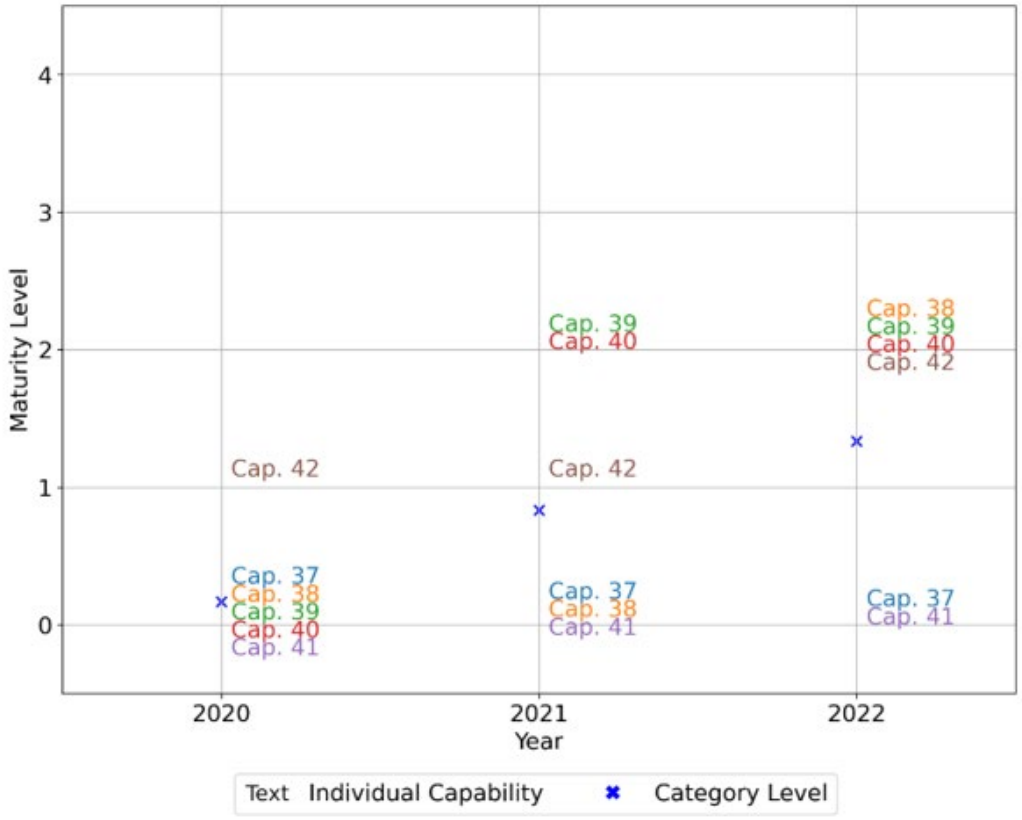


Figure 4.6.8-2: PG&E's Maturity Survey Responses for All Resource Allocation Methodology Capabilities (2020-2022)



PG&E's maturity level is limited in the "scenario analysis across different risk levels" capability by the following responses in the Maturity Survey.

- Consistent with its approach in 2021, PG&E does not include proposed initiatives and their estimated costs across different levels of risk scenarios. For PG&E to reach the highest maturity level in this area, it would need to provide an accurate high-risk reduction and low-risk reduction scenario in addition to its currently provided proposed scenario, including projected costs and total risk reduction potential.[230]
- PG&E provides projections for each scenario at the circuit level. This is an improvement over the territory-level granularity capability it reported in 2021. A higher level of maturity would be scenario projection at the span level. Scenario projection at the asset level would indicate the highest level of maturity in this capability.[231]

PG&E's maturity level is limited in the "portfolio-wide initiative allocation methodology" capability by the following responses on the Maturity Survey.

- PG&E considers RSE estimates when allocating capital, an improvement over 2021. However, using accurate RSE estimates to determine capital allocation for all initiatives within categories, or across its portfolio, represents higher maturity.[232]
- When generating RSE estimates, PG&E incorporates the state of equipment and location where the initiative will be implemented. Including information at the asset level indicates the highest level of maturity.[233]
- In 2021 PG&E did not verify its RSE estimates.[234] PG&E's current RSE estimates are verified by historical or experimental pilot data. PG&E anticipates reaching the highest level of maturity, with RSE estimates being confirmed by independent experts or other utilities in California, by 2023.

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[230] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to H.I.a.

[231] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to H.I.b.

[232] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to H.V.a.

[233] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to H.V.b.

[234] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to H.V.c.

4.6.8.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle.

PG&E completed calculations for several RSE estimates: going from 54 risk mitigation and control programs used in 2020 to 286 in 2021.[235] While RSE estimates are currently used at the program level, PG&E has begun to increase the granularity of their application. For example, PG&E incorporates RSE estimates into wildfire mitigation initiatives and plans to consider them when comparing options within an initiative. It also engaged a third-party technical advising group to assess RSE methodologies used in its 2022 Update and provide recommendations for future WMP submissions. By calculating more RSE estimates, PG&E builds additional rigor into its decision-making process and increases the quantitative comparison of cost-effectiveness among mitigation initiatives.

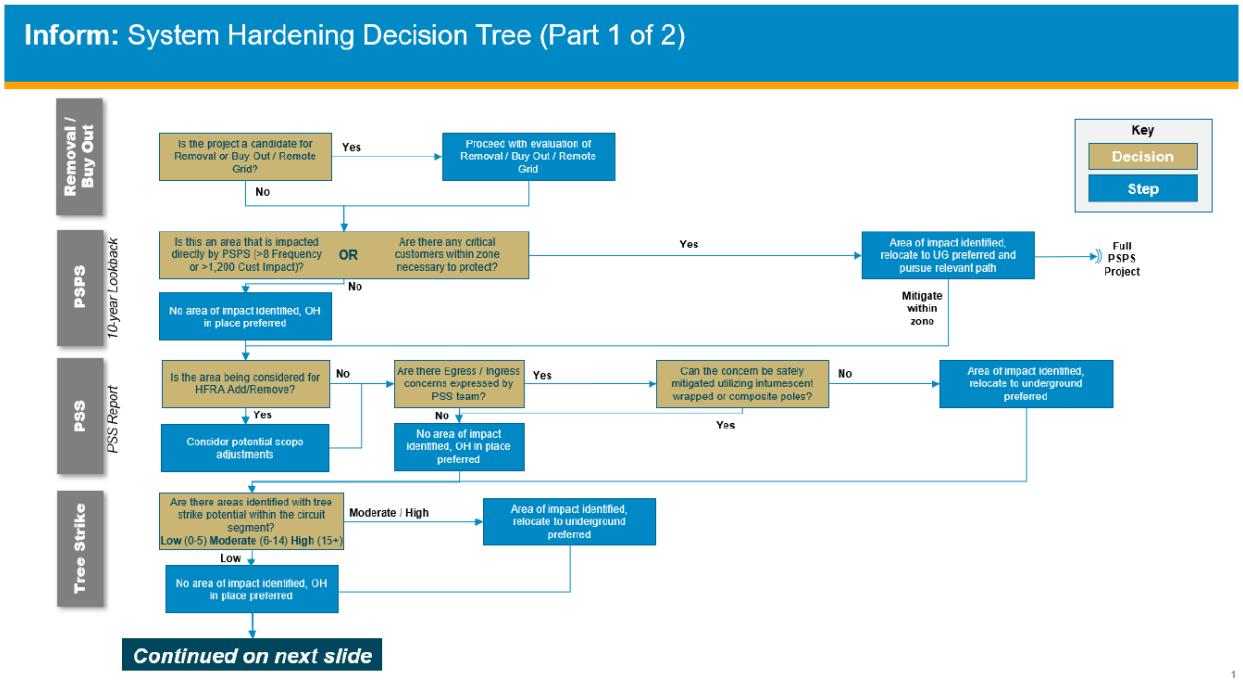
In 2021, PG&E began the first phase of its value framework pilot, which was a new methodology to aid in resource allocation by distributing workforce and financial resources across categories. PG&E first applied this pilot methodology to its Transmission Capital portfolio and plans to continue developing the value framework on an individual program basis. PG&E expects to incorporate risk modeling outputs into the value framework to better optimize its electric capital and expense portfolio. The goal is to improve safety and reliability while controlling costs by identifying cost efficiencies to maximize as much risk-mitigating work as possible without increasing demand on financial resources.

PG&E's primary risk model underwent further evolution with the 2022 Wildfire Distribution Risk Model (WDRM) v3. The WDRM now quantifies additional risk drivers and produces a spatial map combining risks from different causes and/or assets. In the near future (2023-2028), PG&E anticipates continued improvements in modeling will allow it to assess pre- and post-mitigation Multi-Attribute Value Function (MAVF) scores, as well as RSE estimates at the project location level. PG&E plans to focus on improving its modeling risk drivers, the granularity of model results, and provide risk reduction values for mitigation alternatives. In the long-term, PG&E aims to evaluate risk down to the span and asset level.

[235] PG&E's 2022 Update, p. 778.

In its Action Statement on PG&E's 2021 WMP Update,[236] Energy Safety emphasized the importance of decision-making flowcharts with a particular focus on how they bring transparency to a utility's mitigation selection and prioritization process. In response to a key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update, PG&E-21-26, Inadequate Discussion on Impact of Risk-Spend Efficiencies (RSE) in Initiative Selection, PG&E increased its decision-making transparency by providing a flowchart. PG&E presented its "Mitigation Decision Tree for System Hardening" to illustrate its prioritization process as shown in Figure 4.6.8-3 and Figure 4.6.8-4. [237]

Figure 4.6.8-3: Mitigation Decision Tree for System Hardening (Part 1 of 2)(Source: PG&E)[238]

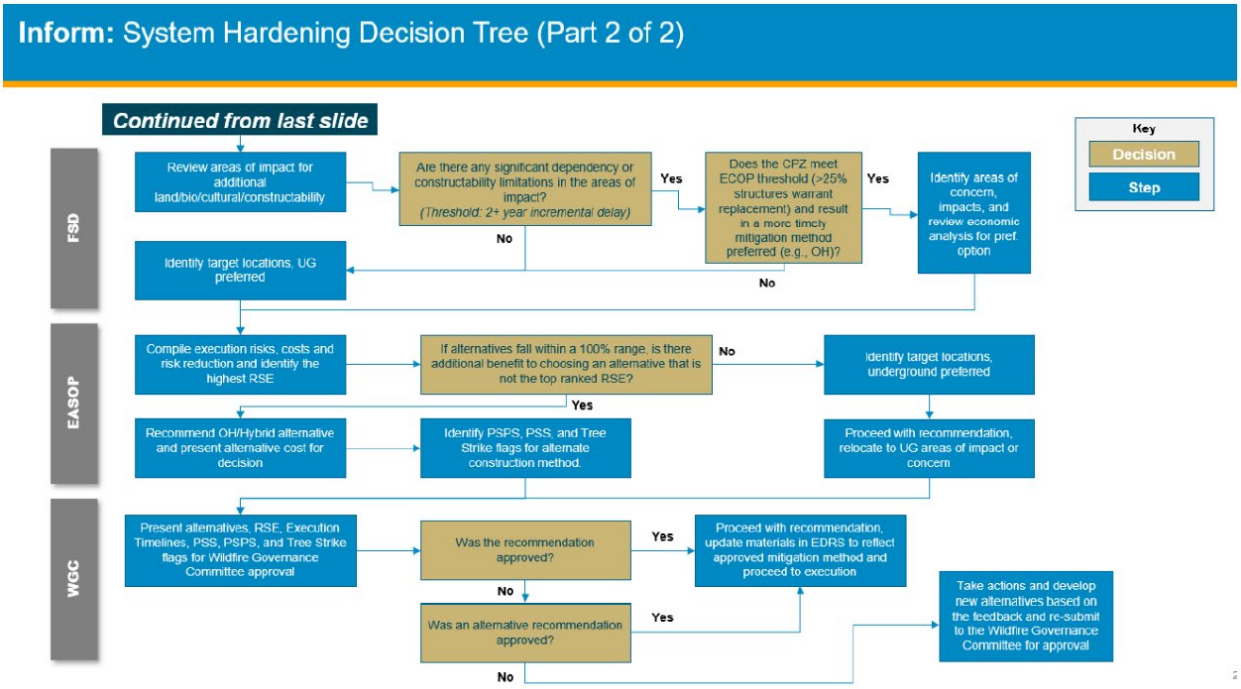


[236] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 99 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[237] Pacific Gas and Electric Company Progress Report Response to Energy Safety Remedies PG&E-21-01 through PG&E-21-28, November 1, 2021, pp. 96-97 (accessed Sept. 22, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51852&shareable=true.

[238] Pacific Gas and Electric Company Progress Report Response to Energy Safety Remedies PG&E-21-01 through PG&E-21-28, November 1, 2021, pp. 96-97 (accessed Sept. 22, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51852&shareable=true.

Figure 4.6.8-4: Mitigation Decision Tree for System Hardening (Part 2 of 2) (Source: PG&E)[239]



[239] Pacific Gas and Electric Company Progress Report Response to Energy Safety Remedies PG&E-21-01 through PG&E-21-28, November 1, 2021, pp. 96-97 (accessed Sept. 22, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51852&shareable=true.

4.6.8.3 PG&E Revision Notice

As described in Section 1.3.2, Energy Safety issued PG&E a Revision Notice in response to its 2022 Update submitted on February 25, 2022. PG&E submitted its responses to the revision notice on June 27, July 11, and July 26, 2022. This section evaluates that response as it relates to resource allocation methodology.[240]

Critical Issue RN-PG&E-22-13: PG&E Does Not Provide Disaggregated Data on its System Hardening Initiatives

As in prior years, PG&E aggregates system hardening into one initiative titled "System Hardening Distribution." This continued aggregation impedes transparency, wherein individual mitigation strategy mile targets, RSE estimates, and costs are not readily identifiable. For instance, it is unclear what overhead hardening entails (e.g., what percentage is covered conductor vs. traditional hardening). As a result, it is difficult to measure achievement in specific areas (e.g., covered conductor) and make comparisons across utilities. In 2021, Energy Safety identified PG&E's aggregation of system hardening RSE estimates as a critical issue, which PG&E addressed by providing the costs, miles treated, and RSE estimates for covered conductor installation, undergrounding, and remote grid. PG&E did not provide this level of detail in its 2022 Update.

PG&E continues to provide unacceptably aggregated data regarding its system hardening initiatives, including targets, costs and risk-spend efficiency data. This is not in accordance with the WMP Guidelines.[10] This has been an ongoing issue, as Energy Safety also raised this issue in 2021 in RN-PG&E-03.[241]

In RN-PG&E-22-13, Energy Safety required PG&E to separately provide detailed costs, miles previously treated, a range for miles planned to be treated, and RSE estimates for covered conductor installation, undergrounding, line removal, and any other system hardening initiatives currently presented together as one value in PG&E's 2022 Update.

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[240] https://efiling.energysafety.ca.gov/Search.aspx?docket=2022-WMPs: Pacific Gas and Electric Company 2022 Wildfire Mitigation Plan Response to Revision Notice, June 27, 2022 (30 Day Response), (accessed August 26, 2022).

[241] Energy Safety's 's Revision Notice for Pacific Gas & Electric Company's 2021 Wildfire Mitigation Plan Update, p. 11 (accessed September 15, 2022): https://energysafety.ca.gov/wp-content/uploads/docs/misc/wmp/2021/utility/pge/pge-wmp-revision-notice-correction-clean.pdf.

Energy Safety also required PG&E to revise Table 12 to provide the required information for each initiative listed in Energy Safety's 2022 WMP Guidelines.

RN-PG&E-22-13: PG&E Response Summary

In response, PG&E provided disaggregated information for its system hardening program.[242] It included 2022 and 2023 estimated miles, costs and risk spend efficiencies for covered conductor installation, undergrounding, line removal, and remote grid. PG&E's summary table in response to this critical issue is reproduced below, and Table 12 of its 2022 Update has been revised to provide the required information.

Table 4.6.8-1: Disaggregated System Hardening Program Information (Source: PG&E)

		Units (Miles)		Cost (millions)		RSE
Initiative #	Initiative Name	2022	2023	2022	2023	
7.3.3.17.1	Total System Hardening Program, Distribution	470	527	$977	$1,458	5.54
7.3.3.3	Covered Conductor Installation	305	170	$366	$265	7.55
7.3.3.16	Undergrounding	163	357	$611	$1,193	4.40
7.3.3.17.1 (LR)	Line Removal	9.3	-	$0.985	-	140
7.3.3.17.5	Remote Grid	2 (units)	1 (unit)	$17	$8.5	22.6

PG&E noted that the actual projects and costs will vary as its teams review each project and recommend the most risk spend efficient solutions. PG&E stated that its 2022 initiative target remains 470 miles of total system hardening program work.

RN-PG&E-22-13: Energy Safety Evaluation

PG&E has satisfied each required remedy described in RN-PG&E-22-13. PG&E has resolved this critical issue. PG&E provided separate costs, miles and RSE estimates for covered

[242] For more information, see PG&E's 2022 Wildfire Mitigation Plan Response to Revision Notice dated June 27, 2022

conductor installation, undergrounding, line removal and other system hardening initiatives (i.e., remote grid). PG&E revised Table 12 of its 2022 Update as requested. Additionally, PG&E provided further information to explain these inputs:

- Miles: PG&E developed the 2022 and 2023 system hardening total program and disaggregated forecasts in the 2023 GRC based on information available at the time of the 2023 GRC filing. PG&E reported that it expects that the actual miles of system hardening work under each initiative will vary from the forecasts as permitting and other issues arise, resulting in other projects moving into the plan to achieve the overall system hardening target. Therefore, PG&E explained that the disaggregated miles should be considered directional and not as targets in its 2022 Update.
    - The 2022 mileage in the revised Table 12 adds up to 468 miles, compared to PG&E's total system harding target of 470 miles in Table RN-PG&E-22-13-01, as line removal work performed in 2022 will count towards the total target.
    - PG&E did not forecast line removal miles in the revised Table 12. 2022 reflects the total miles removed this year as of June 21, 2022. PG&E explains that line removal miles are difficult to forecast due to multiple factors.[243]
    - Undergrounding forecasts do not include Butte County rebuild miles.
- Costs and RSE estimates: In addition to high-level RSE estimates for system harding initiatives like those provided in the revised Table 12, PG&E performed a final economic analysis for individual system hardening projects once they have been designed and vetted. PG&E conducted this analysis to create net present values for the lifetime costs of each design approach, including long-term maintenance needs and costs including vegetation management, inspections, and more. PG&E reports that its final recommendation and documentation will be submitted to PG&E's Wildfire Risk Governance Steering Committee (WRGSC) to review the project scope, RSE, and related analysis for guidance and approval.

[243] PG&E explained in its response that it is difficult to quantify the number of customers that will return to their homes and request service as part of a fire rebuild project which affects the number of service lines that will either be rebuilt or removed in fire rebuild areas. In addition, customers considering a remote grid project involving line removal may choose wired service instead, idle facility line removal is driven by inspections and customer investigations each year, and PG&E looks for opportunities to remove lines are at are coincident or dependent on other hardening work

- Two new remote grid units are targeted for operation in 2022: one unit is forecasted in PG&E's 2023 GRC application. PG&E does not consider the forecasted costs for remote grid to be included in the total WMP system hardening forecasted costs for 2022 and 2023 originally provided within the 2022 WMP.

While PG&E provided disaggregated targets and costs, PG&E continues to use its combined system hardening program for its actual 2022 WMP targets on miles, costs, and RSE estimates.

4.6.8.4 Areas for Continued Improvement

PG&E must continue to improve in the following areas. Areas for continued improvement in this section are in addition to areas for continued improvement resulting from PG&E's Revision Notice Response.

Revise Process of Prioritizing Wildfire Mitigations

Upon review, Energy Safety found that PG&E's system hardening decision-making flowchart does not give sufficient weight to quantitative factors such as costs, risk reduction values, and RSE estimates. For example, the flowchart hierarchy prioritization is influenced more by construction limitations than by RSE estimates. This may lead PG&E to fast-track more expedient locations rather than considering the option with the highest RSE estimate. In addition, it is notable that PG&E's decision-making process heavily favors undergrounding. PG&E did not provide a thorough analysis of other mitigation options to demonstrate how alternatives factor into its decision-making process. Currently, PG&E's decision-making process is particularly driven by whether undergrounding is feasible; if undergrounding is not feasible, another mitigation strategy is chosen. Energy Safety asserts that mitigation strategies must be chosen for a given area based on risk model output, prioritized by the risks present at that location. PG&E's goal must be to conduct a rigorous, quantitative analysis of alternative strategies that prioritizes a mitigation strategy according to highest risk, addresses risk by location and uses limited resources effectively. Quantitative measures must have higher placement in the decision tree hierarchy than is currently shown. Additionally, PG&E should not default to undergrounding by focusing primarily only on feasibility, as discussed in Section 4.6.3.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

4.6.9 Emergency Planning and Preparedness

The emergency planning and preparedness section of the Guidelines[244] requires the utility to provide a general description of its overall emergency preparedness and response plan, including a discussion of how the plan is consistent with legal requirements for customer support before, during, and after a wildfire. This discussion must cover support for low-income customers, billing adjustments, deposit waivers, extended payment plans, suspension of disconnection and nonpayment fees, and repairs. The utility is also required to describe emergency communications before, during, and after a wildfire in languages deemed prevalent in its territory (Decision 19-05-036, supplemented by Decision 20-03-004),[245] and other languages required by the CPUC.

This section of the 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.

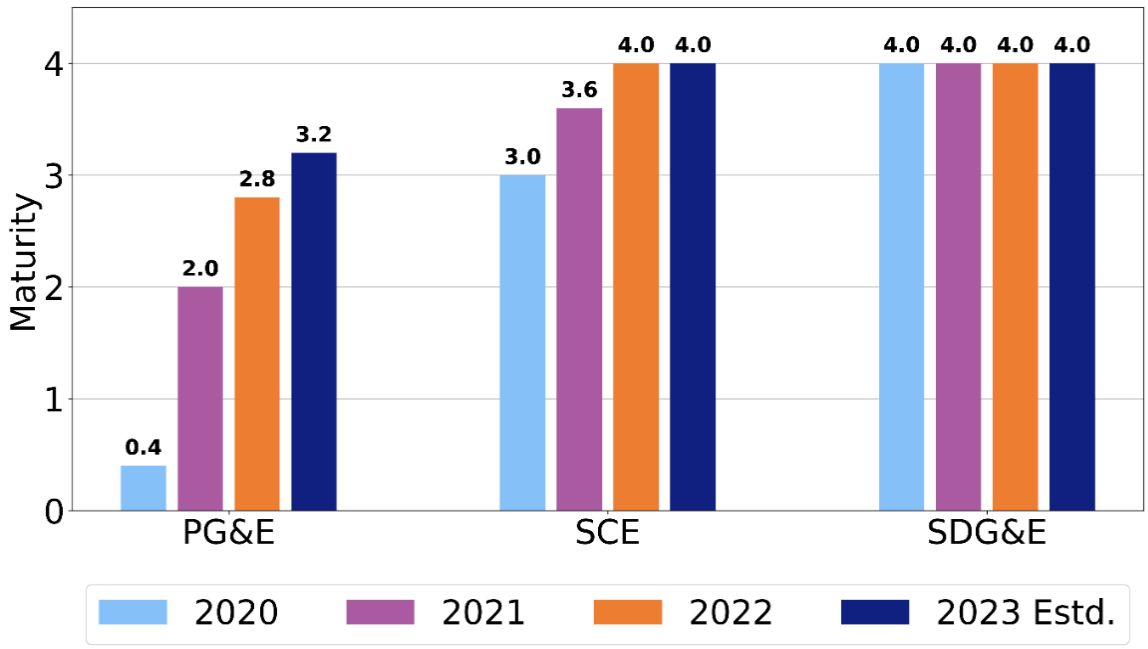
4.6.9.1 Maturity Assessment

Over the course of the current WMP cycle, PG&E has increased its maturity level in the emergency planning and preparedness category each year. According to its responses on the 2022 Maturity Survey, PG&E is self-reporting at a level 2.8 maturity in this category. PG&E's maturity level in this category is lower than its peers, with SCE and SDG&E reporting at a level 4 in 2022. See Figure 4.6.9-1.

[244] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 p. 77 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[245] A language is prevalent if it is spoken by 1,000 or more persons in the utility's territory or if it is spoken by 5% or more of the population within a "public safety answering point" in the utility territory. See California Government Code section 53112 for more information.

Figure 4.6.9-1: Cross-Utility Maturity Levels for Emergency Planning and Preparedness – Large IOUs (2020-2022 Actual, 2023 Estimated)



According to its responses on the survey, individual capability levels in this category either remained the same or increased from 2021 to 2022, and PG&E does not report low maturity levels (0 or 1) for any of its emergency planning and preparedness capabilities, as seen in Figure 4.6.9-2.

PG&E increased its maturity levels in the following capability areas:

- Its "Wildfire plan integrated with overall disaster/emergency plan" increased from an average capability maturity level of 0 in 2020 and 2021 to 4 in 2022.[246]
- Its "Plan to restore service after a wildfire related outage" increased from an average capability maturity level of 2 in 2020 and 2021 to 4 in 2022.[247]

[246] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, Capability 43.

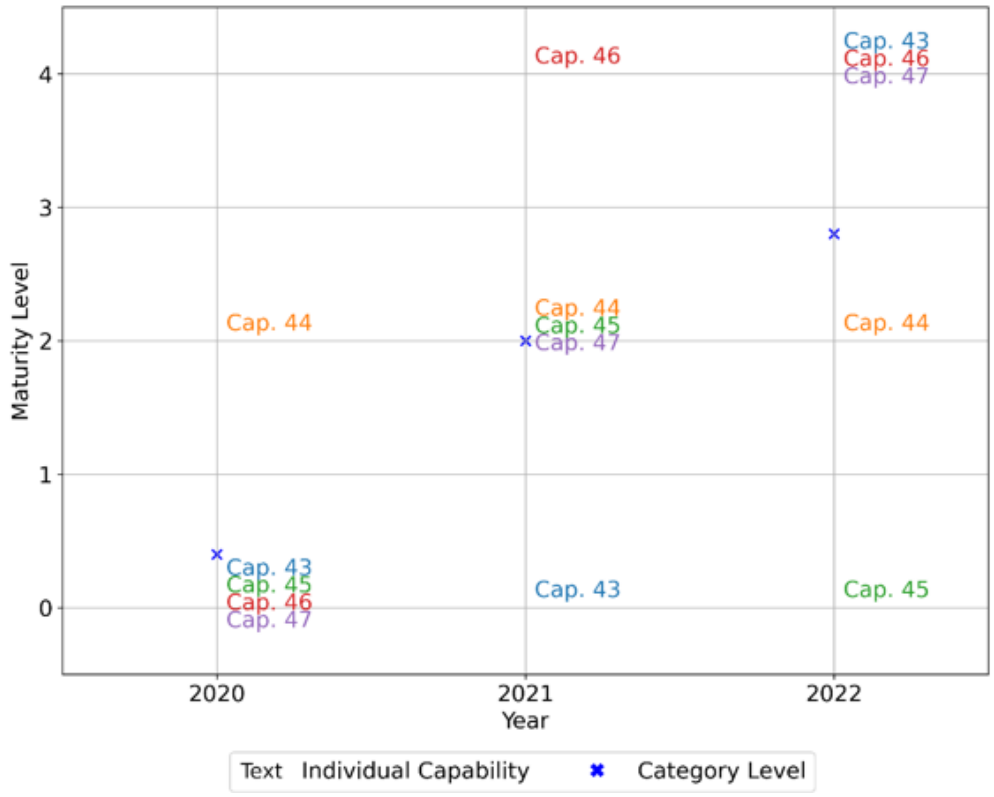
[247] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, Capability 44.

- Its "Processes for continuous improvement after wildfire and PSPS events" increased from an average capability maturity level of 2 in 2021 to a level 4 in 2022.[248]

A capability area limiting PG&E's maturity is described below.

- PG&E reports that more than 98 percent of PG&E's affected customers receive complete details of available information during and after a wildfire. PG&E also reports that 99.5 percent of Medical Baseline (MBL) customers, receive complete details of available information during and after a wildfire. For the percent that receive information during a wildfire PG&E projects that it will increase this to greater than 99 percent by 2023.[249]

Figure 4.6.9-2: PG&E's Maturity Survey Responses for All Emergency Planning and Preparedness Capabilities (2020-2022)



[248] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, Capability 47.

[249] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, responses to I.III.b and I.III.c.

4.6.9.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle:

In its Action Statement on PG&E's 2021 WMP Update, Energy Safety identified three issues and corresponding remedies in the emergency planning and preparedness category, requiring PG&E to provide the following in its 2022 Update:[250]

- In its 2021 Update, PG&E stated that it reviews and evaluates communications to customers and the public after a wildfire event and that this feedback is then used to improve customer and public communications and outreach efforts for the following year. However, PG&E failed to explain in its 2021 Update the type of information it collects about wildfire outreach efforts, how it is collected, and how it is used to inform future outreach efforts (or prioritize improvements). In its Action Statement on PG&E's 2021 WMP Update, Energy Safety required PG&E to develop a transparent methodology to track customer feedback, identify priorities and incorporate those into future plans. In its 2022 Update, PG&E provided more detailed information on how it assesses outreach effectiveness, the types and timing of surveys it conducts and feedback it receives, as well as more specific program refinements PG&E has made based on its customer feedback.[251]
- In 2021, PG&E indicated that it uses its After-Action Review (AAR) process to identify lessons learned from each Emergency Operations Center (EOC) and develop protocols learned from wildfire response; however, PG&E did not demonstrate how the AAR process has improved its protocols based on these lessons learned. Energy Safety required PG&E to describe lessons learned through its AAR process along with any corrective action improvements implemented as a result of this process. In its 2022 Update, PG&E provided more detailed information on its Corrective Action Program

[250] See Energy Safety's Action Statement on PG&E's 2021 WMP Update, pp. 107-108 (accessed April 12, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[251] See Section 4.6, Attachment 2, of PG&E's 2022 Update, "Issue 5.9.A" (accessed Aril 12, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52094&shareable=true.

(CAP), including specific examples of issues identified through that process, and associated lesson learned.[252]

- In its Action Statement on PG&E's 2021 WMP Update, Energy Safety determined that PG&E's emergency planning and preparedness category maturity increased, despite a decrease in spending. Energy Safety required PG&E to describe how it plans to accomplish projected increase in maturity in Emergency Planning and Preparedness despite decreased spend. In response to this remedy,[253] PG&E stated that its spending in this category does not show a decrease and points to Energy Safety's Action Statement on PG&E's 2021 WMP Update. Figure 5.9.b "Emergency planning and preparedness spend per HFTD overhead circuit mile, large utilities 2020-2022" in the Action Statement shows an increase for PG&E between its 2020 actual and 2021 and 2022 planned spend totals. Additionally, Table 3-2 of PG&E's 2021 WMP Update ("Summary of WMP Expenditures by Category") also shows a projected spend increase in Emergency Planning between 2020 actual, 2021 planned, and 2022 planned. Given that PG&E's spending in this category does not indicate a decrease, Energy Safety finds that PG&E has adequately addressed this remedy.

Energy Safety finds that PG&E has fully addressed each of these issues.

PG&E has progressed in the development of its Emergency Planning and Preparedness programs and initiatives. Among other advancements made in this category, PG&E made progress in the following areas:

- PG&E has exceeded its hiring goal for service restoration staff. In 2020, PG&E conducted an internal supply and demand review to assess staffing needs. In its 2021 Update, PG&E stated that it "projected a need to hire approximately 40 linemen and 100 apprentices each year for the next five years."[254] PG&E met this goal in 2020 and

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[252] [252] See Section 4.6, Attachment 2, of PG&E's 2022 Update, "Issue 5.9.B" (accessed Aril 12, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52094&shareable=true.

[253] See Section 4.6, Attachment 2, of PG&E's 2022 Update, "Issue 5.9.C" (accessed Aril 12, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52094&shareable=true.

[254] PG&E's 2021 WMP Update, p. 746.

exceeded it in 2021. In response to a data request, [255] PG&E states that it intends to meet its hiring goal in 2022 as well.

- PG&E is updating its Company Emergency Response Plan (CERP). PG&E states that it is developing two additional hazard annexes to the CERP, tsunami and extreme weather annexes, to supplement its CERP and provide emergency response protocols specific to those hazards.
- PG&E is also updating its PSPS service restoration protocols. In 2021, PG&E implemented "all clear zones" to improve service restoration protocols and PSPS re-energization at more granular level. PG&E states that its meteorology team uses the Ignition Probability Weather (IPW) Model as a tool to determine these zones.[256] PG&E states that in 2021, both its PSPS field and control center personnel completed training on these updated restoration protocols.[257]

4.6.9.3 Areas for Continued Improvement

Given PG&E's maturity commitments to continue to progress in this category, Energy Safety has no areas for continued improvement for PG&E under the emergency planning and preparedness section of its 2022 Update.

4.6.10 Stakeholder Cooperation and Community Engagement

The stakeholder cooperation and community engagement section in the Guidelines[258] requires the utility to report on the extent to which it will engage the communities it serves. This engagement includes cooperating and sharing best practices with community members, agencies outside California, fire suppression agencies, the U.S. Forest Service, and others engaged in vegetation management or fuel reduction.

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[255] Data Request OEIS-PG&E-22-008, Question 8.

[256] PG&E 2022 Update, p. 715.

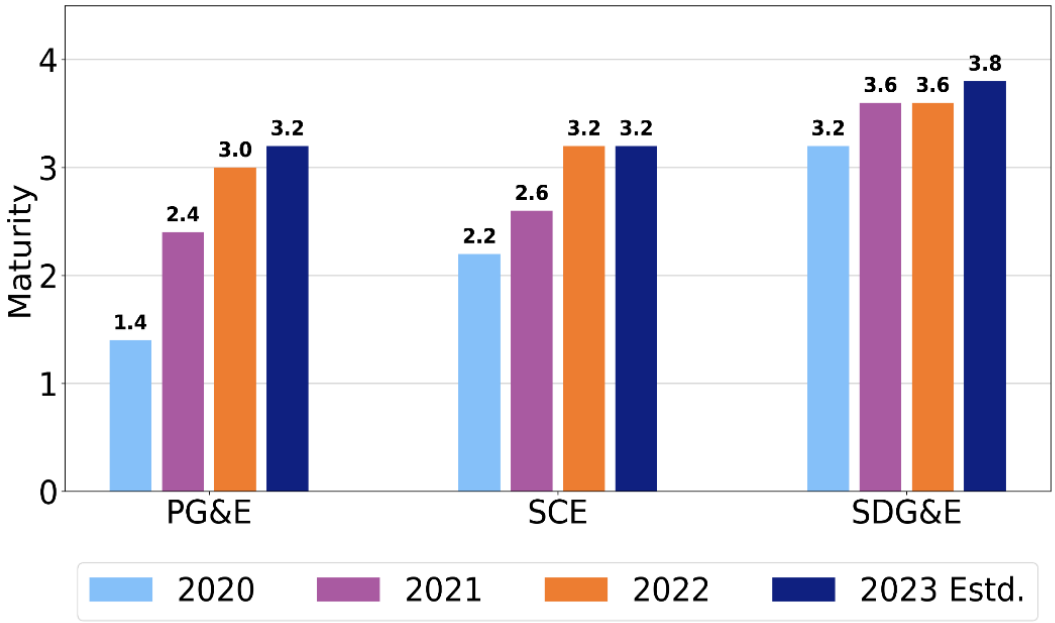
[257] PG&E 2022 Update, p. 806.

[258] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.7.3 p. 77 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

4.6.10.1 Maturity Assessment

Over the course of the current WMP cycle, PG&E has gradually increased its maturity level in the stakeholder cooperation and community engagement category. According to its responses on the 2022 Maturity Survey, PG&E reports a level 3 maturity in this category, with 4 being the highest possible maturity level allowed by the maturity survey. Although PG&E has increased its maturity level in this category in 2021 and 2022, it is still at a slightly lower level in 2022 than its peers. See Figure 4.6.10-1.

Figure 4.6.10-1: Cross-Utility Maturity Levels for Stakeholder Cooperation and Community Engagement – Large IOUs (2020-2022 Actual, 2023 Estimated)



According to its responses on the survey, individual capability levels in this category either remained the same or increased from 2021 to 2022, and PG&E does not report low maturity levels (0 or 1) for any of its stakeholder cooperation-related capabilities, as seen in Figure 4.6.10-2.

PG&E increased its maturity in the following capabilities:

- Its maturity in the collaboration with emergency response agencies capability increased from an average capability maturity level of 2 in 2020 and 2021 to 3 in 2022.[259]
- Its maturity in the collaboration on wildfire mitigation planning with stakeholders capability increased from an average capability maturity level of 0 in 2020 and 2021 to 2 in 2022.[260]

Capabilities limiting PG&E's maturity levels are described below.

- PG&E has not currently implemented a defined process for testing lessons learned from other utilities to ensure local applicability; however, it plans to do so by 2023.[261]
- PG&E indicates that there are communities within its HFTD areas where meaningful resistance is expected in response to its efforts to mitigate fire risk.[262]
- PG&E indicates that is does not currently have a demonstratively cooperative relationship with communities containing greater than 90 percent of the population in HFTD areas (e.g., by being recognized by other agencies as having a cooperative relationship with those communities).[263]
- PG&E does not communicate fire paths to the community as requested.[264]
- PG&E's substantial fuel management is currently limited to its rights of way; however, PG&E projects that it will conduct fuel management throughout its service territory by 2023.[265]
- PG&E does not currently cultivate a native vegetative ecosystem across its territory that is consistent with lower fire risk.[266]

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[259] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, Capability 51.

[260] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, Capability 52.

[261] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to J.I.f.

[262] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to J.II.b.

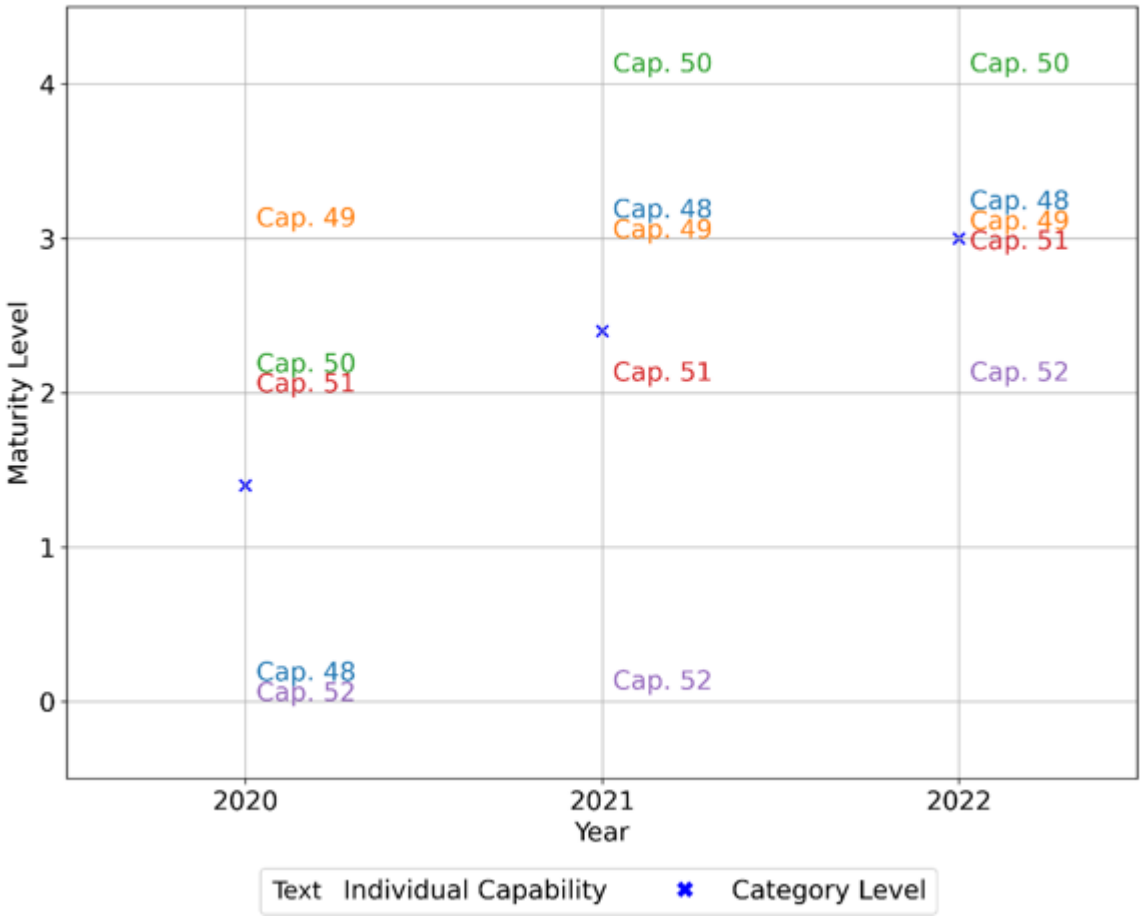
[263] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to J.II.e.

[264] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to J.IV.d.

[265] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to J.V.a.

[266] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to J.V.c.

Figure 4.6.10-2: PG&E's Maturity Survey Responses for All Stakeholder Cooperation and Community Engagement Capabilities (2020-2022)



4.6.10.2 PG&E Progress

PG&E has progressed in the development of its stakeholder cooperation and community engagement programs and initiatives. PG&E reports conducting frequent engagement with state agencies, counties, cities, tribes, first responders, community choice aggregators, water, wastewater and communication service providers and other local emergency responders and community groups throughout the service area to partner on emergency plans and increase public awareness related to emergency planning and preparedness. As part of this outreach and engagement strategy, PG&E hosts quarterly meetings with tribal and local government entities, public safety partners, and representatives of AFN populations

and vulnerable customers grouped into five regions across PG&E's territory.[267] Because public safety partner agencies and other community organizations evolve over time, PG&E has dedicated representatives within its Federal Affairs, State Government Relations, Local Public Affairs (LPA), PSSs, and Tribal Relations departments.

Continuing from its 2021 plan, PG&E has integrated two agency outreach regulatory requirements with the Regionalized Working Groups: the semi-annual meetings to discuss electric grid, microgrid projects and the other wildfire safety related topics;[268] and the semi-annual Wildfire Mitigation Meetings to discuss wildfire mitigation activities and solicit feedback.[269]

Noteworthy areas of progress include the following.

- Customer outreach to Medical Baseline (MBL) customers:
    - In 2021, PG&E launched a new MBL customer application form on its website to allow customers the ability to apply online. PG&E updated this program to improve the enrollment and unenrollment processes.
    - PG&E launched a Medical Practitioner Portal for medical practitioners to easily certify customers' medical needs.
    - PG&E revised its MBL application "denial" letters to include reasons for denial, possible remedies, and information on self-identifying as Vulnerable Customer Status.
    - PG&E updated its MBL webpage with additional resources for customers (e.g., MBL Frequently Asked Questions (FAQs), fact sheet, etc.).
- Funding for Forest Service fuels reduction: As part of its Fuels Reduction Partnership Program with the United States Forest Service (USFS), PG&E awarded approximately 4.3 million dollars to forests in USFS jurisdiction for fuel reduction work in 2021. PG&E states that "this funding will result in fuel load reduction to 6,721 acres of USFS lands

[267] As required by CPUC Decision 20-05-051.

[268] Required by CPUC Decision 20-06-017 in the Microgrid Order Instituting Rulemaking (OIR), p. 46.

[269] Required by CPUC Investigation 19-06-015 in the Wildfire Order Instituting Investigation (OII), Appendix A, Exhibit C, p. 7.

outside [of its] rights of way (ROW).[270] PG&E states that it plans to award up to 5 million dollars to the USFS in 2022.

4.6.10.3 Areas for Continued Improvement

Energy Safety has no areas for continued improvement for PG&E under the stakeholder cooperation and community engagement section of its 2022 Update.

4.7 Public Safety Power Shutoff (PSPS), Including Directional Vision for PSPS

In recent years, utilities have increasingly used Public Safety Power Shutoffs to mitigate wildfire risk. PSPS events introduce substantial risk to the public and impose a significant burden on public services that must activate during these events. Energy Safety supports the use of PSPS only as a last resort and expects the utilities to present clear plans for reducing the scale, scope, and frequency of PSPS events.

In 2021, Energy Safety 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 CPUC PSPS decisions 19-05-036 and 20-03-004).[271] This section of the Guidelines[272] 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. The Guidelines specifically require[273] utilities to

[270] PG&E's 2022 Update, p. 851.

[271] When calculating RSE estimates 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.

[272] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.8 pp. 78-83 (accessed March 6, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51912&shareable=true.

[273] 2022 Wildfire Mitigation Plan Guidelines Template, Attachment 2.8.6, p. 83 (accessed September 17, 2022).

address Public Utilities Code section 8386(c)(8)[274] requirements to identify circuits that have frequently been de-energized and provide measures for how utilities will reduce the need for, and impact of, future de-energization of those circuits.

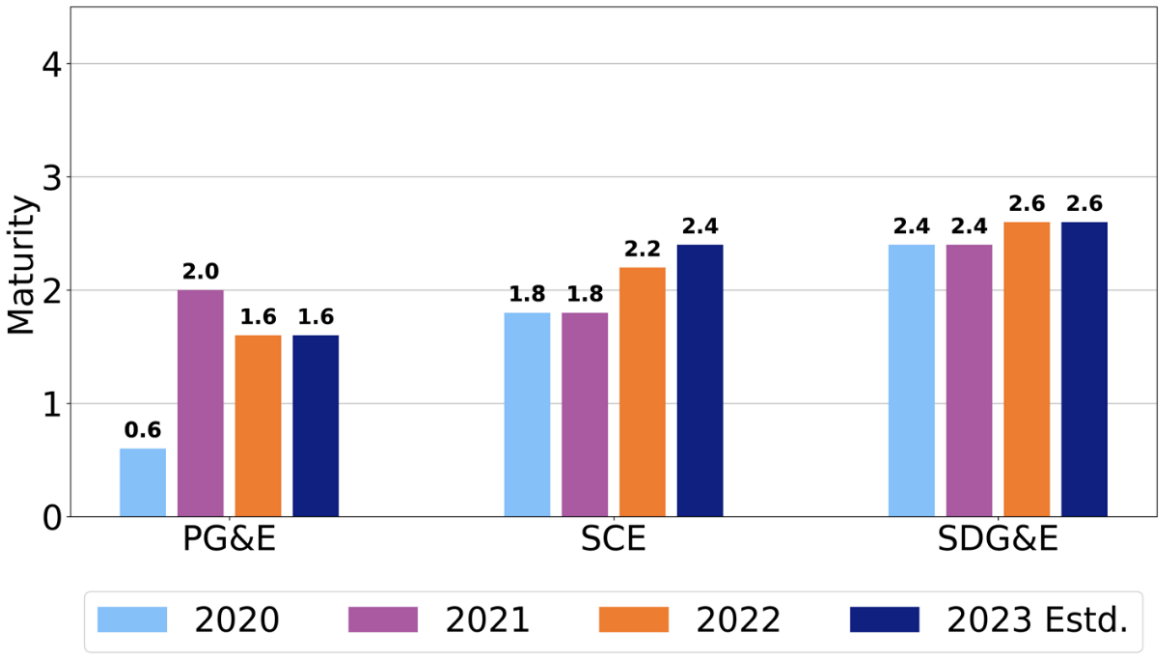
4.7.1 Maturity Assessment

The Maturity Model does not include a distinct PSPS category. PSPS questions in the Maturity Survey are found under capabilities in various maturity categories. The PSPS-related capabilities referenced here are in the maturity categories of situational awareness, grid operations and operating protocols, and emergency planning and preparedness. The PSPS category represented in Figure 4.7-1 below includes PSPS-related capabilities from these categories. Maturity levels are calculated in the same way as the other categories.

According to its responses on the 2022 Maturity Survey, PG&E started the current WMP cycle at a low maturity level relative to its peers in several maturity categories and capabilities related to PSPS. In 2020 PG&E assessed itself at a low maturity level (0.6) and grew substantially (by 1.4) in its 2021 assessment. While PG&E has made progress during the current WMP cycle, it projects the lowest maturity level (1.6) among the large utilities at the conclusion of the current WMP cycle. Overall, based on its responses to the 2022 Maturity Survey PG&E's maturity has decreased in the PSPS-related categories since 2021, and it projects no improvement for 2023. This is due in part to reversals in the number of affected customers notified prior to forecasted PSPS and a growing number of customer complaints.

[274] Senate Bill No. 533, Chapter 244, An act to amend Section 8386 of the Public Utilities Code, relating to electricity: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB533 (accessed April 11, 2022).

Figure 4.7-1: Cross-Utility Maturity Levels for PSPS-Related Capabilities - Large IOUs (2020-2022 Actual, 2023 Estimated)



Some areas which may be preventing PG&E from maturing further are discussed below.

PG&E's maturity level has seen significant growth in the "estimation of wildfire and PSPS risk-reduction" capability of the risk assessment and mapping category. PG&E's ignition risk reduction impact assessment tool has reached the highest level of maturity in its granularity (i.e., asset level) and estimate assessment (i.e., independent expert assessment supported by historical data of incidents and near misses).[275]

In the "grid design for resiliency and minimizing PSPS" capability of the situational awareness category, PG&E's maturity level remained consistent. Its current maturity level may be limited by its response to four questions on the Maturity Survey, including:

- PG&E noted the level of redundancy in its transmission architecture continues to have many single points of failure.[276]

[275] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to A.IV.b.

[276] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.a.

- In 2021 and 2022, PG&E indicated its distribution architecture had a level of redundancy covering at least 50 percent of customers in the HFTD, which is less than the 70 percent to 85 percent coverage that represents a higher level of maturity.[277]
- The level of sectionalization of PG&E's distribution architecture is not limiting the number of customers within one switch, which would represent a higher level of maturity.[278]

In the grid operations and protocols category, PG&E's maturity was limited by several answers, including:

- PG&E reported that 1 percent or more of customers complain during PSPS events. Having less than 0.5-1 percent of customers complain during PSPS events represents a higher level of maturity.[279]
- PG&E continued to affirm its existing process for accurately inspecting de-energized sections of the grid prior to re-energization; this process is not augmented with sensors and aerial tools indicative of a higher level of maturity.[280]
- PG&E noted it takes an average of 12 hours or less to re-energize its grid from a PSPS event once weather has subsided to below its de-energization threshold. Re-energizing its grid following a PSPS event within 8 hours represents a higher level of maturity.[281]

4.7.2 PG&E Progress

PG&E has made the following progress thus far in the current WMP cycle:

Outcome Metrics

PG&E implemented five PSPS events in 2021, and it reduced the average number of customers impacted by implementing smaller and shorter PSPS events. From 2019 to 2020,

[277] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.b.

[278] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to C.III.c.

[279] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.III.c.

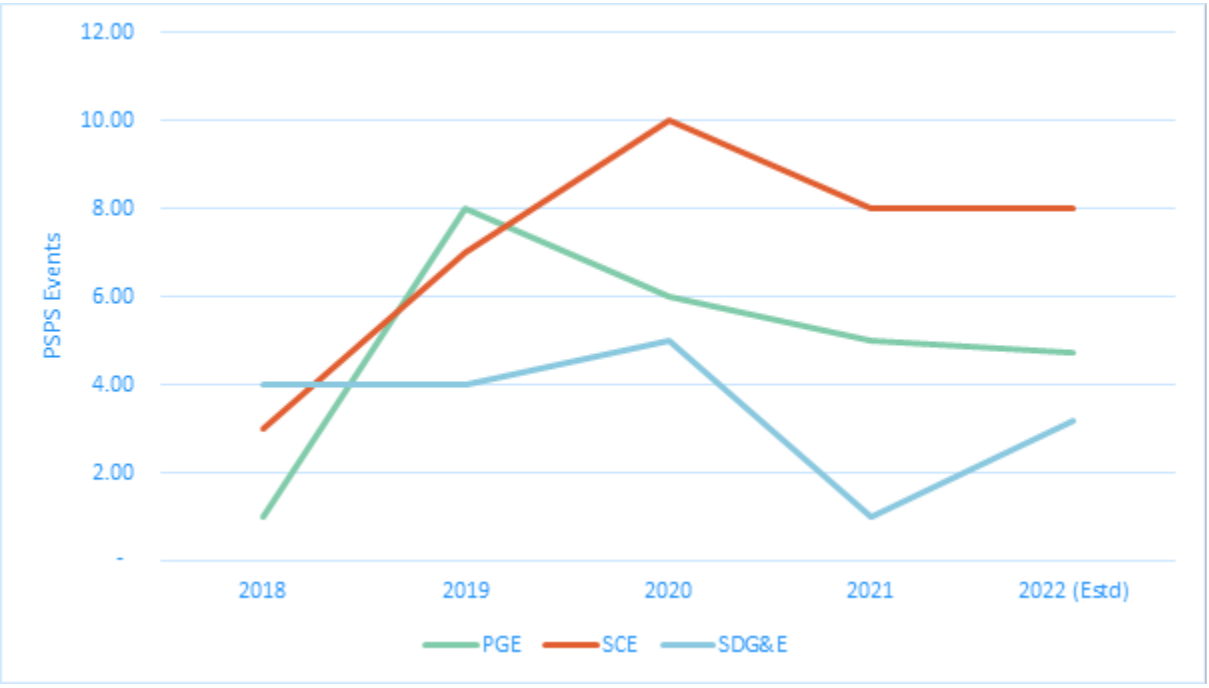
[280] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.V.a.

[281] PG&E's 2022 Utility Wildfire Mitigation Maturity Survey, response to F.V.c.

PG&E had a decrease in annual total customer hours of outages and PSPS events. In 2021, PG&E conducted a historical lookback analysis, from 2018-2021, that showed a reduction of 82,000 customer hours interrupted per PSPS event, totaling 1,599,000 customer hours.[282] From 2020 to 2021, PG&E had a further reduction, in part due to favorable weather conditions, which contributed significantly to PSPS impact reductions among all utilities in 2021.

Using metrics provided in Table 11 regarding scale, scope, and frequency of PSPS events from 2018-2021, PG&E was an outlier among the large IOUs in 2019, the worst year for PSPS events in terms of number of customers impacted. Since 2019, PG&E has shown improvement, as demonstrated in Figures 4.7-2, 4.7-3, 4.7-4. Overall, for the 2018-2021 timeframe PG&E is between SCE and SDG&E in terms of PSPS event frequency. However, throughout the current WMP cycle, PG&E has had the highest number of circuits and highest total customer hours de-energized in PSPS events.

Figure 4.7-2: Recent Use of PSPS: Frequency of PSPS events (Total) – Large IOUs (2018-2021 Actual, 2022 Projected)



[282] PG&E's 2022 Update, pp. 876-877.

Figure 4.7-3: Recent Use of PSPS Circuits: Scope of PSPS events (Total) by Overhead Circuit Mile – Large IOUs (2018-2021 Actual, 2022 Projected)

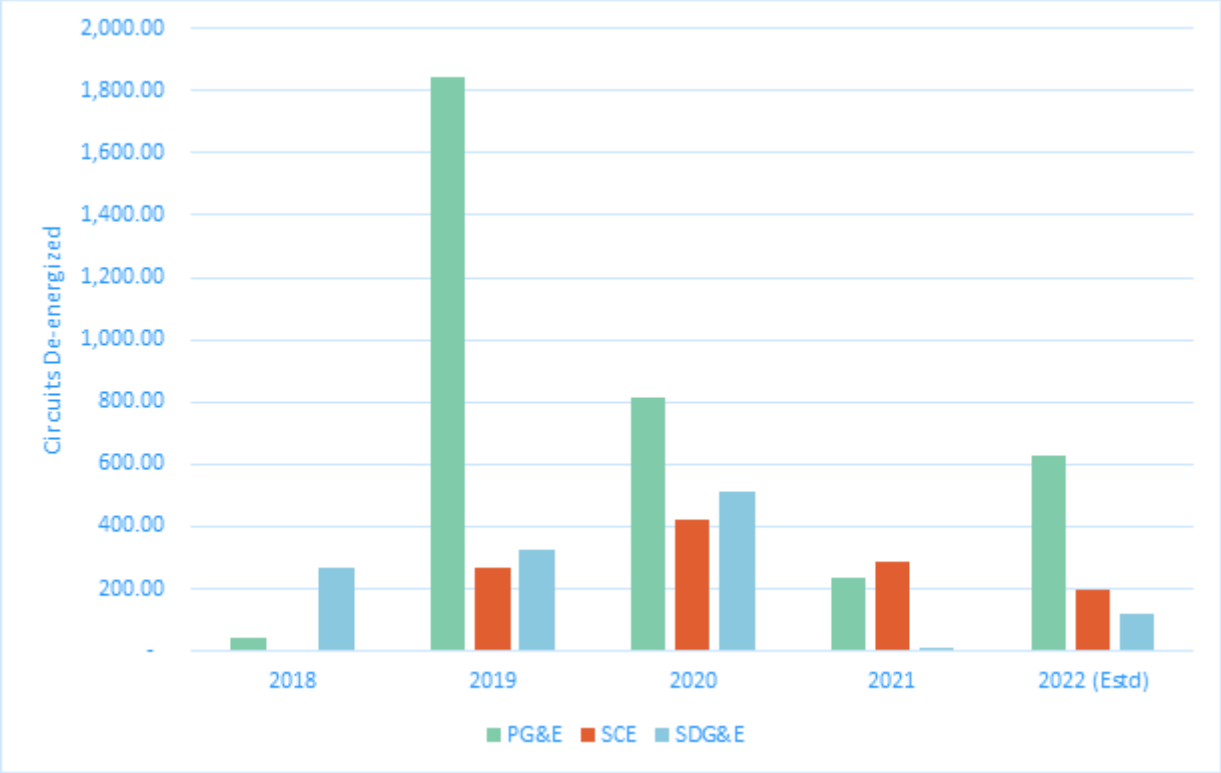


Figure 4.7-4: Recent Use of PSPS, Duration of PSPS Events (Total) – Large IOUs (2018-2021 Actual, 2022 Projected)



PSPS Mitigation

With each of its PSPS events in 2021, PG&E implemented several strategies to better balance mitigating wildfire risks with reducing customer impact. PG&E updated its meteorology models and PSPS protocols, continued sectionalizing transmission and distribution lines, installed temporary microgrids and generators, and completed undergrounding projects. PG&E has outlined a strategic vision including mitigation initiatives targeted to reduce PSPS event size over time and minimize customer impacts during PSPS events. Near-term solutions aim to lessen the impact of PSPS events, while long-term mitigations seek to reduce the scale, scope, and frequency of PSPS events.

Near-Term Plans (2022)

PG&E's near-term plans to lessen the impact of PSPS events are listed below:

- PG&E is focused on improving community resource centers, customer contact information, customer notifications, food replacement services, and electric vehicle charging networks.[283]
- To reduce restoration times, PG&E will evaluate 1) developing weather forecasts to identify conditions that allow safe helicopter patrolling, and 2) implementing a mobile platform capable of providing a visual map of the PSPS event footprint for field patrol personnel.[284]
- PG&E aims to target wildfire mitigations in locations most likely to be impacted by PSPS events. It will use data from a 10-year historical weather event lookback and from actual PSPS events to identify locations it has de-energized most frequently. PG&E anticipates completing the following mitigations in 2022:
    - PG&E aims to install 100 distribution sectionalizing devices[285] and 15 transmission sectionalizing devices on lines in the HFTD.[286]

[283] PG&E's 2022 Update, pp. 868-869.

[284] PG&E's 2022 Update, p. 919.

[285] PG&E's 2022 Update, p. 934.

[286] PG&E's 2022 Update, p. 456.

- PG&E is targeting constructing four temporary distribution microgrids to support critical services.[287]
- PG&E is targeting completing 175 miles of distribution system hardening, thus excluding circuits from PSPS that have been undergrounded.[288]
- PG&E plans to launch a new program to provide vulnerable customers with a solar and storage system to provide backup power during an outage.[289]

Long-Term Plans

PG&E's long-term plans (for 2023 and beyond) for mitigating the scale, scope, and frequency of PSPS events are listed below.

- PG&E is targeting circuits for undergrounding using its new PSPS consequence framework, which assigns every circuit a risk score based on the frequency, duration, and number of customers expected to be impacted by PSPS. Critical facilities and customers identified as more vulnerable to PSPS are afforded a greater prioritization weight. When a circuit is identified for grid hardening for PSPS, the scoping process will also consider alternative mitigations such as remote grid, sectionalizing devices, temporary distribution microgrids, and Fixed Power Solutions. See Section 4.6.3, "Grid Design and System Hardening" for more information.
- PG&E plans to explore long-term transmission mitigation opportunities such as transmission rebuild, transmission undergrounding, or permanent generation at substations to further drive down PSPS scope across its transmission infrastructure.
- PG&E is conducting a pilot of new technology that detects objects approaching energized power lines and responds quickly to shut off power before impact. This technology also shuts off power if it detects elevated fire risk conditions associated with energized power line equipment failures. The prototype field test installation was completed in 2021, and PG&E is currently working on approval of the final version.

[287] PG&E's 2022 Update, p. 935.

[288] PG&E's 2022 Update, p. 531.

[289] PG&E's 2022 Update, pp. 492-495.

In Tables 8.1-1 and 8.1-2 of its 2022 Update, PG&E estimates changes in the frequency, duration and number of customers impacted by PSPS events resulting from increased grid hardening.[290] A key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update was PG&E-21-25, Lack of Specificity Regarding how Increased Grid Hardening Will Change System Operations, Change PSPS Thresholds, and Reduce PSPS Events.[291] Additionally, in response to key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update, PG&E-21-29, PSPS Targets and Projections Set to Expire,[292] PG&E submitted a Change Order Request in September with new targets and projects, which Energy Safety approved.[293] As further conveyed in its Progress Report from November 1, 2021, PG&E addressed the prescribed remedy regarding mitigation alternatives.[294]

Protocols for De-Energization and Re-Energization

As of August 2021, PG&E is using its updated PSPS protocols to assess PSPS events, and in September 2021 PG&E completed the development of new PSPS transmission protocols. PG&E plans to use these 2021 PSPS protocols in the 2022 PSPS season. PG&E has no plans to significantly modify the scoping methodology or meteorology models in 2022 as had been previously done in 2020 and up to three times during 2021.[295]

To reduce customer impact from PSPS, circuit segmenting is conducted while lines are de-energized, which allows for "step restoration" once the weather "all clear" is received.[296] In

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[290] PG&E's 2022 Update, pp. 871-872.

[291] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 17 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[292] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 116 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[293] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 116 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

[294] Pacific Gas and Electric Company Progress Report Response to Energy Safety Remedies PG&E-21-01 through PG&E-21-28, November 1, 2021, pp. 89-93 (accessed August 29, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51852&shareable=true.

[295] PG&E's 2022 Update, p. 869.

[296] PG&E's 2022 Update, pp. 714-715.

2021, PG&E made improvements to the "all-clear" process via the use of "all clear zones" to identify specific assets approved for restoration and thereby improve resource staging to reduce outage duration.

PG&E's PSPS Risk-Benefit Tool factors in forecasted circuits, customers impacted, customer outage minutes, and wildfire simulation data to estimate the consequence of potential wildfire risk and PSPS risk at the circuit level. This is an upgrade in response to a key area for improvement cited in Energy Safety's Action Statement on PG&E's 2021 Update, PG&E-21-05, Lack of PSPS Consequence Model at a Circuit Segment Level.[297] This tool calculates risk scores, capturing safety, reliability, and financial impact.

PG&E is currently evaluating how the potential duration of interrupted power adversely impacts service reliability for customers located on a specific circuit and the likelihood of resulting injury and/or property damage. This is the first iteration of the tool, and PG&E aims to further quantify other potential concerns associated with de-energization.

In 2022, PG&E intends to expand the enhanced powerline safety setting (EPSS) scope to the entire HFTD and high fire risk area (HFRA) in its service territory. PG&E plans to install EPSS protection devices on 1,018 circuits, with each device individually programmed.[298] PG&E will determine when to activate EPSS settings based on FPI ratings throughout the service territory. See Section 4.6.6, "Grid Operations and Operating Protocols, Including PSPS" for more information on EPSS.

Community Engagement

PG&E conducts outreach on emergency preparedness, provides notification during PSPS events, and offers additional support to impacted customers. In 2021 PG&E sought to make PSPS events less burdensome, highlighting the following accomplishments:[299]

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[297] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 46 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true .

[298] PG&E's Fourth Errata to 2022 Update (Docket: 2022-WMPs), provided April 29, 2022, p. 2.

[299] PG&E's 2022 Update, pp. 936-937.

- PG&E leveraged 61 community-based organization partnerships to help support access and functional needs (AFN) customers with food assistance, a portable shower/laundry service, and two-family resource centers.
- PG&E provided 9,500 food boxes, conducted 9,900 customer assessments for backup power and delivered 6,500 batteries to qualifying customers.
- PG&E increased Medical Baseline program enrollment by 36 percent since 2020 to over 263,000 customers. This enabled PG&E to increase PSPS notifications capabilities to medically vulnerable communities.
- PG&E disseminated PSPS communication using 15 non-English languages and American Sign Language.

Frequently De-Energized Circuits

In its 2022 Update PG&E sufficiently addresses new requirements in Public Utilities Code section 8386(c)(8) to identify circuits that have frequently been de-energized (Figure 4.7-5). PG&E reports 261 frequently de-energized circuits 2018-2021,[300] and provides the following mitigations: [301]

- PG&E completed 210 miles of distribution system hardening in 2021 including undergrounding, overhead hardening, microgrid and remote grid; 470 circuit miles of system hardening work in the HTFD, or adjacent buffer zone areas are planned for 2022. Of these, 171 circuits had some portion mitigated by grid hardening.
- PG&E completed 204 miles of transmission lines hardening or removal in 2021; 32 miles of transmission conductor are planned for replacement or removal in 2022.
- PG&E replaced equipment in HFTD areas that create ignition risks including non-exempt fuses (greater than or equal to 1,400) and surge arresters (greater than or equal to 15,000). Replacement of 3,000 non-exempt fuses and approximately 4,500 surge arresters is planned for 2022, along with the installation of additional automated devices to sectionalize the grid to reduce PSPS event impact.

[300] PG&E's 2022 Update, pp. 965-1000.

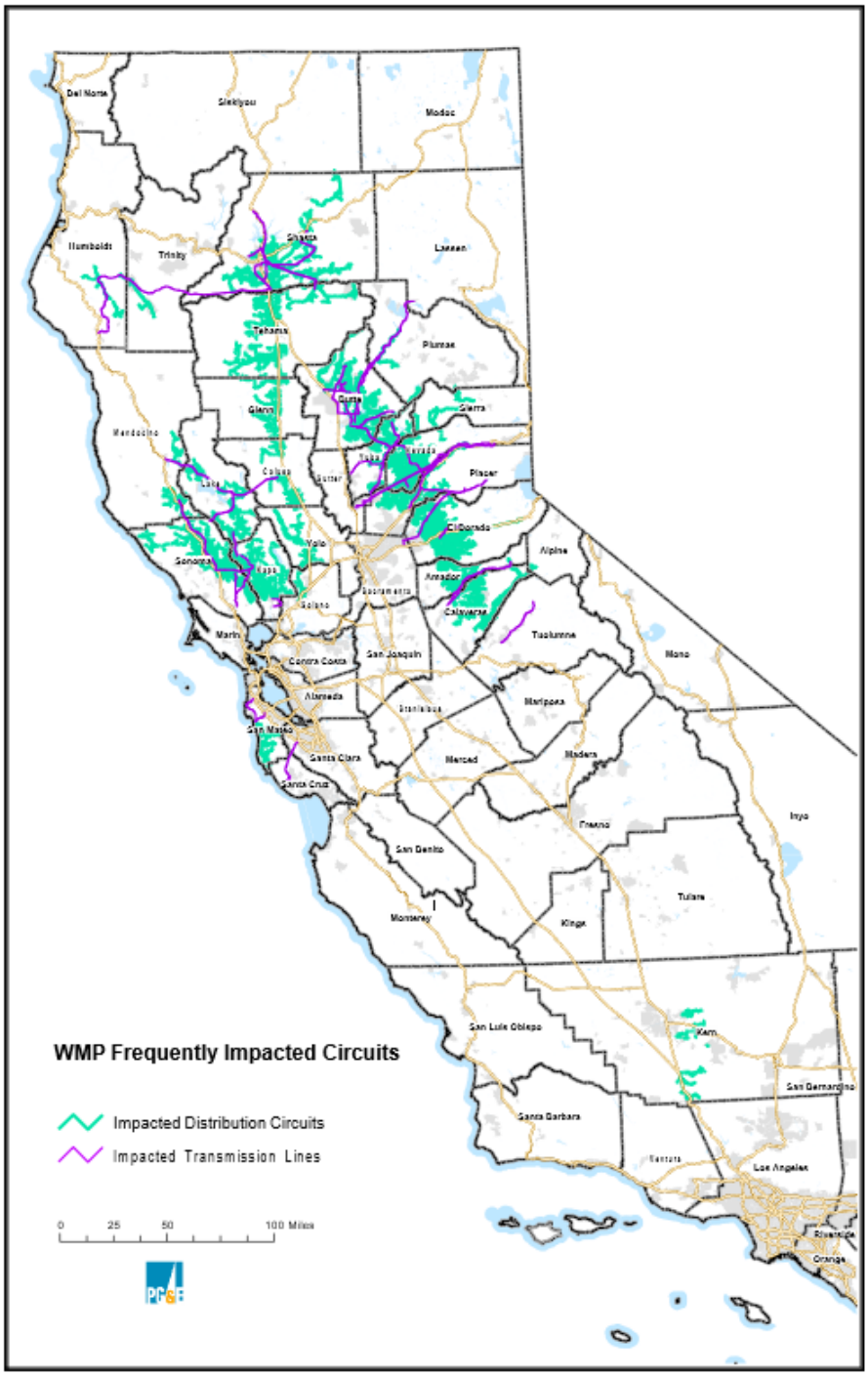
[301] PG&E's 2022 Update, p. 531.

- PG&E launched new plans to underground 10,000 miles of overhead distribution lines in HFTD areas. PG&E plans to complete greater than 175 miles of undergrounding in 2022, with the goal of increasing undergrounding annually to reach 1,200 miles per year by 2026. [302] See Section 4.6.3, "Grid Design and System Hardening" for more information.

PG&E provides the following required map of frequently de-energized circuits:

[302] PG&E's 2022 Update, p. 9.

Figure 4.7-5: Map of Frequently De-energized Circuits (Source: PG&E)[303]



[303] Data Request OEIS-PG&E-006, Question 2.

4.7.3 Areas for Continued Improvement

In addition to progress made, PG&E must continue to improve in the following areas.

Quantify Mitigation Benefits of Reducing PSPS Scale, Scope, and Frequency

PG&E did not clearly demonstrate in Table 11, Recent Use of PSPS and Other PSPS Metrics, of its 2022 Update, anticipated 2022 mitigation initiative benefits of projected reductions in scale, scope, and frequency for 2023. However, PG&E depicts anticipated benefits in Tables 8.1-1 and 8.1-2 of its 2022 Update. In response to a data request, PG&E indicated "PG&E projected PSPS metrics in 2022 based on planned system enhancements and improvements, and Table 11 keeps those values static for 2023. PG&E anticipates continued improvement from 2022 to 2023, but we do not yet have the data and analysis on the impact of those improvements. Thus, for the purposes of this table, without further data and analysis, no additional improvements have been assumed or forecasted."[304] Going forward, PG&E must identify how it used the mitigation initiatives claimed in the WMP Update in each of the PSPS events in its quarterly data reporting beyond the current year.

Energy Safety sets forth specific areas for improvement and associated required progress in Section 7.

[304] Data Request OEIS-PG&E-007, Question 19.

5. Next Steps

PG&E is expected to continue to mature over the coming year. However, PG&E must specifically demonstrate the required progress set forth in Section 7.

5.1 Change Orders

If PG&E seeks to modify (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 Request. For information and requirements regarding the change order process, refer to the 2022 Change Order Guidelines.[305]

[305] Revised 2022 Change Order Guidelines for Electrical Corporations (accessed November 8, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52883&shareable=true.

6. Consultation with the Office of the State Fire Marshal

The Office of the State Fire Marshal is a CAL FIRE program. Public Utilities Code section 8386.3(a) requires Energy Safety to consult with the Office of the State Fire Marshal in reviewing electrical corporations' WMPs and WMP Updates. Energy Safety and CAL FIRE have a memorandum of understanding in place to facilitate this consultation.[306] The Office of the State Fire Marshal participated in all aspects of the evaluation, but this Decision does not purport to speak for the Office of the State Fire Marshal or CAL FIRE.

[306] Required by Pub. Util. Code § 8386.5.

7. List of PG&E's Areas for Continued Improvement and Required Progress

Energy Safety evaluated 2022 Updates with a particular focus on how each utility is driving down the risk of utility-related ignitions. The evaluation included assessing the utility's progress implementing wildfire mitigation initiatives, evaluating the feasibility of its strategies, and measuring year-to-year trends. As a result of this evaluation, Energy Safety identified areas where the utility should continue to improve its wildfire mitigation capabilities in future plans. The complete list of all PG&E's areas for continued improvement follows below.

- **PG&E-22-01. Prioritized List of Wildfire Risks and Drivers.**
  - Description: Currently, PG&E's prioritized list of wildfire risks and drivers (Table 4.2-2) weights the risk drivers by average outage multiplied by ignition rate; it does not account for the likelihood of the ignition to cause a catastrophic wildfire.
  - Required Progress: In its 2023 WMP, PG&E must further refine its prioritized list of wildfire risks and drivers. It must do so by weighting each risk driver by likelihood of causing a catastrophic wildfire (e.g., does this ignition tend to happen in high wildfire risk areas identified by PG&E's risk models, including the HFTD).
  - Discussed in Section 4.3, "Lessons Learned and Risk Trends."

- **PG&E-22-02. Collaboration and Research in Best Practices in Integrating Climate Change Impacts and Wildfire Risk and Consequence Modeling.**
  - Description: PG&E and the other large utilities are currently pursuing their own efforts at integrating the potential impacts of climate change on their risk and consequence modeling on the topic of integrating climate change into projections of wildfire risk. They are not actively collaborating with each other on these efforts and are not actively taking advantage of the existing climate change modeling expertise of state agencies and academic institutions.

- Required Progress: Prior to the submission of their 2023 WMPs, all electrical corporations (not including independent transmission operators) must participate in an Energy Safety-led scoping meeting to discuss how utilities can best learn from each other, external agencies, and outside experts. They must also participate in any follow-on activities to this meeting. In addition, the climate change and risk modeling scoping meeting will identify future topics to explore regarding climate change modeling and impacts relating to wildfire risk. This scoping meeting may result in additional meetings or workshops or the formation a working group. Energy Safety will provide additional details on the specifics of this scoping meeting in due course.
- Discussed in Section 4.3, "Lessons Learned and Risk Trends."

- **PG&E-22-03. Inclusion of Community Vulnerability in Consequence Modeling.**
  - Description: PG&E does not currently adequately include the impacts of wildfire on communities, such as community vulnerability, within consequence modeling.
  - Required Progress: Prior to the submission of their 2023 WMPs, all electrical corporations (not including independent transmission operators) must participate in an Energy Safety-led scoping meeting to discuss how to best learn from each other, external agencies and outside experts on the topic of community vulnerability. They must also participate in any follow-on activities to this meeting. In addition, the community vulnerability scoping meeting will identify future topics to explore regarding integration of community vulnerability into consequence modeling and impacts relating to wildfire risk. This scoping meeting may result in an additional meetings or workshops or the formation of a working group. Energy Safety will provide additional details on the specifics of this scoping meeting in due course.
  - Discussed in Section 4.6.1, "Risk Assessment and Mapping."

- **PG&E-22-04. Fire Suppression Considerations.**
  - Description: PG&E's fire spread modeling does not currently factor in suppression effects (e.g., fire department efforts).
  - Required Progress: Prior to the submission of its 2023 WMP, PG&E must work with other utilities to evaluate how to best account for, quantify, and model suppression effects on wildfire spread. Further guidance will be determined and covered during the risk model working group meetings established by Energy Safety's 2021 WMP Action Statements.

- Discussed in Section 4.6.1, "Risk Assessment and Mapping."

- **PG&E-22-05. Eight-Hour Fire Spread Simulations.**
  - Description: PG&E's eight-hour fire spread simulations may be impacting the accuracy of its wildfire spread consequence modeling.
  - Required Progress: PG&E must:
    - Prior to the submission of its 2023 WMP, PG&E must benchmark against other utilities to account for catastrophic fire risk that occurs more than eight hours post-ignition and provide a summary of lessons learned in its 2023 WMP. Further guidance may be determined and covered within the risk model working group established by the 2021 WMP Action Statements.
    - In its 2023 WMP, PG&E must include a description of resulting changes to its wildfire spread consequence modeling or anticipated changes and a timeline for implementation.
    - Discussed in Section 4.6.1, "Risk Assessment and Mapping."

- **PG&E-22-06. Addressing Increase in Risk Events.**
  - Description: PG&E reports an increase in risk events from 2021 to 2022.
  - Required Progress: In its 2023 WMP, PG&E must:
    - Analyze root causes and trends for the increases in risk events and ignition likelihood broken down by sub-driver.
    - Provide its plans to address increases in ignition rates broken down by risk drivers and sub-drivers, including efforts to address the root cause(s) outside of routine or program-level WMP initiatives.
    - Describe and quantify effectiveness for how PG&E anticipates covered conductor and undergrounding initiatives will impact expected ignitions due to conductor damage or failure.
  - Discussed in Section 4.6.1, "Risk Assessment and Mapping."

- **PG&E-22-07. Applying Modeling Lessons-Learned from Third-Party Review.**
  - Description: The third-party review of PG&E's third version of its risk model identified issues for PG&E to address.
  - Required Progress: In its 2023 WMP, PG&E must provide its plan to address any issues identified in the 2022 third-party review of its risk model, including:
    - Specific steps and improvements PG&E plans to implement to address gaps.
    - A timeline for implementation.

        - An update on progress made to address the issues, including references to where changes have been applied.
    - Discussed in Section 4.6.1, "Risk Assessment and Mapping."

- **PG&E-22-08. Better Application of Specific Lessons Learned from Utility-Caused Fires.**
    - Description: PG&E reports lessons from individual catastrophic fires. However, the lessons learned as reported provide insufficient detail about how they are tied to the specific cause of each fire. Furthermore, PG&E does not provide sufficient details on measures implemented as a result of these lessons, which may differ by fire.
    - Required Progress: In its 2023 WMP, PG&E must provide specific analysis on how lessons learned are specifically tied to the causes of past PG&E-equipment related catastrophic fires beyond what it has provided to date. This must include:
        - Specific cause analysis for each catastrophic fire that analyzes in detail the underlying sources and issues that led to ignition and spread.
        - Evaluation of underlying programmatic and systemic issues in relation to the causes.
        - Consideration of resource availability to make sweeping changes, including analysis of risk prioritization and cost/benefit analysis compared to other wildfire mitigation changes being made.
    - Discussed in Section 4.6.1, "Risk Assessment and Mapping."

- **PG&E-22-09. Evaluation of Model Reprioritization and Fire Rebuild in High-Risk Areas.**
    - Description: PG&E lacks vetting of the accuracy of its version three (V3) risk model compared to its version two (V2) risk model, including future vegetation projections in fire rebuild areas. This is important given its changes in modeling future vegetation growth.
    - Required Progress: In its 2023 WMP, PG&E must provide further details and analysis on how its model output changed risk scores and resulting prioritization of work. This must include:
        - Analysis on the impact that specific changes to mapping methodology had on risk scores and prioritization of work. This should include confidences in risk model outputs between V2 and V3 as well as a list of projects that were de-prioritized through changes implemented between V2 and V3 of the model.

        - Description of the type of fuel mapping being completed to evaluate the future risk in fire scars, including details on the analysis completed to determine the most accurate fuel cases being used.
    - Discussed in Section 4.6.1, "Risk Assessment and Mapping."

- **PG&E-22-10. Justification of Weather Station Network Density.**
    - Description: PG&E reports meeting its targeted goal of deploying 1,300 weather stations. However, comparing weather station density to peer utilities, PG&E has fewer weathers stations installed per circuit mile than its peers.
    - Required Progress: In its 2023 WMP, PG&E must explain how the long-term goal of 1,300 weather stations was determined and that this number provides sufficient granularity. This analysis must address how spatial gaps in its network have been identified.
    - Discussed in Section 4.6.2, "Situational Awareness and Forecasting."

- **PG&E-22-11. Covered Conductor Effectiveness Lessons Learned.**
    - Description: PG&E has not yet provided goals or timelines for implementing lessons learned from the covered conductor joint effectiveness study.
    - Required Progress: In its 2023 WMP, PG&E must:
        - Provide a concrete list of goals with planned dates of implementation for any lessons learned in the covered conductor effectiveness joint study.
        - Provide a table indicating which WMP sections include changes (compared to its 2021 and 2022 Updates) as a result of the covered conductor effectiveness joint study. This should include, but not be limited to:
            - Changes made to covered conductor effectiveness calculations.
            - Changes made to initiative selection based on effectiveness and benchmarking across alternatives.
            - Inclusion of rapid earth fault current limiter (REFCL), open phase detection (OPD), early fault detection (EFD), and distribution fault anticipation (DFA) as alternatives, including for PSPS considerations.
            - Changes made to cost impacts and drivers.
            - An update on data sharing across utilities on measured effectiveness of covered conductor in-field and pilot results, including collective evaluation.
    - Discussed in Section 4.6.3, "Grid Design and System Hardening."

- **PG&E-22-12. Covered Conductor Inspection and Maintenance.**
  - Description: PG&E lacks specific directives for inspection procedures and practice regarding covered conductor inspection and maintenance.
  - Required Progress: All electrical corporations (not including independent transmission operators) must work to share and determine best practices for inspecting and maintaining covered conductor, including either augmenting existing practices or developing new programs. This should be considered as a continuation of the covered conductor effectiveness joint study established by Energy Safety's 2021 WMP Action Statements. The study will continue to be utility-led, with the expectation for Energy Safety to be included as a participant. A report on progress on this continuation of the covered conductor effectiveness joint study will be expected in the 2023 WMPs.
  - Discussed in Section 4.6.3, "Grid Design and System Hardening."

- **PG&E-22-13. New Technologies Evaluation and Implementation.**
  - Description: PG&E could benefit from cross-utility collaboration for new technology exploration and benchmarking.
  - Required Progress: All electrical corporations (not including independent transmission operators) must collaborate to evaluate the effectiveness of new technologies that support grid hardening and situational awareness such as REFCL and DFA/EDF, particularly in combination with other initiatives. Utilities must also share practices and evaluate implementation strategies for these new technologies. This should be considered as a continuation of the covered conductor effectiveness joint study established by Energy Safety's 2021 WMP Action Statements. The scope of this study should now be expanded to cover grid hardening overall. The study will continue to be utility-led, with the expectation for Energy Safety to be included as a participant. A report on progress on this expansion of the covered conductor effectiveness joint study will be expected in the 2023 WMPs.
  - Discussed in Section 4.6.3, "Grid Design and System Hardening."

- **PG&E-22-14. Decreased Transmission Hardening Targets.**
  - Description: PG&E decreased its transmission hardening targets from 2021 to 2022 due to project lead time and delays from changing prioritization based on risk model output.

  - Required Progress: In its 2023 WMP, PG&E must show that it is setting transmission hardening targets based on risk and not decreasing targets solely based on project delays. If PG&E's updated risk model results in a lower number of transmission miles requiring hardening, PG&E must justify the decrease.
  - Discussed in Section 4.6.3, "Grid Design and System Hardening."

- **PG&E-22-15. Decreased Transmission/Distribution Sectionalization Device Targets.**
  - Description: PG&E decreased its targets for installing additional sectionalization devices on both the distribution and transmission systems.
  - Required Progress: In its 2023 WMP, PG&E must either:
    - Adequately demonstrate and provide analysis performed to support the decreased targets (i.e., how the decreased target provides the same risk reduction benefit), OR
    - Increase targets for sectionalization device installation for both the distribution and transmission levels. The targets should be set to provide appreciable benefits by decreasing the number of customers relying on each device.
  - Discussed in Section 4.6.3, "Grid Design and System Hardening."

- **PG&E-22-16. Progress and Updates on Undergrounding and Risk Prioritization.**
  - Description: PG&E's undergrounding plan is not currently broken out by year past 2023.
  - Required Progress: In its 2023 WMP, PG&E must:
    - Provide an updated spreadsheet with the locations and mileage for undergrounding broken out by year from 2024 to 2026.
    - Discuss how each project was prioritized based on risk and feasibility.
    - Provide an update on the progress PG&E has made thus far in meeting its undergrounding targets, both past and future, including any changes made in resources and availability of labor.
  - Discussed in Section 4.6.3, "Grid Design and System Hardening."

- **PG&E-22-17. Future Quantitative Targets to Reduce the Backlog of Repairs.**
  - Description: PG&E's increased inspections (performed to exceed existing General Order [GO] requirements and better address wildfire risk) resulted in a backlog of repairs. While PG&E committed to backlog reduction targets, PG&E did not include quantitative targets for reducing its backlog past 2023.

- Required Progress: In its 2023 WMP, PG&E must provide quantitative targets for addressing repairs for infractions found during inspections, broken down by severity level of the finding, accounting for the entire backlog. Prioritization should be given for risk tags presenting the most ignition risk within the HFTD/HFRA areas.
- Discussed in Section 4.6.4, "Asset Management and Inspections."

- **PG&E-22-18. Retainment of Inspectors and Internal Workforce Development.**
  - Description: PG&E does not currently have a defined plan to increase asset inspector employee retention, which may be affecting the quality of inspections being completed. PG&E also primarily relies on contractors to complete asset inspection work.
  - Required Progress: In 2023, PG&E must:
    - Provide a plan to increase retention over time for trained and qualified inspectors.
    - Provide a plan for increasing and sustaining a consistent, year-over-year internal workforce that builds on existing experience and mentors new employees for asset inspections.
  - Discussed in Section 4.6.4, "Asset Management and Inspections."

- **PG&E-22-19. Benchmarking with Other Utilities on Inspector Qualifications.**
  - Description: PG&E may require qualifications of its asset inspectors that differ from those of other utilities, potentially inhibiting continued availability of qualified and competent inspectors.
  - Required Progress: By its 2023 WMP, PG&E must benchmark its required qualifications of asset inspectors with the required qualifications of other utilities. Based on this benchmarking, in its 2023 WMP, PG&E must:
    - Provide a discussion of the differences in qualifications required by other utilities as well as differences in the QA/QC results of other utilities' asset inspections.
    - Analyze the pros and cons of adjusting its required qualifications to match those of other utilities and adjust its required qualifications as PG&E deems appropriate.
  - Discussed in Section 4.6.4, "Asset Management and Inspections."

- **PG&E-22-20. Asset Inspection Drone Program Pilot**.
  - Description: PG&E is using drones in a limited capacity within its aerial inspection program pilots.
  - Required Progress: In its 2023 WMP, PG&E must:

        - Include testing and analysis results of drones for asset inspections as part of its aerial inspection pilot program.
        - Report analysis from the pilot, including find rates across inspection types and effectiveness based on resource limitations and timing. PG&E must report find rates and effectiveness and also compare these between detailed asset inspections and climbing inspections.
        - Report on its 2022 expanded use of drones and other aerial technology for asset inspections based on findings from the pilot program.
    - Discussed in Decision Section 4.6.4, "Asset Management and Inspections."

- **PG&E-22-21. Asset Inspections Quality Assurance and Quality Control.**
    - Description: PG&E is falling behind on its asset inspection quality assurance and quality control (QA/QC) goals and does not currently have goals for 2023.
    - Required Progress: In its 2023 WMP, PG&E must:
        - Provide quantitative targets, including acceptable quality levels (AQL[s]), for asset inspection QA/QC for 2023 and 2024. The AQL target(s) for performance must be no less than 95 percent.
        - Provide the results of its remaining 2022 asset inspection QA/QC.
        - Discuss any additional changes made to its asset inspection program and/or QA/QC process based on continued lessons learned through the 2022 QA/QC program. This should include a list of specific failures and weak points that have contributed to PG&E's high QA/QC failure rates in 2022.
        - Provide a description of the progress made to reach its goals, including analysis of the impact of implementing each change to its QA/QC process.
    - Discussed in Section 4.6.4, "Asset Management and Inspections."

- **PG&E-22-22. Progress on Meeting Asset Inspection Regulatory Requirements.**
    - Description: PG&E is not meeting General Order (GO) requirements; it has thousands of overdue work tags.
    - Required Progress: PG&E must come into compliance with and eliminate its maintenance backlog pursuant to the relevant, overdue GO work order backlog requirements by the end of 2023. In its 2023 WMP, PG&E must:
        - Provide its resource plan describing how it will progress on closing outstanding and overdue work orders in the HFTD to eventually reach a

functional capability whereby more work orders are being closed than are being opened.
        - Provide an update of its progress on addressing remaining work tags in 2022, including the number of work tags opened and closed per quarter.
        - Provide a remedial plan to address its full maintenance backlog including GO backlogs as soon as feasible.
        - By the end of 2023, develop a plan detailing how PG&E will clear the GO repair backlog no later than the end of the 2023-2025 WMP cycle and demonstrating capability to maintain its repair cycle within GO requirements. PG&E must include this plan in its WMP Update submitted in 2024.
    - Discussed in Section 4.6.4, "Asset Management and Inspections."

- **PG&E-22-23. Reduce Necessity for the Utility Defensible Space Program.**
    - Description: PG&E clears a 50-foot horizontal radial distance around some poles in the HFTD as part of its Utility Defensible Space (UDS) program. While Energy Safety believes UDS is effective, Energy Safety does not consider this activity to be a long-term solution.
    - Required Progress: In its 2023 WMP, PG&E must:
        - Report on any progress made to reduce the need for the UDS program.
        - Provide a plan for achieving progress that extends through the 2023-2025 WMP cycle.
    - Discussed in Section 4.6.5, "Vegetation Management and Inspections."

- **PG&E-22-24. Progression of Vegetation Management Maturity.**
    - Description: In response to RN-PG&E-22-09, PG&E identified several initial steps to mature in certain capabilities in its vegetation management program.
    - Required Progress: In its 2023 WMP, PG&E must report on its progress in implementing its initial steps to increase the maturity of its vegetation management program including any resulting plans and timelines.
    - Discussed in Section 4.6.5, "Vegetation Management and Inspections."

- **PG&E-22-25. External Engagement for Vegetation Management.**
    - Description: PG&E has created a Constraints Resolution Team and expanded access to "ProjectWise" to address vegetation management (VM) constraints.

Nevertheless, PG&E must continue to make efforts to decrease constrained miles for VM programs.
    - Required Progress: In its 2023 WMP, PG&E must report on how it is addressing and reducing the number of constrained miles for VM programs, including metrics. Additionally, PG&E must consider setting internal targets for the Constraints Resolution Team to demonstrate its success rate and report on these targets in its 2023 WMP. PG&E must also consider creating a "right tree-right place" program: offering tree replacements at no cost to customers may reduce customer refusal constraints.
    - Discussed in Section 4.6.5, "Vegetation Management and Inspections."

- **PG&E-22-26. Auditing of Internal Pre-Inspectors.**
    - Description: PG&E has hired 108 internal pre-inspectors. PG&E's QA/QV scope currently does not apply to internal pre-inspectors.
    - Required Progress: By the time PG&E submits its 2023 WMP all pre-inspectors must be subject to the QA/QV.
    - Discussed in Section 4.6.5, "Vegetation Management and Inspections."

- **PG&E-22-27. Vegetation Management Wildfire Inspection Guide – Stakeholder Engagement.**
    - Description: PG&E is developing a Vegetation Management Wildfire Inspection Guide to assess hazard trees in post-fire situations.
    - Required Progress: PG&E must engage with Energy Safety, Cal FIRE, the Wildfire Safety Advisory Board, and stakeholders to receive feedback on the guide. In its 2023 WMP, PG&E must attach the finalized guide, provide a summary of stakeholder input, and report on any input given by stakeholders that was integrated into the guide.
    - Discussed in Section 4.6.5, "Vegetation Management and Inspections."

- **PG&E-22-28. Progression of Effectiveness of Enhanced Clearances Joint Study.**
    - Description: The 2021 Action Statements required the large IOUs to conduct a study assessing the effectiveness of enhanced clearances. Progress has been made in the study; however, the study must continue to progress.
    - Required Progress: By the submission of the 2023 WMPs, PG&E, along with SCE and SDG&E, must (1) standardize the data collection process for the cross-utility database of tree-caused risk events, (2) determine where and in what form the database will exist, (3) examine, to the best of their ability, whether

the correlation between enhanced clearances and the lower number of tree-caused outage events may be attributable to other factors beyond clearances, such as the management of hazard trees and the installation of covered conductor. Energy Safety expects the large IOUs to make incremental progress and update their analyses with each WMP submission through at least 2025.

- Discussed in Section 4.6.5, "Vegetation Management and Inspections."

- **PG&E-22-29. Participation in Vegetation Management Best Management Practices Scoping Meeting.**
  - Description: Vegetation management processes and protocols for the reduction of wildfire risk are not uniform across electrical corporations.
  - Required Progress: Prior to the submission of their 2023 WMPs, PG&E and all other electrical corporations (not including independent transmission operators) must participate in an Energy Safety-led scoping meeting to discuss how utilities can best learn from each other and future topics to explore regarding vegetation management best management practices for wildfire risk reduction. This vegetation management best management practices scoping meeting may result in additional meetings or workshops or the formation of a working group. Energy Safety will provide additional details on the specifics of this scoping meeting in due course.
  - Discussed in Section 4.6.5, "Vegetation Management and Inspections."

- **PG&E-22-30. Response Operations for Potential Fault/Outages in its Highest Risk Areas.**
  - Description: PG&E does not discuss in its WMP its prioritized response operations for faults/outages as they occur in its highest risk areas of its service territory.
  - Required Progress: In its 2023 WMP, PG&E must discuss how it has developed its processes and procedures to locate, prioritize, and respond to the locations of faults/outages in its highest risk areas as they occur. This should include discussion of how PG&E uses its wildfire consequence modeling to locate, prioritize, and respond to the locations of faults/outages in the HFTD as they happen.
  - Discussed in Section 4.6.6, "Grid Operations and Operating Protocols, Including PSPS."

- **PG&E-22-31. PSPS Wind Threshold Change Evaluations.**
  - Description: PG&E has not yet evaluated PSPS threshold changes as a result of installing covered conductor.
  - Required Progress: In its 2023 WMP, PG&E must:
    - Coordinate with other utilities[307] to understand the impacts of installing covered conductor and associate changes that could be made to PSPS thresholds as a result.
    - Provide a summary of key findings, including any changes implemented to PG&E's PSPS procedures or practices.
    - Provide any studies completed by third parties on wind speed thresholds for covered conductor, or, if not yet completed, a timeline for completion.
    - Provide a description and associated justification of any modifications to PSPS wind speed thresholds since the 2022 Update.
  - Discussed in Section 4.6.6, "Grid Operations and Operating Protocols, Including PSPS."

- **PG&E-22-32. Updates on EPSS Reliability Study.**
  - Description: PG&E has not yet included any data from 2022 in its EPSS reliability impact study.
  - Required Progress: In its 2023 WMP, PG&E must provide the results from an updated 2022 EPSS reliability impact study, including any related safety impacts. This must include, but is not limited to:
    - Number of outages.
    - Duration of outages.
    - Number of customers impacted.
    - Number of customers belonging to vulnerable populations (such as AFN, Medical Baseline, and Social Vulnerability Index) impacted.
    - Impact on community values, including intangibles (e.g., livelihood).
    - Response time for outages.
    - Asset health (open work tags, asset age, etc.).

[307] "Other utilities" in this case are SCE and SDG&E.

    - Vegetation data.
    - Resource constraints (access issues, staffing numbers, etc.).

  PG&E must also provide an updated plan of actions being taken based on the analysis performed in its EPSS reliability impact study to reduce reliability and safety impacts of EPSS.
- Discussed in Section 4.6.6, "Grid Operations and Operating Protocols, Including PSPS."

- **PG&E-22-33. Progress on Filling Asset Inventory Data Gaps.**
  - Description: Much of PG&E's asset inventory is missing age, installation, or other data.
  - Required Progress: In its 2023 WMP, PG&E must:
    - Outline all programs underway to improve the quality of its asset data, including timelines and progress.
    - Provide an update on its progress filling missing data (data holes) expressed in terms of the percent increase in data broken down by asset type and data field (installation date, asset age, manufacturer, etc.).
  - Discussed in Section 4.6.7, "Data Governance."

- **PG&E-22-34. Revise Process of Prioritizing Wildfire Mitigations.**
  - Description: PG&E's current process of prioritizing wildfire mitigations assigns a high priority to undergrounding and does not demonstrate adequate weight to risk model outputs or RSE estimates.
  - Required Progress: In its 2023 WMP, PG&E must conduct a quantitative analysis of alternative mitigation techniques. This must:
    - Support an overall mitigation strategy that prioritizes mitigation techniques and projects according to highest wildfire risk, addresses wildfire risk by location, and effectively uses resources.
    - Evaluate all alternatives to undergrounding, both as individual mitigations as well as combinations, focusing on addressing location-specific risks.
    - Incorporate RSE estimates and risk model outputs at a project level early in the decision-making process, adjusting both the scope and pace of PG&E's undergrounding program as necessary based on the

analyses performed. Describe and justify the threshold at which projects move forward even as risk prioritization evolves.
    - Discuss how undergrounding projects are prioritized based on wildfire risk and feasibility. The discussion must include how PG&E weighs wildfire risk and project feasibility.
  - Discussed in Section 4.6.8, "Resource Allocation Methodology."

- **PG&E-22-35. Quantify Mitigation Benefits of Reducing PSPS Scale, Scope, and Frequency.**
  - Description: PG&E provided in its 2022 Update a narrative including anticipated mitigation initiative benefits reducing PSPS scale, scope, and frequency for 2022, but PG&E did not provide clear projections for these benefits for 2023 in Table 11.
  - Required Progress: In its 2023 WMP, PG&E must clearly show how its investments in mitigation initiatives are projected to make an impact on reducing the scale, scope and frequency of PSPS events. PG&E must:
    - Document its estimated reductions for 2023-2026.
    - Identify how it used mitigation initiatives in each of the PSPS events identified in the Quarterly Data Report PG&E provides to Energy Safety (e.g., how many customers impacted by PSPS events were mitigated using installed switches).
    - Collect and/or model the data necessary to support quantitatively demonstrating PSPS scale, scope, and frequency reduction forecasts that take into account system sectionalization, technology enhancements, and customer support program improvements.
  - Discussed in Section 4.7, "Public Safety Power Shutoff (PSPS), Including Directional Vision for PSPS."

8. Conclusion

PG&E's 2022 Update is approved.

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 ignition risk. 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 2022 Update and fully comply with the conditions listed in this Decision to ensure it meaningfully reduces of utility-related ignition and PSPS risk within its service territory.



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APPENDICES

Appendices

Appendix A. Status of 2021 WMP Issues

Energy Safety's 2021 Update Action Statement for each utility contained a set of "issues" and associated "remedies." Each issue was categorized into one of three groups:

- *Critical issues* were those for which Energy Safety issued a Revision Notice to the utility with required remedies. The utility submitted a revised Update addressing the critical issues, and Energy Safety re-evaluated the Update with the utility's revisions. Upon that review, issues may have been downgraded to either "key areas for improvement" or "additional issues," or were fully resolved.
- *Key areas for improvement* were areas Energy Safety identified as significant to reducing utility-related wildfire risk. Energy Safety provided remedies that utilities were required to address over the course of the year. Utilities were required to report on progress in these key areas in a progress report submitted to Energy Safety on November 1, 2021.
- *Additional issues* were those Energy Safety identified as areas for continued improvement to increase the maturity of the utility's wildfire mitigation capabilities. Energy Safety provided remedies that utilities were required to address over the course of the year. Utilities were required to report on progress in the 2022 Update.

Issues identified in 2021 either have been resolved or are incorporated in the 2022 areas for continued improvement. The 2021 key areas for improvement are listed in Table A-1. The status column indicates whether each has been fully remedied. If not, the column notes where to find more information in this Decision.

Table A-1. PG&E 2021 Key Issues Status

Issue #	Title	Status
PG&E-21-01 Risk Assessment and Mapping	Unclear inclusion of future climate data into planning	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.1 of this Decision.
PG&E-21-02 Risk Assessment and Mapping	Lack of consistency in approach to wildfire risk modeling across utilities	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress.
PG&E-21-03 Risk Assessment and Mapping	Inadequate speed of improvements made to risk modeling	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.1 of this Decision.
PG&E-21-04 Risk Assessment and Mapping	PG&E does not adequately justify the wind speed inputs it uses in its Probability of Ignition Models.	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress.
PG&E-21-05 Risk Assessment and Mapping	Lack of PSPS consequence model at a circuit-segment level	PG&E sufficiently addressed the required remedy.
PG&E-21-06 Risk Assessment and Mapping	Insufficient transparency for modifications to Wildfire Risk Models and circuit segment prioritization	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.1 of this Decision.
PG&E-21-07 Situational Awareness and Forecasting	PG&E's DFA and EFD technology pilot outcome is lacking justification for the scope of installment.	PG&E sufficiently addressed the required remedy.
PG&E-21-08	Weather station program target not met	PG&E sufficiently addressed the required remedy.

Issue #	Title	Status
Situational Awareness and Forecasting		
PG&E-21-09 Grid Design and System Hardening	Limited evidence to support the effectiveness of covered conductor	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.1 of this Decision.
PG&E-21-10 Grid Design and System Hardening	Insufficient pace of expulsion fuse replacement plan	PG&E sufficiently addressed the required remedy.
PG&E-21-11 Grid Design and System Hardening	Insufficient detail regarding installation of expulsion fuses in HFTD areas	PG&E sufficiently addressed the required remedy.
PG&E-21-12 Grid Design and System Hardening	Failure to adequately track copper conductor replacements and insufficient detail regarding targeting replacements to highest risk areas	PG&E sufficiently addressed the required remedy.
PG&E-21-13 Grid Design and System Hardening	Failure to demonstrate that system hardening plan targets highest risk circuit segments	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.3 of this Decision.
PG&E-21-14 Grid Design and System Hardening	Inadequate transparency of system hardening plan	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.3 of this Decision.
PG&E-21-15 Asset Management and Inspections	Insufficient detail regarding covered conductor maintenance	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress

Issue #	Title	Status
		and related areas for continued improvement see Section 4.6.4 of this Decision.
PG&E-21-16 Asset Management and Inspections	Insufficient evidence of effective covered conductor maintenance program	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.4 of this Decision.
PG&E-21-17 Asset Management and Inspections	Insufficient evidence of QA/QC for work performed by contractors	PG&E sufficiently addressed thus far; Energy Safety will continue to monitor progress. For discussion of progress and related areas for continued improvement see Section 4.6.4 of this Decision.
PG&E-21-18 Vegetation Management and Inspections	Minimally planned maturity of VM program	PG&E sufficiently addressed the required remedy.
PG&E-21-19 Vegetation Management and Inspections	Delays in achieving mutually agreeable environmental mitigation	PG&E sufficiently addressed the required remedy.
PG&E-21-20 Vegetation Management and Inspections	Non-inclusion of fire damage attributes in hazard tree assessments	Utility did not sufficiently address the required remedy. For more information on how the utility must improve, see areas for continued improvement, Section 4.6.5 of this Decision.
PG&E-21-21 Vegetation Management and Inspections	Unknown environmental impact and efficacy of PG&E's Preventative Fire Retardant Program (PFRP)	PG&E sufficiently addressed the required remedy.
PG&E-21-22 Vegetation Management and Inspections	Incomplete identification of vegetation species and record keeping	PG&E sufficiently addressed the required remedy.

Issue #	Title	Status
PG&E-21-23 Vegetation Management and Inspections	Inadequate joint plan to study the effectiveness of enhanced clearances	Sufficiently addressed thus far; Energy Safety will continue to monitor progress.
PG&E-21-24 Vegetation Management and Inspections	Need for quantified vegetation Management compliance targets	PG&E sufficiently addressed the required remedy.
PG&E-21-25 Grid Operations and Operating Protocols, Including PSPS	Lack of specificity regarding how increased grid hardening will change system operations, change PSPS thresholds, and reduce PSPS events	PG&E sufficiently addressed the required remedy. Energy Safety will continue to monitor progress.
PG&E-21-26 Resource Allocation Methodology	Inadequate discussion on impact of Risk Spend Efficiencies (RSE) in initiative selection	Utility did not sufficiently address the required remedy. For more information on how the utility must improve, see areas for continued improvement, Section 4.6.8 of this Decision.
PG&E-21-27 Resource Allocation Methodology	Lack of methodology to verify RSE estimates	PG&E sufficiently addressed the required remedy.
PG&E-21-28 Resource Allocation Methodology	RSE values vary across utilities	Sufficiently addressed thus far; Energy Safety will continue to monitor progress.
PG&E-21-29 Public Safety Power Shutoff (PSPS), Including Directional Vision for PSPS	PSPS targets and projections set to expire	PG&E sufficiently addressed the required remedy.

Appendix B. Revision Notices Issued to PG&E in 2022

Public Utilities Code section 8386.3(a) states, "Before approval, the division may require modifications of the plan." Energy Safety effectuates this provision through issuance of a Revision Notice.

Table A-2 lists critical issues that Energy Safety identified in PG&E's 2022 Update, the corresponding Revision Notice, and the status of each critical issue identified.

Table A-2: 2022 PG&E Revision Notice Issued on May 26, 2022[308]

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
RN-PG&E-22-01 **Risk Assessment and Mapping**	PG&E has not adequately documented the causes of, or direct lessons learned from, PG&E-ignited catastrophic wildfires	In its 2022 Update, PG&E has not adequately documented the causes of, or direct lessons learned from, PG&E-ignited catastrophic wildfires, including how		A response to RN-PG&E-22-01 was due in 30 days. For each PG&E-ignited catastrophic wildfire (greater than 500 acres) since 2017,[310] PG&E must: • List the cause(s) of each catastrophic wildfire and any associated lessons learned, and	PG&E has de-escalated the critical issue; PG&E must demonstrate continued progress as described in Section 7

[308] "Energy Safety Issues Revision Notice for PG&E's 2022 Wildfire Mitigation Plan Update," Energy Safety's News web page, May 26, 2022: https://energysafety.ca.gov/news/2022/05/26/energy-safety-issues-revision-notice-for-pges-2022-wildfire-mitigation-plan-update/ (accessed Sept. 23, 2022); PG&E 2022 WMP Update Revision Notice (May 26, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52478&shareable=true (accessed September 22, 2022).

[310] Where CAL FIRE or local fire suppression agencies determined PG&E caused the fire or the CPUC's Safety and Enforcement Division found PG&E in violation.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		such lessons have informed its WMP initiatives.[309]		Detail the specific measures PG&E is taking to i) directly mitigate the causes of past PG&E-ignited catastrophic wildfires, and ii) integrate lessons learned from past PG&E-ignited wildfires into its wildfire mitigation strategy.[311]	(PG&E-22-08).

[309] Under Pub. Util. Code § 8386(c)(14), the WMPs must include "A description of the actions the electrical corporation will take to ensure its system will achieve the highest level of safety, reliability, and resiliency, and to ensure that its system is prepared for a major event, including hardening and modernizing its infrastructure with improved engineering, system design, standards, equipment, and facilities, such as undergrounding, insulation of distribution wires, and pole replacement." See generally 2022 WMP Guidelines, Attachment 2, 42-50; *id.*, Attachment 4, pp. 4, 16 (Capability 46, Protocols in place to learn from wildfire events), 20-23 (different sections of the 2022 WMP Guidelines requiring utilities to use lessons learned to combat risk of utility-related wildfires).

[311] See 2022 WMP Guidelines, Attachment 2, pp. 42-44.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
RN-PG&E-22-02 **Grid Design and System Hardening**	PG&E did not report on the amount of work being completed in top-risk areas	PG&E did not comply with the 2022 WMP Guideline requirement to report on the amount of work being completed in top-risk areas as determined by risk model output.[312]		A response to RN-PG&E-22-02 was due in 45 days. PG&E must provide an update of Table 5.3-1(A) with top-risk percentages based solely on risk model output. The revised table must specifically provide the percentage of each type of work being completed in	PG&E has resolved the critical issue; PG&E has satisfied each required remedy for RN-PG&E-22-02.

[312] See 2022 WMP Guidelines, Attachment 2, pp. 54-55. in Table 5.3-1, utilities must populate the column "Target%/ Top-Risk%" for each 2022 performance target related to initiatives in the following categories: Grid design and system hardening; Asset management and inspections; and Vegetation management and inspections. This column allows utilities to identify the percentage of the target that will occur in the highest risk areas. For example, if a utility targets conducting 85% of its vegetation management program in the top 20% of its risk-areas, it should input "85/20" in this column. In the "Notes" column, utilities must provide definitions and sources for each of the "Top-Risk%" values provided. In the given example above, an acceptable response would be: "The top 20% of risk areas used for this target relate to the circuit segment risk rankings from [Utility Company's] Wildfire Risk Model outputs, as described in [hyperlink to Section XX] of the 2022 Update."

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		Instead, PG&E redefined top-risk to be a combination of the highest risk areas as determined by risk model output and three additional criteria. Energy Safety finds that recent fire rebuild locations are not directly correlated to near-term wildfire risk, as discussed in RN-PG&E-22-03. Further, PG&E		the top-risk circuits defined by risk model outputs. This must be done without conflating the percentages of top-risk circuits with other criteria, including PSPS-impacted locations, fire rebuild projects, and PSS-identified locations. Separate from Table 5.3-1(A), PG&E must provide information to demonstrate that PSPS-impacted locations are correlated with the top risk.	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		has not sufficiently demonstrated that PSPS-impacted locations correlate to highest wildfire risk.			
RN-PG&E-22-03 **Grid Design and System Hardening**	PG&E is not adequately focusing grid hardening work, particularly undergrounding, on highest-risk areas based on risk model output	PG&E is not adequately focusing grid hardening work, particularly undergrounding, on highest-risk areas based on		A response to RN-PG&E-22-03 was due in 45 days. PG&E must revise its system hardening plan to adequately demonstrate prioritization based on highest-risk areas. PG&E must provide details of, and commit to, a more aggressive 2022–2024 goal of locating undergrounding	PG&E has resolved the critical issue; PG&E has satisfied each required remedy for RN-PG&E-22-03.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		risk model output.[313]		in its top 20 percent risk-ranked circuits, on par with its peers. The undergrounding goal must not include any undergrounding associated with fire rebuild miles. If PG&E takes any additional risks into account when developing this more aggressive undergrounding goal, aside from those already considered as part of the	

[313] See 2022 WMP Guidelines, Attachment 2, pp. 74-75; *id.*, Attachment 4, pp. 10-11, 28 (A utility's risk model will be based on the extent to which it "uses more ignition prevention equipment with higher risk-spend efficiency." In the Maturity Model "higher scores are assigned to utilities that use more ignition prevention equipment with higher risk-spend efficiency.").

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				risk model output, PG&E must: • Identify the percentage of undergrounding work that will be driven by these additional risk categories (i.e., PSPS, open work tags, Public Safety Specialist selected, etc.) • Explain why PG&E's existing risk model output does not sufficiently cover these additional risks.	
RN-PG&E-22-04	PG&E does not provide planned undergrounding locations	PG&E does not provide planned undergrounding locations beyond		A response to RN-PG&E-22-04 was due in 60 days. PG&E must provide an update of its planned	PG&E has resolved the critical issue; PG&E

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
Grid Design and System Hardening	beyond 2023, nor adequately demonstrate that it is currently prepared to meet its ambitious undergrounding goals	2023, and it does not adequately demonstrate that it is currently prepared to meet its aggressive undergrounding goals.[314] Furthermore, PG&E has not demonstrated that undergrounding		undergrounding projects in 2024, following a similar format as PG&E-21-14 from the 2021 WMP Final Action Statement. This should be in the form of a spreadsheet with the following information: • Location[316] • Status of the project (scoping, design permitting, etc.) • Relevant Circuit Protection Zones (CPZs)/Risk Score	has satisfied each required remedy for RN-PG&E-22-04.

[314] See 2022 WMP Guidelines, Attachment 2, p. 99; PG&E-21-14 from Energy Safety's Action Statement on PG&E's 2021 WMP Update (PG&E must provide additional details in its 2022 Update on "the decision to underground and its plans for such undergrounding"); see also 2022 WMP Guidelines, Attachment 2, pp. 53, and Public Utilities Code section 8386(b) (WMP is forward-looking and long-term).

[316] As available, the revised undergrounding plan for 2024 must also include locations via geospatial data.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		is risk-spend efficient at the project level when compared to other grid hardening efforts.[315]		• Circuit ranking based on 2021, 2022, and 2023 risk model output[317] • Measured effectiveness of ignition risk reduction projected to result from undergrounding at that circuit segment • Planned length • Risk-type identified for prioritization of the project (top 20 percent of risk buydown curve, fire rebuild, PSPS mitigation, public	

[315] See 2022 WMP Guidelines, Attachment 4, p. 11 (Capability 14, Risk-based grid hardening and cost efficiency).

[317] Added in addition to the items requested in PG&E-21-14.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				safety specialist identified, or non-risk related, or combination of the proceeding). PG&E must include a timeline for the frequency with which it will determine undergrounding mileage and locations based on updated risk model output, factoring in RSE comparison with other initiatives. The timeline must continue past 2024.[318] If the above information for the targeted 400 miles in 2023 and 800 miles in 2024	

[318] See 2022 WMP Guidelines, Attachment 2, p. 99; PG&E-21-14 from Energy Safety's Action Statement on PG&E's 2021 WMP Update.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				is not available, PG&E must provide justification as to why it is unable to provide any of the missing information and provide a timeline for when the information will be available.[319]	
RN-PG&E-22-05 **Asset Management and Inspections**	PG&E has a significant backlog of repairs and needs a more aggressive plan to address the	PG&E has a significant backlog of repairs and needs a more aggressive plan to address the poor health of its		A response to RN-PG&E-22-05 was due in 45 days. PG&E must create a plan that demonstrates consistent progress on reducing the number of open tags and improve the health of its	PG&E has de-escalated the critical issue; PG&E must demonstrate continued progress as

[319] See 2022 WMP Guidelines, Attachment 2, p. 99; see also PG&E-21-14 from Energy Safety's Action Statement on PG&E's 2021 WMP Update.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
	poor health of its infrastructure	infrastructure.[320] Since 2020, PG&E has consistently had a growing backlog of work orders. Its 2022 Update does not provide a plan for timely addressing this issue.		infrastructure.[321] To ensure that PG&E is reducing its backlog of work orders, PG&E must have a plan to complete more remediations than findings found. PG&E must provide a resource plan, including timeline and quantitative targets for either a number or percentage of tags PG&E plans to resolve per quarter for the remainder of 2022 as well as 2023. The plan must include a description of how PG&E prioritizes	described in Section 7 (PG&E-22-22).

[320] See 2022 WMP Guidelines, Attachment 4, pp. 32-37; see also p. 35 (Capability 19, Asset maintenance and repair).

[321] See 2022 WMP Guidelines, Attachment 4, pp. 32-37; see also p. 35 (Capability 19, Asset maintenance and repair).

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				completion based on risk analysis and modeling and where resources are being diverted from other efforts, if applicable. PG&E must also provide a spreadsheet of all open work orders as of the date of its response to this Revision Notice that were generated in HFTD as well as all remediations in HFTD that have been completed in 2021. This data must include: • Date work order was generated • Priority of Work Order • HFTD Tier	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				• Remediation Due Date • Date Remediation Completed (if applicable) • Latitude • Longitude	
RN-PG&E-22-06 **Asset Management and Inspections**	PG&E does not sufficiently explain its increase in distribution-level ignitions from equipment failure, nor provide a remediation plan	PG&E does not sufficiently explain its increase in distribution-level ignitions from equipment failure, nor does it provide a forward-looking		A response to RN-PG&E-22-06 is due in 30 days. PG&E must provide a plan to address increases in ignitions from equipment failures categorized by equipment type, which	PG&E has resolved the critical issue; PG&E has satisfied each required remedy for RN-PG&E-22-06.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		plan to address this increase.[322]		must include the following:[323] • Conductors • Switches • Crossarms • Reclosers • Connection devices The plan must include any additional efforts, if any, PG&E will undertake that are informed by a root cause analysis outside those efforts PG&E completes as part of its	

[322] See 2022 WMP Guidelines, Attachment 2, pp. 86-89.

[323] Some short descriptions of PG&E's changes were included in OEIS-PG&E-22-004. However, PG&E should provide further description of root cause analyses performed and direct changes made relating to trends and causes. See 2022 WMP Guidelines, Attachment 2, pp. 86-89; see also *id.*, Attachment 4, pp. 28-31.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				routine maintenance program or as part of program-level WMP initiatives. As applicable, PG&E must include descriptions of root analyses completed by equipment type and explain any trends that inform changes to its inspections and maintenance programs. If such root cause analyses have not already been performed, PG&E must explain why, as well as how it has otherwise identified trends and reoccurring issues. PG&E must explain why it does not predict decreases	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				in ignitions for equipment failures from 2022 to 2023, broken down by equipment type. PG&E must also explain how mitigations it is implementing for all equipment types affect predicted ignition rates.[324]	
RN-PG&E-22-07 **Asset Management and Inspections**	PG&E's ignition projections do not account for its ignition mitigation measures	PG&E's ignition projections do not factor in the utility's ignition mitigation measures and therefore may be artificially high.		A response to RN-PG&E-22-07 was due in 30 days. PG&E must revise and resubmit Table 7.2 from PG&E's 2022 Update to project 2022 and 2023 ignitions factoring in risk reduction benefits of	PG&E has resolved the critical issue; PG&E has satisfied each required remedy for

[324] Data Request OEIS-PG&E-22-004, Question 5.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		PG&E must explain how implementation of mitigation measures will impact ignition projections.[325]		mitigation measures, including (but not limited to) EPSS, undergrounding, and covered conductor. PG&E must also provide a narrative description for what factors are considered when calculating ignition projections, inclusive of WMP mitigation measure implementation, the weights of such factors and effects on projected ignitions.	RN-PG&E-22-07.

325 PG&E's 2022 Update, Quarterly Data Report, Table 7.2.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
RN-PG&E-22-08 **Asset Management and Inspections**	PG&E has high find and failure rates in its quality assurance and quality control of asset inspections	PG&E has high find and failure rates[326] in its quality assurance and quality control (QA/QC) of asset inspections, demonstrating a low quality of asset inspections, and		A response to RN-PG&E-22-08 was due in 30 days. PG&E must explain actions taken to improve its quality control processes.[328] Specifically, PG&E must: • For all listed actions[329] to increase the quality of its asset inspections, provide an update on progress and	PG&E has de-escalated the critical issue; PG&E needs to demonstrate continued progress as described in Section 7 (PG&E-22-21).

[326] "Find rate" is defined as the percentage of reviews in which discrepancies were identified (Data Request OEIS-PG&E-22-008, Question 3) whereas "failure rate" is defined as when QA/QC inspections led to a "failed review," meaning the inspection record review indicates a compelling abnormal condition was miss-identified by the inspector, resulting in an incorrectly updated EC/LC notification, or failure to create an EC/LC notification (Data Request CalAdvocates-PGE-2022WMP-08, Question 4).

[328] PG&E's Reply Comments to the 2022 WMP, pp. 39-40.

[329] See 2022 WMP Guidelines, Attachment 2, pp. 73, 75; *id.*, Attachment 4, p. 12.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		it has not provided adequate details on its plan to improve asset inspection quality moving forward.[327]		timeline for implementation. • Provide quarterly quantitative asset management QA/QC goals for both findings and reducing failure rates for the remainder of 2022 and 2023. • Explain whether there is a failure rate threshold at which PG&E will take remedial or disciplinary action on an inspector. If so, provide that threshold and	

[327] See 2020 WMP Guidelines, Attachment 4, p. 12 (Capability 20, QA/QC for asset management).

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				describe the action that PG&E takes to address inspectors with high failure rates. • Provide a detailed description of how PG&E escalates non-adherence to asset inspections processes and procedures. • Provide actions to improve training for both internal inspectors and contractors in PG&E's asset inspection and management program based on repeat QA/QC findings. • Provide an update on PG&E's QA/QC	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				findings and failure rates for asset inspections completed since the 2022 Update filing.	
RN-PG&E-22-09 **Vegetation Management and Inspections**	PG&E has failed to provide plans to mature in certain vegetation management capabilities	PG&E has failed to provide plans to mature in certain vegetation management capabilities. According to its 2020 Maturity Survey, PG&E had only planned on maturing		A response to RN-PG&E-22-09 was due in 60 days. PG&E must benchmark its use of predictive and risk modeling in VM with SCE and SDG&E. PG&E should also consider benchmarking with at least one electric utility outside California. PG&E must report on practices learned from benchmarking regarding the use of predictive and risk modeling in VM and discuss the initial steps that	PG&E has resolved the critical issue; PG&E has satisfied each required remedy for RN-PG&E-22-09.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		one[330] of six capabilities by 2023. In its evaluation of PG&E's 2021 WMP Update, Energy Safety required PG&E to reach a maturity level of at least 1 for capabilities 24 "Vegetation grow-in mitigation" and 25 "Vegetation fall-in mitigation" by		it will take to incorporate those practices into its VM programs.	

[330] Capability 21, Vegetation inventory for condition assessment.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		the end of 2023.[331] PG&E is on track to satisfy this requirement. Notwithstanding, between 2020 and 2022, PG&E has not increased its overall maturity level for vegetation management (VM).[332] According to its			

[331] PG&E-21-18 from Energy Safety's Action Statement on PG&E's 2021 WMP Update ("Minimally planned maturity for VM program")

[332] Data Request OEIS-PG&E-22-002, Question 1.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		responses on the 2022 Maturity Survey, PG&E does not have plans to increase maturity in using predictive modeling to inform inspections or ignition and propagation risk modeling to guide clearances, measures that are in use by its peer utilities.			
RN-PG&E-22-10	PG&E does not report targets for its vegetation	PG&E did not report targets for its VM quality		A response to RN-PG&E-22-10 was due in 30 days. PG&E must provide targets	PG&E has resolved the critical

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
Vegetation Management and Inspections	management quality assurance and quality verification program or for poles brushed	assurance and quality verification (QA/QV) program or for poles brushed.[333] These targets are required by 2022 WMP Guidelines and PG&E-21-24.[334] Through data requests, Energy Safety learned PG&E has internal		in accordance with PG&E-21-24 and the 2022 WMP Guidelines for its QA/QV program and number of poles brushed per Public Resources Code 4292. For the QA/QV targets, PG&E may provide either the percentage of vegetation inspections audited (as prescribed by the Guidelines) or the number of audits/reviews it plans to perform (as described in Data Request OEIS-PG&E-	issue; PG&E has satisfied each required remedy for RN-PG&E-22-10.

[333] Pole brushing requirements are set forth in Public Resources Code section 4292 (https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=4292&lawCode=PRC).

[334] Pole brushing requirements are set forth in Public Resources Code section 4292; see also 2022 WMP Guidelines, Attachment 4, p. 13 (Capability 26, QA/QC for vegetation management); PG&E-21-24 from Energy Safety's Action Statement on PG&E's 2021 WMP Update.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		targets for QA/QV and poles brushed per Pub. Util. Code Section 4292 but has not committed to targets in its 2022 Update.		22-005, Answer 6, and reiterated in Table 8). PG&E must establish an Acceptable Quality Level (AQL) for performance for each QA/QV program listed in Table 8. The AQL for each program may be no lower than 95 percent.[335] Targets and associated AQLs must be presented in a revised WMP Table 5.3-1.	
RN-PG&E-22-11	PG&E has failed to implement the vegetation	PG&E has failed to implement the vegetation		A response to RN-PG&E-22-11 is due in 30 days. PG&E must provide a progress	PG&E has resolved the critical

[335] An AQL of 95% or greater is in line with PG&E's peer utilities.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
Vegetation Management and Inspections	management refresher curriculum it committed to implement in its 2021 WMP Update	management refresher curriculum it committed to implement in its 2021 WMP Update.[336]		update, a summary of the curriculum, and a timeline to complete the implementation of its VM refresher training in 2022.	issue; PG&E has satisfied each required remedy for RN-PG&E-22-11.
RN-PG&E-22-12 **Grid Operations and Protocols,**	PG&E has failed to provide sufficient evidence to support its extensive use of Enhanced	PG&E has failed to provide sufficient evidence to support its extensive use of Enhanced		A response to RN-PG&E-22-12 was due in 45 days. PG&E is required to take action in the following areas: 1) explain how it will analyze EPSS deployment and modify settings; 2)	PG&E has de-escalated the critical issue; PG&E must demonstrate continued

[336] Energy Safety's Action Statement on PG&E's 2021 WMP Update, p. 86 (accessed September 15, 2022): https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=51745&shareable=true.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
Including PSPS	Powerline Safety Settings and instead relies on the findings of a time-limited pilot deployed in 2021	Powerline Safety Settings (EPSS).[337] PG&E relies on the findings of a time-limited EPSS pilot deployed in 2021 to support the widespread deployment of EPSS.[338] While PG&E reported ignition reductions over		reassess customer impacts associated with more widespread use of EPSS; 3) explain its EPSS customer impact mitigation plan; 4) detail its customer outreach plan; 5) present an EPSS staffing and resourcing plan; 6) detail an EPSS benchmarking plan; and 7) submit monthly EPSS data reports through the end of 2022. 1. PG&E must provide a plan explaining	progress as described in Section 7 (PG&E-22-32).

[337] See Pub. Util. Code § 8386(a); 2022 WMP Guidelines, Attachment 4, pp. 13-14, 45-48.

[338] PG&E's 2022 Update, Figure PG&E-7.3.6-2: CPUC-Reportable Ignition Reduction on EPSS Enabled Circuits and Overall Decreases in HFTD Area Ignitions After EPSS Enabled, p. 733.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		the period of the pilot, there is not clear evidence that all of these ignition reductions can be directly attributable to EPSS settings. Energy Safety is concerned that PG&E is hastily deploying this strategy across its system based on minimal data and without fully		how it will collect and analyze data from EPSS deployment throughout 2022 and adjust settings to balance wildfire ignition reduction against public safety impacts of outages.[339] This plan must include details on how PG&E determines the number and locations of protective devices throughout its system.	

[339] See Pub. Util. Code § 8386(a); 2022 WMP Guidelines, Attachment 4, pp. 13-14, 45-48.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		understanding the public safety impacts that may result from widespread application.		2. PG&E must submit a reassessment of the impacts associated with the widespread use of EPSS. This reassessment should include a consideration of additional factors, such as existing asset health (based on open repair tags, equipment risk, etc.) and public safety impacts to determine the circuits that will be most impacted by EPSS. 3. PG&E must explain how it will mitigate the circuits most impacted by EPSS, including a timeline for each mitigation measure and the	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				projected impact of the mitigation measures on the likelihood of a trip on each circuit. PG&E must include how the circuits identified in this reassessment differ from the initial 50 circuits identified in its 2022 Update. Additionally, PG&E must explain if 50 circuits is the appropriate number on which to focus mitigations, and if so, why. 4. PG&E must provide details on its EPSS outreach plan, including preparation for access and functional needs	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				(AFN) and Medical Baseline customers, in areas that are subject to EPSS. This should include how PG&E is educating the public about EPSS and how PG&E will support customers, particularly AFN and Medical Baseline customers, to mitigate the impact of outages caused from EPSS. 5. PG&E must provide a restoration response and resource staffing plan that includes information on how PG&E plans to dedicate surge staff to support the projected increase	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				in EPSS-related outages (and from what areas or purposes surge staff are being diverted). 6. PG&E must provide a plan for how often it will benchmark against other utilities that deploy protective sensitive settings and what topics it will seek to benchmark to apply learnings in as close to real time as possible to PG&E's system. PG&E must also include a description of any updates made to its program to date as a result of benchmarking that	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				has already occurred. 7. Beginning with submission of its first Revision Notice Response to RN-PG&E-22-12 and monthly thereafter through 2022, PG&E must submit to Energy Safety the following information through the 2022 Wildfire Mitigation Plan Updates docket (#2022-WMPs): a. Circuit Protection Zones (CPZ) where EPSS is deployed (with ID) b. The number of times	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				EPSS resulted in a trip on each CPZ c. The number of customers that experienced an outage for each event d. The restoration time for each outage e. The cause of the fault for each outage f. The number of ignitions that occurred on lines enabled with EPSS	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				g. The number of ignitions that resulted in a wildfire greater in size than 10 acres h. The amount of time it took for PG&E to identify (and suppress if applicable) the ignition i. Any changes made to EPSS over the month and explanation of why those changes were made	

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
				j. Estimated ignition reductions resulting from EPSS including methodology for arriving at this estimate	
RN-PG&E-22-13 **Resource Allocation Methodology**	PG&E does not provide sufficiently disaggregated data on its system hardening initiatives	PG&E does not provide disaggregated data on its system hardening initiatives. PG&E continues to provide unacceptably aggregated data regarding its		A response to RN-PG&E-22-13 was due in 30 days. PG&E must separately provide detailed costs, miles previously treated, a range for miles planned to be treated, and RSE estimates for covered conductor installation, undergrounding, line removal, and any other system hardening	PG&E has resolved the critical issue; PG&E has satisfied each required remedy for RN-PG&E-22-13.

Critical Issue #	Critical Issue Title	Critical Issue Description		Required Remedy	Energy Safety Evaluation
		system hardening initiatives, including targets, costs and risk-spend efficiency data. This is not in accordance with the WMP Guidelines.[340] Energy Safety also raised this issue in 2021 in RN-PGE-03.[341]		initiatives currently presented together as one value in PG&E's 2022 Update. Table 12 must be revised to provide the required information for each initiative listed in Energy Safety's 2022 WMP Guidelines.	

[340] See 2022 WMP Guidelines, Attachment 4, pp. 14-15, 55-59.

[341] PG&E-21-03 from Energy Safety's Action Statement on PG&E's 2021 WMP Update ("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.").

Appendix C. Energy Safety Data Request Responses

The following are data requests and their responses from PG&E related to the Decision above.

Regarding: PG&E Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment Survey (Docket #2022-WMPs)

Data Request: Energy Safety-PG&E WMP 2022 Update-DR-001 (Question 001)

Request date: February 11, 2022

Request:

Question 001. In PG&E's cover letter to its Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment submitted February 4, 2022, PG&E states: "*in addition to our internal review of the questions and the scores, this year we were also able to benchmark with Southern California Edison Company (SCE) and San Diego Gas & Electric Company (SDG&E) regarding the Survey. These benchmarking discussions were very helpful, especially to understand how the other utilities were interpreting certain questions and approaching the response to those questions. This benchmarking resulting in a re-evaluation of some of our scores based on feedback from the other utilities*." Energy Safety would like to know the following:

a. To which questions of the 2022 Wildfire Mitigation Plan Maturity Model Assessment answered by PG&E does this above notice apply?
b. How will this re-interpretation affect accuracy of and comparison to responses to the same questions from the 2020 and 2021 surveys?

Response date: February 16, 2022

Question 001 Response:

a. PG&E, SCE, and SDG&E exchanged draft scores for all survey questions. Additional details, including the utilities' assumptions and interpretations of the questions, were shared for the following:

Number	Question
A.I.c	How granular is utility's ability to model scenarios
A.I.e	What additional information is used to estimate model weather scenarios and their risk?
A.II.e	What confidence interval, in percent, does the utility use in its

	wildfire risk assessments?
A.III.e	How granular is the ignition risk estimation process?
C.III.b	What level of redundancy does the utility's distribution architecture have?
C.III.c	What level of sectionalization does the utility's distribution architecture have?
C.IV.b	At what level can estimates be prepared?
C.IV.d	What grid hardening initiatives does the utility include within its evaluation?
C.V.a	How are new hardening solution initiatives evaluated?
C.V.b	Are results of pilot and commercial deployments, including project performance, project cost, geography, climate, vegetation etc. shared in sufficient detail to inform decision making at other utilities?
D.I.a	What information is captured in the equipment inventory database?
D.I.b	How frequently is the condition assessment updated?
D.II.b	How are patrol inspections scheduled?
D.III.c	At what level of granularity are the depth of checklists, training, and procedures customized?
D.IV.a	What level are electrical lines and equipment maintained at?
E.I.b	How frequently is inventory updated?
E.II.b	How are vegetation inspections scheduled?
E.II.c	What are the inputs to scheduling vegetation inspections?
E.III.b	How are procedures and checklists determined?
E.III.c	At what level of granularity are the depth of checklists, training, and procedures customized?
E.IV.c	What modeling is used to guide clearances around lines and equipment?
E.IV.g	How long after cutting vegetation does the utility remove vegetation waste along right of way?
E.V.b	How is potential vegetation that may pose a threat identified?
E.V.e	How long after cutting vegetation does the utility remove vegetation waste outside its right of way?
F.III.c	During PSPS events, what percent of customers complain?
F.V.b	How automated is the process for inspecting de-energized sections of the grid prior to re energization?
F.VI.b	What training and tools are provided to field workers?
G.I.f	Does the utility share best practices for database management and use with other utilities in California and beyond?
H.I.b	For what level of granularity is the utility able to provide projections for each scenario?
H.II.b	What initiatives are captured in the ranking of risk spend efficiency?
H.II.e	At what level of granularity is the utility able to provide risk efficiency figures?

H.III.b	At what level can estimates be prepared?
H.IV.b	At what level can estimates be prepared?
H.IV.d	What grid hardening initiatives are included in the utility risk spend efficiency analysis?
H.V.a	To what extent does the utility allocate capital to initiatives based on risk- spend efficiency (RSE)?
H.V.b	What information does the utility take into account when generating RSE estimates?
H.VI.a	How does the utility develop and evaluate the efficacy of new wildfire initiatives?
H.VI.c	At what level of granularity does the utility measure the efficacy of new wildfire initiatives?
I.II.e	Is there an inventory of high risk spend efficiency resources available for repairs?
I.III.b	What percent of affected customers receive complete details of available information?
I.III.c	What percent of affected medical baseline customers receive complete details of available information?

b. For clarification, as we indicated in the cover letter to our 2022 Wildfire Mitigation Plan Maturity Model Assessment (2022 Maturity Model Survey), when we prepared our 2022 Maturity Model Survey responses, we reviewed past responses, evaluated our current and future state, benchmarked with the other utilities, and used our best judgment to respond as accurately and completely as possible. In 2020 and 2021, PG&E provided accurate responses to the Maturity Model Survey using the best information available to us at the time. Our responses to the 2022 Maturity Model Survey are similarly accurate, but we now have additional information as result of benchmarking with other utilities to better align our understanding of Energy Safety's questions as well as the substantive maturing and evolution of our wildfire mitigation programs. Submission of our 2022 Maturity Model Survey responses does not affect the accuracy of prior responses.

Regarding: PG&E Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment Survey (Docket #2022-WMPs)

Data Request: Energy Safety-PG&E WMP 2022 Update-DR-001 (Question 002)

Request date: February 11, 2022

Request:

Question 002. Additionally, certain responses indicated an improvement of PG&E's maturity score from 2020 to 2021, then a regression from 2021 to 2022. Energy Safety would like to better understand these trends, beginning with answers to the following questions:

Under Capability 28, Incorporating Ignition Risk Factors in Grid Control, Question F.II.b asks "*Does the utility have systems in place to automatically track operation history including current, loads, and voltage throughout the grid at the circuit level*?"

In 2021 PG&E answered Yes. In 2022 PG&E answered No.

a. Is this change an effect of re-interpreting the question based on benchmarking with SCE and SDG&E as described in PG&E's cover letter to its Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment? If so, explain why the answer changed from yes to no.
b. Describe the processes that led to a regression of automatic tracking of operation history including current, loads, and voltage throughout the grid at the circuit level in 2022.

Response date: February 16, 2022

Question 002 Response:

a. No, PG&E's response to question F.II.b was not changed based on benchmarking the question.
b. We believe the 2021 score of "ii. Yes" was incorrectly assigned. Our records show a consistent response of "i. No" in 2020 and 2021. Since 2020, we have noted that PG&E currently has systems in place to track operation history including current, loads, and voltage throughout the grid, but we do not have 100% visibility. Distribution operation history is tracked in SCADA, and transmission operation history is tracked in our Energy Management System (EMS) and/or OSI PI (Data Historian). In the future, PG&E will continue to expand our tracking of operation history, but we do not anticipate having a fully automated process by 2023. PG&E would be happy to discuss potential

process improvements with Energy Safety based on past survey submission experiences to help minimize potential data entry errors in the future.

Regarding: PG&E Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment Survey (Docket #2022-WMPs)

Data Request: Energy Safety-PG&E WMP 2022 Update-DR-001 (Question 003)

Request date: February 11, 2022

Request:

Question 003. Under Capability 29, PSPS Operating Model and Consequence Mitigation, Question F.III.b asks "*What share of customers are communicated to regarding forecasted PSPS events?*" PG&E's 2021 answers indicated higher maturity than PG&E's answers in 2022.

In 2021 PG&E answered as follows.

Present: iv. "PSPS events are communicated to >99% of affected customers and >99.9% of medical baseline customers in advance of PSPS action."

As of Jan 1, 2023: iv. "PSPS events are communicated to >99% of affected customers and >99.9% of medical baseline customers in advance of PSPS action"

In 2022 PG&E answered

Present: ii. "PSPS events are communicated to >95% of affected customers and >99% of medical baseline customers in advance of PSPS action"

As of Jan 1, 2023: iii. "PSPS events are communicated to >98% of affected customers and >99.5% of medical baseline customers in advance of PSPS action"

a. Were the above answers provided in 2022 affected by re-interpreting the question based on benchmarking with SCE and SDG&E as described in PG&E's cover letter to its Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment?
b. From 2021 to 2022, the percentage of affected customers to whom PSPS events are communicated decreased from >99% to >95%. Clarify the reason for this decrease.

Response date: February 16, 2022

Question 003 Response:

a. No, PG&E's response to question F.III.b was not changed based on benchmarking the question.
b. In 2021, PG&E notified 97.6% of affected customers and approximately 99% (98.7%) of medical baseline customers during PSPS events. With the understanding that it will be

difficult to achieve 100% notification because some customers do not provide their contact information, and notifications to all customers may not be possible due to in-event shifts in weather, we are forecasting option (iii) performance in 2023. To improve performance, PG&E is continuing to send postcards to customers that did not receive PSPS event notifications directly from PG&E due to invalid or missing contact information and encourages customers to update their contact information for future notifications. In 2021, PG&E also transitioned our agency contact information system to a platform that allows city, county, and tribal stakeholders to update their contact information directly in PG&E's system at any point. This transition helps ensure PG&E has the latest agency contact information for PSPS events.

Regarding: PG&E Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment Survey (Docket #2022-WMPs)

Data Request: Energy Safety-PG&E WMP 2022 Update-DR-001 (Question 004)

Request date: February 11, 2022

Request:

Question 004. Under Capability 29, PSPS Operating Model and Consequence Mitigation, Question F.III.c asks "*During PSPS events, what percent of customers complain?*"

In 2021 PG&E answered iii. Less than 0.5%. In 2022 PG&E answered i. 1% or more.

a. What specific data source(s) does PG&E use to track customer complaints relating to PSPS events?
b. Using the data sources described in Question 004 a, explain why customer complaints increased from "Less than 0.5%" in 2021 to "1% or more" in 2022.
c. Did complaints associated with the EPSS program or Fast Trip settings impact the number of complaints used to answer this question?

Response date: February 16, 2022

Question 004 Response

In 2021, PG&E utilized additional data sources to track customer complaints relating to PSPS events including:

- Complaints from our customer-facing Wildfire Safety and Customer Relations Teams;
- Contact Center Intake;
- Complaints from commercial customers received by our Operational Emergency Centers (OECs);
- Complaints received by our Business Energy Solutions team, made up of reps assigned to commercial customers;
- Complaints posted to social media; and
- Complaints received by our Emergency Operations Center (EOC) Liaison Officer team.

a. Utilizing these additional data sources to track customer complaints resulted in an increase in the number of complaints included in the 10 day reports.

b. No. The complaints accounted for those related to PSPS and not for other wildfire mitigation programs.

Regarding: PG&E Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment Survey (Docket #2022-WMPs)

Data Request: Energy Safety-PG&E WMP 2022 Update-DR-001 (Question 005)

Request date: February 11, 2022

Request:

Question 005. Under Capability 32. Ignition Prevention and Suppression, Question F.VI.B asks "*What training and tools are provided to workers in the field?*"

In 2022 PG&E answered 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

In 2021 PG&E answered v. All criteria in option (iv) met and apply to contractors as well as utility workers.

The answers above indicate that PG&E regressed in this question from 2021 to 2022.

a. Explain the extent of reduction in suppression tools and suppression training to workers in field.
b. Clarify if the reduction in suppression tools and suppression training extends to contractors, as well.
c. Are the answers provided for this question in 2022 based on re-interpretation of the question based on indicated benchmarking with SCE and SDG&E as described in PG&E's cover letter to its Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment?

Response date: February 16, 2022

Question 005 Response:

a. There has been no reduction in the tools required and training given to workers in the field. The team re-evaluated our response in 2021 related to communications tools. Because of the communications challenges in certain parts of our service territory, the current and future state scores were reduced back to (iii). We believe the 2021 score of (v) was incorrectly assigned.
b. There has been no reduction in the tools required and training given to PG&E contractors.

c. No, PG&E's response to question F.VI.b was not changed based on benchmarking the question.

Regarding: Follow up on re-interpreted answers

Data Request: OEIS-PG&E-22-002 (Question 01)

Request date: Tuesday, February 22, 2022

Request:

Q01. As a follow up to the answer received from DR-001, which asked: 'In PG&E's cover letter to its Submission of 2022 Wildfire Mitigation Plan Maturity Model Assessment submitted February 4, 2022, PG&E states: "*in addition to our internal review of the questions and the scores, this year we were also able to benchmark with Southern California Edison Company (SCE) and San Diego Gas & Electric Company (SDG&E) regarding the Survey. These benchmarking discussions were very helpful, especially to understand how the other utilities were interpreting certain questions and approaching the response to those questions. This benchmarking resulting in a re-evaluation of some of our scores based on feedback from the other utilities*." Energy Safety would like to know the following: To which questions of the 2022 Wildfire Mitigation Plan Maturity Model Assessment answered by PG&E does this above notice apply?,' please answer the below questions:

Energy Safety requires like data for comparison across a three-year Maturity Survey for the years 2020, 2021, and 2022 to determine whether the utility has truly progressed or regressed. To help ensure accuracy in comparison of re-interpretated responses to the same questions from the 2020 and 2021 surveys, for each of the 41 questions re-interpreted in answering the 2022 Maturity Survey, please provide the following:

a. How was this specific question re-interpreted?
b. What would PG&E's answer to the question have been had it been answered in the same way it was interpreted in the 2020 and 2021 Maturity Surveys submitted by PG&E?

Additionally, certain responses indicated an improvement of PG&E's maturity score from 2020 to 2021, then a regression from 2021 to 2022 or low maturity assessments. Energy Safety would like to better understand maturity assessment trends through answers to the following questions:

Response date: March 4, 2022

Q01 Response:

a. PG&E reviewed each of the 2022 WMP survey questions and prepared responses based on the best judgment of our subject matter experts (SME). In the response below, we provide for each of the 41 questions identified in our response to WMP-Discovery2022_DR_OEIS_001_Q01(a): (1) the question number, survey capability description, and question; (2) the 2022 WMP survey current and future state scores; and (3) the explanation of our response to the same question from the 2020 and 2021 WMPs and the interpretation and explanation for the 2022 WMP score.
In cases where the explanation for the 2020 and 2021 WMP survey scores are the same, a single explanation is provided. In cases where there are different explanations for the 2020 and 2021 WMP scores, separate explanations are provided. For the 2022 WMP survey scores, we have provided different explanations for current and future state where applicable. We are also providing information regarding our assumptions for certain survey questions where assumptions were identified by our SME teams.

b. PG&E is unable to provide what its answer would have been to the questions identified above "had it been answered the same way it was interpreted in the 2020 and 2021 Maturity Surveys submitted by PG&E" because the answers to the 2022 WMP survey questions were based on a number of factors including, as explained in our response to WMP-Discovery2022_DR_OEIS_001_Q01(b):

   For clarification, as we indicated in the cover letter to our 2022 Wildfire Mitigation Plan Maturity Model Assessment (2022 Maturity Model Survey), when we prepared our 2022 Maturity Model Survey responses, we reviewed past responses, evaluated our current and future state, benchmarked with the other utilities, and used our best judgment to respond as accurately and completely as possible. In 2020 and 2021, PG&E provided accurate responses to the Maturity Model Survey using the best information available to us at the time. Our responses to the 2022 Maturity Model Survey are similarly accurate, but we now have additional information as result of benchmarking with other utilities to better align our understanding of Energy Safety's questions as well as the substantive maturing and evolution of our wildfire mitigation programs. Submission of our 2022 Maturity Model Survey responses does not affect the accuracy of prior responses.

   No one factor, such as benchmarking with the other utilities, impacted our 2022 WMP survey scores. Instead, these scores were based on a thorough review of the questions, current and future state of our wildfire mitigation programs, and benchmarking with the other utilities. We cannot, however, go back in time to

determine how we would have answered the same question in 2020 or 2021 in light of changes that have occurred since that time. However, above in part (a) we have provided our understanding of each of the 41 questions and an explanation of our response.

Regarding: Risk mapping and simulation

Data Request: OEIS-PG&E-22-002 (Question 02)

Request date: Tuesday, February 22, 2022

Request:

Q02. Regarding PG&E's response to Maturity Survey question A.V.b (*How automated is the mechanism to determine whether to update algorithms based on deviations*?):

a. How is PG&E planning to increase automation for algorithm updates based on deviations?
b. How does PG&E currently perform partial (<50%) automation for this task?

Response date: March 4, 2022

Q02 Response:

a. As described in the response to part b below, wildfire consequence algorithms are calibrated with data from recent fires and the ignition probability algorithms are re-run with updated failure and ignition data sets each year. With this cadence of data availability, the partially automated methods are deemed most appropriate, and PG&E does not plan to fully automate these processes at this time.
b. For both the probability of ignition and wildfire consequence portions of the wildfire risk models, partially automated processes are used check the predictive performance of the algorithms and data employed. These processes are deemed partially automated in that the code is automated, but the initiation of the code is manual. For the wildfire consequence, the Technosylva algorithms are linked to the Cal FIRE fire alert system to enable the model to calibrate the simulation output with burn footprints. For the ignition probability, as new ignitions and failure data sets are made available, usually at the end of each year, the automated model code is executed with the updated data sets. The relative improvement of the Area Under the Receiver Operating Characteristic (ROC AUC or AUC) curves are used to evaluate the predictive performance of the algorithms. See 2022 WMP, p. 130 (defining ROC AUC).

Regarding: Risk mapping and simulation

Data Request: OEIS-PG&E-22-002 (Question 03)

Request date: Tuesday, February 22, 2022

Request:

Q03. Regarding PG&E's response to Maturity Survey question A.V.c (*How are deviations from risk model to ignitions and propagation detected*?):

a. Describe how PG&E "manually" checks deviations between the risk model to ignitions and propagation detection.
b. Provide PG&E's plan to progress to a semi-automated for this check by January 1, 2023.

Response date: March 4, 2022

Q03 Response:

a. As described in the response to OEIS_002-Q02, the ignition probability is re-run annually with updated sets of failures and ignitions. The predictive power given the updated data is then assessed with the AUC curve.
b. Refinements to the model code are planned to semi-automate the ignition probability algorithm. These refinements include building automated data pipelines for the necessary data sets to within the Foundry platform. Currently, these data sets are prepared and ingested manually.

Regarding: Grid design and system hardening

Data Request: OEIS-PG&E-22-002 (Question 04)

Request date: Tuesday, February 22, 2022

Request:

Q04. Regarding PG&E's response to Maturity Survey question C.II.a (*Does grid design meet minimum G095 requirements and loading standards in HFTD areas?*):

a. Describe how PG&E plans to exceed GO 95 requirements by January 1, 2023.

Response date: March 4, 2022

Q04 Response:

a. As it relates specifically to System Hardening Design Requirements, General Order (GO) 95 does not specify minimum System Hardening Design Criteria. Since 2019, PG&E has defined Specific System Hardening Design Requirements which are specified in TD-9001B-009 Rev 2. The specific system hardening design requirements that exceed GO 95 minimum requirements are Pole Setting Depth calculations and Pole Loading Calculations that calculate pole sizing using the maximum wind loading assumptions when calculating pole sizes in High Fire Threat District (HFTD) Tier 2 and Tier 3 circuit locations. PG&E also specifies locations where intumescent wrapped poles and covered tree wire are required, which is not currently defined in GO 95.

Regarding: Grid design and system hardening

Data Request: OEIS-PG&E-22-002 (Question 05)

Request date: Tuesday, February 22, 2022

Request:

Q05. Regarding PG&E's response to Maturity Survey question C.III.a (*What level of redundancy does the utility s transmission architecture have?):*

a. Provide the percentage of circuits that have n-1 redundancy.
b. Provide PG&E's plan to increase level of redundancy for transmission circuits.

Response date: March 4, 2022

Q05 Response:

a. Customer impact after a single line outage event (N-1) is typically dependent on the transmission system operating configuration, which is subject to change (for example, some customer loads may have two transmission line connections, with one being the primary source of power.) Loss of the primary source may result in a momentary interruption to the customer while switching to the secondary or back-up source. This, however, would still be considered more redundant than having only a single line that serves the customer with no secondary or back-up source. Approximately 38% of PG&E's electric transmission lines have full redundancy (meaning under normal operating configuration, loss of the line should not have a direct impact to the customer). Additional lines may have partial redundancy, like in the example above where there is a back-up or secondary transmission line. Use of any secondary lines is contingent on the capacity and voltage needs of the system at the time of the outage event.
b. While it is not always practical or economical to avoid radial system conditions which result in load loss for N-1 events, PG&E makes our best effort to provide reliable electric service to customers. To do that, PG&E follows the CAISO planning standards which require all single substations with 100 MW or more of load to be served through a loop system (two transmission lines). In addition, even if the 100 MW threshold is not met, the CAISO allows investment to increase the level of redundancy to reduce load loss exposure as long as the investment can be justified through a benefit to cost ratio (BCR) above 1.0. PG&E has justified projects to add N-1 redundancy using the CAISO planning standards in the past, and future projects typically are considered based on

transmission line performance history and resulting customer impact and/or expected changes in load growth.

Regarding: Grid design and system hardening

Data Request: OEIS-PG&E-22-002 (Question 06)

Request date: Tuesday, February 22, 2022

Request:

Q06. Regarding PG&E's response to Maturity Survey question C.III.c (*What level of sectionalization does the utility s distribution architecture have?*):

a. Provide the percentage of circuits that have more than 2000 customers within one switch.
b. Describe PG&E's plan to isolate circuits to reduce the number of customers within one switch.

Response date: March 4, 2022

Q06 Response:

a. PG&E overhead main line design guidelines recommends a three-phase switching device every 250 customers or one mile of overhead line, whichever comes first. In HFTD areas, there are over 1,900 distribution "default" sectionalizing devices to isolate HFTD customers during PSPS events. Information regarding the number of customers affected by these devices is provided below:
    - 7% of these devices impact 2,000 or more customers in HFTD areas
    - 10% of these devices impact 1,000 to 1,999 customers in HFTD areas
    - 23% of these devices impact 200 to 999 customers in HFTD areas
    - 60% of these devices impact less than 200 customers in HFTD areas
b. PG&E continues to install new PSPS sectionalizing devices within HFTD areas to isolate smaller targeted customers zones as described in WMP Section 7.3.3.8.1. New device locations are selected based on the highest frequency of PSPS occurrence based on the PSPS 10-year Lookback Model, and locations that minimize the most customers impacted (either via switching/load transfer opportunities or installation close to the designated meteorology shutoff polygons). Also, as described in WMP Section 7.3.3.7 PG&E continues to replace non-exempt fuses in HFTD areas with exempt fuses, which can also be used as sectionalizing devices during PSPS depending upon the designated meteorology shutoff polygons during each event.

Regarding: Grid design and system hardening

Data Request: OEIS-PG&E-22-002 (Question 07)

Request date: Tuesday, February 22, 2022

Request:

Q07. Regarding PG&E's response to Maturity Survey question C.III.d (*How does the utility consider egress points in its grid topology?*):

a. Given PG&E "does not consider" egress as part of its grid topology design, how does PG&E currently factor and account for egress into wildfire and safety risks?
b. How is PG&E planning to input egress into grid topology design moving forward?

Response date: March 4, 2022

Q07 Response:

a. For purposes of risk modeling, PG&E has not performed an assessment of transportation corridors or vehicular flow rates in our service territory. However, PG&E has considered ingress/egress as a factor when evaluating circuit segments for wildfire mitigation and system hardening. See e.g., 2022 WMP, pp. 524, 531, 540, 542 (addressing ingress and egress issues). As part of the circuit segment review, as explained in our response to Remedy PGE-21-14, submitted on November 1, 2021, the Mitigation Decision Tree for System Hardening, our Public Safety Specialist (PSS) team review the segments identified for proposed System Hardening specifically for Ingress/Egress consideration as well as other local conditions.
b. In addition, during 2021, PG&E engaged UCLA Garrick Institute for Risk Sciences to develop an approach and methodology on how to consider Egress. As of the end of 2021, a pilot model that produces a probability of a safe evacuation of a community has been developed. This pilot model has subsequently been calibrated on the evacuation of the town of Paradise as a result of the Camp Fire. We are also reviewing and evaluating the Risk Associated with Value Exposure (RAVE) module from Technosylva that has components for estimating egress considering location and community factors. PG&E discusses this in more detail in Section 4.6, Additional Issue 5.1.C in its 2022 WMP.

Regarding: Grid design and system hardening

Data Request: OEIS-PG&E-22-002 (Question 08)

Request date: Tuesday, February 22, 2022

Request:

Q08. Regarding PG&E's response to Maturity Survey question C.IV.d (*What grid hardening initiatives does the utility include within its evaluation?):*

a. Define PG&E's understanding of what "Some" and "Most" include when considering grid hardening initiatives.
b. How does PG&E plan to move from considering some hardening initiatives to most by January 1, 2023?

Response date: March 4, 2022

Q08 Response:

a. Currently, risk models inform the prioritization of System Hardening (Covered Conductor and Undergrounding) programs. RSEs are currently calculated for multiple grid hardening initiatives (beyond just Covered Conductor and Undergrounding programs) as presented in Table 12 of the 2022 WMP. In regard to the range of System Hardening initiatives, PG&E considered this as 'some' of the available mitigation options. PG&E is developing modeling capabilities to measure the risk reduction for individual asset replacements that would, in PG&E's view, move this capability to 'most.'
b. The 2022 Wildfire Distribution Risk Model (WDRM) v3 described in PG&E's 2022 WMP will add the capabilities to model 'most' system hardening initiatives. See 2022 WMP, pp. 128-148.

Regarding: Asset management and inspections

Data Request: OEIS-PG&E-22-002 (Question 09)

Request date: Tuesday, February 22, 2022

Request:

Q09. Regarding PG&E's response to Maturity Survey question D.I.a (*What information is captured in the equipment inventory database?*):

a. Describe why PG&E moved from having an "accurate inventory of equipment" to "no service territory-wide inventory" from 2021 to 2022. Include any lessons learned from benchmarking with other utilities.
b. Provide an estimated percentage of the equipment currently within PG&E's inventory.
c. Provide PG&E's plan to move towards an accurate inventory service territory-wide, including integration of inspections and repairs, by January 1, 2023.

Response date: March 4, 2022

Q09 Response:

a. PG&E's survey score moved from "ii. There is an accurate inventory of equipment that may contribute to wildfire risk, including age, state of wear, and expected life cycle" to "i. There is no service territory wide inventory of electric lines and equipment including their state of wear or disrepair."

   Part of the reason for the change is a more granular interpretation of having an accurate inventory of the age and "expected life cycle" of transmission line assets. PG&E is undertaking a multi-year effort to collect age and attribute data on all ignition-related transmission line components. For example, where previously PG&E would collect installation date information of its transmission towers, we are now planning to collect the installation date for components within the tower, such as hardware, guy systems, splices, shield wire, etc. Where installation dates cannot be found, conservative age assumption logic will be applied for a determination of expected useful life.

   Electric distribution has a similar maturity regarding an accurate inventory of equipment as Transmission. Parameters such as age and status of wear of assets for Distribution equipment is still being verified and refined.

b. The survey score was reduced primarily due to the granularity of the data regarding age and expected lifecycle, rather than the percent of equipment missing from the inventory. For both transmission and distribution, the inventory of major assets (e.g., poles, conductors) is fairly complete, though sub-component and attribute information may be in various states of completion. For example, as of a March 2022 snapshot, approximately 65% of transmission line SCADA switches had missing installation dates (age) in the system of record. To contrast, only about 9% of transmission steel towers had missing installation dates in the system of record.
c. Though PG&E has several efforts underway to improve our asset inventory, these will not be completed by January 1, 2023. Some efforts include utilizing detailed inspection reports to continue to refine and update our asset inventory. Additionally, for transmission assets, the Asset Information Collection (AIC) effort is another project that is also refining and updating the asset inventory. For the AIC effort, updating all High Fire Threat District (HFTD) structures is expected to be complete by the end of the year, with the work on the non-HFTD structures continuing into 2023. Although we will continue to make progress throughout 2022, the as-built process update and updates to GIS may also not be completed by January 2023.

Regarding: Asset management and inspections

Data Request: OEIS-PG&E-22-002 (Question 10)

Request date: Tuesday, February 22, 2022

Request:

Q10. Regarding PG&E's response to Maturity Survey question D.I.c (*Does all equipment in HFTD areas have the ability to detect and respond to malfunctions?):*

a. Why does PG&E only update asset condition annually?
b. Provide all existing bottlenecks that prevent PG&E from updating its asset conditions more frequently, including any plans to alleviate such bottlenecks.'

Response date: March 4, 2022

Q10 Response:

a. Asset conditions update daily as inspections, maintenance and other project and programs are completed. However, for the purpose of asset management planning, PG&E's system is relatively stable and conditions do not change dynamically enough to necessitate more frequent updates. Many of the use cases for the condition data are developed into annual work plans.
b. PG&E has determined to update asset planning health models annually for the purpose of work planning. Version control and management of change of the condition data and subsequent health models are some key reasons why models are not updated more frequently.

Regarding: Asset management and inspections

Data Request: OEIS-PG&E-22-002 (Question 11)

Request date: Tuesday, February 22, 2022

Request:

Q11. Regarding PG&E's response to Maturity Survey question D.IV.a (*What level are electrical lines and equipment maintained at?*):

a. Why is PG&E not currently meeting consistent maintenance, as required?
b. What percentage of circuits are not meeting required regulation?
c. How did benchmarking with other utilities change PG&E's response and understanding?

Response date: March 4, 2022

Q11 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. PG&E responded to this survey question that "i. Electric lines and equipment not consistently maintained at required condition over multiple circuits." The basis for this response was that system-wide there is a backlog of transmission and distribution maintenance tags as a result of changes to the inspection program starting in 2019 through the Wildfire Safety Inspection Program. The intent of the of the program (and the current routine detailed inspection program) is to fully assess the health of the assets in high fire threat areas. By design, it is to provide a greater level of scrutiny to the lines inspected which has resulted in an expected increased number of findings. Further information regarding PG&E's maintenance program can be found in the quarterly CPUC report that is attached to this response as "WMP-Discovery2022_DR_OEIS_002-Q11Atch01."
b. PG&E does not maintain this information in the normal course of business because maintenance for transmission and distribution lines is done on a per structure basis, not necessarily by circuit. However, detailed information regarding the number of tags created through Q4 2021, and the number of tags currently open, can be found in "WMP-Discovery2022_DR_OEIS_002-Q11Atch01."

c. Benchmarking with other utilities did not result in changes to our response or understanding of this question.

Regarding: Grid operations and protocols

Data Request: OEIS-PG&E-22-002 (Question 12)

Request date: Tuesday, February 22, 2022

Request:

Q12. Regarding PG&E's response to Maturity Survey question F.III.d (*During PSPS events does the utility's website go down?*):

a. How many times did PG&E's website go down during PSPS events in 2021? Include associated timeframes for when the website was down, as well as a percentage of time that the website was down during PSPS events.
b. What is PG&E's plan to decrease the likelihood that the website will go down during PSPS events moving forward?

Response date: March 4, 2022

Q12 Response:

a. PG&E's website did not go down during any PSPS events in 2021.
b. In 2022, PG&E plans to continue to leverage the cloud-based website called "Safety and Alerts Center" which was used in 2021. Whenever there is a high volume event, PG&E will redirect website traffic from pge.com to this standalone cloud-based website. The alerts site allows PG&E to handle website traffic spikes while maintaining normal course of business (e.g., customers log into their accounts to view energy statements, pay a bill, submit a service application).

Regarding: Vegetation Management

Data Request: OEIS-PG&E-22-003(Question 01)

Request date: Friday, March 4, 2022

Request:

Q01. Considering Maturity Model Survey question E.IV.h, how would PG&E answer this modified version? Does the utility work with landowners to provide a use(s) for vegetation cut on the landowner's property? (Y/N)

Response date: March 10, 2022

Q01 Response:

Maturity Model Survey capability description and question E.IV.h. state:

- Capability Description: The utility's standards and actions for treating vegetation that has grow-in potential around lines and equipment. Higher scores are awarded for utilities that use ignition risk modeling and vegetation growth rates to determine appropriate vegetation clearances and trim cycles.
- Question: Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?

PG&E works with landowners to provide them with the option for PG&E to remove vegetation waste or leave it for the landowner's use. The most common uses for vegetation that is cut is either firewood or mulch, which depends on the type of vegetation waste provided to the property owner.

Regarding: Vegetation Management

Data Request: OEIS-PG&E-22-003 (Question 02)

Request date: Friday, March 4, 2022

Request:

Q02. Considering Maturity Model Survey question E.V.f, how would PG&E answer this modified version? Does the utility work with landowners to provide a use(s) for vegetation cut on the landowner's property? (Y/N)

Response date: March 10, 2022

Q02 Response:

Maturity Model Survey capability description and question E.V.f. state:

- Capability Description: The utility's processes for treating vegetation that has strike potential on its grid. Higher scores are awarded to utilities that treat vegetation based on a granular understanding of individual vegetation strike potential.
- Question: Does the utility work with local landowners to provide a cost-effective use for cutting vegetation?

PG&E works with landowners to provide them with the option for PG&E to remove vegetation waste or leave it for the landowner's use. The most common uses for vegetation that is cut is either firewood or mulch, which depends on the type of vegetation waste provided to the property owner.

Regarding: Vegetation Management

Data Request: OEIS-PG&E-22-003 (Question 03)

Request date: Friday, March 4, 2022

Request:

Q03. From the Maturity Survey, in Category E (Vegetation Management) it is apparent that PG&E is building a granular, frequently updated inventory (Capability 21) and moving towards using "predictive modeling of vegetation growth" to schedule vegetation inspections (E.II.c). However, PG&E still (and will as of Jan 1, 2023) schedule VM inspections based on annual or periodic schedules (E.II.b) and determine procedures/checklists based on statue and regulatory guidelines only (E.III.b).

a. Explain why PG&E is developing predictive modeling capabilities for VM (E.II.c) but not using those models to schedule inspections and determine procedures/checklists?
b. When will predictive modeling be used to schedule inspections and create procedures/checklists?

Response date: March 10, 2022

Q03 Response:

a. PG&E's vegetation management inspections are performed annually to allow adherence to the annual pruning cycle. Our inspection schedule planning is driven by several elements including historic tree work volume by circuit, environmental considerations (elevation restrictions, limited operating periods), local and/or regulatory commitments, and workflow consistency. PG&E will pursue predictive modeling of its Vegetation Management program to further support risk-informed decision making and planning for programs such as Enhanced vegetation management (EVM), but annual inspections are expected to continue to define the inspection cycle frequency.
b. Predictive modeling may never fully replace annual scheduled inspections but should continue to further support risk-informed decision making.We utilize historical data to predict our 2022 annual plan volume of work, at the circuit level, not at the tree level. We are hiring a data scientist to explore predictive modelling for tree growth and tree health. Our future use of this is dependent on the outcome of exploring this predictive modeling.

Regarding: Vegetation Management

Data Request: OEIS-PG&E-22-003 (Question 04)

Request date: Friday, March 4, 2022

Request:

Q04. Concerning Maturity Survey question E.IV.c, why is PG&E not using ignition and propagation risk modeling to guide clearances around lines and equipment?

a. How does and will PG&E's ignition and propagation risk modeling guide clearances?
b. When?

Response date: March 10, 2022

Q04 Response:

Maturity Model Survey capability description and question E.IV.c. state:

- Capability Description: The utility's standards and actions for treating vegetation that has grow-in potential around lines and equipment. Higher scores are awarded for utilities that use ignition risk modeling and vegetation growth rates to determine appropriate vegetation clearances and trim cycles.
- Question: What modeling is used to guide clearances around lines and equipment?

a. PG&E adheres to CPUC standards when determining clearances around lines and equipment, which has proven to be successful using in-person inspections. Currently, PG&E's ignition and risk modeling do not guide clearances.
b. PG&E believes ignition risk modeling is more appropriate for possible fall-in and blow-in scenarios and currently has no plans to utilize ignition risk modeling to guide clearances.

Regarding: Q05 2022 Maturity Questions

Data Request: OEIS-PG&E-22-003 (Question 05)

Request date: Friday, March 4, 2022

Request:

Q05. In data request OEIS-PG&E-22-002, Energy Safety asked PG&E to answer 41 2022 Maturity Survey questions it said it benchmarked through consultation with other utilities in 2022 by the same standard of interpretation it used to answer the same 41 questions in 2021 and 2020. In its response, PG&E indicated that "We cannot, however, go back in time to determine how we would have answered the same question in 2020 or 2021 in light of changes that have occurred since that time."

Energy Safety understands that PG&E cannot go back in time to change its answers from 2021 or 2020, and that other factors have changed, however Energy Safety is asking PG&E to answer those questions in the same way in 2022 as they did in 2021 and 2020 in order to understand the true progression of PG&E's maturity not attributed to re-interpretation of questions. Prior to benchmarking its 2022 answers with other utilities and re-interpreting these questions, what was PG&E's answer to those questions?

Response date: March 10, 2022

Q05 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

In the table below, we have listed each of the 41 survey questions that we benchmarked with the other utilities, the question text, and 2022 current and future state score. We then indicate in the following columns:

1. Change in Score: Whether there was a change in score from the 2021 WMP survey to the 2022 WMP survey. If the score did not change between 2021 and 2022, there was no change as a result of our interpretation of the survey question or benchmarking and thus subsequent columns are marked "not applicable."
2. Change Due to Interpretation/Benchmarking: If there was a change in score, in this column we indicate whether that change was a result of our 2022 interpretation of the survey question and/or benchmarking with the other utilities. Changes to the scores

may also have been a result of changes that occurred in 2021, for example the development of our risk models. If there is a change in scores resulting from events which occurred in 2021, for example a change in risk modeling, this column would indicate "No" because the change did not result from our interpretation or benchmarking.

3. Reason for Change: In this column, we identify the reason for the change. For example, if the change was because of how we interpreted climate and weather in the survey question (Survey Question A.I.c), we indicate the reason in this column as being "climate vs. weather." If, on the other hand, the change in score was due to improved risk modeling capabilities, that is indicated in the column.
4. Using the 2020 and 2021 Maturity Model Methodology - Current and Future State Scores: These two columns indicate the scores that would have resulted using the interpretation and non-benchmarking approach that we used for the 2020 and 2021 surveys.

In our response to OEIS_002-Q01, we provided a detailed explanation of the basis for the 2022 score for each of these 41 survey questions. Rather than repeat that information in the table below, we are incorporating that information by reference as a more detailed explanation of the basis for each 2022 survey score for the 41 identified questions.

We fully support Energy Safety's interest in understanding through the utilities' respective survey responses year-over-year progress and are hopeful that these responses facilitate that understanding. Each survey question and response involve a fair amount of detail and so PG&E would be happy to meet with Energy Safety and walk through each 2022 survey response and explain the basis for the response. This may also provide an opportunity to discuss ambiguity in certain survey questions. PG&E would also welcome a meeting with all of the utilities and Energy Safety to discuss each utility's understanding of and approach to the survey questions so that the utilities and Energy Safety can develop a common understanding of the survey.

Regarding: Section 9.5 - Model Documentation

Data Request: OEIS-PG&E-22-004 (Question 01)

Request date: Friday March 11, 2022

Request:

Q01. Please provide the Model Documentation and User Guide or available technical paper for each of the following from Table 9.5-1 Glossary of Primary Models (p. 1038):

a. Fire Potential Index (FPI) Model
b. Public Safety Power Shutoff (PSPS) Consequence Model

Response date: March 16, 2022

Q01 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. A technical whitepaper of our Fire Potential Index (FPI) model is included in our response. See "WMP-Discovery2022_DR_OEIS_004-Q01Atch01".
b. A whitepaper of our Public Safety Power Shutoff (PSPS) Consequence Model as of September 2021 is included in our response. See "WMP- Discovery2022_DR_OEIS_004-Q01Atch02". Please note in Section 4.5.1(i) of the 2022 WMP on p. 202 we discuss the updates made since September 2021 and these are still in review.

Regarding: Table 8 – to include underground circuit miles

Data Request: OEIS-PG&E-22-004 (Question 02)

Request date: Friday March 11, 2022

Request:

Q02. While PG&E provided undergrounding information in its GIS data, PG&E did not specifically report underground circuit miles in the nonspatial tables. Underground circuit miles were obtained from the GIS submission.

a. Please provide updated data for rows 1a, 2a, and 3a in Table 8, which include underground circuits.

Response date: March 16, 2022

Q02 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

PG&E has updated Table 8 1a, 2a, and 3a to include the Underground Circuit Miles in the 2021 columns in the attachment WMP-Discovery2022_DR_OEIS_004- Q02Atch01.xlsx. Please note that given the response deadline of this request, PG&E is unable to retroactively update the figures for 1a, 2a, and 3a to include underground circuit miles for 2019 and 2020 as PG&E's GIS system is a dynamic 'real-time' system that reflects the current assets in PG&E's service territory. When old assets are removed or replaced they are removed from the GIS system.

Regarding: Section 7.2 and 9.1 - Climate-driven risk map

Data Request: OEIS-PG&E-22-004 (Question 03)

Request date: Friday March 11, 2022

Request:

Q03. Regarding Section 7.3.2 – Risk assessment and mapping, and Section 9.1 – Risk mapping and simulation

a. Section 7.3.2 of the 2022 Guidelines requires the inclusion of a "climate-driven risk map and modeling based on various relevant weather scenarios relevant maps within the report or appendices" for every risk assessment and mapping initiative. Section 9.1 defines "climate-driven risk map and modeling based on various relevant weather scenarios" as: "Development and use of tools and processes demonstrating medium and long-term climate trends based on the best available climate models demonstrating the most wildfire-relevant impacts (e.g., warming trends, fuel moisture trends, soil moisture trends, vegetation distribution trends). Describe how these trends are being incorporated into risk modeling or other risk-informed analyses."
    i. Provide the page number(s) within the 2022 WMP update that fulfills the requirement for the provision of climate-driven risk map and modeling demonstrating medium and long-term climate trends for the risk assessment and mapping initiatives.
    ii. If there are no, or any missing, climate-driven risk maps incorporating medium and long-term climate trends for the risk assessment and mapping initiatives (see Q07ai), please submit those maps.
    iii. Provide the page number(s) within the 2022 WMP update that describes how medium and long-term climate trends are being incorporated into risk modeling or other risk-informed analyses.
    iv. If there is no description of how medium and long-term climate trends are being incorporated into risk modeling or other risk-informed analyses in the 2022 WMP update (see Q07aiii), please provide that description.

Response date: March 16, 2022

Q03 Response:

Please refer to Section 7.3.1.2 of PG&E's 2022 WMP on pages 354-357 titled Climate- Driven Risk Map and Modeling Based on Various Relevant Weather Scenarios.

Consistent with the direction in California Public Utilities Commission (CPUC or Commission) Decision (D.) 19-10-054, PG&E utilizes the climate scenarios and projections from the most

recent Statewide Climate Change Assessment (California Fourth Climate Change Assessment) and focuses on Representative Concentration Pathway (RCP) 8.5 when considering risk driven by climate change. As we utilize publicly available data from the California Climate Change Assessment, we do not reproduce the maps in our WMP.

Regarding: Lessons learned from past catastrophic fires

Data Request: OEIS-PG&E-22-004 (Question 04)

Request date: Friday March 11, 2022

Request:

Q04. How has PG&E changed its mitigation plans to address lessons learned from past catastrophic fires?

a. Include page numbers in the 2022, 2021, or 2020 WMP for discussion of each of the following applied lessons and a description of such changes:
    i. 2017 – Railroad Fire, Atlas Fire, Cascade Fire, Redwood Fire, and Nuns Fire
    ii. 2018 – Camp Fire
    iii. 2019 – Camino Fire, Bethel Island Fire, and Kincade Fire
    iv. 2020 – Zogg Fire
    v. 2021 – Dixie Fire and Fly Fire

Response date: March 16, 2022

Q04 Response:

Our wildfire mitigation initiatives and programs are developed based on numerous inputs including, but not limited to, feedback from internal and external experts, benchmarking with other utilities, detailed data such as weather and ignition data, actual experience with and results from initiatives and programs, and lessons learned from wildfires. Thus, it is not always possible to ascribe the initiation of or changes to a program or initiative based on a single factor, such as lessons learned from a wildfire.

For purposes of answering this data request, we are identifying initiatives or programs that were impacted by lessons learned from the wildfires identified and that were discussed in our Wildfire Mitigation Plans (WMP). The list identified for each fire(s) may not be comprehensive but is representative of the kinds of mitigation changes that were informed by lessons learned.

After the 2017 North Bay Fires[342], we implemented a number of programs to understand and mitigate wildfire risk based in part on lessons learned from the North Bay Fires including:

Program or Initiative	WMP Citation
Initiating the Community Wildfire Safety Program (CWSP)	2019 WMP, p. 12
Updating risk modeling	2019 WMP, pp. 21-28
Initiating the Enhanced Vegetation Management (EVM) Program	2019 WMP, pp. 70-76
Installing weather stations and high-definition cameras for situational awareness	2019 WMP, p. 4
Initiating the Wildfire Reclosing Disable Program	2019 WMP, pp. 47-49
Starting targeted system hardening	2019 WMP, p. 61[343]
Evaluation of pole materials	2019 WMP, p. 64
Updating Fire Potential Index	2019 WMP, pp. 88-89
Establishing bill and service modifications and disaster relief to support customers	2019 WMP, pp. 100-101, 125
Public Safety Power Shutoff (PSPS) program on a limited number of distribution and transmission circuits	2019 WMP, pp. 4, 6
Creating the Wildfire Safety Operations Center	2019 WMP, pp. 43, 93

These programs were intended to reduce wildfires resulting by coordinating our wildfire mitigation efforts with first responders, customers and communities, developing and utilizing risk modeling tools, reducing vegetation caused ignitions, increasing our situational awareness of wildfire conditions, and adopting PSPS as a last resort to mitigate wildfire potential during certain events.

[342] The North Bay Fires include the Railroad Fire, Atlas Fire, Cascade Fire, Redwood Fire, and Nuns Fire.

[343] 2019 WMP, p. 61 (this reference refers to the program starting in 2018 in coordination with the 2017 RAMP Report).

In addition to continuing these wildfire programs or initiatives, as a result of the 2018 Camp Fire, we initiated or expanded the following programs or initiatives:

Program or Initiative	WMP Citation
Initiating Safety and Infrastructure Protection Team (SIPT)	2019 WMP, p. 6, 51-52
Continuing refinements to risk modeling	2019 WMP, pp. 21-22

Program or Initiative	WMP Citation
Significantly expanding the EVM Program and other vegetation management programs, such as the use of LiDAR	2019 WMP, pp. 3, 41-42, 71-80
Initiating enhanced inspections for transmission and distribution facilities under Wildfire Safety Inspection Program (WSIP)	2019 WMP, pp. 3, 40-41, 52-60
Significantly expanding system hardening	2019 WMP, pp. 3, 41
Significantly expanding weather station and high definition camera installation	2019 WMP, pp. 3, 42, 91-92.
Significantly expanding the PSPS program to include more distribution and transmission facilities in High Fire Threat District (HFTD) areas	2019 WMP, pp. 4, 6
Adding Supervisory Control and Data Acquisition (SCADA) capabilities to allow for remote reclose blocking in all HFTD areas	2019 WMP, pp. 5-6
Initiating numerous PSPS mitigation strategies such as sectionalizing devices, resilience zones, and customer support	2019 WMP, pp. 43-44, 96
Initiating program to replace non-exempt overhead line equipment in HFTD areas	2019 WMP, p. 69
Focusing on increasing available and qualified personal to perform vegetation management work	2019 WMP, pp. 81-83

The 2019 Camino, Bethel Island, and Kincade Fires were evaluated by our Electric Incident Investigation (EII) Department for lessons learned and changes to our internal processes and procedures. With regard to how information from these fires was reflected in our wildfire programs and initiatives, and described in our WMP, ignition data generally was used for risk modeling and ascertaining the main drivers for ignition probability. See 2020 WMP, pp. 3-7 to 3-12; 3-30 to 3-33; 4-10 (describing Outage Producing Wind and Fire Potential Index modeling using ignition data); 5-279 to 5-282. In addition, ignition data was used to continue to refine our wildfire programs and mitigations. See e.g. 2020 WMP, p. 5-125 (describing how ignition data is used to evaluate and refine system hardening program). In addition, as a result of lessons learned, particularly from the Kincade Fire, we have initiated the removal of idle

facilities (2020 WMP, pp. 5-131 to 5-132; 2022 WMP, p. 538) and the failure modes analysis informed the development of our Wildfire Transmission Risk Model (2022 WMP, pp.

149-158). Finally, as a result of our continued analysis of all fires in PG&E's service territory (not just HFTD Tiers 2 and 3) for our 2022 WDRM v3, our probability models consider both primary and secondary overhead distribution voltages (2022 WMP, pp. 128-148) and our Wildfire Consequence Model now considers fire propagation and consequence in all "burnable" locations within PG&E's service territory (2022 WMP, pp. 159-167).

Similarly, the 2020 Zogg Fire was reflected in ignition data that was used to further refine our wildfire modeling and risk analysis. See 2021 WMP, pp. 132-133, 155-157. In addition, lessons learned from the Zogg fire informed our 2020 PSPS Protocols as we explained in the 2021 WMP:

> Based on a further analysis of the propensity of tree-related outages and the tree overstrike exposure near the Zogg Fire ignition point, we proposed to modify the 2020 PSPS Protocols to include the 70th percentile or above Tree Overstrike Potential areas. We presented this analysis in an April 20, 2021 tree overstrike workshop hosted by the CPUC. Based on this analysis, locations with a Tree Overstrike Potential in the 70th percentile or above will be directly considered when evaluating potential PSPS events.192 For reference and clarity, we found that at the 70th percentile value, a 2 x 2 km grid cell contains approximately 10,000 ft of overstrike or approximately 10,000 ft of timber measured from the point of the trees that could first impact our conductors to the top of the trees that could impact our conductors. Additionally, the 70th percentile and above grid cells capture approximately 92% of the tree overstrike potential in the HFTD. The amount of overstrike in feet increases as the percentile increases.[344]

Finally, the Dixie and Fly Fires, as well as significant and dramatic changes in wildfire risk resulting from climate change, informed our decisions to implement the Enhanced Powerline Safety Setting (EPSS) program as well as our plan to underground 10,000 miles of overhead distribution lines. In addition to using the data from the Dixie and Fly fires, as well as other 2021 fires, to continue to refine and improve our ignition probability and risk modeling, as

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[344] 2021 WMP, p. 980.

described above for the 2019 and 2020 fires, lessons learned from the Dixie and Fly Fires helped inform:

Program or Initiative	WMP Citation
Ongoing evaluation of wildfire mitigation programs and initiatives based on wildfire data and significant changes in wildfire risk	2022 WMP, pp. 2, 49
Initiating the EPSS program	2022 WMP, pp. 6-7, 730-739
Initiating our 10,000 miles of undergrounding program	2022 WMP, pp. 6, 523-535

Regarding: Table 7.1

Data Request: OEIS-PG&E-22-004 (Question 05)

Request date: Friday March 11, 2022

Request:

Q05. Regarding Table 7.1:

a. Provide the number of events broken down by equipment type that fall in the "Other" category in Rows 20, 39, 65, and 91.
b. Why is PG&E expecting an increase in wire-down events for the following from 2022 to 2023?:
    i. Vegetation contacts
    ii. Connectors
c. How is PG&E planning on addressing the wildfire risk presented by the following equipment failures/event causes at the distribution level, which showed increase wire down and/or outage events in 2021? Describe any failure mode analyses evaluating the cause for the increases in 2021, and any associated changes in maintenance or inspections from lesson learned in 2021:
    i. Transformers
    ii. Conductors
    iii. Fuses
    iv. Poles
    v. Crossarms
    vi. Connection devices
    vii. Other, including specific equipment types as delineated in part (a)
    viii. Wire-to-wire contacts
    ix. Vegetation contacts

Response date: March 16, 2022

Q06 Response:

a. PG&E has cause categories it uses for describing outage events and many align well with those designated in the requested WMP report format. However, many categories are also different and require a translation to best fit the PG&E cause categories into the designated WMP report format.

   The following table provides the number of events in 2021 broken out by equipment type in the "Other" category of Row 20 (also designated as metric 2.h. of Table 7.1).

The data provided in this response is based on the current information in PG&E's outage data base, which may differ slightly from the data initially reported in the WMP Q4 report due to PG&E's post outage review process.

2021 Distribution Equipment Failure Wire Down Events - Details of "Other - Distribution": # 2.h.

	Supplemental Cause			
Failed Equipment	**Overhead**	**Fire- pole**	**Electrical Overload**	**Total**
Pole-Wood	164	46	0	210
Conductor- Overhead	0	7	4	11
Transformer (OH)	9	0	0	9
Other	5	0	0	5
Anchor or Guy	4	0	0	4
Switch (OH)	2	0	0	2
Woodpin	2	0	0	2
Transformer	1	0	0	1
Cutout- fuse holder	1	0	0	1
Pole - Tower- steel	1	0	0	1
Footings- Tower or Pole	1	0	0	1
Capacitor	1	0	0	1
Grand Total	**191**	**53**	**4**	**248**

The following table provides the number of events in 2021 broken out by equipment type in the "Other" category of Row 65 (also designated as metric 18.o. of Table 7.1).

2021 Distribution Equipment Failure Outage Events - Details of "Other - Distribution": # 18.o.

	Supplemental Cause					
Failed Equipment	**Underground**	**Overhead**	**Electrical Overload**	**Fire- pole**	**Substation**	**Total**
Conductor- Underground	651	0	2	4	0	657
Cutout- fuse holder	6	462	4	7	0	479
< Blank >	1	247	6	0	0	254
Elbow	218	0	2	0	0	220
Connector or Splice (UG)	202	1	3	0	0	206
Secondary	149	0	7	5	0	161
Other	42	106	4	2	3	157
Pothead(Riser Termination)	4	114	3	4	3	128
Service conductor	13	104	3	0	0	120
Conductor- Overhead	1	0	35	18	0	54
Woodpin	0	36	0	1	0	37
Customer Equipment	4	14	2	2	0	22
Circuit Breaker	0	0	7	0	6	13
Cable Termination(live front	12	0	0	0	0	12
Metering Equipment	2	8	0	0	1	11
PT/CCVT	1	8	1	0	0	10
Bus	5	4	0	0	0	9
Generator	1	0	0	0	2	3
Relay	0	1	0	0	2	3
SCADA	0	2	0	0	1	3
Street Light Equipment	0	3	0	0	0	3
Grand Total	**1,312**	**1,110**	**79**	**43**	**18**	**2,562**

Row 91

In the table below, we provide additional equipment type details for the 2021 events identified in Cause Category 26 and Sub-Cause Category 26.o:

YEAR	Cause Category	Cause Detail	Table 7.1 Cause Category	#	Table 7.1 Sub-Cause Category
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-reactive equipment	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-reactive equipment	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-reactive equipment	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-relay	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-relay	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-relay	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-relay	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-relay	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-relay	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-other-station	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-PT	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-PT	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-PT	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-PT	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-PT	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-reactive equipment	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-PT	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission
2021	Equipment Failure	Equip Fail-PT	26. Equipment / facility failure - Transmission	26.o.	Other - Transmission

Row 39

Cause Category 10 and Sub-Cause Category 10.h. was used whenever we had a transmission line structure fail and cause a wire down event. PG&E considered using "10.c. Crossarm damage or failure – Transmission", but this is more of a distribution structure failure rather than a transmission structure failure. Hence, the "10.h Other - transmission" category was chosen.

In the table below, we provide additional equipment type details for the 2021 events identified in Cause Category 10 and Sub-Cause Category 10.h:

YEAR	Cause Category	Cause Detail	Table 7.1 Cause Category	#	Table 7.1 Sub-Cause Category
2021	Equipment Failure	Equip Fail-structure-line	10. Equipment / facility failure - Transmission	10.h	Pole damage or failure - Transmission
2021	Equipment Failure	Equip Fail-structure-line	10. Equipment / facility failure - Transmission	10.h	Pole damage or failure - Transmission
2021	Equipment Failure	Equip Fail-structure-line	10. Equipment / facility failure - Transmission	10.h	Pole damage or failure - Transmission
2021	Equipment Failure	Equip Fail-structure-line	10. Equipment / facility failure - Transmission	10.h	Pole damage or failure - Transmission
2021	Equipment Failure	Equip Fail-structure-line	10. Equipment / facility failure - Transmission	10.h	Pole damage or failure - Transmission

b. PG&E used the following methodology for projecting wire down events for each row (including those for vegetation contact and connectors):

2022 projections for Quarter X: are the average of 2020 and 2021 actuals for Quarter X

2023 projections for Quarter X: are the average of 2021 actuals and 2022 projections for Quarter X

The numbers in the projection columns reflect the methodology above. In this case, the year 2020 drops out of the 2023 forecast and is replaced by 2022 projections, which have a higher number of wires down incidents than 2020 actuals. As a result, our 2023 projections are greater than the 2022 projections.

c. PG&E's System Hardening Program – Distribution, Section 7.3.3.17.1, focuses on mitigation of potential catastrophic wildfire risk caused by distribution overhead equipment failures, including vegetation contact incidents, in and near Tier 2 and 3 HFTDs in PG&E's service territory. This program targets the highest wildfire risk miles and applies various mitigation activities, including: (1) line removal, (2) conversion of distribution lines from overhead to underground, (3) application of Remote Grid alternatives, (4) mitigation of exposure through relocation of overhead facilities, and (5) in-place overhead system hardening. For 2022, the highest wildfire risk miles are separated into four categories:
    1. Top 20% of circuit segments as defined by PG&E's 2021 Wildfire Distribution Risk Model (WDRM) v2 for System Hardening,
    2. Fire and Major Emergency Rebuild within HFTD,
    3. PSPS mitigation projects, and
    4. Locations identified by PG&E's Public Safety Specialist (PSS) team as presenting elevated wildfire risk.

    In addition to PG&E's System Hardening Program – Distribution, which addresses the listed equipment failures / event causes referenced in this question, PG&E has also developed other targeted programs to address these issues. The following summarizes these targeted programs and any associated failure analyses that were performed:

    i. Transformers: Please refer to Section 7.3.3.14, Transformers Maintenance and Replacement. PG&E has modified our preventative maintenance strategy by deploying oil temperature monitoring of transformers to allow us to detect anomalies in equipment heating that are potential signatures of equipment failure, as well as incorporating smart meter data and machine learnings to predict transformer failures before they occur. Both of these preventative maintenance strategies allow us to identify and address potential failures before they occur. Furthermore, PG&E has also expanded our maintenance and inspection strategy to perform infrared inspections of distribution electric lines

and equipment (Section 7.3.4.4) to help detect abnormal "hot spots" by using infrared imaging and temperature measuring systems. Excessive heating gradients on transformers is a potential sign of potential equipment failure.

PG&E's failure analyses review of CPUC reportable ignitions from 2017-2021 has identified that transformer equipment failures were the third highest priority driver for equipment caused CPUC reportable ignitions.

ii. Conductors: Aside from PG&E's System Hardening Program – Distribution, Section 7.3.3.17.1, addressing conductor failures, PG&E has also expanded our maintenance and inspection strategy to perform infrared inspections of distribution electric lines and equipment (Section 7.3.4.4) to help detect abnormal "hot spots" by using infrared imaging and temperature measuring systems. Excessive heating gradients on line conductors are a potential sign of equipment failure.

PG&E's failure analyses review of CPUC reportable ignitions from 2017-2021 has identified that conductor equipment failures was the top priority driver for equipment caused CPUC reportable ignitions.

iii. Fuses: Please refer to Section 7.3.3.7, Expulsion Fuse Replacement. PG&E has also expanded our maintenance and inspection strategy to perform infrared inspections of distribution electric lines and equipment (Section 7.3.4.4) to help detect abnormal "hot spots" by using infrared imaging and temperature measuring systems. Excessive heating gradients on fuses are a potential sign of equipment failure.

PG&E's review of CPUC reportable ignitions from 2017-2021 has identified that fuses were the sixth highest priority driver for equipment caused CPUC reportable ignitions.

iv. Poles: Please refer to Section 7.3.3.6, Distribution Pole Replacement and Reinforcement, Including with Composite Poles. PG&E has modified our inspection and maintenance strategy to perform intrusive pole inspections for distribution poles (Section 7.3.4.6.1) to help detect potential rot that could lead to pole failures. We also leverage pole loading analysis to determine if distribution poles have an adequate safety factor and warrant replacement (Section 7.3.4.13).

PG&E's review of CPUC reportable ignitions from 2017-2021 has identified that poles were the fourth highest priority driver for equipment caused CPUC reportable ignitions.

v. Crossarms: Please refer to Section 7.3.3.5, Crossarm Maintenance, Repair, and Replacement and Section 7.3.3.6, Distribution Pole Replacement and Reinforcement, Including with Composite Poles. PG&E's review of CPUC

reportable ignitions from 2017-2021 has identified that crossarms were the ninth highest priority driver for equipment caused CPUC reportable ignitions.

vi. Connection Devices: PG&E interprets "Connection Devices" to be splices, clamps or connectors. Aside from PG&E's System Hardening Program – Distribution Section 7.3.3.17.1, PG&E has also expanded our maintenance and inspection strategy to perform infrared inspections of distribution electric lines and equipment (Section 7.3.4.4) to help detect abnormal "hot spots" by using infrared imaging and temperature measuring systems. Excessive heating gradients on splices, clamps or connectors are a potential sign of equipment failure.

PG&E's failure analyses review of CPUC reportable ignitions from 2017-2021has identified that splices, clamps or connector equipment failures were the second highest priority driver for equipment caused CPUC reportable ignitions.

vii. Other, including specific equipment types as delineated in part (a): Aside from PG&E's System Hardening Program – Distribution Section 7.3.3.17.1, PG&E does not have another targeted program to address the equipment types considered as "Other", including specific equipment types delineated in part a of this question.

viii. Wire-to-wire contacts: Aside from PG&E's System Hardening Program – Distribution Section 7.3.3.17.1, PG&E does not have another targeted program to address wire to wire contacts in the HFTD.

ix. Vegetation Contacts: Please refer to Section 7.3.5.2, Detailed Inspections and Management Practices for Vegetation Clearances Around Distribution Electrical Lines and Equipment. PG&E's failure analyses review of CPUC reportable ignitions from 2017-2021 has identified vegetation contact as the top priority driver for CPUC reportable ignitions.

Regarding: Table 7.2

Data Request: OEIS-PG&E-22-004 (Question 06)

Request date: Friday March 11, 2022

Request:

Q06. Regarding Table 7.2:

a. Why is PG&E expecting an increase in ignitions for the following from 2022 to 2023?:
    i. Vegetation contacts
    ii. Connectors
    iii. Conductor damage
    iv. Transformers
    v. Wire-to-wire contacts

Response date: March 16, 2022

Q06 Response:

PG&E has projected an increase in distribution ignitions from vegetation contacts, connectors, conductor damage, transformers, and wire-to-wire contacts from 2022 to 2023 in non-HFTD areas only. PG&E used the following methodologies for projecting the ignitions in each of the aforementioned categories:

- The 2022 projections are the average of 2018, 2019 and 2020 ignitions
- The 2023 projections are the average of 2019, 2020, 2022 (projected) ignitions

The projected increases are a result of different years being used for the projections. In this case, the year 2018 drops out of the 2023 forecast and is replaced by the 2022 projection, which has a higher number of incidents than 2018. As a result, our 2023 projections are greater than the 2022 projections. Please note that 2021 data was excluded from both projections to exclude any variability due to EPSS.

Regarding: EPSS Analysis

Data Request: OEIS-PG&E-22-005 (Question 01)

Request date: Friday March 18, 2022

Request:

Q01. Provide and describe the "EPSS Reliability Impact analysis" as mentioned on page 494 of PG&E's 2022 WMP Update.

Response date: March 23, 2022

Q01 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

For the safety of our customers, PG&E is re-engineering the safety settings on our powerlines to automatically turn off power in one-tenth of a second if a wildfire threat is detected. In 2022, our Enhanced Powerline Safety Settings (EPSS) program brings these new safety settings to all distribution circuits in High Fire Threat District (HFTD) and High Fire Risk Areas (HFRA) in our service territory, as well as select non-HFTD areas. See 2022 WMP, p. 733. While having the more sensitive settings is helping to prevent wildfires, it can also result in power outages for our customers, which we are taking steps to alleviate.

To understand which customers and areas of our territory could be most impacted by the implementation of EPSS, we conducted the EPSS Reliability Impact analysis (hereafter "Reliability Study") anchored upon the historical performance of each circuit included in the 2022 EPSS Program scope. For these circuits, we reviewed applicable outages from 2019 – 2021 between May and November and recalculated each outage's customer impact as if EPSS had been enabled – quantifying by Customers Experiencing Sustained Outages (CESO). The recalculation is necessary as the EPSS settings are intended to detect potential wildfire threats that normally operating devices, or manual protection devices such as fuses, would not otherwise detect. However, this means that outages that previously had resulted in fuse or transformer level outages may now result in zone-level outages when EPSS is enabled.

Please see attached WMP-Discovery2022_DR_OEIS_005-Q01Atch01.xlsx for PG&E's preliminary Reliability Study as of January 25, 2022 that informed Q1 2022 EPSS Program planning activities. Note we may adapt, update, or augment the results of this study with

additional data or insights to further improve and target reliability mitigations to the areas that will have the greatest impact for our customers and communities.

Furthermore, we continue to strengthen our customer support by augmenting the resources available to customers to help ease the burden of losing power through the expansion of programs such as:

1. Generator and battery rebates for customers who rely on well water, customers in our Medical Baseline Program and certain small businesses in Tiers 2 and 3 HFTDs, as well as those affected by EPSS. This year, we are changing the support tiers so the program is available to more customers.
2. Portable batteries for customers in our Medical Baseline Program who live in high fire-risk areas. This year, we are dropping income-based qualifications.
3. Backup power transfer meters to make it easier and safer for customers to connect a portable generator. This program is launching this year as a pilot to select customers and will be available to all customers in Tiers 2 and 3 HFTDs and those affected by EPSS this year.
4. Clearer outage notification language with more accurate estimated times of restoration
5. New partnerships with community-based organizations to share resources and information as well as food resource partnerships with Meals on Wheels and local food banks

Regarding: Poles

Data Request: OEIS-PG&E-22-005 (Question 02)

Request date: Friday March 18, 2022

Request:

Q02. How many poles in PG&E's territory are subject to PRC 4292?

a. How many of these poles does PG&E intend to inspect and work (as necessary) in 2022?

Response date: March 23, 2022

Q02 Response:

There are approximately 83,000 poles in PG&E's territory that are subject to California Public Resources Code (PRC) Section 4292.

a. PG&E intends to inspect and work (as necessary) 100% of all poles subject to PRC Section 4292 in 2022 barring any external factors.

Regarding: VM Workforce

Data Request: OEIS-PG&E-22-005 (Question 03)

Request date: Friday March 18, 2022

Request:

Q03. PG&E noted during the workshop that it has hired pre-inspectors as union employees.

a. What percentage of pre-inspectors are contractors and what percentage are PG&E employees?
b. Has PG&E found a difference in performance between contractor and PG&E employee pre-inspectors?
    i. If so, describe the observed differences in performance
c. Provide relevant metrics, including QA/QV findings demonstrating performance. broken down by type of inspector (contractor v. PG&E employee) to show any differences between contractor and PG&E employee pre-inspector performance.

Response date: March 23, 2022

Q03 Response:

a. There are currently 108 internal Pre-Inspectors and 1,500 contract Pre-Inspectors. Approximately 6.7% of the current Pre-Inspectors are PG&E employees (108/1,608= 6.7%). Our target is to have 150 Pre-Inspector employees.
b. Currently, our focus is on hiring and on-boarding of resources and implementing training programs for both internal and contract resources. The training programs are focused on creating a consistent understanding of the responsibilities for a Pre-Inspector. At this time, we have not measured performance between internal and contract Pre-Inspection resources.
c. Not applicable. The QA/QV scope is currently focused on contract Pre-Inspectors and does not evaluate the performance of PG&E Pre-Inspector employees.

Regarding: VM Targets

Data Request: OEIS-PG&E-22-005 (Question 04)

Request date: Friday March 18, 2022

Request:

Q04. Provide the QA/QV results for vegetation management broken down by inspection type completed in 2019, 2020, and 2021. This should include:

a. Percentage of inspections with infractions found (e.g., under-trimming, over-trimming, missed hazard tree, improper clean-up etc.).
b. Percentage of (a) which required remediation (e.g., re-inspection, additional trimming, removal of a tree).
c. List of lessons learned from infractions and associated changes made to inspections moving forward.

Response date: March 23, 2022

Q04 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. QAVM:

   Please find attachment WMP-Discovery2022_DR_OEIS_005-Q04Atch01, which provides QAVM results for 2019, 2020, and 2021, broken down by Pre-Inspection and Pole Clearing audits. QAVM provides a total count of non-conformances among the total population of inspections that occurred, and the compliance percentages are provided per audit.

   QVVM:

   PG&E tracks the total number of non-conformances found for QVVM but does not track the percentage of individual inspections with a non-conformance finding.

   Please find a table of non-conformance findings found during QVVM Reviews by year in the table below:

Quantity of Findings by Year

Review Year	2019	2020	2021
Total	19,522	21,502	20,032

2021 was the first year QV performed an official EVM audit. The 2021 QV audit data relating to EVM is provided below, where the compliance pass rate is calculated using the percentage of segment miles passed without a finding relative to total segment mileage.

Line Segment Count	Total Findings	Pass Miles	Fail Miles	Total Miles	Pass Rate
5,574	36	265.64	1.67	267.31	99.4%

b. QAVM:

All QAVM non-conformance findings identified in response to question 4a were identified for remediation.

QVVM:

All QVVM non-conformance findings identified in response to question 4a were identified for remediation.

All 2021 QV non-conformance findings relating to the EVM audit identified in response to question 4a were identified for remediation.

c. Most of the lessons learned from non-conformance findings are implemented by the Work Verification and Quality Control (QC) programs within Vegetation Management. Through these programs, we have identified opportunities for alignment in regard to the missed trees and the acceptance criteria associated with the inspection of healthy trees. We have held multiple alignment sessions with our teams and the applicable field teams/responsible parties. We have also held multiple field calibration sessions with the QA/QV Teams to ensure that we are aligned on expectations. Please see Sections 4.1a, 7.3.5.6, and 7.3.5.13 of the 2022 WMP for additional information regarding lessons learned and our vegetation management improvements.

Regarding: VM Inspections

Data Request: OEIS-PG&E-22-005 (Question 05)

Request date: Friday March 18, 2022

Request:

Q05. According to Section 7.3.5.13, out of the 7 QA/QV programs PG&E describes, 4 programs fell short of targets. PG&E cites various reasons for the shortfall including resource constraints. How is PG&E:

a. Addressing resource constraints for QA/QV?
b. Minimizing turnover and loss of talent for QA/QV?
c. Ensuring QA/QV targets are met in 2022?

Response date: March 23, 2022

Q05 Response:

a. QAVM – The goals for this year during planning were to meet all of our objectives while having an audit plan based on the resources available. We have gained efficiencies by combining audits in areas that share borders and have one Defined scope contractor. This allows us to give more accurate results for the contractor's performance and eliminates redundant audit plans and reports. We have also reduced the number of procedure audits and we are working in teams on these audits to ensure thorough work.

   QVVM – There was an elimination of a redundant audit type identified at the end of 2021 that allows us to reduce our resource constraints for 2022. Additionally, the QV audit schedule is reviewed daily during the team's Daily Operating Review to discuss roadblocks and issues.

b. QAVM – We offer a lot of room for growth within our department by promoting people from career to senior and senior to expert. We provide opportunities for personal growth through encouraging people to attend training opportunities and obtain certifications, which costs are covered by PG&E.

   QVVM – The CFVM contractor team had their contract revised in late 2021 to compensate for QV Field Techs being hired by higher paying contractors from Vegetation Management. The wages were increased significantly by an additional $10-15 an hour to support stabilize the workforce.

c. QAVM – Daily and weekly tracking through daily operating review. We are constantly evaluating progress, who is ahead and who is behind, and this information is used to move people to where the work is needed.

   QVVM – Our schedule is reviewed daily during our Daily Operating Reviews as well as during our weekly CFVM contractor calls.

Regarding: VM Audits

Data Request: OEIS-PG&E-22-005 (Question 06)

Request date: Friday March 18, 2022

Request:

Q06. In Section 7.3.5.13, PG&E provides the number of QA/QV audits it intended to perform in 2021 (e.g., for QAVM-Distribution Audits, PG&E had planned to complete 65 audits). Provide the number of audits PG&E plans to perform in 2022 for each QA/QV program:

a. QAVM – Distribution Audits
b. QAVM – Vegetation Pole Clearing Audit
c. QAVM – Transmission Audits
d. QAVM – Procedure Audits
e. QVVM – Distribution
f. QVVM – Vegetation Pole Clearing
g. QVVM – Transmission

Response date: March 23, 2022

Q06 Response:

The number of audits / reviews PG&E plans to perform (under the Quality Management department) for 2022 is shown below:

QAVM

Distribution Audits	43 Audits
Vegetation Pole Clearing Audits	1 Audit
Transmission Audits	1 Audit
Procedure Audits	4 Audits

QVVM

Distribution Reviews	1,522 Reviews
Vegetation Pole Clearing	3,421 Poles*
Transmission Reviews	260 Reviews

*The 2022 QVVM Vegetation Pole Clearing plan is tracked by the number of poles that are reviewed and does not have an estimated number of “reviews” for 2022.

Regarding: PSPS Damage

Data Request: OEIS-PG&E-22-005 (Question 07)

Request date: Friday March 18, 2022

Request:

Q07. Regarding PSPS, on p. 863, PG&E describes "…the January 19, 2021, event that resulted in a massive level of damages that severely impacted restoration."

a. Explain the types of damage.
b. Quantify the damage observed, by type indicated in Q07.a).

Response date: March 23, 2022

Q07 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. See PG&E's Public Safety Power Shutoff (PSPS) Report to the CPUC for the January 19-21, 2021 De-energization. See pg. 29-31 for explanation of the types of damage.
b. See PG&E's Public Safety Power Shutoff (PSPS) Report to the CPUC for the January 19-21, 2021 De-energization See pg. 29 for data regarding the damage observed.

Please see "WMP-Discovery2022_DR_OEIS_005-Q07Atch01" for the PSPS Damage- Hazard Data for 1/18/2021 event.

Regarding: PSPS Notification

Data Request: OEIS-PG&E-22-005 (Question 08)

Request date: Friday March 18, 2022

Request:

Q08. Regarding PSPS notification, discussing lessons learned from 2021, on p. 866 PG&E indicates "external communications and customer notification processes showed large improvements in 2021. PG&E will continue to work on this as an area for further improvement in 2022, focusing on decreasing the amount of time required to send customer notifications, accuracy of notifications, automating processes, and for issuing updated notifications based on scope changes due to weather."

a. To what granularity is customer notification correlated with circuit sectionalization?
b. Is PG&E able to send Initial Notifications of a Potential PSPS De-Energization and Notifications of Cancellation of PSPS De-Energization to customers on a discrete circuit segment, as opposed to an entire circuit?
c. If a) and b) are not currently true, are there plans to notify customers regarding PSPS events at the segment level?
d. If there are plans to notify customers regarding PSPS events at the segment level, what is the timeline for implementing segment-level notification?
e. If there are no plans to notify customers regarding PSPS events at the segment level, what is the reasoning behind this decision?
f. If there are one or more technical issues that prohibit or otherwise make segment-level notification impossible or impractical, explain those issues.

Response date: March 23, 2022

Q08 Response:

a. PG&E creates notifications based on the customers downstream of the device that it plans to open on that specific circuit based on the scope of the event. The planned device could be a SCADA or manual device based on where the risk area for that event intersects the circuit.
b. PG&E is able to send Initial Notifications of a Potential PSPS De-Energization and Notifications of Cancellation of PSPS De-Energization to customers on the circuit segment level. See answer a) for how PG&E creates notifications.
c. Not applicable.

d. Not applicable.
e. Not applicable.
f. Not applicable.

Regarding: Mitigation Costs to Ratepayer

Data Request: OEIS-PG&E-22-005 (Question 09)

Request date: Friday March 18, 2022

Request:

Q09. As reported in Table 3-2, PG&E's increase in electric costs to ratepayer due to wildfire mitigation activities (total) is markedly higher than the ratepayer impact provided by PG&E's direct utility peers:

- 2021 for PG&E $11.63, SCE $1.60, and SDG&E $0.00

- 2022 for PG&E $6.13, SCE $6.90, SDG&E $1.92 (projected)

a. How does PG&E explain this vast discrepancy in in electric costs to ratepayers due to wildfire mitigation activities?
b. How is PG&E justifying the increase to ratepayers at a cumulative rate so much higher than its peers?

Response date: March 23, 2022

Q09 Response:

a. While we cannot specifically speak to the costs reflected in the 2022 WMPs for Southern California Edison Company (SCE) and San Diego Gas & Electric Company (SDG&E), PG&E has put together a cost comparison table (below) against its utility peers to help explain the differences in electric costs to customers due to wildfire mitigation activities. As summarized in the table below, vegetation management (VM) and grid design and system hardening are the major cost drivers of the WMP for the period of 2020-2022.

   Specifically, the 2020 GRC Decision (D.20-12-005) authorized PG&E to establish a VM balancing account and wildfire mitigation balancing account (WMBA). System hardening activities are tracked and recorded in the WMBA. PG&E is authorized to amortize the approved VM and WMBA costs incurred in 2020 beginning March 2021 through 2023. As a result, the customer impact of $11.63 for 2021 includes a portion of the 2020 spending.

   Please see the specific amounts below for VM and WMBA that are included in existing rates or will be collected in rates:

- 2020 – $657.6 million in expense for vegetation management; $61.4 million in expense and $603.3 million in capital expenditures for wildfire mitigation. These amounts are amortized in customer rates beginning March 2021 until 2023.
- 2021 – $723.4 million in expense for vegetation management; $63.6 million in expense and $930.9 million in capital expenditures for wildfire mitigation. These amounts are collected in customer rates in 2021-2023.
- 2022 – $795.7 million in expense for vegetation management; $57.4 million in expense and $1,151.1 million in capital expenditures for wildfire mitigation. These amounts are collected in customer rates in 2022 through 2023/2024.

Description	2020-2022 WMP Total (With 2020 & 2021 Actual, 2022 Planned) $000	2020-2022 Vegetation Management $000	2020-2022 Grid Design and System Hardening $000	Source Reference
PG&E	$15,222.7	$5,153.2	$7,876.0	Table 3.1-2: Summary of WMP Expenditures by Category, Page 40, 2022 PG&E WMP Update
SCE	$4,636.0	$1,072.4	$2,357.9	Table 3-1 and 3-2: Summary of WMP Expenditures by Category, Page 27, 2022 SCE WMP Update
SDG&E	$1,883.5	$210.0	$1,153.6	Table 3-2: Summary of WMP Expenditures by Category, Page 15, 2022 SDG&E WMP Update

Some of the differences in costs may also be related to regulatory timing for recovery. For example, SCE explained that its cost estimates: "[f]or 2017- 2021, the increases do not include costs that are either under review, that will be reviewed by the Commission for later cost recovery or are otherwise not included in customer rates." See SCE 2022 WMP, p. 28. SDG&E explained:

> SDG&E's wildfire mitigation activities forecasted prior to 2019 are currently recovered through its 2019 General Rate Case (GRC). Since the passage of Senate Bill 901 and Assembly Bill 1054, SDG&E has recorded wildfire mitigation expenditures incremental to its authorized revenue requirement in CPUC-authorized memorandum accounts, including its Wildfire Mitigation Plan Memorandum Account (WMPMA), the Fire Risk Mitigation Memorandum Account (FRMMA), and other cost recovery mechanisms. SDG&E anticipates that, consistent with the direction of AB 1054, cost recovery for expenditures related to the WMP will be addressed in its next GRC. (SDG&E 2022 WMP, p. 16, footnote omitted)

Thus, SCE's and SDG&E's actual costs for earlier periods may be higher once Commission review of these costs is complete.

b. Please see subpart (a) above regarding the differences between PG&E, SCE and SDG&E. All of the wildfire mitigation costs recovered by PG&E from customers are reviewed and approved by the California Public Utilities Commission (CPUC) or the Federal Energy Regulatory Commission (FERC) through open and transparent regulatory processes. The CPUC reviews these costs and allows PG&E to recover costs that are just and reasonable consistent with California Public Utilities Code §451. FERC also reviews and approves costs as being just and reasonable.

Regarding: EPSS Data

Data Request: OEIS-PG&E-22-005 (Question 10)

Request date: Friday March 18, 2022

Request:

Q10. PG&E noted in its WMP that the deployment of EPSS throughout pilot areas in its service area led to a significant reduction in ignitions. After reviewing the ignition data submitted by PG&E, the basis of this claim is unclear (i.e., the total ignitions and annual ignitions normalized by environmental conditions were similar to 2020). Please provide the following:

a. Geospatial data showing the locations of circuits/circuit segments which were protected by fast trip settings/EPSS in 2021, the date each was installed, and the number of de-energizations (and customer hours) resulting from each EPSS system
b. Geospatial data showing the locations of circuits/circuit segments which are currently protected by fast trip settings/EPSS, the date each was installed, and the number of de-energizations (and customer hours) resulting from each EPSS system
c. A summary for each automated de-energization, including whether it was a true hazard (i.e., resulting from object contact, equipment failure, etc.) or a false alarm/nuisance de-energization
d. An explanation of the criteria used to determine when to enable fast trip settings/EPSS on these circuits (during extreme FPI, RFWs, fire season, etc.)
e. Geospatial data showing the locations, cause codes, dates and times for ignitions, wires-down events, and outages that occurred along circuit segments with fast trip settings/EPSS enabled

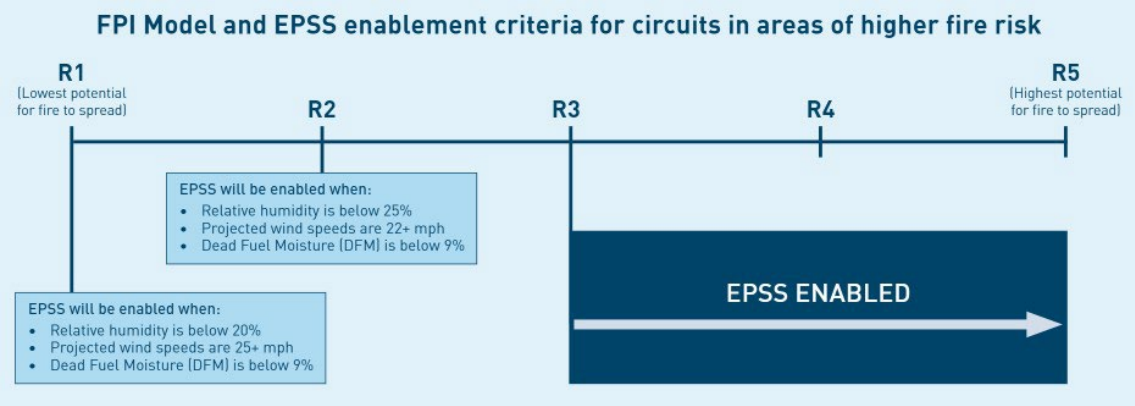
Response date: March 23, 2022

Q10 Response:

a. Please see attached WMP-Discovery2022_DR_OEIS_005-Q10Atch01CONF.xlsx tab '1-2021 EPSS 10.20.2021'. For Outage (de-energizations) data, see tab '3 - 2021-22 EPSS Outages'. Please note that this attachment has been designated confidential.
b. Please see attached WMP-Discovery2022_DR_OEIS_005-Q10Atch01CONF.xlsx tab '2-2021 EPSS 03.10.2022'. For Outage (de-energizations) data, see tab '3 - 2021 -22 EPSS Outages'. Please note that this attachment has been designated confidential.
c. Please see attached WMP-Discovery2022_DR_OEIS_005-Q10Atch01CONF.xlsx tab '3-2021-22 EPSS Outages'. Please note through the course of our outage response and /

or review processes PG&E classifies each outage by its's initiating cause if reasonably identifiable. If a cause is unable to be determined, although the outage is logged as 'Unknown' this does not imply that a safety or wildfire hazard did not exist. Please note that this attachment has been designated confidential.

d. PG&E currently uses an internal Fire Potential Index (FPI) - A detailed explanation of the Fire Potential Index (FPI) can be found in the 2022 WMP in section 4.5.1.(f) - to determine when to enable EPSS in addition to other localized weather and operational factors. In combination with the FPI at a location, we have developed criteria to enable EPSS when high winds, low humidity and low dead fuel moisture (DFM) indicate an increased risk of wildfire ignitions. Our current enablement criteria is shown below:



Please see attached WMP-Discovery2022_DR_OEIS_005-Q10Atch01CONF.xlsx tab '4-2021 EPSS Ignitions'. Please note PG&E is including Ignition 1258 in this submission. At the time of ignition, PG&E determined this ignition did not to meet reporting criteria due to eyewitness accounts to the fire size being less than 1-linear meter in size. In late February, PG&E received a fire incident report from the responding fire-suppression agency noting that the fire size did meet CPUC reporting criteria, conflicting with the prior determination. This ignition had previously been excluded from analysis on the effectiveness of PG&E's 2021 EPSS program. Please note that this attachment has been designated confidential.

Regarding: WMP-Discovery2022_DR_CalAdvocates_003-Q01Atch01CONF.xlsx

Data Request: OEIS-PG&E-22-006 (Question 01)

Request date: Tuesday March 22, 2022

Request:

Q01. In response to WMP-Discovery2022_DR_CalAdvocates_003-Q02, PG&E, provided the below spreadsheet, an Excel table of all transmission circuits existing as of January 1, 2022. Energy Safety requests the below document and will adhere to established confidentiality requirements agreed to with PG&E, as set forth in the 2022 Wildfire Mitigation Plan Update Guidelines.

a. Provide WMP-Discovery2022_DR_CalAdvocates_003-Q01Atch01CONF.xlsx

Response date: Date

Q01 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

PG&E is providing the requested document previously provided to Public Advocates as attachment "WMP-Discovery2022_DR_OEIS_006-Q01_Atch01_CONF.xlsx" which includes both transmission and distribution information at the circuit level.
The attachment specified in this request "WMP-Discovery2022_DR_CalAdvocates_003-Q01Atch01CONF.xlsx" included only Transmission information. In a supplemental request, PG&E provided Public Advocates both Distribution and Transmission information in the attachment named "WMPDiscovery2022_DR_CalAdvocates_003 Q02Supp01Atch01CONF.xlsx" which has been reproduced as "WMPDiscovery2022_DR_OEIS_006-Q01Atch01CONF.xlsx" attached here.
Please note that the attachments included here are marked as confidential because they contain critical energy infrastructure information.

Regarding: Frequently de-energized circuits map

Data Request: OEIS-PG&E-22-006 (Question 02)

Request date: Tuesday March 22, 2022

Request:

Q02. The frequently de-energized circuit map provided as "Section_86_Atch01" appears incomplete, as it does not show all circuits listed in Section 8.6, Table 8.6-1 as presented in the guidelines, to address Public Utilities Code Section 8386(c)(8) requiring the "Identification of circuits that have frequently been de-energized. For instance, by zooming in to 500%, no circuits are visible in the map for Amador, Calaveras, El Dorado, Glenn, or Tuolumne Counties, nor in various other counties with de-energized circuits listed in Table 8.6-1.

a. Provide a map which displays all circuits listed in Table 8.6-1.
b. If a territory-wide map is scaled inappropriately to visibly display all circuits indicated, break the map into more than one map and scale appropriately for visibility (e.g., 1:250K or 1:100K), and/or use call-out maps within the map to make all frequently de-energized circuits visible.
c. Differentiate discrete circuits by color.
d. Confirm the total number of frequently de-energized circuits in Table 8.6-1.
e. Provide an excel table of Table 8.6-1 with the number of times (frequency) each circuit was de-energized, with Column 4 "Dates of Outages" provided as a count.

Response date: March 25, 2022

Q02 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. For the map displaying all circuits listed in Table 8.6-1 please see "WMP-Discovery2022_DR_OEIS_006-Q02Atch01".

   Please note that the wrong map was inadvertently provided in the WMP. We will be submitting an ERRATA to update the WMP.

   The list of frequently de-energized circuits impacted by PSPS were established by analyzing circuit level data filtering circuits that were de-energized for PSPS three or more times in any calendar year from 2019 to 2021. To provide the most accurate data

on frequently impacted circuits the entirety of each circuit is shown in the maps provided. This method provides more accuracy when evaluating any given point on the circuit to see how many times it has been impacted by PSPS. This is due to the changes to circuits and the changes in how circuits are sectionalized historically.

Please be advised that the Bucks Creek 1101 – Distribution Circuit is not displayed in the map provided. This is due to the fact that the circuit was destroyed in the Dixie Fire. What we have provided is the current configuration of the system.

b. Please see “WMP-Discovery2022_DR_OEIS_006-Q02Atch01".
c. Please see “WMP-Discovery2022_DR_OEIS_006-Q02Atch01".
d. There are 262 frequently de-energized circuits in Table 8.6-1.
e. Please see “WMP-Discovery2022_DR_OEIS_006-Q02Atch02".

Regarding: PSPS Grid Mitigation Prioritization

Data Request: OEIS-PG&E-22-007 (Question 01)

Request date: Friday March 25, 2022

Request:

Q01. On P. 870, PG&E Indicates "Based on the 2021 10-year PSPS lookback analysis, PG&E identified potential locations for our transmission and distribution PSPS mitigation programs."

a. In addition to PSPS risk is PG&E also evaluating prioritization for our transmission and distribution PSPS mitigation programs based on riskiest circuits in terms of ignition risk?

Response date: March 30, 2022

Q01 Response:

a. For wildfire mitigation programs and initiatives, such as System Hardening or EVM, PG&E has developed the 2022 Wildfire Distribution Risk Model (WDRM) v3, which is described in detail in Section 4.5.1(b) in the WMP. PG&E has made improvements to the WDRM which provide the capability to compare wildfire risks for additional risk drivers as well as measuring the risk reduction for specific mitigation work. The WDRM will add the ability to estimate the reduction in the ignition probability due to a new or hardened conductor. This will provide improved insights for aligning the right mitigation for locations on the distribution grid.

   For System Hardening PG&E uses a 10-year lookback to evaluate circuit segments selected for scoping and execution based on the decision trees explained in 7.3.3.17.1 of the 2022 WMP. A small number of projects were selected on an emerging project by project basis for the purpose of PSPS mitigation either due to a high frequency or due to an impact to a critical customer. Ignition risk is also considered for these projects when selecting the specific scope of work.

Regarding: Grid Ops & Protocols Maturity

Data Request: OEIS-PG&E-22-007 (Question 02)

Request date: Friday March 25, 2022

Request:

Q02. With regard to maturity survey question F.IV.a Does the utility have explicit thresholds for initiating a PSPS? PG&E's answer has remained the same from 2021 to 2022.

a. At what point in time does PG&E expect to have explicit policies for the thresholds above which PSPS is activated, but attain the goal to maintain its grid in sufficiently low risk condition to not require any PSPS activity though may de-energize specific circuits upon detection of damaged condition of electrical lines and equipment or contact with foreign objects?

Response date: March 30, 2022

Q02 Response:

a. As PG&E continues to improve our electric grid and systems we expect our PSPS thresholds to be updated in a positive correlation with the system improvements. For example, PG&E's undergrounding efforts, and other wildfire safety measures, will make our system safer and more resilient to better serve customers and respond to the state's evolving climate challenges. Building and expanding PG&E's electric distribution system underground will not only help eliminate wildfires caused by overhead equipment failures, but it will also help to reduce the need for and/or frequency of PSPS outages and improve system reliability under the full range of weather and fire risk conditions. As electric undergrounding and other mitigation programs progress, we will evaluate data on the impact of these systems improvements and mitigations to help inform improvements to our PSPS modeling and thresholds.

Regarding: Grid Ops & Protocols Maturity

Data Request: OEIS-PG&E-22-007 (Question 03)

Request date: Friday March 25, 2022

Request:

Q03. With regard to maturity survey question F.IV.c Under which circumstances does the utility de-energize circuits? Select all that apply. PG&E answered all options: 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.

a. Does PG&E foresee a time when one of options i., ii., or iii. could be excluded from consideration to de-energize?
b. What are the highest ranked additional reasons not listed?

Response date: March 30, 2022

Q03 Response:

a. PG&E will continue to evaluate the circumstances in which we de-energize circuits. Currently PG&E does not foresee removing any of these reasons.
b. Additional reasons not listed:
    - Safety risk to the public and customers
    - Routine maintenance / planned outages to facilitate planned work
    - Hazard or damage on a line that leads to a fault (e.g., damaged equipment, foreign objects)

Regarding: Grid Ops & Protocols Maturity

Data Request: OEIS-PG&E-22-007 (Question 4)

Request date: Friday March 25, 2022

Request:

Q04. With regard to maturity survey question F.V.b How automated is the process for inspecting de-energized sections of the grid prior to re-energizing? In the 2021 Survey, PG&E answered as of January 1, 2023 it would be "Partially automated, <50%" and this year changed that answer to "Manual process, not at all."

a. Explain why PG&E expects the process for inspecting de-energized sections of the grid prior to re-energizing to be manual process, not at all, instead of partially automated, <50%
b. When does PG&E expect to automate the process for inspecting de-energized sections of the grid prior to re-energizing?

Response date: March 30, 2022

Q04 Response:

a. Our 2021 WMP survey response to question F.V.b was aspirational in nature. In our 2022 maturity survey response to F.V.b, we lowered the maturity survey score as we have not yet identified technology development that would enable a reliable assessment of de-energized circuitry without manually patrolling the circuitry.
b. PG&E does not expect to automate this process in the near future.

Regarding: Customers Experiencing Sustained Outages

Data Request: OEIS-PG&E-22-007 (Question 05)

Request date: Friday March 25, 2022

Request:

Q05. Regarding OEIS0PG&E-22-005, provide the additional columns in WMP-Discovery2022_DR_OEIS_005-Q01Atch01:

a. The original number of Customers Experiencing Sustained Outages (CESO) from the actual outages that occurred (opposed to the predicted if EPSS was enabled)
b. The original summed outage duration in minutes
c. The predicted outage duration in minutes

Response date: March 30, 2022

Q05 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. & b
b. PG&E interprets this request as asking for a historical look-back of (a) original CESO and (b) Customer Minutes / Outage Duration (PG&E interprets Outage Duration to mean "CAIDI1") for outages that have occurred on the same circuits of the 2022 EPSS Scope. See attached Excel Spreadsheet, WMP- Discovery2022_DR_OEIS_007-Q05Atch01.

   The previous data has been updated to reflect refined methods of associated outage data on the identified circuits with the specific devices that will be enabled in EPSS

c. The subject analysis did not include a predicted outage duration. The purpose of the analysis was to predict the CESO impact.

Regarding: Transmission Detailed Ground Inspections

Data Request: OEIS-PG&E-22-007 (Question 06)

Request date: Friday March 25, 2022

Request:

Q06. Regarding WMP-Discovery2022_DR_CalAdvocates_12-Q08 and WMP Discovery2022_DR_CalAdvocates_012-Q02Atch01:

a. Define the population of transmission detailed ground inspections reviewed through Desktop Reviews, including but not limited to the number of inspections checked, and the date range that those inspections occurred within.
    i. Define the population of transmission detailed ground inspections reviewed through Field Reviews, including but not limited to the number of inspections checked, and the Regarding: PSPS Grid Mitigation Prioritization

Response date: March 30, 2022

Q06 Response:

Regarding WMP-Discovery2022_DR_CalAdvocates_12-Q08 and WMP Discovery2022_DR_CalAdvocates_012-Q02Atch01:

a. Define the population of transmission detailed ground inspections reviewed through Desktop Reviews, including but not limited to the number of inspections checked, and the date range that those inspections occurred within.
b. Define the population of transmission detailed ground inspections reviewed through Field Reviews, including but not limited to the number of inspections checked, and the date range that those inspections occurred within.
c. Explain the QA/QC processes for Transmission, climbing inspections and Transmission, drone inspections. Information should include the following stats for every year applicable (i.e., 2019, 2020, 2021):
    i. Population of inspections eligible for QA/QC process;
    ii. Number of inspections undergoing QA/QC process; and
    iii. Number of inspections with failed review or infractions.

ANSWER 06

a. The Desktop QC process reviews a sample from the overall completed inspection population. The QC sampling for Desktop Review in 2021 did not sample from all completed transmission detailed ground inspections.

The process begins with obtaining a list of all completed detailed ground inspections (MAT code BFZ) for the review period. The population was filtered, and the sample was focused on contractors and inspections that did not generate notifications. The sample size is determined using the standard 95% confidence level and 10% margin of error, also known as a 95/10. Once the total sample size is generated by Division/MWC, we calculate the number of records for each inspector proportionate to the total volume of inspections conducted by the inspector in that Division/MWC. Once the counts are generated for each inspector, records will be randomly picked. For example, if an inspector performed 100/1000 (10%) inspections in that Division for the two-week period, and the sample size for the Division was 100, then QC will look at 10 randomly assigned records for that inspector. The goal is to assess every inspector that was actively performing inspections for the work period being QC assessed. 7,748 inspections were checked. Those inspections occurred from March 16, 2021, to December 20, 2021.

b. The Field QC process only reviews a sample from the overall completed inspection population. The QC sampling for Field Review in 2021 did not sample from all completed transmission detailed ground inspections. The sampling method did apply some filters. The process begins with obtaining a list of all completed detailed ground inspections (MAT code BFZ) for the review period. Then the Wildfire Consequence Scores are applied to the population of data (by asset location), and the entire population is prioritized by Wildfire Consequence Score, from highest to lowest. The population is then separated into equal deciles, decile 10 being the highest scores and decile one being the lowest scores. The sample is then randomly pulled from the population deciles using the following weighting: 18 percent from decile 10, 16 percent from decile 9, 14 percent from decile 8, 12 percent from decile 7, 10 percent from decile 6, 10 percent from decile 5, 8 percent from decile 4, 6 percent from decile 3, 4 percent from decile 2, and 2 percent from decile 1. The sample size is determined using the standard 95% confidence level and 10% margin of error, also known as a 95/10. Once the sample size is generated, records will be randomly picked. 1,512 inspections were checked. Those inspections occurred from August 29, 2021, to March 23, 2021.
c. With regards to Transmission Climbing Inspections, Quality Management (QV Transmission) has not performed any Climbing Inspection audits for the period 2019 to 2021. Specific to Aerial Inspections, we do not currently have an official QA/QC process in place, outside of the Aerial Inspections internal processes. We are, however,

actively working to stand up a formal QA/QC program through the System Inspections QC team; one with a sustainable, statistically significant, framework that does not require a one-to-one review of every inspection record. In the interim, we have implemented the following ad hoc processes until a formal, repeatable, process is finalized.

In 2022, the process is as follows:

- The Inspector completes the inspection;
- Recommended notifications are then sent to an Inspection Review Specialist for review. The Inspection Review Specialist can then either support, downgrade, upgrade, or cancel the recommended notification;
- Any supported notifications are sent to the Centralized Inspection Review Team for final gatekeeping. The Centralized Inspection Review team then either support, downgrade, upgrade, or cancel the inspection on their end;
- Inspections without notifications also are sent to the Inspection Review Specialists to check for potential notifications.

In 2021, the process was as follows:

- Inspections are conducted;
- Inspections results are then reviewed by the Aerial Inspection Review Specialists;
    - The total number reviewed in 2021 was 67,783;
    - The number inspections with additional findings was not recorded as this was part of our normal inspection process and not a stand-alone QC process.
- Inspection results are also subject to an ad hoc review by Exponent;
    - The total number reviewed by Exponent was 651;
    - The number inspections with additional findings has not been finalized and is still in process;
- Additionally, an ad hoc review by the Quality Verification team (2021 Quality Verification Transmission Audit #503 System Inspections GO 165) is performed;
    - The total number reviewed by the Quality Verification team was 47 (1,521 opportunities);
    - Number inspections with findings 7 (15 total findings);
    - There was a 99% compliance rate.

In 2020, the process was as follows:

- Aerial Inspection internal No-Notification Reviews were performed;
    - The total number reviewed was 9,605;
    - The total number of inspections with additional finings was 848. In 2019, the process was as follows:
- Aerial Inspections internal No-Notification Review were performed;
    - The total number reviewed was 21,255;
    - The total number inspections with additional findings was 3,412.

Regarding: IR Inspections

Data Request: OEIS-PG&E-22-007 (Question 07)

Request date: Friday March 25, 2022

Request:

Q07. Provide the same information in the same format as supplied in Table 1, for climbing inspections, IR inspections, and drone inspections for detailed and transmission levels respectively:

a. Number of total circuit miles inspected
b. Level 1 findings
c. Level 2 findings
d. Level 3 findings
e. Number of circuit miles inspected in HFTD
f. Level 1 findings in HFTD
g. Level 2 findings in HFTD
h. Level 3 findings in HFTD

Response date: Date

Q07 Response:

Climbing Inspections

PG&E does not currently have a QA/QC process for climbing inspections and, therefore, cannot provide this data.

Drone Inspections

The requested data on drone inspections is included in the attachment "WMP-Discovery2022_DR_OEIS_007-Q07Atch01.xlsx." All limitations of the data provided are noted directly beneath the table containing the data and in the "Comments" section in Column W.

Infrared Inspections

The requested data on drone inspections is included in the attachment "WMP-Discovery2022_DR_OEIS_007-Q07Atch01.xlsx." All limitations of the data provided are noted directly beneath the table containing the data and in the "Comments" section in Column W.

Regarding: System Hardening

Data Request: OEIS-PG&E-22-007 (Question 08)

Request date: Friday March 25, 2022

Request:

Q08. Regarding Table 5.3-1, provide similar information for system hardening excluding undergrounding.

Response date: March 30, 2022

Q08 Response:

After reviewing this request, we asked for clarification from the Office of Energy Infrastructure Safety (Energy Safety) and were informed that Energy Safety is specifically looking for a target%/top risk% for covered conductor work.

As indicated in the 2022 WMP, PG&E does not have a separate target for covered conductor installation. In addition, the target%/top risk% in Table 5.3-1 reflects the relevant risk score of the Circuit Protection Zones where our distribution system hardening mitigations (e.g. undergrounding, covered conductor installation, line removal) will take place. We do not separate different system hardening mitigations by risk ranking. Instead, we use various system hardening mitigations to address risk among the highest rated circuits. Accordingly, the target%/top risk% for our system hardening target listed in Table 5.3-1 applies across all the system hardening mitigations utilized by PG&E.

Regarding: WDRM V3 and WFC Model

Data Request: OEIS-PG&E-22-007 (Question 09)

Request date: Friday March 25, 2022

Request:

Q09. Provide a copy of E3's review of PG&E's 2022 WDRM v3 and WFC Model when it is complete.

Response date: March 30, 2022

Q09 Response:

The report is not finalized at this time. We currently anticipate the report will be available in April.

Regarding: Vibration Dampers

Data Request: OEIS-PG&E-22-007 (Question 10)

Request date: Friday March 25, 2022

Request:

Q10. In Southern California Edison's 2022 WMP Update, the utility states that "in high and medium vibration susceptibility areas, vibration can reduce the covered conductor's useful life from 45 years to an average of 20 years if not addressed" and that "[i]nstalling dampers minimizes equipment failure ignition drivers, such as damage or failure of the conductor, connector, and/or splice" (Section 7.3.3.3.3 "Vibration Damper Retrofit [SH-16]," p. 202).[1]

a. Is PG&E including vibration dampers as part of its covered conductor installations? If so, provide the percentage of covered conductor installations that include vibration dampers, as well as a description of how PG&E determined where to install vibration dampers.
b. Has PG&E done an analysis for determining what areas within its system would be susceptible to vibrations and potentially benefit from vibration dampers? If so, describe how SDG&E made such determinations, which areas are classified as potentially benefiting from vibration dampers, and what criteria or thresholds are used to determine if vibration dampers should be installed.
c. If PG&E is not currently including vibration dampers as part of its covered conductor installations, please explain whether PG&E plans to do so in the future and what those plans are, including possible retrofits.
d. Provide a description of any lessons learned regarding vibration damper installation for covered conductor, whether they be from SCE, lessons shared by SCE or other utilities during the joint utility covered conductor effectiveness effort, or from broader industry experience, or PG&E's in-house research and experience.

Response date: March 30, 2022

Q10 Response:

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[1] See the Southern California Edison 2022 WMP Update here: https://www.sce.com/sites/default/files/custom-files/SCE%202022%20WMP%20Update.pdf (accessed March 24, 2022).

a. PG&E does not currently include vibration dampers as part of our covered conductor installations. However, we are working with a manufacturer of spiral vibration dampers (SVD) to finalize its manufacture recommendations for SVD placement using data from a completed field test that monitored both dampened and un-dampened spans at the same PG&E location. We will be using the existing manufacture guidelines that are currently being used at other utilities as a reference to help determine PG&E standards. We have agreement with a supplier to install test equipment and install VORTEX dampers for testing. We still need to select the location, which has been recommended for a 1000' span of 397 or 715 aluminum conductor.
b. We are currently conducting analysis and evaluations of the two types of vibration dampers (SVD and VORTEX) in partnership with the manufacturers to determine the appropriate placement, number of dampers per span based on conductor size, span lengths and span tensions. These criteria will determine the specific existing and future circuits that will require vibration dampers.
c. We are evaluating the application of vibration dampers on both new installations and retrofit applications.

   In 2021, PG&E completed field evaluations of the spiral vibration dampers (SVD) applied on 1/0 Aluminum Conductor Steel Reinforced (ACSR) and smaller diameter conductor, including piloting SVD on a long span of PG&E 1/0 ACSR. Additionally, PG&E has reviewed:

   1. Manufacturer provided part numbers and damper types,
   2. Manufacturer recommended number of dampers required per phase for all PG&E tree wire
   3. Long span sag and tension data for PG&E approved covered tree wire.

   In 2022, we intend to complete the following next steps:

   1. Approve the manufacturer provided part numbers, damper types,
   2. Pilot the installation of VORTEX dampers on large conductor
   3. Finalize part numbers, damper types, and the required number of dampers required per phase.
   4. Update standards to provide guidance on the appropriate installation and use of dampers on existing and new tree wire conductor installations.
d. The test results from the vibration test equipment show the need for the installation of dampers and the need to retrofit locations that will exceed the limitations that will be established in the new standards. PG&E has learned from the pilots and evaluations

that the application and installation of field dampers on covered tree wire is very similar to applications on bare conductors when comparing span lengths, tension, and insulator attachment types.

Regarding: Covered Conductor

Data Request: OEIS-PG&E-22-007 (Question 11)

Request date: Friday March 25, 2022

Request:

Q11. This joint response on covered conductor effectiveness states "[s]everal covered-conductor-specific failure modes exist that require operators to consider additional personnel training, augmented installation practices, and adoption of new mitigation strategies (e.g., additional lightning arrestors, conductor washing programs, etc.)" (ps. 7-8):

a. What additional training has PG&E implemented for personnel pertaining to these covered conductor failure modes? Please list all trainings, the frequency at which trainings are required to be taken, and which personnel are required to take the trainings. Include the trainings used to train personnel for inspections, maintenance, and installation of covered conductor.
b. How has PG&E augmented its installation practices to prevent these covered conductor failure modes?
c. What new mitigation strategies has PG&E adopted to prevent these covered conductor failure modes?

Response date: March 30, 2022

Q11 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. PG&E has no documented trainings responsive to this request. "WMP-Discovery2022_DR_OEIS_007-Q11Atch01.pdf" details installation, jacket removal, and general information relating to the installation of covered conductor.
b. Specialists and manufacturer representatives provided trainings on cable stripping and handling at multiple service centers after the release of High Density Polyethylene tree wire, but this was not documented or required for all locations.
c. PG&E is working towards installing vibration dampers as part of future covered conductor installations. Please see the response to OEIS_007-Q10 for additional information.

Regarding: Covered Conductor

Data Request: OEIS-PG&E-22-007 (Question 12)

Request date: Friday March 25, 2022

Request:

Q12. Regarding covered conductor inspections and maintenance.

a. Provide the following job aids:
    i. TD-2305M-JA02
    ii. TD-2305M-JA08
    iii. TD-2305M-JA12
b. Provie a description and list of all changes made to inspections and maintenance procedures as it directly relates to covered conductor and all associated equipment.

Response date: March 30, 2022

Q12 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a.
    i. Please see attachment "WMP-Discovery2022_DR_OEIS_007-Q12Atch01.pdf".
    ii. Please see attachment "WMP-Discovery2022_DR_OEIS_007-Q12Atch02.pdf".
    iii. Please see attachment "WMP-Discovery2022_DR_OEIS_007-Q12Atch03.pdf".
b. As mentioned on page 439 of the 2022 WMP, "PG&E does not have a separate covered conductor maintenance program. Like bare conductor, covered conductor is inspected for visual concerns as part of our standard GO 165 inspections." There are currently no special maintenance recommendations specifically for covered conductor.

Regarding: Risk Scores

Data Request: OEIS-PG&E-22-007 (Question 13)

Request date: Friday March 25, 2022

Request:

Q13. Regarding WMP-Discovery2022_DR_CalAdvocates_004-Q08Atch01.xlsx and Discovery2022_DR_CalAdvocates_004-Q09Atch01.xlsx:

a. Provide an additional column with the coinciding risk scores for each project in WMP-Discovery2022_DR_CalAdvocates_004-Q08Atch01.xlsx, similar to WMP-Discovery2022_DR_CalAdvocates_004-Q09Atch01.xlsx
b. Provide an additional column with the risk rankings for WMP-Discovery2022_DR_CalAdvocates_004-Q09Atch01.xlsx, similar to Discovery2022_DR_CalAdvocates_004-Q08Atch01.xlsx
c. Do risk scores align and correspond with the top risk percentages presented in Table PG&E-5.3-1(A) from the 2022 WMP Update? If not, explain how the two correlate and/or differ.
d. Provide the same information presented in these two Excel files for system hardening projects planned in 2023 and 2024.

Response date: March 30, 2022

Q13 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. Added in attachment "WMP-Discovery2022_DR_OEIS_007-Q13Atch01.xlsx."
b. Added in attachment "WMP-Discovery2022_DR_OEIS_007-Q13Atch01.xlsx."
c. Transmission system hardening requires long lead time projects, with emphasis on operational feasibility. Many in-flight projects to be completed in 2022 are based on HFTD locational risk (as noted in Table PG&E-5.3-1(A)) and do not correspond directly to the specific line wildfire risk scores. In-flight projects provide benefits of system hardening, though they may have a variety of project drivers such as capacity, GO-95 conductor clearance compliance, etc.
d. For transmission line, "WMP-Discovery2022_DR_CalAdvocates_004- Q09Atch01.xlsx" includes projects projected to complete in 2023 and 2024 and projects in-flight with

completion dates beyond 2024. This list does not include potential new projects kicking off in 2023 and 2024.

Regarding: Wildfire Risk Scores

Data Request: OEIS-PG&E-22-007 (Question 14)

Request date: Friday March 25, 2022

Request:

Q14. Provide WMP-Discovery2022_DR_CalAdvocates_003-Q01Atch01CONF.xlsx with the additional columns:

a. Wildfire Risk Score – 2021
b. Wildfire Risk Score – 2022

Response date: March 30, 2022

Q14 Response:

a. and b.
WMP-Discovery2022_DR_CalAdvocates_003-Q01 requested PG&E to "provide an Excel table of all distribution circuits existing as of January 1, 2022 (as rows) that includes the following information in separate columns..." Question 1 did not include any risk scores. Subsequently, PG&E performed a download of GIS segments, provided data for the additional columns as requested, and delivered this response to Cal Advocates on February 10, 2022.

WMP-Discovery2022_DR_CalAdvocates_003-Q12 requested risk scores for the distribution circuits identified in WMP-Discovery2022_DR_CalAdvocates_003-Q01. Our response explained that PG&E's latest vintage of our Wildfire Risk Model utilizes segments generated in 2020.1 Segmentation as of 01/01/2022 has not been generated, as it would result in different segments and risk scores than those being utilized to develop PG&E's work plans. Thus, consistent with earlier response, we are unable to provide the requested information. However, we would be happy to work with Energy Safety to determine if there is other information that we can provide which would address the subject areas being reviewed by Energy Safety.

Regarding: Risk Associated with Value Exposure (RAVE) Module

Data Request: OEIS-PG&E-22-007 (Question 15)

Request date: Friday March 25, 2022

Request:

Q15. In PG&E's response to WMP-Discovery2022_DR_OEIS_002-Q07, PG&E states that they "are also reviewing and evaluating the Risk Associated with Value Exposure (RAVE) module from Technosylva that has components for estimating egress considering location and community factors."

a. Provide a list of the community factors evaluated, including associated weights of each factor when implemented into modeling
b. What is PG&E's current status of implementing the RAVE module?
c. What are PG&E's conclusions on its analysis of the RAVE module?
d. What is PG&E's timeline for implementation of the RAVE module?
e. How is PG&E accounting for community factors in the meantime? In particular, describe what factors PG&E considers regarding vulnerable communities, and how such are accounted for in its risk analysis and modeling, including weights.

Response date: March 30, 2022

Q15 Response:

PG&E is evaluating the Risk Associated with Value Exposure (RAVE) module from Technosylva for potential inclusion in the Wildfire Distribution Risk Model (WDRM) v4 model that will begin development in Q2 2022. This model is scheduled to be reviewed and approved in Q1 2023 and used to generally plan wildfire mitigation plans for 2024. As such the review and evaluation of the RAVE module is just beginning. PG&E is not in a position to provide the requested data on the RAVE module.

In the interim, community factors are not directly accounted for in the WDRM.

Regarding: Decision-Making Process for System Hardening

Data Request: OEIS-PG&E-22-007 (Question 16)

Request date: Friday March 25, 2022

Request:

Q16. In PG&E's 2022 WMP Update, PG&E states the following (p. 531):

Because system hardening work is generally identified 12 or more months before construction, the decision tree that was used for selecting between various distribution system hardening methods (e.g., undergrounding, covered conductor, line removal etc.) for 2022 work was not changed to incorporate our updated 2022 goals of expanding EPSS and undergrounding.

Regarding PG&E's decision-making process for system hardening:

a. Is PG&E currently using the 2021 methodology for decision-making, as presented on May 21, 2021 to the Wildfire Safety Division ("previous methodology")?
b. When did/does PG&E intend to use the methodology outlined in the progress report in Figure PG&E-Remedy-21-14-01 ("new methodology")?
c. For any circuits PG&E is planning on installing covered conductor based on the previous methodology:
    i. What percentage and number of circuit miles would have been determined to be undergrounded using the new methodology?
    ii. For any such miles, what additional initiative(s) in conjuncture with covered conductor is PG&E using to further reduce risk?

Response date: March 30, 2022

Q16 Response:

a. PG&E utilized the decision tree presented in 2021 for the 2022 scope of work.
b. The decision tree referenced in Figure PG&E-Remedy-21-14-01 p. 44 is the same decision tree utilized to develop the 2022 scope of work referenced in part a.
c. No change. The decision trees referenced in subparts a and b are the same.

Regarding: EPSS Reliability

Data Request: OEIS-PG&E-22-007 (Question 17)

Request date: Friday March 25, 2022

Request:

Q17. PG&E states that it will "initiate reliability mitigations on 50 EPSS capable circuits in the HFTD areas, HFRA and non HFTD buffer zones based on highest projected Customer Experiencing Sustained Outage (CESO)."

a. Explain a list of what "reliability mitigations" includes
b. Provide calculations and explanations for how each mitigation is anticipated to improve reliability

Response date: March 30, 2022

Q17 Response:

a. Reliability mitigations could include work within the following categories.
    i. CE: Critical Operating Equipment Notifications that either support enablement or reliability
    ii. EC: Electric Corrective Maintenance tags that could impact reliability if not corrected prior to failure
    iii. ER: Asset Replacement/Installation that could impact reliability if not corrected prior to impact or failure
    iv. EVM: Enhanced Vegetation Management trimming that goes beyond regulatory clearance and trimming requirements
    v. EV: Vegetation Notification that calls out a clearance issues that is required by regulatory clearance requirements
b. These actions will have an impact on mitigating reliability impacts by resolving conditions that could result in an outage if not addressed. Resulting outage performance will be compared to historical CESO related to EPPS enabled circuits to calculate reliability results.
    vi. CE: Addressing critical operating equipment tags allows the circuit to be fully enabled in EPSS. Additionally, resolving the tag can mitigate a condition that could result in a larger outage when the circuit is enabled in EPSS.
    vii. EC: Completion of identified maintenance conditions prior to failure will
    viii. prevent potential outages on these circuits
    ix. ER: Asset replacement/installation items include replacing non-exempt cutouts with exempt to reduce risk, Migratory Bird work that will install covers on

identified locations to minimize bird caused outages and other items that will reduce risk or improve reliability.

x. EVM: Completing 2022 EVM work on the circuits that align to our top 50 circuits identified as part of EPSS

xi. EV: Complete reduced clearance conditions that could impact reliability if not addressed prior to a vegetation interaction with power lines

Regarding: Utility Defensible Space (UDS) Program

Data Request: OEIS-PG&E-22-007 (Question 18)

Request date: Friday March 25, 2022

Request:

Q18. In Section 7.3.5.20, PG&E details its Utility Defensible Space (UDS) program and sets a target of 7,000 distribution poles in the HFTD.

a. To what standard does PG&E clear these poles? (i.e., to what radius and height?)
    i. Explain the rationale behind choosing this standard, including any scientific or wildfire safety rationales behind the extent of clearance.
    ii. Has PG&E considered the environmental impacts of this clearance radius? If so, what are environmental impacts, both positive and negative? (e.g., erosion, removal of invasive species, habitat fragmentation, water quality, etc.)
b. Is PG&E considering alternative mitigation measures (i.e., ones that would negate the need for some or all of the UDS program)?
    i. If so, what are those mitigation measures?
    ii. If not, why not?
c. Provide the procedural document for the UDS program (or a link to it).

Response date: March 30, 2022

Q18 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. PG&E clears poles to a 50' horizontal radial distance around poles, and a minimum vertical clearance of understory vegetation 6' from the ground.
    iii. The rationale for these distances is grounded on benchmarking with other California utilities, as well as basic principles of defensible space and fuel management guidelines set forth on California Public Resources Code (PRC) Section 4291 for improved structures. Given the variability of site specific factors and other maintenance that can limit or compliment UDS work, the target of 50' is a reasonable and obtainable clearance to set a baseline for the program. PG&E will continue to calibrate UDS based on the experience and feedback we gain through initial years of program execution.
    iv. PG&E incorporated environmental impact considerations into the overall program scope including:

- UDS is purposefully not a bare-ground program to reduce ground disturbance and potential for erosion
- UDS targets mitigation of ladder fuels surrounding overhead assets rather than removal of trees. This helps the program align with forest practice rules while achieving the goal of modifying the vertical and horizontal continuity of fuels
- Environmental pre-screening is incorporated into work planning. All proposed work locations go through an initial environmental screening determining their Environmental release to construction steps. Work locations that fall within areas of Environmental constraints have additional steps taken including but not limited to biological reviews, and cultural oversight.

b. Yes
   i. The UDS program will continue to be calibrated in coordination with PG&E's other wildfire mitigation programs. This coordination will vary based on site specific factors. Certain mitigations such as EVM, system hardening, retardant applications, and EPSS can be complemented by UDS treatments or render the treatments less beneficial without modification or avoidance altogether. These calibrations are expected as an on-going process planning improvements.
   ii. Undergrounding will eliminate the need for UDS. As undergrounding efficiencies and limitations are further documented in the HFTD, the UDS program and targeted areas will be calibrated to avoid work in areas that will not realize longer term UDS benefits.
   iii. Not applicable.
c. Please see attached, "WMP-Discovery2022_DR_OEIS_007-Q18Atch01.pdf" UDS Standard TD-7109S.

Regarding: PSPS Projections

Data Request: OEIS-PG&E-22-007 (Question 19)

Request date: Friday March 25, 2022

Request:

Q19. PG&E projects reductions in scale, scope and frequency in 2022 and 2023 based on mitigations and improved protocols and lessons learned in 2021. For instance, per PSPS event in PG&E-8.3-1 on page 934, PG&E shows estimated quantitative reduction of scope (Number of Customers) of 26,843 and estimated quantitative reduction of duration per event (Customer Hours) of 843,267. In Table 11, PG&E projects the same number of events for 2022 and 2023 as for 2021 (5). Yet, Table 11 (Rows 1a., 1b., and 1c.) show increases from 2021 to 2022 and no reductions between 2022 and 2023.

a. Explain why there are identical total numbers indicated in 2022 or 2023 for Table 11, rows 1.a., 1b., and 1.c.
b. Explain what analysis produced identical total numbers for 2022, and 2023.

Response date: March 30, 2022

Q19 Response:

a. PG&E projected PSPS metrics in 2022 based on planned system enhancements and improvements, and Table 11 keeps those values static for 2023. PG&E anticipates continued improvement from 2022 to 2023, but we do not yet have the data and analysis on the impact of those improvements. Thus, for the purposes of this table, without further data and analysis, no additional improvements have been assumed or forecasted.
b. Please see the response to question a. on why years 2022 and 2023 are the same.

   To determine the impacts of our 2021 PSPS Criteria on scope, duration, and frequency (Table 11 - Rows 1a., 1b., and 1c.), we performed a look back analysis to identify where and when PSPS events would have occurred in the past four years utilizing our latest PSPS protocols and system improvements. This 4-year look back study was developed using the years 2018-2021 to simulate historical weather and the resulting PSPS events using our current PSPS Protocols. The estimated quantitative targets for scope, frequency, and duration are based on the 4-year average of the simulated events. We also projected our 2022 portfolio of mitigation work against the 4-year lookback

analysis of PSPS events to quantify their impacts on PSPS scope, frequency, and duration.

Regarding: 7.3.2.1.3 weather stations

Data Request: OEIS-PG&E-22-007 (Question 20)

Request date: Friday March 25, 2022

Request:

Q20. Regarding section 7.3.2.1.3 weather stations:

a. How many of PG&E's weather stations have been upgraded to give readings at 10 to 30-second intervals?
b. How many (in percentages) of PG&E's weather stations are ground-based versus pole-mounted?
c. Are any of PG&E's weather stations outfitted with 10hr fuel moisture sensors?
d. What is the total number of weather stations PG&E plans to have deployed in its weather station network?
e. Regarding PG&E's 2022 Program targets for weather stations:
    i. Please provide the number of new weather station installs for 2022.
    ii. Please provide the number of optimized weather station installs in 2022.

Response date: March 30, 2022

Q20 Response:

a. Currently, 1,025 weather stations provide readings at 30-second observation intervals when the functionality is enabled. There are no weather stations that provide 10-second observation intervals at this time.
b. All PG&E weather stations are pole or tower mounted. There are no stations that are ground mounted.
c. No. PG&E does not have any weather stations with fuel moisture sensors deployed.
d. PG&E's long-term goal to install 1,300 weather stations was completed in 2021, with 1 station roughly every 20 circuit miles in high fire threat areas. This year we plan to install or optimize (relocate) an additional 100 weather stations and will continue refining the network incrementally in future years.
e. PG&E's target is to install or optimize 100 stations in 2022. To date, four new stations have been installed and zero have been optimized. The remaining 96 additional sites are currently in the sighting, engineering or evaluation process. We do not have a specific target breakdown for installing versus optimizing, as that determination is dependent on the work performed in the field.

Regarding: Maturity Span Based

Data Request: OEIS-PG&E-22-007 (Question 21)

Request date: Friday March 25, 2022

Request:

Q21. Regarding PG&E's response to Maturity Survey question B.III.c:

a. Please describe how PG&E interprets span based.

Response date: March 30, 2022

Q21 Response:

PG&E interprets this term consistent with the way it is interpreted in our 2022 WMP, and it is included in the Glossary of Defined Terms (see page 1031):

"The space between adjacent supporting poles or structures on a circuit consisting of electric lines and equipment."

Regarding: Maturity Granularity

Data Request: OEIS-PG&E-22-007 (Question 22)

Request date: Friday March 25, 2022

Request:

Q22. Regarding PG&E's response to Maturity Survey question B.IIc:

a. Please describe what PG&E needs to do to improve weather data granularity to the span-based level.

Response date: March 30, 2022

Q22 Response:

We interpret this question as asking about weather data collection in the field from weather stations. To collect weather data at a span-based level, PG&E would have to install a weather station on every single pole or tower to collect weather data on each span.

Regarding: Safety and Infrastructure Protection Teams (SIPT)

Data Request: OEIS-PG&E-22-007 (Question 23)

Request date: Friday March 25, 2022

Request:

Q23. Regarding Safety and Infrastructure Protection Teams (SIPT) in section 7.3.2.5:

a. In 2022, PG&E is planning on increasing staffing by 22 full-time employees. How many SIPT Crews and Engines will PG&E have after increasing this staffing?

Response date: March 30, 2022

Q23 Response:

In 2022, PG&E received budgetary approval to increase SIPT staffing, allowing for the hiring of an additional 22 employees. Without factoring in attrition, PG&E aims to have a total of 45 SIPT engines/crews in operation in 2022, up from 40 in 2021.

Regarding: DTS Fast

Data Request: OEIS-PG&E-22-007 (Question 24)

Request date: Friday March 25, 2022

Request:

Q24. Regarding DTS FAST on Page 874

a. Was the prototype field test installation at the Santa Cruz service center that was completed in 2021 on distribution or transmission?
b. Please provide an explanation on what approving the final version of DTS FAST means?

Response date: March 30, 2022

Q24 Response:

a. The prototype field installation that was demonstrated at the Santa Cruz service center in 2021 was for Distribution.
b. Approving a version of DTS FAST that PG&E will feel comfortable deploying into the grid, beyond a pilot phase, is contingent on several items including:
    1. Ensuring the communication links between the signals from the installed hardware to the substation are robust;
    2. Ensuring that the hardware on the poles or towers has the right operational settings and the configuration has been tested and documented for production type use;
    3. Ensuring the standards for installation, operation and maintenance are all in place;
    4. Ensuring all personnel that will encounter the system in the field understand the purpose of the equipment and know what to do should they need to disable or interact with it; and
    5. Performing a risk assessment to understand if the addition of new hardware into the distribution grid introduces any risks.

Regarding: Distribution Arcing Fault Signature Library

Data Request: OEIS-PG&E-22-008 (Question 01)

Request date: Friday April 1, 2022

Request:

Q01. In section 7.3.2.2.6, Distribution Arcing Fault Signature Library, PG&E described completing an R&D project at the end of 2021, and the AH&PC team performed a strategic assessment of the results. PG&E then determined that the outcome of the pilot was not sufficient to develop a comprehensive fault signature library applicable to the larger incipient fault analytics tools that will be used to proactively detect and mitigate conditions that might result in a wildfire. And that no future actions are planned at this time.

a. Please provide the details from the assessment of the results from the R&D project and what the limitations were that lead to the decision to no longer pursue the initiative.

Response date: April 6, 2022

Q01 Response:

This project was deployed on a single high event circuit in the Peninsula region. Two types of sensors were deployed to capture electrical and mechanical data. The Electrical Phenomena Cluster (EPC) utilized a fiber optical sensor with very high dynamic range. It was installed at the substation and collected voltage, current, vibration and acoustic signals. Micro Phase Measurement Units (mPMU) were installed in two locations. One at the substation, and the other near the end of circuit and measured voltage and current. Data was collected for eight months from January 2021 through August 2021.

The EPC sensor did not perform as expected and did not provide any useful waveform data. Data from PMU sensors did not provide any additional waveform classification benefits beyond existing waveform classification results already available through other technologies, including Distribution Fault Anticipation (DFA) and Line Sensors, both of which are being deployed in high wildfire threat areas as part of PG&E's WMP commitments. Since no additional waveform data was produced as a result of this R&D effort, the decision was made not to take additional actions with this project, at this time.

Regarding: Transmission hardening projects

Data Request: OEIS-PG&E-22-008 (Question 02)

Request date: Friday April 1, 2022

Request:

Q02. In WMP-Discovery2022_DR_CalAdvocates_014-Q09 PG&E states that "some in-progress projects are forecasted in service towards the end of 2022" regarding transmission hardening projects.

a. Provide the mileage of projects described to be forecasted.
b. Explain why PG&E has decreased its transmission system hardening mileage from 104 in 2021 to 32 in 2022.
    i. Include any description of impacts from PG&E's 2021 reprioritization based on 2021 WMP model as well as resource changes to distribution.

Response date: April 6, 2022

Q02 Response:

a. Approximately 23 miles above the 2022 target are forecasted towards the end of 2022.
b. Conductor projects typically span multiple years, and some years will have more mileage placed into service than other years. Execution challenges also impact when conductor projects are completed. Execution challenges include material availability (long lead times have about doubled), clearance availability, permitting, and competing resources with emergent work such as fire rebuild projects. Reprioritization of work based on risk models, as well as resource changes to distribution, were not factors in the 2021 to 2022 mileage differences.

Regarding: Asset Inspections

Data Request: OEIS-PG&E-22-008 (Question 03)

Request date: Friday April 1, 2022

Request:

Q03. Regarding PG&E's asset inspections:

a. What percentage of inspections are completed by contractors vs. internally by PG&E employees?
b. Provide a list of contractors used for asset inspections.
c. How does training for contractors performing inspections differ from internal PG&E personnel?
d. Provide the find rate for QA/QC of inspections performed by contractors.
e. Provide documentation and procedures for PG&E's QA/QC process for asset inspections.
f. Provide the number of inspectors that performed detailed asset inspections in 2021.
g. Provide the number of detailed asset inspections performed by inspectors in 2021.
h. Provide the average circuit mile per inspector per day completed for detailed asset inspections in 2021.

Response date: April 6, 2022

Q03 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

PG&E understands this request and its subparts to refer to the detailed inspections referenced in sections 7.3.4.1 and 7.3.4.2 of its 2022 WMP.

a. The percentage completed by contractor vs internal for Transmission Ground inspections completed for 2021: Contractor 84%; Internal 16%.

   The percentage completed by contractor vs internal for Transmission Aerial inspections completed for 2021: 100 % Contractor.

   The percentage completed by contractor vs internal for Transmission Climb inspections completed for 2021: 100% Internal.

The percentage completed by contractor vs internal for Substation inspections completed for 2021: 100% Contractor.

The percentage completed by contractor vs internal for Distribution ground inspections completed for 2021: Contractor 87%; Internal 13%.

b. The contractor/vendor ARB is used to perform inspections for Distribution and Transmission assets. The contractor/vendor Rokstad is used to perform inspections for Distribution, Transmission, and Substation assets. The contractor/vendor Canus is used to perform inspections for Distribution assets.
c. For our contract workforce, PG&E's System Inspections Department offers Detailed Overhead Asset Inspection training programs for: (1) Transmission linemen contractors; and (2) Distribution linemen contractors. These contractors are qualified linemen who are hired under a specific annual contract. Our Detailed Overhead Asset Inspection contractor training is designed specifically for our contract workforce. This training program focuses on Onboarding, Processes, and Mobile technology. It uses Web-Based Training and Instructor Led Training. It's designed to train contract linemen about PG&E, System Inspections, Detailed Overhead Inspections, ETPM/EDPM, Job Aids, CalFire requirements, GO165 requirements, field safety, using technology, field hazards, asset conditions, and to document the Detailed Overhead Inspection results.

   Distribution Only: For PG&E linemen employees and Canus contract linemen, Distribution Compliance Inspectors and Canus contract inspectors are trained by PG&E's System Inspections Department on performing: (1) Distribution Underground Inspections; (2) Distribution Underground Patrols; and (3) Overhead Patrols. It uses web-based training and instructor-led Training. This course is designed to train linemen about PG&E, System Inspections, Underground Inspections, Underground/Overhead Patrols, EDPM, Job Aids, CalFire requirements, GO165, field safety, using technology, field hazards, asset conditions, and to document the Underground Inspection and

   Underground/Overhead Patrols results. This training program also includes Electric Detailed Overhead Asset Inspection training content.

   Transmission Only: PG&E's Academy provides training to PG&E employees who perform: (1) Transmission Underground Inspections; Transmission Underground Patrols; and (3) Transmission Overhead Patrols.

d. In the context of this request, PG&E understands the phrase “find rate” to mean the percentage of reviews in which discrepancies were identified. The find rate for QA/QC of inspections performed by contractors in 2021 was as follows:

   For 2021 Transmission Inspections that were Desktop QC Reviewed, the find rate was 58%.

   For 2021 Distribution Inspections that were Desktop QC Reviewed, the find rate was 38%.

   For 2021 Transmission Inspections that were Field QC Reviewed, the find rate was 5%.

   For 2021 Distribution Inspections that were Field QC Reviewed, the find rate was 58%.

e. Please see attachment “WMP-Discovery2022_DR_OEIS_008-Q03Atch01” showing our Inspection Quality Control Desktop Procedure TD-8123P-01.

f. The number of inspectors that performed detailed asset inspections for Transmission Detailed inspections: 122.

   The number of inspectors that performed detailed asset inspections for Transmission Climbing Detailed Inspections in 2021 is: 36.

   The number of inspectors that performed detailed asset inspections for Transmission Aerial Detailed Inspections in 2021 is: 83.

   The number of inspectors that performed detailed asset inspections for Substation Detailed Inspections in 2021 is: 10.

   The number of inspectors that performed detailed asset inspections for Distribution Detailed Inspections in 2021 is: 624.

g. The number of completed Transmission Detailed Inspections in 2021 is: 66,137. The number of completed Transmission Climbing Detailed Inspections in 2021 is: 3,309.

   The number of completed Transmission Aerial Detailed Inspections in 2021 is: 67,783.

   The number of completed Substation Detailed Inspections in 2021 is: 142.

   The number of completed Distribution Detailed Inspections in 2021 is: 907,599.

h. In the normal course of business, PG&E does not maintain this information in circuit miles, but instead records this information in units. In 2021, the average units per inspector per day completed for detailed asset inspections was as follows:

The average number of completed Transmission Detailed Inspection units per inspector per day in 2021: 9.

The average number of completed Transmission Climbing Inspection units per inspector per day in 2021: 4.

The average number of completed Transmission Aerial Inspection units per inspector per day in 2021: 290.

The average number of completed Substation Inspection units per inspector per day in 2021: 0.

The average number of completed Distribution inspection units per inspector per day in 2021: 15.

Regarding: HFRA modifications

Data Request: OEIS-PG&E-22-008 (Question 04)

Request date: Friday April 1, 2022

Request:

Q04. Provide the geospatial files for the HFRA modifications shown on pg. 77 of PG&E's 2022 WMP Update.

Response date: April 6, 2022

Q04 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

The requested geospatial files are provided as "WMP-Discovery2022_DR_OEIS_008-Q04Atch01".

Regarding: Distribution system hardening

Data Request: OEIS-PG&E-22-008 (Question 05)

Request date: Friday April 1, 2022

Request:

Q05. In CalAdvocates_007-Q01, PG&E states that it "completed over 210 miles of distribution system hardening, with approximately 66% of these circuits falling within the highest risk miles defined as the top 20% of the risk buydown curve, fire re-build miles, and PSPS mitigation miles."

a. What is the percentage specifically that falls into each of the following respective categories?
    i. Top 20% of the risk buydown curve
    ii. PSPS Impacted locations
    iii. Locations where risk has materialized/historic wildfire locations
    iv. PSS-identified locations
b. Where was the remaining 34% completed?
c. What is PG&E's plan to meet the 80% threshold moving forward (i.e., approximate percentages in top risk per year)?

Response date: April 6, 2022

Q05 Response:

a.
    i. 25% (52.5 miles) of the total 210.5 distribution system hardening miles installed in 2021 fall into the Top 20% of the risk buy down curve.
    ii. 1% (2.8 miles) of the total 210.5 distribution system hardening miles installed in 2021 fall into the PSPS mitigation category.
    iii. 40% (83.7 miles) of the total 210.5 distribution system hardening miles installed in 2021 fall into the Fire Rebuild (i.e., Locations where risk has materialized)
    iv. category.
    v. This category was not used as a highest wildfire risk category in 2021. Therefore, none of the 210.5 miles were allocated to this category in 2021.
b. The remaining 34% (71.5 miles) of the total 210.5 distribution system hardening miles installed in 2021 was primarily carryover / in construction work from 2020 that did not utilize the 2021 WDRM v2. All of this work took place in the HFTD and was prioritized as described in the 2020 WMP on pages 5-143 to 5-144.

c. The 80% goal referenced in this request is a three-year goal from 2021 – 2023. (See page 545 of the 2022 WMP.) As indicated above, the primary reason for trending below the 80% goal in 2021 was because PG&E was completing in progress/carry over system hardening work from 2020 that did not utilize the 2021 WDRM v2. We still expect to meet our three-year goal because future planned work is driven by the 2021 WDRM v2. See the table below for current 2021-2023 actuals plus remaining forecasted mileage for distribution system hardening as of 3/29/2022:

2021 - 2023 System Hardening Actuals / Forecast Mileage Summary	Top 20% Risk	Fire Rebuild	PSPS Mitigation	Other Miles (outside 2021-2023 high risk criteria)*	Total Overall Portfolio
Mileage (Actuals/Forecast)	893.1	222.6	52.7	178.6	1346.9
Percentage by category	66%	17%	4%	13%	100%
Percentage meeting high risk criteria	87%				

*Note: The 2021-2023 highest wildfire risk criteria identified on page 608 of the 2021 WMP did not include PSS-identified locations. Therefore, to monitor the three-year goal of completing 80% of our distribution system hardening mileage in the highest wildfire risk circuit miles, we are using the three categories identified in the 2021 WMP in the chart above.

Regarding: Ignition tracking

Data Request: OEIS-PG&E-22-008 (Question 06)

Request date: Friday April 1, 2022

Request:

Q06. In PG&E's 2022 WMP update, in section 7.3.7.4, PG&E discloses that it conducted an audit of work tracking databases which identified ignitions which had not been reported, "increasing PG&E's reportable ignition record by 23 percent." Regarding this audit, Energy Safety would like to know:

a. Was any type of internal report on the audit prepared?
    i. If so, please provide a copy.
b. PG&E's WMP update states that the audit led to "several corrective actions" but does not describe them – what were those specific actions?
c. What is the temporal scope of ignitions not originally reported that were discovered?
d. Does the spatial distribution of discovered ignitions show any pattern (are ignitions that were originally missed concentrated in certain areas, or distributed differently from ignitions that were originally reported?
e. Were the discovered ignitions attributable to a particular cause or set of causes?
f. Was the distribution of causes different for ignitions that were missed compared to those that were originally reported?
g. Were any of PG&E's models that use ignitions as an input re-run with these additional ignitions included? If so, did model results change?
    i. If so, what were any further effects of those changes?
    ii. Did this have any impact on initiative selection?

Response date: April 6, 2022

Q06 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. Yes.
    i. Please refer to the attached documents "WMP-Discovery2022_DR_OEIS_008-Q06Atch01" and "WMP-Discovery2022_DR_OEIS_008-Q06Atch02."
b. To reduce the occurrence of missed ignitions, the following actions have been taken:

- PG&E partnered with IT to implement revisions to Field Automation System (FAS) to better self-guide the restoration team to identify ignition events – these enhancements were deployed in June 2021;
- PG&E partnered with Dispatch and Scheduling on upcoming communications to the field regarding the usage of FAS to capture ignition events;
- PG&E partnered with the Asset Failure Analysis team on the field data collection improvement pilot;
- PG&E worked with the academy to implement an annual training requirement related to the use of the CPUC fire tab per our standards (RISK-6306S);
- PG&E incorporated the review of all potential ignition related FAS tags into the scope of the Ignitions Investigations Team;
- PG&E revised the RISK 6306-01 standard to include lessons learned from this audit as well as processes related to the ongoing review of FAS for potential missed ignitions.

c. 318 ignitions from 2014 to 2021 were identified that meet reportable ignition criteria.

d. There is no discernable pattern related to the locations of the discovered ignitions compared to the ignitions that were originally reported. The following table shows the distribution of the discovered reportable ignitions by PG&E region:

Division	Count
FRESNO	38
SIERRA	31
NORTH VALLEY	28
YOSEMITE	27
STOCKTON	24
NORTH BAY	22
SONOMA	22
LOS PADRES	21
HUMBOLDT	19
SACRAMENTO	17
CENTRAL COAST	15
KERN	15
SAN JOSE	12
PENINSULA	8
DE ANZA	7
DIABLO	6
MISSION	3

SAN FRANCISCO	2
EAST BAY	1

e. The following table shows the distribution of the discovered reportable ignitions by suspected cause:

Suspected Cause	Count
Contact - 3rd Party	30
Contact - Animal - Bird	29
Contact - Animal - Nest	2
Contact - Animal - Other	7
Contact - Customer (Equip/Structure/Veg)	4
Contamination	2
Equipment - PG&E	127
Utility work / Operation	1
Vegetation	105
Weather - High Wind	5
Weather - Lightning	1
Wire-Wire Contact	5

f. The following table shows the percent distribution of the discovered reportable ignitions by suspected cause compared to the originally reported ignitions between 2014-2021:

Suspected Initiating Cause	Audit Findings	Originally Reported
Contact - 3rd Party	9.4%	16.2%
Contact - Animal - Bird	9.1%	9.0%
Contact - Animal - Nest	0.6%	0.6%
Contact - Animal - Other	2.2%	3.8%
Contact - Customer (Equip/Structure/Veg)	1.3%	0.3%
Contamination	0.6%	0.5%
Equipment - PG&E	39.9%	38.8%
Utility work / Operation	0.3%	1.7%
Unknown	0.0%	0.2%
Vegetation	33.0%	26.9%
Weather - High Wind	1.6%	0.1%
Weather - Lightning	0.3%	0.2%
Wire-Wire Contact	1.6%	1.8%

g. No, the current PG&E Models that are in use to guide the work have not be re-run and so the work plans are not adjusted.
    i. Not applicable.
    ii. No. However, these additional ignitions have been incorporated into the next generation of the Wildfire Distribution Risk Model that is being released this year, to inform the work plans for 2023.

Regarding: Maturity Survey

Data Request: OEIS-PG&E-22-008 (Question 07)

Request date: Friday April 1, 2022

Request:

Q07. In response to Data Request OEIS-PG&E-2022-001, Question 5a, PG&E states that it re-evaluated its 2021 [Maturity Survey] response related to communications tools (Question F.VI.b). PG&E also states, "because of the communications challenges in certain parts of our service territory, the current and future state [maturity] scores were reduced back to (iii)."

a. What "communications challenges", specifically, is PG&E having that resulted in its reduced maturity score?
b. Which portions of PG&E's service territory do these communications challenges apply?
c. What is PG&E doing to remediate these challenges?

Response date: April 6, 2022

Q07 Response:

a. The reduced maturity score for question F.VI.b was not the result of newly discovered communication challenges. As noted in WMP- Discovery2022_DR_OEIS_001-Q05, the 2021 score of "v" was incorrectly assigned. The score of "iii" reported in 2020 and 2022 reflects radio and cell phone communication limitations posed by the terrain and topography of California combined with a lack of adequate cell towners by communication service providers.
b. Radio and cell phone communications are inhibited predominantly in mountain areas and along the coastline in PG&E's service territory.
c. PG&E's communication system is sufficient for our normal business operations. To combat the communication challenges described in response to Questions 7a and b above, PG&E radios use very high frequency (VHF) signals. VHF signals are needed in PG&E's large service territory because they are less impacted by topography and terrain than the ultra-high frequency (UHF) signals used by other utilities (e.g. 800 mHz and/or 900 mHZ radio systems), which often require additional mountain-top repeaters. However, VHF signals cannot eliminate all communication challenges resulting from the lack of adequate cell towers by communication service providers in PG&E's service territory.

Regarding: Restoration staffing

Data Request: OEIS-PG&E-22-008 (Question 08)

Request date: Friday April 1, 2022

Request:

Q08. On p. 746 of PG&E's 2021 WMP Update, PG&E states that it projected a need to hire approximately 40 Linemen and 100 Apprentices each year for the next five years, based on an internal demand and supply review. On p. 788 of PG&E's 2022 WMP Update, PG&E states that its hired 41 Linemen and 123 Apprentice Linemen, exceeding its target for staffing for support service restoration by 1 Lineman and 23 Apprentice Linemen.

a. Given that PG&E exceeded its 2021 target for service restoration staffing, will PG&E be reducing its hiring of Lineman and Apprentice Linemen in 2022?
    i. Or will PG&E continue its hiring goal of "40 Linemen and 100 Apprentices each year for the next five years?"
b. How many Linemen and Apprentice Linemen has PG&E hired in 2022 so far and how many does PG&E plan to hire in 2022?

Response date: April 6, 2022

Q08 Response:

a. PG&E will not be reducing the hiring of Linemen or Apprentice Linemen in 2022.
    i. PG&E is currently planning on hiring approximately 40 Linemen and 100 Apprentices each year.
b. Year to date, PG&E has hired 15 Apprentices and 21 Linemen and intends to hire approximately 40 linemen and 100 apprentices in 2022.

Regarding: Expenditures Vegetation Management

Data Request: OEIS-PG&E-22-009 (Question 01)

Request date: Friday April 8, 2022

Request:

Q01. Based on analysis of information reported in the WMP, PG&E reports a $530 million increase in vegetation management category initiatives over the amount projected for 2022 in the 2021 WMP Update.

a. What accounts for the $530 million increase in vegetation management category initiatives?

Response date: April 13, 2022

Q01 Response:

a. The $530 million increase in vegetation management category initiatives in the 2022 WMP are greater than the forecast in 2021 WMP in order to account for updated estimates of work required in 2022. Program to initiative mapping has been updated in some cases from 2021 to 2022, therefore, please see below for updates by VM program.
    - **Routine**: In September 2021, we began to transition the maintenance of EVM work that has already been performed to Routine VM patrols. The 2022 forecast was increased primarily to reflect this anticipated increase in units requiring work by the Routine program.
    - **Tree Mortality:** In 2021, the volume of trees identified as requiring work and wood management by the Tree Mortality program (formerly CEMA) was greater than forecasted. This is primarily attributed to current drought conditions, resulting in an increase of tree mortality rates. The 2022 forecast was increased to reflect similar circumstances anticipated in 2022.
    - **Enhanced Vegetation Management (EVM):** In 2021, the volume of trees identified as requiring mitigation in EVM was significantly greater than anticipated. The 2022 forecast was increased to reflect similar circumstances anticipated in 2022. The current forecast assumes that 2022 EVM scope of trees requiring mitigation is similar to 2021 EVM scope.

- **Transmission programs**: The 2022 forecast reflects increased costs related to Right of Way Expansion, response to major emergencies, and additional transmission vegetation management expenses.
- **"One Vegetation Management**" (Strengthened Routine) Scope: In 2022, PG&E will begin transitioning from three separate VM Program elements (Routine, Enhanced and Tree Mortality) to its "One Veg" program where processes, tools, procedures, and personnel are shared across all the VM activities.

Regarding: Expenditures Grid Design and System Hardening

Data Request: OEIS-PG&E-22-009 (Question 02)

Request date: Friday April 8, 2022

Request:

Q02. Based on analysis of information reported in the WMP, PG&E reports an increase of $198 million in Grid Design and System Hardening category initiatives over the amount projected for 2022 in the 2021 WMP Update.

a. What accounts for of $198 million increase in Grid Design and System Hardening category initiatives?
b. Did it go up because of increase undergrounding miles?

Response date: April 13, 2022

Q02 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. There are several forecast increases and decreases given the numerous initiatives within the Grid Design and System Hardening category. In general, the main drivers for the increase are due to increased unit/work volume, inclusion and re- mapping of certain MATs to better align with the 2022 WMP initiatives, and new programs and projects. Please refer to attachment "WMP- Discovery2022_DR_OEIS_009-Q02Atch01" for forecast changes to the various initiatives within the Grid Design and System Hardening category (Section 7.3.3). The attachment includes descriptions for initiatives with $10 million or more in projected change (both increase and decrease) from the 2021 WMP (Revised) forecast.
b. There are overall forecast increases for initiatives with undergrounding miles (7.3.3.17.1 System Hardening and 7.3.3.17.6 Butte Rebuild). The drivers for the forecast increase are below and can also be found in the attachment "WMP-Discovery2022_DR_OEIS_009-Q02Atch01":
    - 7.3.3.17.1 - Mainly driven by change in forecasted work and unit mix. The 2021 WMP forecast assumed more Overhead Hardening miles versus Underground miles, while the 2022 WMP forecast has been updated to shift more work

toward Underground work. Underground costs per mile are higher than Overhead Hardening costs per mile.

- 7.3.3.17.6 – The 2022 WMP included the full MAT code costs for Butte Rebuild, including management and other program related costs, while the 2021 WMP had only included direct costs of the construction of rebuild mileage.

Regarding: Expenditures (Table 12) Undergrounding Initiative

Data Request: OEIS-PG&E-22-009 (Question 03)

Request date: Friday April 8, 2022

Request:

Q03. Table 12 shows zero spending for the undergrounding Grid Hardening Initiative 7.3.3.16 Undergrounding of electric lines and/or equipment (Row 61).

a. What accounts for zero spending on undergrounding initiatives in Table 12?
b. Provide expenditures for undergrounding initiatives for 2022.
c. If this information is elsewhere in the WMP, please provide where it can be found. If it is aggregated with another program, please de-aggregate and provide this expenditure for undergrounding only.

Response date: April 13, 2022

Q03 Response:

a. As articulated in PG&E's 2022 WMP, Initiative 7.3.3.16 is not managed as a stand- alone program with its own data, metrics, and financials. As stated on page 523 of the 2022 WMP, "Undergrounding is one of PG&E's System Hardening methods described in Section 7.3.3.17.1." Additionally, as noted on page 527, "The 175 circuit mile target includes undergrounding taking place as part of both System Hardening (Section 7.3.3.17.1), Butte County Rebuild efforts (Section 7.3.3.17.6) including a small volume of previously hardened overhead lines that are being placed underground, and any other undergrounding work performed in HFTD or fire rebuild areas."
b. Undergrounding forecasts are consolidated into initiative 7.3.3.17.1 and 7.3.3.17.6. The Undergrounding portion of the forecast is $611 million out of the $977 million total forecast in 7.3.3.17.1. In addition, Butte Rebuild undergrounding effort is $138 million forecasted in initiative 7.3.3.17.6.
c. Please refer to part (b) above.

Regarding: Expenditures (Table 12) Covered Conductor Initiative

Data Request: OEIS-PG&E-22-009 (Question 04)

Request date: Friday April 8, 2022

Request:

Q04. Table 12 shows zero spending for the undergrounding Grid Hardening 7.3.3.3 Covered conductor installation (Row 38).

a. What accounts for zero spending on covered conductor initiatives in Table 12?
b. Provide expenditures for undergrounding initiatives for 2022.
c. If this information is elsewhere in the WMP, please provide where it can be found. If it is aggregated with another program, please de-aggregate and provide this expenditure for covered conductor only.

Response date: April 13, 2022

Q04 Response:

a. As articulated in PG&E's 2022 WMP, Initiative 7.3.3.3, Covered Conductor Installation, is not managed as a stand-alone program with its own data, metrics, and financials. As stated on page 433 of the 2022 WMP, "targeted covered conductor installation is being performed as part of PG&E's System Hardening Program (7.3.3.17.1)."
b. Covered Conductor installation is a part of the Overhead Hardening portion of our System Hardening Program that includes pole replacements and other program work (see pages 539-540 of the 2022 WMP). The Overhead Hardening portion of the forecast is $366 million out of the $977 million total forecast for Initiative 7.3.3.17.1.
c. Please refer to part (b) above.

Regarding: Expenditures Data Governance

Data Request: OEIS-PG&E-22-009 (Question 05)

Request date: Friday April 8, 2022

Request:

Q05. Based on analysis of information reported in the WMP, spending in the data governance initiative category decreased by $53 million compared to the amount projected from the 2021 WMP Update.

a. What accounts for the $53 million decrease in data governance initiative spending?

Response date: April 13, 2022

Q05 Response:

PG&E assumes the comparison is for 2022 forecast. The driver of change in the Data Governance category is mainly driven by initiative 7.3.7.5 Other, IT projects to support wildfire mitigation work; see summary below.

In the 2021 WMP, the cost forecast for 2022 was based on 2021 forecast, we have since revised the target based on our understanding of the current needs and current projects.

	2022 WMP	2021 WMP (Revision Notice)	
PGE Initiative #	**2022 Fcst**	**2022 Fcst**	**Difference**
7.3.7.1	$858	$1,161	($303)
7.3.7.2	$866	$400	$466
7.3.7.3	$1,047	$580	$467
7.3.7.4	$651	$1,023	($372)
7.3.7.5	$94,400	$146,828	($52,428)

Regarding: Sectionalization Devices

Data Request: OEIS-PG&E-22-009 (Question 06)

Request date: Friday April 8, 2022

Request:

Q06. Provide the following information regarding PSPS Distribution sectionalizing devices:

a. The average number of sectionalizing devices per circuit mile.
b. PG&E's goal for number of sectionalizing devices per circuit mile.
c. The average number of customers per sectionalizing device.
d. The range of numbers of customers per sectionalizing device (i.e., minimum and maximum).
e. The median number of customers per sectionalizing device.
f. PG&E's goal for maximum number of customers per sectionalizing device.

Response date: April 13, 2022

Q06 Response:

PG&E interprets the focus of this question to be distribution sectionalizing devices planned for PSPS events to isolate circuit segments that traverse into HFTD/HFRA areas. Based on this interpretation, to generate the responses the following data was utilized. PG&E has nearly 26,000 miles of distribution circuitry that traverses into HFTD/HFRA areas. PG&E has over 1,900 default PSPS distribution automated sectionalizing devices comprised of over 1,100 new devices installed between 2019 and 2021 specifically for PSPS, and nearly 800 other existing devices that were part of the normal circuit design prior to 2019.

a. The average number of PSPS distribution automated sectionalizing devices per HFTD/HFRA circuit mile is approximately 0.077
b. PG&E does not have a goal for the number of PSPS sectionalizing devices per HFTD/HFRA circuit mile. The goal is to ensure there is a sectionalizing device available to isolate all circuit segments that traverse into HFTD/HFRA areas, no matter if the circuitry is less than one mile in length, or several hundred miles in length. Some circuits are entirely within the HFTD/HFRA area and are several hundred miles in length and only utilize one device (i.e., the substation circuit breaker) to isolate during PSPS events.

c. The average number of customers per default PSPS distribution automated sectionalizing devices is 488.
d. The range of number of customers per default PSPS distribution automated sectionalizing devices is from 1 up to just over 6,500.
e. The median number of customers per default PSPS distribution automated sectionalizing device is 134.
f. PG&E does not have a goal for the maximum number of customers per default PSPS distribution automated sectionalizing device. The goal is to ensure there is a sectionalizing device available to isolate all circuit segments that traverse into HFTD/HFRA areas, no matter if the circuitry serves one customer or several thousand customers. Some circuits are entirely within the HFTD/HFRA area and serve several thousand customers and only utilize one device (i.e., the substation circuit breaker) to isolate during PSPS events.

Regarding: Ignition Audit Tracking

Data Request: OEIS-PG&E-22-009 (Question 07)

Request date: Friday April 8, 2022

Request:

Q07. In PG&E's 2022 WMP update, in section 7.3.7.4, PG&E reports that it conducted an audit of work tracking databases which identified ignitions which had not been reported. Energy Safety asked several questions pertaining to this audit in data request OEIS 008 Question #6, including the following (item b): "PG&E's WMP update states that the audit led to "several corrective actions" but does not describe them – what were those specific actions?" PG&E's response to this was as follows:

To reduce the occurrence of missed ignitions, the following actions have been taken:

- PG&E partnered with IT to implement revisions to Field Automation System (FAS) to better self-guide the restoration team to identify ignition events – these enhancements were deployed in June 2021;
- PG&E partnered with Dispatch and Scheduling on upcoming communications to the field regarding the usage of FAS to capture ignition events;
- PG&E partnered with the Asset Failure Analysis team on the field data collection improvement pilot;
- PG&E worked with the academy to implement an annual training requirement related to the use of the CPUC fire tab per our standards (RISK-6306S);
- PG&E incorporated the review of all potential ignition related FAS tags into the scope of the Ignitions Investigations Team;
- PG&E revised the RISK 6306-01 standard to include lessons learned from this audit as well as processes related to the ongoing review of FAS for potential missed ignitions.

Energy safety requests the following items:

a. Provide any available documentation on the "field data collection improvement pilot" or, if there is no existing documentation, describe the pilot (purpose, scope, methods, data collection)
b. Provide a redline copy of the RISK 6306-01 standard showing the relevant revisions.

Response date: April 13, 2022

Q07 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. Attached as "WMP-Discovery2022_DR_OEIS_009-Q07Atch01.pdf" please find the documentation regarding the Asset Failure Data Collection Initiative. Additionally, the following is an outline of the Asset Failure Data Collection Initiative's purpose, scope, methods, and data collection:
    i. **Purpose** – the Asset Failure Data Collection Initiative will allow Electric Operations to better understand the health of electric assets as it relates to outages. For assets that have failed, it will provide information on what asset failed and why it failed. For assets still in operation, it will help identify the risk of failure and potential causes of failure. In simple terms, this initiative takes both a reactive and proactive approach to assess electric outages.
    ii. **Scope** – this initiative applies to Distribution outages caused by Equipment Failures. This initiative focuses on equipment failures that cause the majority of outages, including (but not limited to) transformers, overhead and underground primary conductors, connectors, jumpers, poles, cross-arms, overhead secondary conductors, fuses, insulators, and capacitors.
    iii. **Methods and Data Collection** – to collect the necessary data for this initiative, Troublemen and first-responders are trained to capture key failure data. The data collection is integrated into current Troublemen work processes. There is an expanded team of asset engineers and analysts who will review the data received from the field and validate the equipment failure causes. This data will be stored in a centralized database of asset failures in Palantir Foundry.
b. Please see the attachment entitled "WMP-Discovery2022_DR_OEIS_009-Q07Atch02.pdf." Revisions were made to include the ongoing review of the systems of record outlined in section 2.4 for any potential missed ignitions.

While we are not in possession of a redline copy, the Revision Notes, beginning on the bottom of page 7, and continuing on page 8, provide a detailed description of all changes made to content in this document. Please note that the employee names in the document have been redacted in lieu of providing a confidentiality declaration.

Regarding: PSPS Risk vs. Benefit Tool Application

Data Request: OEIS-PG&E-22-010 (Question 01)

Request date: Friday April 15, 2022

Request:

Q01. In the Section 8.2.3.7 PG&E describes its use of the risk vs. benefit tool in four events in 2021 to support the evaluation of the potential public safety risk due to a PSPS event against the forecasted potential wildfire risk.

a. To date, did PG&E use the risk-benefit tool for determining to initiate any events that did not result in a PSPS event?

Response date: April 20, 2022

Q01 Response:

a. To date, PG&E's use of the risk-benefit tool during the 2021 PSPS season resulted in all four events supporting the decision for de-energization to mitigate wildfire risk. Other than the four 2021 PSPS events, the risk-benefit tool has not been used as there were no weather events meeting PSPS thresholds. As described in PG&E's WMP, the analysis from our risk-benefit tool is one of multiple factors that are considered to help inform the PSPS decision-making process, and no single factor drives the determination that a PSPS is necessary. The main drivers considered for PSPS events under the 2021 PSPS Protocols are described in Section 8.2 of the 2022 WMP.

Regarding: Community Wildfire Safety Program Project Prioritization

Data Request: OEIS-PG&E-22-010 (Question 02)

Request date: Friday April 15, 2022

Request:

Q02. Regarding PG&E's attachment CONFIDENTIAL_PGE_2022-WMP_Section_46_Remedy_2114_Atch01_CONF to the 2022 WMP Update:

a. Concerning the project type "Community Wildfire Safety Program for projects aimed for 2022-2023":
    i. Describe this project type, including where more information about this project type is described within the 2022 WMP (or previous WMPs, if applicable).
    ii. How were the projects that fall under this project type selected and prioritized?
    iii. How does this project type overlap and/or align with risk model output?
    iv. Provide a percentage of projects under CWSP that align with the top 20% risk score output from the 2021 Wildfire Distribution Risk Model
b. How does this project type differ from the following: Top 20% MAVF CPZ, Top 250 miles, and Top 50 Miles? Currently, this data is showing around 0.82 miles planned for undergrounding in 2024.
    i. Is this still accurate?
    ii. If not, provide the updated mileage.
    iii. If so, when does PG&E intend to select locations for additional undergrounding miles?
    iv. If locations are not currently selected, how is PG&E planning on expediting undergrounding for completion in 2024?
    v. Are the locations for grid hardening, as a whole, selected for 2024 (i.e., know the hardening location, but don't know the hardening initiative that will be used, UG vs. OH)?
    vi. If so, is it possible to provide an amended response including these projects?

Response date: April 20, 2022

Q02 Response:

a.
    i. The project type "Community Wildfire Safety Program for projects aimed for 2022-2023" represents projects that were selected based on the 2021 WDRM v2 model. During PG&E's scoping process for 2021-2023 system hardening projects, PG&E first reviewed the circuit segments based on the Top 50 miles, Top 250 miles and Top 20% MAVF (previous in-flight projects) to develop the

2021-2023 workplan. After completing these analyses, PG&E began reviewing larger circuit segments or whole circuits, informed by the 2021 WDRM v2, including by incorporating other operational considerations like adjacent circuit segments, to select the next population of system hardening projects. These projects were labeled with the "CWSP 2022-2023" label. Thus, the primary difference between the labels "Top 50 miles", "Top 250 miles" or "Top 20% MAVF" and "CWSP 2022-2023" is timing: the "CWSP 2022-2023" projects were identified and scoped during a later round of scoping, but they are otherwise very similar to the system hardening projects with those other labels. General information regarding Distribution System Hardening work and planned projects can be found in the 2022 WMP in Section 7.3.3.17.1 and in response to Remedy PG&E-21-14.

ii. As described in the response to a.i. above, these projects were selected based on the 2021 WDRM v2 (largely in the Top 20%) in conjunction with operational factors like adjacent planned work.

iii. The risk model output informed the selection of these "CWSP 2022-2023" projects as we primarily reviewed the Top 20% of that risk model in developing these projects. See the response to a.iv. below for the details of the overlap between the Top 20% and these "CWSP 2022-2023" projects.

iv. In the column W of the referenced attachment (CONFIDENTIAL_PGE_2022-WMP_Section_46_Remedy_2114_Atch01_CONF), entitled "2021 Risk Score", a risk score of 1 – 726 denotes circuit segments in the top 20% of the 2021 WDRM v2 risk model (because the highest risk circuit segment is 1 and the cutoff for the top 20% of circuit segments is number 726). Of the 532.8 total forecasted miles for the years 2022-2024 with a "CWSP 2022-2023" label, 494.3 miles, or 92.8%, are in the Top 20% of the 2021 WDRM (as those 494 miles have a circuit segment risk rank between 1 and 726).

b. As discussed in response to a.i above, during PG&E's scoping process for 2021- 2023 system hardening projects, PG&E first reviewed the circuit segments based on the Top 50 miles, Top 250 miles and Top 20% MAVF to develop projects. After completing these analyses, PG&E began reviewing larger circuit segments or whole circuits, informed by the 2021 WDRM, including by incorporating other operational considerations like adjacent circuit segments, to select the next population of system hardening projects. These projects were labeled with the "CWSP 2022- 2023" label. Thus, the primary difference between the labels "Top 50 miles", "Top 250 miles" or "Top 20% MAVF" and "CWSP 2022-2023" is timing: the "CWSP 2022- 2023" projects were identified and scoped during a later round of scoping but they are very similar miles and, as identified is the response to a.iv. above, 93% of the "CWSP 2022-2023" projects are in the Top 20% of the 2021 WDRM as well.

i. The data in the referenced attachment from Remedy 21-14 (CONFIDENTIAL_PGE_2022-WMP_Section_46_Remedy_2114_Atch01_CONF) is from the end of January 2022. As of today, there are ~20 miles of undergrounding scoped for 2024.

   PG&E has recently reviewed and approved, through the Wildfire Risk Governance Steering Committee, the 2022 WDRM v3 that will be used for circuit segment selection for 2024 undergrounding. Now that this model is available, we will be working to scope the additional miles required to fill the 2024 project pipeline and produce a high number of contingency miles that may replace those miles that experience significant dependency challenges. PG&E expects to start scoping additional 2024 projects to start building that workplan in May 2022.

ii. See the response to b.ii above. As of April, PG&E has developed ~20 incremental miles of undergrounding for 2024 but has not materially started scoping 2024 undergrounding projects.

iii. See the response to b.i above.

iv. See the response to b.i above regarding the timing for scoping 2024 undergrounding projects. As discussed in Section 7.3.3.16 of the 2022 WMP, PG&E is developing several strategies to ramp up our execution of undergrounding work to support the increased undergrounding goals in 2022, 2023 and 2024. Some of these strategies include: using skilled and qualified internal and external resources to complete the work and scale the program, in partnership with represented labor partners; looking at opportunities to update, design and construction standards and work process improvements; proactively managing supply chain issues to mitigate current risks associated with global supply chain issues; working to develop alternative solutions that meet our business requirements; and working to expand the supplier base for materials.

v. PG&E's project selection and scoping process generally identifies the future asset type (hardened overhead or underground) around the same time that the project is scoped. Therefore, as discussed in the response to b.i above, PG&E has not materially started scoping system hardening projects for 2024. That work will begin in May 2022.

vi. N/A, per the response to b.v.

Regarding: PSPS-related Mitigation Locations

Data Request: OEIS-PG&E-22-010 (Question 03)

Request date: Friday April 15, 2022

Request:

Q03. On page 870, PG&E indicates potential reductions in PSPS event size in 2022 are expected to come from planned mitigations and "PG&E is currently still in the process of finalizing locations for certain 2022 mitigations but anticipates the following mitigations to come online in 2022. These include:

- Distribution Sectionalizing Devices
- Transmission Sectionalizing Devices
- Temporary Distribution Microgrids
- Distribution System Hardening
- Fixed Power Solutions (FPS)

In a footnote on the same page, PG&E indicates "Some mitigation programs require more than a year of lead time to execute. As a result, some of the mitigations expected to be available in 2022 were identified using earlier data, including the 2020 lookback." This would seem to indicate at least some selections would have had to have been made previously.

a. When does PG&E plan to have these remaining locations finalized?
b. Please provide currently available locations for those which have been finalized as a GIS file (.gdb)?
c. How will it determine locations are in the highest risk areas for PSPS?
d. For each of the above-listed mitigations, please provide a percentage of projects that align with top risk, defined as:
    i. The top 20% risk score output from the 2021 Wildfire Distribution Risk Model
    ii. PSPS Impacted Locations
    iii. Locations where risk has materialized
    iv. PSS Identified Locations.

Response date: April 20, 2022

Q03 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. The locations of all 2022 mitigations planned for PSPS are identified in the attached file WMP-Discovery2022_DR_OEIS_010-Q03Atch01. These locations have been finalized with the exception of Fixed Power Solutions which have an expected finalization date of September 2022; this is driven by challenges with battery storage supply chain and inventory.
b. Please see WMP-Discovery2022_DR_OEIS_010-Q03Atch01.
c. Locations that are highest risk for PSPS are based on data from the PSPS Consequence Model. The purpose of the PSPS Consequence Model is to represent the spatial/circuit variation in PSPS consequence and to prioritize PSPS mitigation efforts in high-risk locations based on frequency, customer, and duration of PSPS impact. This more granular model will help assess the impacts of PSPS de-energizations in support of making PSPS mitigation planning decisions based on lookback analysis. For more details on the PSPS Consequence Model see Section 4.5.1(i) of the WMP.
d. PG&E interprets the reference to 4 items listed as "align with top risk" as the language used for the risk profiles the System Hardening program identified as high wildfire risk. The above-listed mitigations, other than Distribution System Hardening, are meant to target PSPS, and as such, PG&E responds to this question based on this interpretation.

   The Distribution System Hardening expects to have 80% of its miles come from the top 20% risk score output of the 2021 WDRM. The remaining 20% of miles can come from other high wildfire risk sources.

   The remaining mitigation solutions, in relation to the 4 items listed above, are meant to target PSPS impacted locations, and do not address Wildfire directly. Please also note, these mitigation solutions can be used in managing other aspects of risk not listed in this question, like addressing reliability needs in non-HFTD.

   For example, out of the 4 listed "top risks" as identified by OEIS, 100% of Distribution Sectionalizing Devices projects are meant to target PSPS Impacted locations.

   Below is a table to summarize the response.

Mitigation Solution	Distribution Sectionalizing Devices	Transmission Sectionalizing Devices	Temporary Distribution Microgrids	Distribution System Hardening	Fixed Power Solutions (FPS)

i. The top 20% risk score output from the 2021 Wildfire Distribution Risk Model	-	-	-	projected 80%	-
ii. PSPS Impacted Locations	100%	100%	100%	projected 20%	100%

Mitigation Solution	**Distribution Sectionalizing Devices**	**Transmission Sectionalizing Devices**	**Temporary Distribution Microgrids**	**Distribution System Hardening**	**Fixed Power Solutions (FPS)**
iii. Locations where risk has materialized	-	-	-		-
iv. PSS Identified Locations.	-	-	-		-

Regarding: Decision Tree Clarifications and Follow Up

Data Request: OEIS-PG&E-22-011 (Question 01)

Request date: Friday April 22, 2022

Request:

Q01. In response to OEIS-PG&E-22-007 Question 16, PG&E states that it "utilized the decision tree presented in 2021 for the 2022 scope of work."

a. Is this in reference to the decision-tree provided in response to PG&E-Remedy-21-14 as part of the 2021 WMP Progress Report?
b. How and where does PG&E's risk modeling output inform decision-making in relation to the decision-tree discussed in part (a)?
c. When was this decision-making process first implemented?
d. How does this align and/or differ with the system hardening decision-making methodology presented on May 21, 2021, to the Wildfire Safety Division (titled PG&E's System Hardening Program)?
e. What changes to PG&E's decision-making have been made since the May 21, 2021, presentation to the Wildfire Safety Division?

Response date: Wednesday April 27, 2022

Q01 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. Yes

b. The risk model first informs the circuit segment selection. It is then used for the alternative RSE analysis which compares overhead, underground, and hybrid alternatives.

c. This decision-making process was first used in late January 2021 following approval.

d. It is the same.

e. The same decision-making criterion was used for the creation of the 2022 workplan and some of the 2023 workplan. We have, however, adjusted our decision-making process for system hardening work for 2023 incremental miles and beyond to place a greater emphasis on undergrounding. Please see portions of a presentation made to the Wildfire Risk Steering Committee on November 18, 2021 (not October 1, 2021, as indicated) for an overview of the

adjustments that have been made in attachment WMP-Discovery2022_DR_OEIS_011-Q01Atch01. As indicated, these adjustments relate to future work that is unrelated to the 2022 targets or work set forth in the WMP. At a high level, we have created two separate decision trees, one for PSPS and another for Wildfire Risk mitigation work. We have eliminated the option of installing intumescent-wrapped poles to address ingress and egress risk. We are implementing vegetation reviews in areas with vegetation density below the current threshold for undergrounding to determine whether, in fact, undergrounding is a good option. We removed the time to construct criteria and the EC tag threshold. Also, unit cost assumptions were adjusted and additional risk values for wildfire, PSPS, and reliability were all combined to finalize the total risk mitigated.

PG&E recognizes that the adjustments reflected in the attached slide are complex. If Energy Safety is interested in discussing the adjustments made to our system hardening decision making process for 2023 incremental miles and beyond in more detail, PG&E recommends scheduling a meeting or a workshop to discuss the issue.

Regarding: Sectionalization Devices

Data Request: OEIS-PG&E-22-011 (Question 02)

Request date: Friday April 22, 2022

Request:

Q02. In Table 5.3-1(A) of PG&E's 2022 WMP Update PG&E shows a decrease in targets for implementing sectionalization devices both at the distribution and transmission levels. For distribution, PG&E's targets decreased from 250 in 2021 to 100 in 2022. For transmission, PG&E's targets decreased from 29 in 2021 to 15 in 2022.

a. Explain why PG&E has decreased its targets from 2021 to 2022 for sectionalization devices for both distribution and transmission.
b. Provide any risk/benefit analysis completed for implementing more sectionalization devices for determination of targets.
c. Explain how PG&E intends to decrease the number of customers impacted by de-energization (both for EPSS and PSPS) through future sectionalization, including how such analysis is used for determination of targets.

Response date: Wednesday April 27, 2022

Q02 Response:

a. For distribution, many of the highest impact locations have already been sectionalized so there may be lesser benefit (in terms of number of customers likely to benefit from such devices during PSPS events) as compared to work performed in prior years. As more devices are installed each year, the need to install additional devices in subsequent years decreases as the parts of the system experiencing highest frequency of outages and greatest number of customers impacted by PSPS events are addressed. There is decreasing marginal benefit of installing more devices. However, PG&E will continue to install some new sectionalizing devices closer to refined meteorological shutoff boundaries.

For Transmission Line, additional units above the target are in progress in 2022, as noted in WMP Section 7.1.h (an approximate total of over 30 switches). Regarding the decrease in units by 9/1/22, note that sectionalizing device projects span multiple years and have a wide range of variables, dependencies and complexities impacting execution durations including material availability, clearance availability, permitting, seasonal location accessibility, competing high priority work and resource availability. PG&E is experiencing longer lead times and supply chain issues for critical materials. Additionally, the increased complexity of the active projects is resulting in longer clearance durations moving more of the work into the

fall when clearances are more available. As a result, less work is forecasted to complete prior to 9/1/22. Also, similar to distribution, as more devices are installed each year, the benefit from additional devices in subsequent years is lower based on the 10-year lookback.

b. For distribution, PG&E has utilized the PSPS 10-yr Lookback model to identify locations in 2022 for new automated sectionalizing devices with the highest frequency of PSPS occurrence. Selecting these locations to isolate the distribution circuits close to designated meteorology shutoff polygons helps to reduce the customer impact and scope of PSPS events.

For transmission line, prioritization of new or upgraded transmission sectionalizing devices is based on circuit HFTD location, likelihood of potential de-energization during future PSPS events (based on a study of 10-years of weather data), and potential customer impact. Execution efficiencies are also considered in determination of workplan, such as bundling opportunities and switches that were already in progress/carry over from prior years before the lookback study was utilized.

c. For distribution, utilizing the PSPS 10-yr Lookback model, PG&E has identified locations for 2022 for new automated sectionalizing devices from the highest frequency of PSPS occurrence down to locations with 4 PSPS events within 10-years. PG&E is considering transitioning the PSPS sectionalizing device program into an EPSS sectionalizing device program beginning in 2023. Utilizing historical outage data, distribution circuits anticipated to have the highest frequency of EPSS outages, and circuits anticipated to have the highest number of customers impacted by EPSS outages, will be analyzed to determine key locations to replace Tap Line Fuses with new automated sectionalizing devices to reduce the size of EPSS zones.

For transmission line, the 10-yr Lookback model, which was a factor in prioritization of the sectionalizing device work, takes into account the potential customer impact. However, because much of the transmission grid is network-configured, direct customer count is not the sole indicator of switch effectiveness. Sectionalizing devices support reliability by keeping networked paths energized, even if the device has no direct customer impact. In general, actual customer benefits due to switching vary based on severity and location of PSPS events, as well as grid operational conditions at the time of the event.

Regarding: Weather Station Density

Data Request: OEIS-PG&E-22-011 (Question 03)

Request date: Friday April 22, 2022

Request:

Q03. Regarding section 7.3.2.1.3 weather stations:

a. Please explain how PG&E has determined 1300 weather stations as its long-term goal for weather stations density.
    i. Include any weather station to circuit mapping findings PG&E has used to identify any spatial gaps in network.

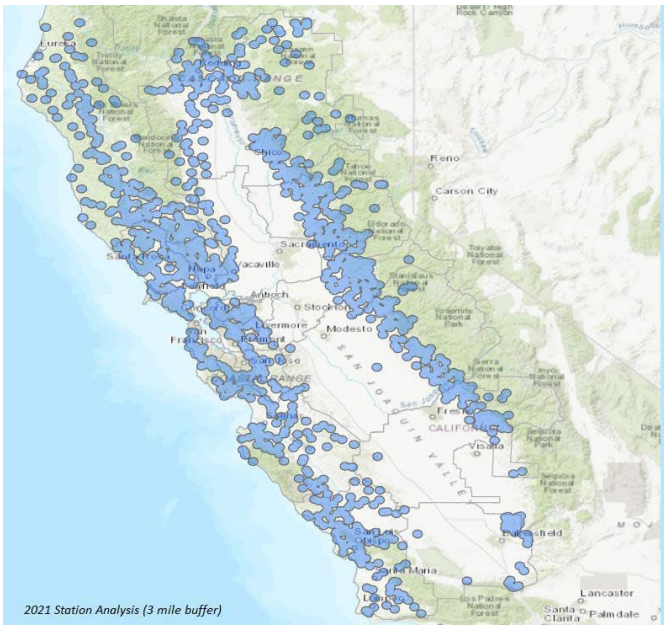
Response date: April 29, 2022

Q03 Response:

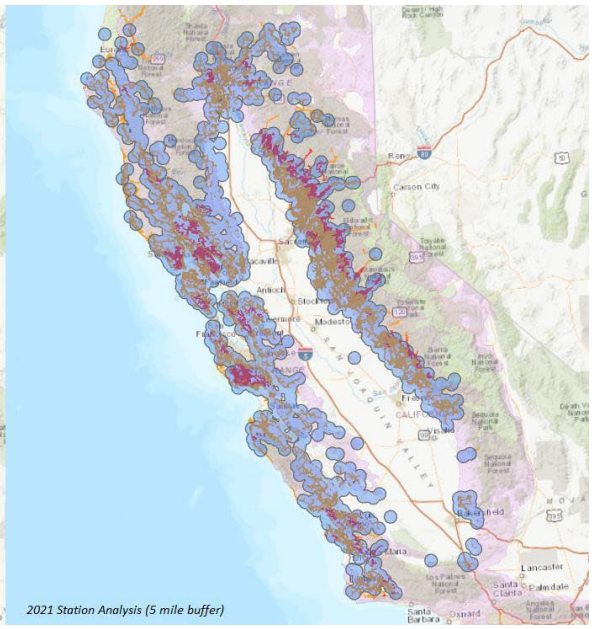
[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. In the 2020 GRC, PG&E forecasted installing approximately 1,300 weather stations in total within five years. Ultimately, PG&E may deploy more than or less than 1,300 stations as it continues to study and learn from these efforts, but 1,300 stations installed by 2022 is the best estimate at this time. It would take years to perform research and modeling to determine the optimum density of weather stations that would provide PG&E with clear knowledge of local conditions in its service territory. In the meantime, PG&E exercised judgment, considering knowledge of its service territory and other utility practices such as those of SDG&E, to decide the density of weather stations to install at this time, which will provide PG&E with sufficiently granular knowledge of local conditions to appropriately guide its wildfire risk reduction measures.
    i. Please see the attached GIS data analyses completed in 2020, 2021, and 2022. The analyses were used by subject matter expert meteorologists to associate a weather station to a high fire threat circuit using both a 3 and 5 mile radius buffer. Using the data output, localized gaps were identified and used as focus for additional weather station siting. Maps were also created as a visual aid (example below). Each year, a computation was done on the network density using data from the analysis and in 2021, the 3 and 5 mile associated results show that the network met the overall target density of roughly 1 weather

station for every 20 high fire threat circuit line miles. As the network gains more density, meteorology will continue to run the same analysis to identify special gaps on an increasingly granular level, and site weather stations to fill in areas of identified need.



2021 Station Analysis (3 mile buffer)



2021 Station Analysis (5 mile buffer)

Regarding: PG&E's Third Errata

Data Request: OEIS-PG&E-22-012 (Question 01)

Request date: Friday April 29, 2022

Request:

Q01. Regarding information in PG&E's Third Errata to its 2022 WMP Update, provided April 25, 2022:

a. PG&E has modified its pole clearing program target to inspect and clear (where clearance is needed) all poles identified in PG&E's VM Database, as of October 1, 2021, in HTFD areas or HFRA, not required by PRC 4292. How many poles meet these criteria?
b. How many assets have been discovered since October 1, 2021?
c. Does PG&E have an estimate for the number of assets it will discover from now to August 31, 2022?
    i. If so, provide the estimate and an explanation of how that estimate was calculated.
d. Why is PG&E extending its target date from April 30, 2022, to October 1, 2022?
e. How does a "target due date" differ from the 45-day timeline?
f. How many assets discovered since October 1, 2021, have exceeded the 45-day timeline for inspection and clearance?
g. How often (percentagewise) has PG&E missed the 45-day deadline due to "External Factors?"
h. What is PG&E's plan for discovering assets for inspection and clearance?
    i. How far along is PG&E in completing this plan?

Response date: May 4, 2022

Q01 Response:

a. Based on our current review, there were approximately 7,000 poles within the High Fire Risk Area (HFRA) and High Fire Threat District (HFTD) areas where clearance is not required by California Public Resources Code (PRC) Section 4292 that were in PG&E's Vegetation Management (VM) Database as of October 1, 2021.
b. PG&E understands that the assets discovered refers to poles in HFTD and HFRA areas. Based on this understanding, approximately 1,480 poles have been added to PG&E's VM Database as of May 3, 2022. However, not all of these poles are within HFTD and

HFRA areas. During the inspection process, approximately 800 of these pole records have been archived because they no longer have non-exempt equipment.

c. Since inspections and initial clearing for 2022 have largely been completed, the discovery of any additional assets is anticipated to be relatively low. However, we do not have a specific estimate of the number of poles that will be identified.
d. The pole clearing program is not a new program, but it is a new target within the WMP. The technology currently used for this program has limitations in its ability to look at any backward period in time. It provides daily snap shots on totals for inventory, completed, and pending work. Therefore, there are process and documentation improvements that need to be developed and implemented to support these limitations and provide the necessary documented evidence for Quality Assurance oversight. To accommodate the necessary improvements, we revised the target date from April 31, 2022 to October 1, 2022.
e. The October 1, 2022 "target due date" is the date by which we will have all the work completed and/or work prescribed for clearance where clearance is required for assets added to our VM Database by August 31, 2022, barring External Factors.
f. The 45 day commitment only applies to assets discovered after August 31, 2022, which will be inspected and cleared (if clearance is needed) within 45 days for poles identified after August 31, 2022, barring External Factors.
g. For clarification, the 45 day inspection and clearance requirement only applies to poles identified after August 31, 2022. Thus, it is not applicable to poles identified after October 1, 2021.
h. See the response to subpart (f).

The discovery plan includes having inspectors on foot patrol inspecting all line mileage within HFTD and HFRA areas and inventorying poles in our system of record with non-exempt equipment. At the time of inspection, work is prescribed and many instances completed. In those instances where it cannot be completed, work is prescribed to determine the appropriate clearing. As of May 3, we have 22 locations the have pending clearance work to perform.

Regarding: EPSS

Data Request: OEIS-PG&E-22-012 (Question 02)

Request date: Friday April 29, 2022

Request:

Q02. Regarding PG&E's implementation of EPSS?

a. How many customer complaints has PG&E received regarding EPSS since implementation in June 2021? Provide a breakdown of number by month.
b. What lessons learned has PG&E implemented as a result of EPSS-related customer complaints?

Response date: May 4, 2022

Q02 Response:

a. In total, 249 EPSS-related complaints were submitted since EPSS was implemented on July 28, 2021. 248 of the complaints were customer complaints received from the CPUC and one was an internal customer complaint referral. In these complaints, customers shared insight on how these safety settings impacted them and ways we can improve.

   Feedback such as this is invaluable, and it allowed us to make changes that reduced the burden of outages on customers and communities. Improvements this year are designed to reduce the number of customers impacted, perform rapid and safe power restoration, and improve customer communication and resources.

Month	Count of Case No.
August 2021	57
September 2021	173
October 2021	15
November 2021	4
Grand Total	249

b. These power line safety settings launched in July 2021 to protect lives, homes and the environment amid prolonged drought and continued wildfire risk. Since being

implemented, EPSS has proven to help prevent wildfires and as a result, it is being expanded this year to all HFTD and HFRA areas in our service territory, as well as select non-HFTD areas.

Under EPSS, power will only be disrupted if powerlines are struck by foreign objects or if there is an issue with the equipment. Therefore, crews must patrol the circuit – and perform any necessary repairs – prior to restoring power. This will ensure no issues exist that could spark an ignition while also helping to restore power for customers as quickly as possible.

We have received feedback from our customers in many different forms, including complaints, comments during webinars, interactions in Regional Working Groups, feedback in customer focus groups, and direct conversations with customers. We have listened to our customers and are responding to their feedback by continuing to identify ways to engage with customers and communities in advance of peak wildfire season, provide more timely and accurate outage information, reduce the impact of EPSS outages, and providing community and customer support, without compromising safety.

When outages do occur, we have heard from customers that they want timely updates regarding their outage status and to understand what caused the outage. We are improving our outage notification tools, and we are enhancing our outage investigation process with the goal of increasing our ability to identify outage causes and corrective actions and we are identifying areas where we can perform additional vegetation management work and prioritize repair or replacement of equipment. This approach is expected to both improve reliability and provide information that customers have indicated is important to them.

As we continue to make adjustments and improvements, we also know that our customers need more information from us about what to expect and how to prepare, we are informing customers about EPSS and the various resources and support services available to them before and during EPSS enablement. We have been and will continue to communicate through a variety of channels to provide customers with the information that they need when they need it.

Additionally, we welcome continued feedback from our communities so we can be the trusted, reliable PG&E our customers expect and deserve. With this goal in mind, we

implemented several improvements to lessen the impact of outages on customers in 2022, including:

- Conducting enhanced outreach to customers and communities regarding these safety settings, our ongoing wildfire safety efforts and outage preparedness resources. We will continue to communicate throughout wildfire season. This includes email, direct mail, social media, local media outreach and paid advertising. Additionally, we are holding public webinars to foster discussions on how we can better serve our communities while sharing more information about the new wildfire safety device settings and the steps we are taking to improve reliability. A list of completed and planned regional webinars can be found at pge.com/firesafetywebinars.

  To date this year we have provided the following information to customers:

  1. ~1.9M Emails/letters to customers
  2. 90+ Local government forums with cities and counties
  3. 42 County-specific EPSS maps
  4. 7 Public webinars
  5. 4 EPSS monthly reports submitted to the CPUC and service lists
  6. 4 Rounds of customer focus groups and message tests
  7. Enhancing our notification and coordination efforts with critical customers (e.g., hospitals, schools and first responders), telecommunications carriers and local agencies.
- Improving our communications with customers by providing faster notifications and information on when power will be restored.
- Expanding resources available to help our customers prepare for outages and stay safe.
  - Generator Rebate Program for customers who rely on well water, customers in our Medical Baseline Program and certain small businesses. For 2022, funding and eligibility will expand.
  - Portable Batter Program for eligible customers in our Medical Baseline Program who live in high fire-threat areas or have experienced two or more Public Safety Power Shutoffs (PSPS) outages since 2020. For 2022, we have removed the low-income requirement.

- Expansion of the Backup Power Transfer Meter offering to all customers on EPSS-capable circuits, making it easier and safer for customers to connect a generator.
- A reduced cost on energy bills and extra alerts for members of the Medical Baseline Program.

Regarding: Ignitions

Data Request: OEIS-PG&E-22-012 (Question 03)

Request date: Friday April 29, 2022

Request:

Q03. Regarding Table 7.2 from PG&E's 2022 WMP Update:

a. Why does PG&E project an overall increase in ignitions from 2022 to 2023?
b. Why does PG&E project a slight increase in overall ignitions for Tier 2 from 2022 to 2023?
c. Why does PG&E project a sustained (no change) number of ignitions for Tier 3 from 2022 to 2023?
d. Why does PG&E project a system-wide increase in ignitions from 2022 to 2023 for the following?
    i. Vegetation contact
    ii. Capacitor bank damage or failure
    iii. Conductor damage or failure
    iv. Fuse damage or failure
    v. Lightning arrestor damage or failure
    vi. Switch damage or failure
    vii. Crossarm damage or failure
    viii. Recloser damage or failure
    ix. Connection device damage or failure
    x. Transformer damage or failure
    xi. Other equipment damage or failure
    xii. Wire-to-wire contact
e. Why does PG&E project an increase in the number of ignitions at the transmission level within Tier 3 for other equipment damage or failure?
f. Why does PG&E project a sustained (no change) number of ignitions at the distribution level within the HFTD from 2022 to 2023 for the following?
    i. Vegetation contact
    ii. Conductor damage or failure
    iii. Pole damage or failure
    iv. Crossarm damage or failure
    v. Connection device damage or failure
    vi. Transformer damage or failure
    vii. Unknown

Response date: May 4, 2022

Q03 Response:

a. (a)-(f) In this response, PG&E provides the methodology used for projecting 2022 and 2023 ignitions in Table 7.2 to address Energy Safety's questions, including the subparts identified above.

   <u>For Distribution ignitions:</u>

   For Non-HFTD:

   - The 2022 projections are the average of 2018, 2019 and 2020 ignitions
   - The 2023 projections are the average of 2019, 2020, 2022 (projected) ignitions

   Please note that 2021 data was excluded from both 2022 and 2023 projections to exclude any variability due to EPSS, which was originally targeted in HFTD areas but could have impacted non-HFTD and HFRA.

   For all Tiers of HFTD, in the respective Tier:

   - The 2022 projections are 71% of 2021 ignitions, based on modeling from a limited pilot of EPSS in 2021.
   - The 2023 projections are unchanged from the 2022 projections.

   <u>For Transmission ignitions:</u>

   For both Non-HFTD and HFTD, in the respective Tier:

   - The 2022 projections are the average of 2019, 2020 and 2021 ignitions
   - The 2023 projections are the average of 2020, 2021 and 2022 (projected) ignitions

   Using the above methodology, projected increases for some ignition drivers result from different years being used for the projections. For example, for distribution non-HFTD ignitions, the year 2018 drops out of the 2023 projection and is replaced by the 2022 projection, which has a higher number of incidents than 2018 for many of the ignition drivers. As a result, our 2023 projections are greater than the 2022 projections for those drivers.

   The methodology described above is how we calculated 2022 and 2023 projections for the ignition drivers identified in Table 7.2 across our service territory. However, as described in the 2022 WMP, we are expanding the EPSS program in 2022 to all distribution circuits in HFTD and HFRA areas in our service territory, as well select non-

HFTD areas. In 2021, EPSS was able to reduce CPUC-reportable ignitions by 80% on EPSS-enabled circuits. The 2022 EPSS program expansion will significantly increase the ignition risk reduction we can achieve. (See page 733 of the 2022 WMP.)

Regarding: One VM Tool Timeline

Data Request: OEIS-PG&E-22-012 (Question 04)

Request date: Friday April 29, 2022

Request:

Q04. On page 697, under “Short-term improvements (2023-2028)”, PG&E lists the vegetation management programs which will use the One VM Tool. Energy Safety acknowledges it defined “Future improvements to initiative” as “the next 5 years,” i.e., 2022-2028 (2022 Guidelines, Attachment 2, page 74). Energy Safety needs to understand whether “Short-term improvements (2023-2028)” is a standard heading (as it is repeated throughout the WMP) or whether “2023-2028” in this case represents a timeline for deployment of the One VM Tool.

a. Confirm that the schedule for deploying the VM One Tool to the listed programs is 2023-2028.
    i. If yes, does PG&E have a more detailed schedule for deployment? If so, share this schedule.
    ii. If no, clarify the schedule of the VM One Tool’s deployment to the listed programs.

Response date: May 4, 2022

Q04 Response:

We used the heading "Short-term improvements (2023-2028)" throughout Section 7.3 in our 2022 WMP for each initiative. This heading is not specific to and does not represent a timeline for deployment of the One VM Tool.

PG&E used the time period from 2023-2028 based the 2022 WMP Guidelines, Attachment 2, p. 74 which explains that “future improvements to initiatives” include “known future plans (beyond the current year) and new/novel strategies the utility may implement in the next 5 years (e.g., references to and strategies from pilot projects and research detailed in Section 4.4).” Since the current year is 2022, we understood the five years “beyond the current year” to be 2023-2028.

The planned deployment schedule, presented below, for the One VM Tool is currently being reviewed for the remaining programs that will require deployment. The proposed schedule revisions will then be discussed with management for approval. We can provide an updated schedule to Energy Safety when our review and management approval process is complete. Planned deployment schedules are guidelines of the

order that PG&E currently plans on working the programs, the timing of IT development, as well as other activities may require subsequent deployment schedule changes in the future.



Regarding: Customer Owned Lines Initiative

Data Request: OEIS-PG&E-22-012 (Question 05)

Request date: Friday April 29, 2022

Request:

Q05. On page 915 under “Preparation for Re-Energization" PG&E lists the restoration team’s activities leading up to re-energization, including “Determine if any Customer Owned Lines identified as being at risk are within the event footprint (both transmission and distribution) as detailed in Section 7.3.6.4. These are then isolated either during segmenting activities or during patrols, but in either case, prior to re-energization.

a. Please explain what criteria is used to determine whether Customer Owned Lines are at risk.
b. How does this new initiative further reduce wildfire ignition risk during the PSPS restoration process?

Response date: May 4, 2022

Q05 Response:

a. Because Customer Owned Lines are typically interconnected to PG&E’s grid and may run through HFTD and HFRA areas, the same PSPS weather and ignition criteria used to scope PG&E’s Distribution and Transmission lines are applied to Customer Owned Lines. Therefore, those Customer Owned Lines that fall within scope of PG&E’s PSPS criteria will be de-energized along with PG&E’s assets.
b. This initiative will ensure that potential ignition risk from Customer Owned Lines are mitigated prior to re-energization. After the ‘all clear’ notification is issued by PG&E, the owner and operator of the Customer Owned Line will be required to provide positive confirmation that their lines are safe and ready to be re-energized. These Customer Owned Lines will remain de-energized until confirmation and acknowledgement for safe re-energization is received by PG&E from the owner and operator of the Customer Owned Lines.

Regarding: PG&E's Fourth Errata re: EPSS

Data Request: OEIS-PG&E-22-013 (Question 01)

Request date: Friday May 6, 2022

Request:

Q01. Regarding information in its Fourth Errata to its 2022 WMP Update, provided April 29, 2022, PG&E has modified the number of circuits from 988 to 1,018 and introduced language to indicate that the May 1st and August 1st target dates measure the number of line devices loaded with engineered settings and deleting reference to circuits.

a. What is the reason for the increase in circuits identified for EPSS enablement?
b. What is the reason for the change of target reframing measurement from circuit to device?
    i. How has this specifically changed the calculation of percent of target addressing percent of risk?
c. Given that focus on devices may overstate or understate the scope of EPSS in terms of miles:
    i. How many circuit miles will be enabled by EPSS?
    ii. How is PG&E determining this?
    iii. How many miles are covered per device when averaged?
d. In terms of decision-making to determine the number of devices, how is PG&E quantifying coverage?
e. In terms of risk addressed, how is PG&E determining what coverage needs to be addressed by EPSS devices based on risk?

Response date: May 11, 2022

Q01 Response:

a. When PG&E established the EPSS program, it established a change control process to govern adjustments to that scope. This adjustment in the number of circuits was driven largely by a refinement of the non-HFTD buffer zone areas. The non-HFTD buffer zones are included to account for areas that contain fine, flashy fuels, where in extreme Red Flag Warning conditions a spark could propagate and could potentially spread into HFTD areas potentially causing a catastrophic wildfire. The refinement was due to the PG&E Meteorology program more precisely defining the buffer zones with polygons adjacent to HFTD and HFRA in some areas, which brought in additional circuits and associated protection devices. We included the expansion from 988 to

1,018 in our second errata submitted on March 31, 2022, which addressed the Section 7.3.6.8 narrative, and then reflected the revised number in our Initiative Target in our fourth errata submitted on April 29, 2022.

b. The purpose of the April 29, 2022, errata was to clarify PG&E's original intent of measuring progress toward the Initiative Target by tracking the progress of loading engineering settings into protection line devices (line reclosers and fuse savers) to make the devices EPSS capable. The reference to "circuit completion" in the original Initiative Target description did not clearly describe the program's intent of loading settings in line reclosers and fuse savers to make a device EPSS capable. The intent of the program was to always track progress against line devices, consistent with the original unit of measure, that were made fully capable for EPSS enablement.
    i. This clarification did not change the calculation of percent of target addressing percent of risk. To maximize EPSS capability to address the likelihood of increased wildfire risk beyond May 1, PG&E took a number of steps to prioritize capability activities. PG&E prioritized making line devices EPSS capable in the southern portions of its service territory first, where wildfire risk is expected to manifest earliest. Additionally, devices located in lower elevation areas throughout the service area were prioritized for EPSS capability earlier than devices located in higher elevation areas, given the higher levels of fuel moisture, snowpack and snowpack runoff in winter through spring months in higher elevation areas. As of May 1, of the 3,580 protection line devices associated with the 1,018 circuits in scope for EPSS, engineering settings were loaded on 3,104 devices or 86 percent of the total protection line devices.

c.
    i. EPSS circuits will be enabled if they meet wildfire risk enablement criteria, which have been defined as Fire Potential Index levels that correlate with R3 conditions and above and for certain combinations of high wind, low relative humidity and low dead fuel moisture at R1 and R2 levels.
    There are 35,053 line miles associated with the HFTD/HFRA zone area. There are another 9,172 line miles associated with the program's non-HFTD buffer area. These circuit miles will have line devices that are capable of being placed into EPSS. The term for this is EPSS capable. Once capable, the devices on the circuit are only put into EPSS mode if the circuit is in a zone that meets the wildfire risk enablement criteria for EPSS enablement. On any given day, the number of miles that are EPSS enabled will vary based on meteorology forecast of wildfire risk.
    ii. This is determined by calculating the circuit line miles within the respective zone, as well as adding the circuit mileage associated with protection line devices that protect the zone but fall outside the defined boundary of either

the HFTD/HFRA or non-HFTD buffer zones. As of May 1, the 3,104 devices that have been made capable can protect 32,696 miles.

iii. 10.3 average miles of circuits per line device

d. PG&E's methodology for quantifying the coverage of devices has not changed. Coverage is defined as overhead primary distribution line sections within the selected HFTD, HFRA, and Non-Tier buffer areas. The upstream protective devices that provide protection for those overhead primary distribution line sections are selected to receive EPSS settings. Device counts are generated by ensuring all overhead primary line sections have a corresponding upstream protective device that should be made capable with EPSS settings.

e. In terms of risk addressed, PG&E intends to provide coverage for all HFRA/HFTD and select non-HFTD buffer areas this year. EPSS enablement is determined by daily meteorology forecasts of wildfire risk at the individual circuit level. This is 100% coverage of HFTD and HFRA areas. The non-HFTD buffer zones are included to reduce the likelihood of an ignition originating in the buffer zone under very dry, high wind conditions where a spark could potentially make its way into HFTD or HFRA and potentially result in a catastrophic wildfire.

Regarding: WDRM V3 Validation Report

Data Request: OEIS-PG&E-22-014 (Question 01)

Request date: Friday May 13, 2022

Request:

Q01. The Wildfire Distribution Risk Model (WDRM) is undergoing third-party review to check for validation. PG&E previously conveyed that the WDRM V3 Validation Report would be published April 29, 2022. Energy Safety requests a copy of this report as soon as it is available.

a. In the interim, please provide the planned publication date.

Response date: May 18, 2022

Q01 Response:

The planned publication date of the third-party review of the 2022 Wildfire Distribution Risk Model (WDRM) v.3 by E3 is June 1, 2022. The initial draft report prompted additional discussions with Technosylva on the Wildfire Consequence modeling resulting in additional information from Technosylva. The publication date has been moved to June 1st in order to review and include this information in the report. PG&E will provide the E3 Report to Energy Safety as soon as it is available.

Regarding: Personnel Costs in WMP

Data Request: OEIS-PG&E-22-014 (Question 02)

Request date: Friday May 13, 2022

Request:

Q02. Energy Safety would like to know whether there were changes the personnel costs related to WMP between 2021 and 2022.

a. If so, please provide this cost differential information.
    i. Overall
    ii. By Mitigation Initiative Category of spend:
        (1) Risk Assessment and Mapping
        (2) Situational Awareness and Forecasting
        (3) Grid Design and System Hardening
        (4) Asset Management and Inspections
        (5) Vegetation Management and Inspections
        (6) Grid Operations and Protocols
        (7) Data Governance
        (8) Resource Allocation Methodology
        (9) Emergency Planning and Preparedness
        (10) Stakeholder Cooperation and Community Engagement
b. Which mitigation initiatives have experienced increases in personnel?

Response date: May 18, 2022

Q02 Response:

a. "Personnel costs" are charged to PG&E's WMP Programs from two sources: (1) internal labor costs for PG&E employees and (2) contract labor costs. Both of those sources of personnel costs have challenges with regard to answering this question specifically.

   For internal PG&E labor, employees charge hours throughout the year to the job/projects they are working on, but they are rarely "dedicated" to one particular program or wildfire risk mitigation activity. A PG&E project manager, engineer or construction crew may work on (and charge to) system hardening for a period of time, then system inspections, then asset management, etc. While costs (including increases or decreases) will be accurately captured, forecasting where "increases

in personnel" have occurred is difficult. PG&E generally does not manage wildfire programs based on headcount assigned to them, but rather based on units of work and cost per unit.

For contract labor costs, the labor portion of the cost is usually merged with other contract costs like equipment usage and materials. Additionally, when a contractor bids on a PG&E job, the pricing is often a simple unit price, all-inclusive of the relevant costs including labor, equipment and materials. Therefore, it is not feasible to track headcount associated with contract labor in support of wildfire risk mitigation workstreams.

WMP Financial forecast for 2021 and 2022 are put together from a total cost view, which does not have details down to personnel costs. Forecast increases could be accompanied by an increase in personnel costs, but there could be other factors as well (e.g., material cost increases, project/program complexity, general inflation, etc.). Please refer to Table 12 of the WMP (attachment 2022-02- 25_PGE_2022_WMP-Update_R0_Section 7.3.a_Atch01_R1) for forecast cost by initiatives. In general, however, the primary cost driver for PG&E wildfire workstreams is labor so when PG&E forecasts a meaningful increase in program costs from 2021 to 2022, there is likely an increase in labor resources (internal and/or external) in support of that increased work.

For 2022 budgeting, we did not do a detailed cost element or resource (internal vs contractor) level plan as we did not have a set work plan at the time of

planning. Instead, we took a higher level approach where we primarily took historical cost element spreads and applied that proportionally to our future budgets. This was applied to the entire Electric Operations, not just the WMP- related programs. At a high level, for the Electric Operations internal labor, PG&E is forecasting the following increase in labor costs between 2021 and 2022:

	2021 Actual ($ thousands)	2022 Forecast ($ thousands)
Electric Operations – Labor Internal	$2,145,918	$2,397,168
Year-over-Year Difference		$251,250

b. Please see response in part (a).

Regarding: Personnel Increases

Data Request: OEIS-PG&E-22-014 (Question 03)

Request date: Friday May 13, 2022

Request:

Q03. Regarding further breakdown of personnel changes:

a. Does PG&E have a plan and resources to hire 100 employees for North Counties and another 100 for Sonoma County for WMP implementation?
b. To which departments or programs would these positions be allocated?
c. Would these positions be full time employees or contractors?
d. What is the ratio of employees to contractors for North Counties and Sonoma County?

Response date: May 18, 2022

Q03 Response:

a. Subject to the complete terms of the stipulated judgment with Sonoma County, PG&E has committed to posting 100 new employee positions headquartered in or serving Sonoma County, and to filling at least 80 of those positions by April 2027 to the extent qualified applicants are identified. Similarly, subject to the complete terms of the stipulated judgment with the North Counties, PG&E has committed to posting 100 new employee positions headquartered in or serving the North Counties, and to filling at least 80 of those positions by April 2027 to the extent qualified applicants are identified. PG&E plans to fulfill these commitments and intends to allocate appropriate resources to do so.
b. Per the terms of the stipulated judgments, the positions to be posted in fulfillment of these commitments may include positions, in among other areas, those relating to electric systems inspections, electric system vegetation management and supervision, Electric Operations, and Gas Operations.
c. These positions would be full-time PG&E employees.
d. At the time the stipulated judgments were executed, the ratio of employees to contractors across the job categories referenced above was approximately 39% in Sonoma County and approximately 50% in the North Counties.

Regarding: Public Safety Specialists

Data Request: OEIS-PG&E-22-014 (Question 04)

Request date: Friday May 13, 2022

Request:

Q04. Regarding PG&E's Public Safety Specialist (PSS) Program

a. Provide how many total Public Safety Specialists positions have been filled for the following years and the counties they were assigned to.
   i. 2020
   ii. 2021
   iii. 2022

Response date: May 18, 2022

Q04 Response:

In 2020, the Public Safety Specialist (PSS) organization began the year with 15 PSS members, who collectively covered the following 49 counties: Alameda, Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Humboldt, Kern, Kings, Lake, Lassen, Madera, Marin, Mariposa, Mendocino, Merced, Modoc, Monterey, Napa, Nevada, Placer, Plumas, Sacramento, San Benito, San Bernardino, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, Yuba.

By the end of 2020 and into 2021, the team increased to 25 PSS members, who covered the aforementioned counties.

In 2022, the team decreased to 18 total PSS members (maintaining coverage for 49 counties), with hiring consideration to increase the number back to 25 PSS members by mid-year. There are also five PSS supervisors, who can support ad hoc county needs as required. The seven-person staffing decrease between 2021 and 2022 was the result of the following: four PSS promotions to supervisor, the passing away of one PSS member, and two PSS members leaving the company.

For the specific PSS assigned to each county, please refer to the following attachments, which provide a snapshot of the county assignments on the dates indicated between 2020 and 2022:

- PSS Map March 13, 2020: "WMP-Discovery2022_DR_OEIS_014-Q04Atch01CONF.pdf;"

- PSS Map August 10, 2020: “WMP-Discovery2022_DR_OEIS_014- Q04Atch02CONF.pdf;”
- PSS Map March 01, 2021: “WMP-Discovery2022_DR_OEIS_014-Q04Atch03CONF.pdf;” and
- PSS Map April 01, 2022: “WMP-Discovery2022_DR_OEIS_014-Q04Atch04CONF.pdf.”

Regarding: EPSS and SCADA

Data Request: OEIS-PG&E-22-014 (Question 05)

Request date: Friday May 13, 2022

Request:

Q05. In its discussion of its EPSS Initiative 7.3.6.8 Protective Equipment and Device Settings (pp. 730-739) SCADA is not mentioned.

a. Please discuss how SCADA is being implemented with EPSS enablement.
b. How many EPSS devices are currently SCADA-enabled?
c. What are PG&E's quarterly goals between now through 2024 for SCADA-enabling additional EPSS devices?
d. Has a protocol been developed to centrally coordinate device/circuit assessment/restoration prioritization based upon SCADA communication?
    i. If so, provide a description of the protocol.
    ii. If not, provide a description of PG&E's plans to evaluate and implement protocols in the future.

Response date: May 18, 2022

Q05 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. Supervisory Control and Data Acquisition (SCADA) is an enabling technology, which allows Distribution Operations to implement EPSS settings that have been loaded on protection devices to be remotely enabled and disabled with EPSS settings based on wildfire risk criteria and be monitored continuously. SCADA technology is integrated with EPSS protection devices. Device communication transmits directly into SCADA and relays details to operators within the Distribution Control Centers (DCC).

   Protection devices on circuits will typically operate automatically based on the EPSS settings. When this occurs, SCADA allows DCC operators to see the action through device operated alarms and visible indicators on displays. This information allows operators to monitor the activity, ensure the area remains stable, and determine the appropriate patrol and restoration strategy.

b. Currently there are approximately 3,900 EPSS-capable devices that are SCADA-capable (data as of 5/17/22).
c. There are currently no quarterly goals to add SCADA functionality to the non- SCADA devices. PG&E is evaluating opportunities to increase SCADA capability subject to network connectivity and other factors.
d. EPSS is a setting, and SCADA is an enabling technology. Operations follows procedure TD 2700P-26 when operating the system via SCADA. The procedure specifies how the Operators can remotely operate equipment safely, regardless of EPSS status. See attached TD 2700-26 “WMP-Discovery2022_DR_OEIS_014- Q05Atch01”. Please note, in an effort to provide this information as quickly as possible, we have redacted employee names from this attachment.

Regarding: Work Orders

Data Request: OEIS-PG&E-22-014 (Question 06)

Request date: Friday May 13, 2022

Request:

Q06. Regarding PG&E's work orders:

a. How many work orders within the HFTD in the past three years have decreased in priority levels? What percentage of total work orders within the HFTD in the past three years does this account for?
b. How many work orders within the HFTD in the past three years have increased in priority levels? What percentage of total work orders within the HFTD in the past three years does this account for?
c. Provide a spreadsheet of all work orders discussed in parts a and b above, including columns for the following:
    i. Work order number
    ii. Work order equipment
    iii. Work order description
    iv. HFTD level
    v. Original priority level
    vi. New priority level
    vii. Date for when the work order was created
    viii. Original due date
    ix. Date for when the work order changed priority level
    x. New due date (if changed)
    xi. Original priority level
    xii. Cause for change in priority level (i.e. reinspection, etc.)
    xiii. Associated wildfire risk ranking from modeling output for circuit location

Response date: May 18, 2022

Q06 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

Given the volume of data associated with this request, we were able to produce a portion of the response for Distribution Pole tags (referred to as work orders in this

question) only. We will supplement the remainder of this response to include Distribution non-pole, Transmission, and Substation work orders as soon as possible.

a. Out of the total distribution pole work orders created between January 1, 2019 through December 31, 2021 there were 5,701 work orders that had decreased in priority level. This represents approximately 5% of the total work orders (5,701 out of 112,905).
b. Out of the total distribution pole work orders created between January 1, 2019 through December 31, 2021 there were 9,077 work orders that had increased in priority level. This represents approximately 8% of the total work orders (9,077 out of 112,905).
c. Please see attachment WMP-Discovery2022_DR_OEIS_014-Q06Atch01, which contains subparts i – viii. We are still gathering data for subparts ix – xiii (please note subpart xi is duplicative of subpart v) and will supplement the response as soon as possible.

Regarding: PG&E's repair backlog

Data Request: OEIS-PG&E-22-015 (Question 01)

Request date: Friday June 3, 2022

Request:

Q01. Regarding PG&E's repair backlog:

a. Please provide an Excel table with the following information in new columns added to the Excel table PG&E submitted in response to CalAdvocates-PGE-2022WMP-09[345] Questions 1, 2, and 3:
   i. Reason for reinspection (if applicable)
   ii. New due date post-reinspection (if applicable)
   iii. New prioritization of work order (if it changed)
   iv. Equipment type
b. Also provide a process flow chart illustrating the inspection process or a description of the inspection process from identification of an issue through to resolving it, including the typical timescale.
   i. Include the length of time between identification to initiation of repair and what triggers initiation of the repair.
c. Additionally, identify any interactions with external agencies, including for permitting, including the following for each agency:
   i. Any barriers to completing work orders due to permitting.
   ii. A list of all work orders that have been initiated but have been delayed due to permitting.
   iii. A list of all work orders for which repair has not been initiated due to permitting concerns.
   iv. A list of all work orders dated in the past year that have been marked as urgent for which a permit was required.
      (1) Provide the amount of time that elapsed from the identification of the issue to when it became urgent.
      (2) Note whether the repair was initiated prior to it being marked as urgent.

Response date: June 15, 2022

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[345] CalAdvocates-PGE-2022WMP-09: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page (accessed May 25, 2022).

Q01 Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. We have interpreted the term "reinspections" to mean the work PG&E describes as Field Safety Reassessments (FSRs), which are field verifications or reassessments of open tags that are considered to have a time dependent condition that could lead to a potential ignition source. These FSRs will document if there has been a change to the field condition of the open tag that poses an increased wildfire risk and if an urgent repair of the asset is warranted, or if the repair can be prioritized for a later date.

   We have also interpreted "reinspections" to not include normally scheduled inspections, such as our annual detailed inspections for transmission and distribution facilities, as well as our routine inspections for substations. This is because these types of inspections are performed consistent with the timelines established under General Orders governing inspections. Therefore, under the "Reason for reinspection" column in the attached spreadsheets, blank cells indicate notification condition reviews were performed as part of normally scheduled inspections. We are only highlighting the maintenance tags that have received an FSR.

   We have limited the information provided to open tags where reinspections have occurred, new due dates following the post re-inspection (if applicable), and new prioritization of a work order if priority changed following the re-inspection and the equipment type.

   Please find attached to this response the requested Excel spreadsheets, which have been updated to include the new columns of information sought:

   1. WMP-Discovery2022_DR_OEIS_015-Q01Atch01.xlsx
      - Under Column N, we have identified tags that have new due dates post re-inspection where the priority has changed following the FSR. Where this column is blank, the tag priority remains, and the tag is prioritized in a risk-informed fashion for work execution, or continues to be part of the FSR re-inspections until the tag repair is completed.
   2. WMP-Discovery2022_DR_OEIS_015-Q01Atch02.xlsx
      - The phrase "Complete on arrival (COA)," found in column N (New due date post-reinspection), represents either notifications that were found to be

complete in the field during the FSR, or the original condition that the notification document was no longer present in the field at the time of the FSR.

3. WMP- Discovery2022_DR_OEIS_015-Q01Atch03.xls
    - The attachment provided for Substation inspections does not highlight any re-inspections in columns N, O, and P because FSRs are not utilized for these assets. Instead, substation utilizes its normally scheduled inspections (monthly or bi-monthly routine inspections) at all locations throughout the year to monitor any conditions identified. PG&E has updated column Q to update the equipment type.

a. As requested, please find attached a process summary flow chart that illustrates our inspection processes: WMP-Discovery2022_DR_OEIS_015-Q01Atch04.pdf

b. We note that subpart c asks PG&E to identify any interactions with external agencies. Providing a comprehensive response would be significantly burdensome due to volume of maintenance repair work that may span numerous agencies. However, we have provided general responses below regarding barriers and permitting issues.

    i. For PG&E Priority "A" tags, we are not required to wait for a permit to complete work orders since the need to perform the work is to ensure the location is made safe and, consequently, permits are not required. For other Priority tags, PG&E may require a permit to conduct the necessary work and permitting may be a barrier to completion in certain instances. Please refer to subpart ii, which identifies common barriers to completing work orders due to permitting.

    ii. For distribution, we currently have a backlog of approximately 240,000 maintenance tags in the High Fire Threat District (HFTD) areas that are being managed in a risk-informed approach, where the highest risk tags are prioritized for work execution. Currently, we do not have a process for isolating which distribution maintenance tags have been delayed due to permitting or other factors. However, we do not believe permitting is a significant reason for the majority of the delays, where other factors such as fire rebuild response, PSPS events, and other emergency events have also disrupted our work schedules. For work orders that have been delayed due to permitting, we refer you to our discussion for transmission and substation work orders below.

    For transmission assets, please find a list of work order notifications (tags) currently impacted by permitting in the following attachment: WMP-Discovery2022_DR_OEIS_015-Q01Atch05.xlsx

For substation assets, the list of work order notifications (tags) delayed due to permitting reasons is attached: WMP-Discovery2022_DR_OEIS_015-Q01Atch06.xls

iii. PG&E does not track the impact of permitting delays against initiation dates. Please see the response to subsection ii above for information regarding work orders delayed due to permitting reasons for transmission and substations.

iv. Work orders that are deemed to be "urgent" are designated by PG&E as Priority "A" tags. For Priority "A" tags, we are not required to wait for a permit to complete work orders since the need to do the work is to ensure the location is made safe and, thus, permits are not needed to perform this work.

Therefore, we do not have any urgent work orders for the past year for which a permit was required.

(1) Since Priority A tags are identified as urgent, the resources deployed must remain at the location until repairs are performed to make the location safe. Therefore, the issue is deemed urgent at the time of identification.
(2) Given the safety implications of Priority A tags, the repair is initiated immediately after it is deemed urgent, and the resources remain at the location until repairs are performed to in order make the location safe.

Regarding: Circuit Protection Zone Risk Buydown Curve

Data Request: OEIS-PG&E-22-016 (Question 01)

Request date: Tuesday, August 9, 2022

Request:

Q01. Provide a risk buydown curve, like the one provided to the Wildfire Safety Division in 2021 demonstrating the differences in CPZ risk rankings from V1 to V2, that demonstrates the changes between the V2 and V3 model outputs.

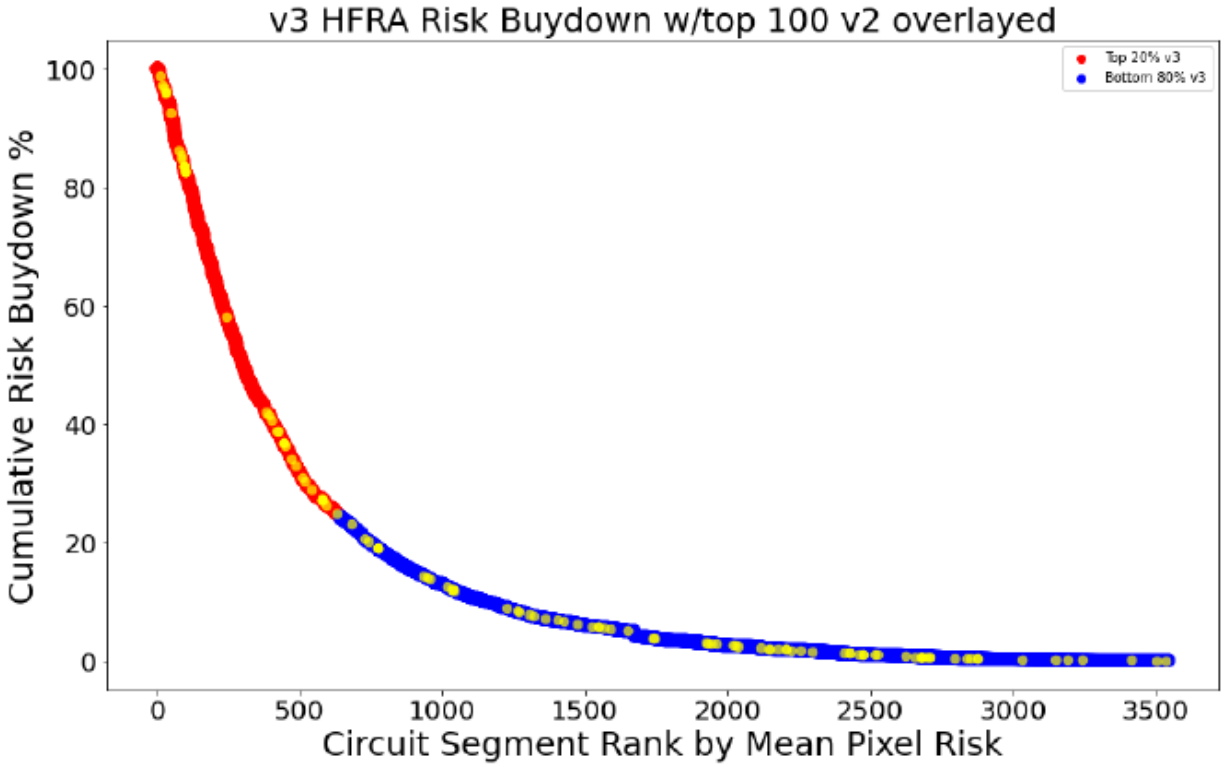
Response date: Friday, August 12, 2022

Response:

Two plots are provided below. These plots compare the WDRM v2 and v3 models by overlaying the top 100 circuit segments from one model on the risk buydown for another. This is a similar approach as was presented in January 2021.

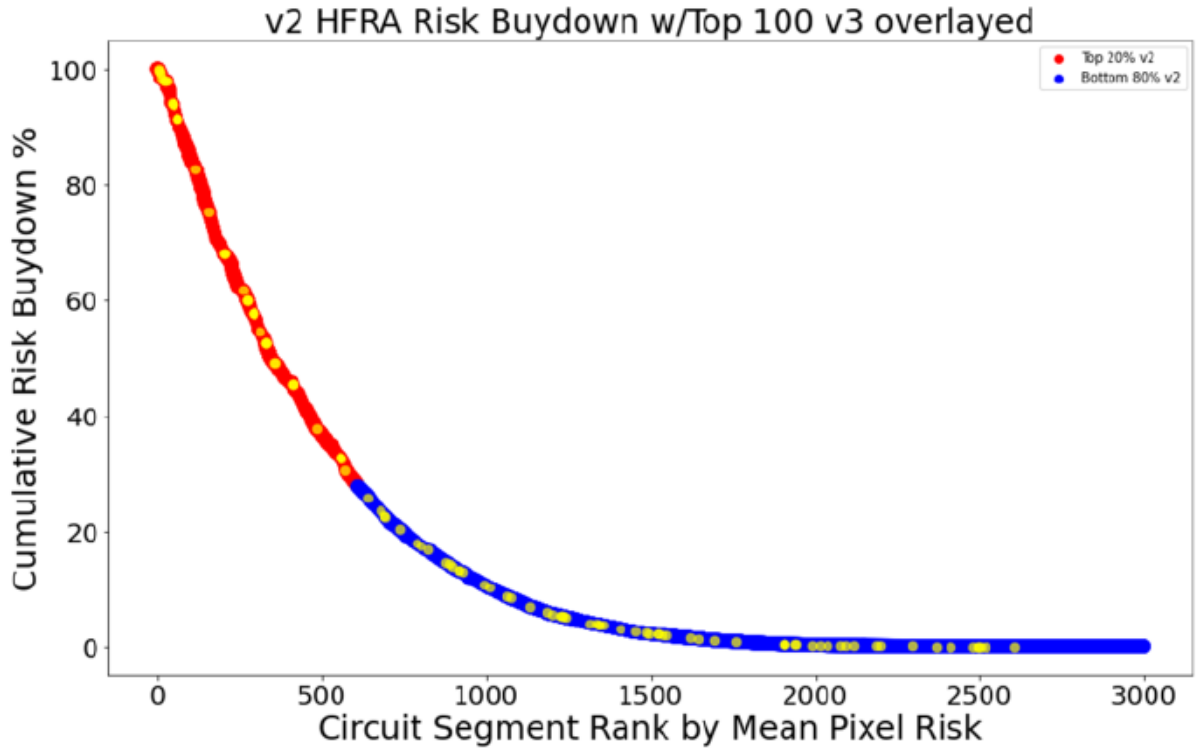
The first plot (Figure WMP-OEIS-016-01.1) displays the risk buy down curve for the latest WDRM v3 model in blue with the top 20% of circuit segments marked in red. The top 100 circuit segments from the WDRM v2 model are shown in the location of the WDRM v3 ranking with yellow dots.

Figure WMP-OEIS-016-01.1: 2022 WDRM v3 Prioritization Output with top 100 Circuit Segments from 2021 WDRM v2



In a similar manner, the second plot (*Figure WMP-OEIS-016-01.2*) displays the risk buy down curve for the WDRM v2 model in blue with the top 20% of circuit segments marked in red. The top 100 circuit segments from the WDRM v3 model are shown in the location of the WDRM v2 ranking with yellow dots.

Figure WMP-OEIS-016-01.2:
2021 WDRM v2 Prioritization Output with top 100 Circuit Segments from 2022 WDRM v3



As shown in both comparison plots, the top 100 circuit segments from the v2 and v3 model are spread across the risk buydown curve. This illustrates that while our models are changing based on improvements made, we are not observing the same level of shift between v2 and v3 as was observed between v1 and v2. (Please see PG&E's 2021 WMP Revision, Section 4.5.1 for a discussion on the changes between v1 and v2.) Many top circuit segments remain highly ranked after our model updates based on improvements in probability failure modules, circuit GIS geometry updates and corrections, as well as improvements to the consequence model.

As mentioned in previous responses, the risk models are a statistical prediction of a dynamic problem. In addition to model improvements, each new model is trained on the latest events which characterize the dynamic evidence of wildfire risk. The fact that one model ranks a location higher or lower than the previous model does not invalidate the previous model, but instead demonstrates continued improvement as our understanding of wildfire ignition and propagation increases and the dynamic nature of wildfire risk.

Regarding: Burn Scar Risk Modeling

Data Request: OEIS-PG&E-22-016 (Question 02)

Request date: Tuesday, August 9, 2022

Request:

Q02. During a call with Energy Safety on August 3, 2022, PG&E discussed using pre-fire vegetation levels for fire burn scars.

a. Describe why PG&E made these choices for determining ground fuels layers as inputs in its wildfire risk modeling.

b. Provide a list of the associated CPZs that fall under these areas within Attachment 2022-07-26_PGE_22-04_RNR_R3_Atch01CONF.

Response date: Friday, August 12, 2022

Response:

a. As described in PG&E's 2022 WMP in section 4.5.1(d) Wildfire Consequence Model, the switch to a 2030 forecasted fuels layer was based on the view that pre-fire vegetation levels best represent the long-term ground fuel potential.

"For long term risk assessment, PG&E utilized a projected fuel layer for the year 2030 that was provided by Technosylva. The intent is that the planning model is used to make longer-term decisions to reduce risk and we wanted to capture the potential future state of the fuels. Technosylva utilized their expertise in vegetative re-growth after fire disturbances (fire scars) to project the state of the fuels in 2030. This work leverages historical data on vegetation regrowth after fires based on satellite data and burn severity maps."

This decision was made in consultation with our Wildfire propagation and consequence modelling provider, Technosylva. Technosylva provides a fuels data updating subscription used by PG&E and other IOUs that ensures surface and canopy fuels data is kept up to date during the calendar year. This is important to ensure daily fire behavior and risk analysis is accurate. This typically involves updates pre-season (July), post-season (December), and regular updates during fire season based on the frequency of large wildfires. Pre and Post season updates include incorporating new data sources, such as LiDAR and other imagery, available from both public and commercial sources. Updates conducted during fire season utilize high resolution imagery sources to conduct burn severity mapping to provide fuels updates for burn areas.

SCE has also adopted the use of a 2030 forecasted fuels layer. From SCE 2022 WMP, page 30, Table SCE-4.1, under Risk Assessment and Mapping – Additional Weather Scenarios and Granular Fuel Data:

“In the prior version of the Technosylva Wildfire Risk Reduction Model (WRRM), SCE utilized 41 weather scenarios. Similarly, SCE used fuels data accounting for present fuel conditions. SCE determined that a wider range of both fuel and wind driven conditions was needed for its risk modeling. In 2021, SCE added an additional 400+ weather scenarios to better represent a wider range of both fuel and wind driven fire conditions. Similarly, SCE incorporated a more granular fuel model to account for fuel regrowth in recently burned locations with fuel regrowth projected out to the year 2030.”

b. Filtering Column B of Attachment 2022-07-26_PGE_22-04_RNR_R3_Atch01CONF for Community Rebuild and Fire Rebuild undergrounding projects identifies CPZs in fire burn scar areas. The V3 risk rankings for these CPZs are influenced, in part, on the forecasted 2030 fuels layer based on pre-fire vegetation levels. Providing the names of additional CPZs in the attachment that were previously impacted by recent fires, and were risk ranked using the 2030 forecast fuels based on pre-fire vegetation levels in V3 of the WDRM, will require additional fire scar and fuels forecast data from Technosylva and a manual review of each identified CPZ. We will contact Energy Safety to discuss options for addressing this request and providing the additional information, if needed.

Regarding: Undergrounding Decision-Making Flowchart

Data Request: OEIS-PG&E-22-016 (Question 03)

Request date: Tuesday, August 9, 2022

Request:

Q03. Provide a flowchart demonstrating PG&E's decision-making process for choosing undergrounding for a particular location, if such differs from the one described in the 2022 WMP Update.

Response date: Friday, August 12, 2022

Response:

The decision tree described on page 561 of Section 7.3.3.16 the 2022 WMP Update submitted on July 26, 2022, is the same decision tree that was used to develop the 2022 undergrounding workplan (excluding fire rebuild work). For 2022 fire rebuild undergrounding projects, the decision tree is described on page 586 of Section 7.3.3.17.1. Any prioritization of undergrounding work taking place as part of the Butte County Rebuild in 2022 is described is Section 7.3.3.17.6 of the 2022 WMP Update.

Regarding: Asset Inspector Qualifications

Data Request: OEIS-PG&E-22-016 (Question 04)

Request date: Tuesday, August 9, 2022

Request:

Q04. What qualifications are required for inspectors completing asset inspections?

Response date: Friday, August 12, 2022

Response: The table below provides the required qualifications for inspectors completing asset inspections.

Electric Transmission Aerial	For the Transmission Line of Business (LOB), qualifications are divided into contractor and employee requirements. Contractors are required take a host of web-based training (WBT) courses to become familiar with our policies, standards, and procedures. Contractors are then required to take a two-day, Instructor Led Training (ILT) course delivered by our Technology and Training Team on our Transmission Inspection Program. Once the WBT's and ILT's are completed, the contract inspector is then sent to their respective division and is provided two days of field training with a PG&E Lead (Inspection Review Specialists, Construction Managers) to answer any additional questions and become familiar with the software. New employees (Troubleman /Towermen) are required to take the contractor training course prior to performing inspections. Additionally, each year, they are required to take a one day, refresher training course that highlights any new changes for the upcoming inspection year. This can consist of program updates, new regulatory initiatives, and/or software changes. Additionally, they are required to take any yearly WBT's that are automatically profiled to them.

	The Transmission Aerial Line of Business (LOB) uses contractors for inspections. Contractors are required take a host of web-based training (WBT) courses to become familiar with our policies, standards, and procedures. Contractors are then required to take a five-day, Instructor Led Training (ILT) course delivered by our subject matter experts on our Aerial Team. Once the WBT's and ILT's are completed, the contract inspector is then required to do a knowledge assessment. After the knowledge assessment, contract inspectors are required to do 25 mock inspections which are scored on a points based system. After passing the mock inspections, contract inspectors are released to do 1-5 days of shadowed inspections. After passing this period, contract inspectors are assigned to an inspection review specialist that is responsible for ensuring competency in inspections and providing corrective feedback throughout the year.
Substation	Inspectors performing inspections on substations are required to complete PSOS-0441 and PSOS-0427 Enhanced Inspection Training, pass a test and complete the field training. They are also required to have general knowledge of substation assets.
Distribution	First, an employee Inspector must be a journeyman lineman. Individuals must go through extensive training and apprenticeship programs to become a journeyman lineman. New employee Inspectors then must attend a three-day "New Inspector" training course, provided by the System Inspections Training & Technology Team, that covers all types of work (overhead/underground patrols, overhead/underground inspections) performed by Compliance Inspectors. Contractors must also attend a three-day training course (specific to overhead inspections), provided by the System Inspections Training & Technology Team, to be qualified to perform overhead inspections. Experienced Inspectors receive annual refresher training course that highlights any changes for the new year. This can consist of

	program updates, new regulatory initiatives, and/or software changes. Additionally, they are required to take any yearly WBT's that are automatically profiled to them.

Regarding: Asset Inspector Retention

Data Request: OEIS-PG&E-22-016 (Question 05)

Request date: Tuesday, August 9, 2022

Request:

Q05. How has PG&E worked to retain and keep inspectors for asset inspections?

Response date: Friday, August 12, 2022

Response:

Yes, we work to retain and keep inspectors for asset inspections. Specifically, System Inspections continues to maintain our internal Inspector headcount. As Compliance Inspectors leave for other opportunities, retirement, etc., we post and fill these Inspector positions through our International Brotherhood of Electrical Workers (IBEW) bidding process to maintain our headcount.

Regarding: Asset Inspector Employee Workforce

Data Request: OEIS-PG&E-22-016 (Question 06)

Request date: Tuesday, August 9, 2022

Request:

Q06. What are PG&E's plans for increasing internal employment of inspectors for asset inspections (as opposed to relying on contractors)?

Response date: Friday, August 12, 2022

Response:

We are currently evaluating the best approach for our 2023 inspections and associated workplans. We will continue to look for efficiencies that will allow us to reduce our dependency on contractor resources. However, at this time we have not settled on a specific plan.

Regarding: One VM Tool

Data Request: OEIS-PG&E-22-017 (Question 01)

Request date: Friday, August 19, 2022

Request:

Q07. In response to data request OEIS-PGE-22-012, question 4, PG&E provided a proposed accelerated timeline for integrating vegetation management programs in the "One VM Tool."
   a. Has PG&E adopted the proposed timeline?
   b. If not, what is the current timeline for integrating vegetation management programs in to the "One VM Tool?"

Response date: Wednesday, August 24, 2022

Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a) PG&E has not adopted an accelerated timeline for the One VM tool. Our response to data request OEIS-PGE-22-012, Question 4 indicated:

> The planned deployment schedule, presented below, for the One VM Tool is currently being reviewed for the remaining programs that will require deployment. The proposed schedule revisions will then be discussed with management for approval. We can provide an updated schedule to Energy Safety when our review and management approval process is complete. Planned deployment schedules are guidelines of the order that PG&E currently plans on working the programs, the timing of IT development, as well as other activities may require subsequent deployment schedule changes in the future.

The complexities of IT development on multiple integrated systems, subsequent user feedback, scope of the project, and leadership decision making has resulted in a more extended schedule than originally anticipated. However, the tool is live in production for users to begin using based on what has been built so far for Distribution Routine and CEMA.

b) Please see attached "WMP-Discovery2022_DR_OEIS_017-Q01Atch01.xlsx" for the current timeline for integrating the Distribution Routine and CEMA programs into the One VM Tool. Integration for the remaining VM programs into the One VM Tool has not been finalized with

the line of business and the project team. We can provide an updated schedule to Energy Safety when our review and management approval process is complete.

Regarding: VM Wildfire Inspection Guide

Data Request: OEIS-PG&E-22-017 (Question 02)

Request date: Friday, August 19, 2022

Request:

Q08. On page 92 of PG&E's 2022 WMP Update, Section 4.6, Attachment 1, PG&E says it is currently in the process of developing a VM Wildfire Inspection Guide and intends to finalize this Inspection Guide by the third quarter of 2022.

a. Is PG&E on track to finalize the VM Wildfire Inspection Guide by the end of Q3 2022?
b. If no, what is the status of the VM Wildfire Inspection Guide and when does PG&E expect to finalize it?

Response date: Wednesday, August 24, 2022

Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. Yes, PG&E is currently on track to finalize the VM Wildfire Inspection Guide (Standard) by the end of Q3 2022. Please see attachment "WMPDiscovery2022_DR_OEIS_017-Q02Atch01.xlsx" for a schedule for finalizing the Standard.

b. N/A

Regarding: Asset Data Inventory

Data Request: OEIS-PG&E-22-018 (Question 1)

Request date: Monday September 26, 2022

Request:

Q01. Regarding PG&E's asset data inventory:

a. Provide a list of each data field (manufacturer, installation date, asset age, etc.) collected within PG&E's inventory for distribution and transmission equipment.
b. Provide the percentage of missing data for each data field broken down by equipment type (transformer, circuit breaker, etc.).
c. Explain how PG&E is determining the "expected life cycle" as well as "status of wear" for equipment, as described in OEIS Data Request 2, Question 9.
d. In OEIS Data Request 2, Question 9, PG&E states that "Parameters such as age and status of wear of assets for Distribution equipment is still being verified and refined." What is PG&E's timeline for completion for this effort?

Response date: Thursday September 29, 2022

Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

a. We are providing a list of data fields for wildfire critical assets as identified and described by Energy Safety within their OEIS GIS Data Standard Version 2.2, found within the 3.1 Asset Point feature dataset section, and for assets that we own and that are stored in a system of record.

b. We are providing a list of data fields for critical assets with their associated percentage of completeness for data submitted in the latest Spatial Quarterly Data Report on August 1, 2022. Please see attachment "WMPDiscovery2022_DR_OEIS_018-Q01Atch01". Please note, in some cases fields may not contain data by default. For example, one of the fields in the OEIS GIS Data Standard V2.2 request support structures associated with transformer sites. However, not all transformers are attached to support structures, they may be on the padmount or found underground. In this case, data would be omitted for this field.

c. We are in the process of determining expected useful life of assets through the development of the Wildfire Transmission Risk Model (WTRM, detailed in WMP Section 4.5.1

(c)). The model incorporates age, in addition to other parameters, to assess risk based on the probability of an asset failure leading to an ignition occurring, and the consequence of a wildfire if it were to occur. Useful life becomes the point at which the asset risk requires mitigation response. For example, the response for a high-risk asset may be a detailed inspection, and the inspection may result in the need to replace or repair that asset. The age of the asset when it requires replacement pinpoints the end of its useful life.

Status of wear is another parameter within the WTRM. This information comes from multiple sources, including direct condition data from inspections, understanding of historical repairs and maintenance, prior incident data, and first principle understanding of the rate of degradation of certain material types in certain environmental conditions.

For Distribution, we are in the process of incorporating Pole Test and Treat (PT&T) data related to remaining strength of the pole to assess useful life of the asset. The Wildfire Distribution Risk Model (WDRM) incorporates age and other factors such as PTT data, to assess risk based on the probability of an asset failure leading to an ignition occurring, and the consequence of a wildfire if it were to occur.

d. We are following two primary and connected paths to understand and improve critical Distribution asset data such as age and condition. Asset age is determined by the installation date, a required field in our Asset Registry. Asset condition is assessed as part of regular system inspections and used with WDRM to support maintenance prioritization.

As outlined in WMP Section 7.3.7.1, we have implemented a centralized data platform (Palantir Foundry) to integrate data from key asset management systems, allowing us to quantitively evaluate data quality and correlate records between systems. A key Foundry-based initiative currently underway is the Asset Registry Data Quality (ARDQ) program. This will be implemented on a risk prioritized basis, with Distribution Overhead assets currently being added. This provides measurement of data quality for critical asset data elements (such as install date) across multiple quality dimensions, including completeness, conformity, and consistency. Identification of gaps, such as missing/null installation dates, is driving remediation efforts, which can include verification of install date during inspections.

System inspections, including GO 165 and the PT&T program, are being used to assess asset condition. Since the beginning of 2022, the PT&T program includes validation of installation date, which is then captured in our asset management systems, updating missing data as applicable.

These approaches together allow us to identify and work down gaps in critical asset data. The ARDQ program provides a dashboard and ongoing metrics that support initiatives and prioritization with asset strategy and inspection. The timelines to complete the support structure asset age data validation is tied to the PT&T program, which has a 10-year cycle. This would complete by 2032.

Regarding: Closing Backlogged Work Orders

Data Request: OEIS-PG&E-22-018 (Question 2)

Request date: Monday September 26, 2022

Request:

Q02. Regarding PG&E's Response to Critical Issue RN-PG&E-22-05:

a. Provide the breakdown by calendar year quarter of Figure RN-PG&E-22-05-01 for tags opened and closed, including the number of tags closed that were backlogged.

Response date: Thursday September 29, 2022

Response:

[Full DR response, including all attachments and tables, can be found on the utility website: https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan-discovery-data-requests.page]

Please see WMP-Discovery2022_DR_OEIS_018-Q02Atch01 for the requested information showing the number of tags opened and closed, including the number of backlogged tags closed.

Appendix D. Comments on the Draft Decision

The following stakeholders submitted comments regarding the Draft Decision on Pacific Gas and Electric Company's 2022 Update (published for comment on October 6, 2022):

- Public Advocates Office at the CPUC (Cal Advocates)
- Green Power Institute (GPI)
- Pacific Gas and Electric Company (PG&E)

The following stakeholders submitted reply comments on the Draft Decision:

- PG&E
- Cal Advocates

Below is a summary of comments resulting in changes to the Final Decision and a summary of those changes.

1. Cal Advocates states Energy Safety should require PG&E to explain the changes between versions 2 and 3 of its wildfire distribution risk model.
   a. Energy Safety has updated PG&E-22-09.
2. Cal Advocates states Energy Safety should require PG&E to identify the causes of its poor asset inspection quality in 2022.
   a. Energy Safety has updated PG&E-22-21.
3. Cal Advocates states Energy Safety should require PG&E to resolve its backlog of repairs by the end of 2025 at latest.
   a. Energy Safety has updated PG&E-22-22.
4. Cal Advocates states Energy Safety should require PG&E to more thoroughly justify the scope and pace of its program to underground 10,000 miles.
   a. Energy Safety has updated PG&E-22-34.
5. GPI recommends setting target pass rates as part of PG&E's asset inspection QA/QC goals.
   a. Energy Safety has updated PG&E-22-21.
6. GPI recommends using the term "community values at risk" from the 2023 Draft Guidelines and clarifying the expanded definition in the 2022 WMP Decision.
   a. Energy Safety has updated PG&E-22-32 and Section 4.6.6.3.
7. GPI comments that PG&E-22-23 should include a requirement to provide a plan for reducing the necessity of UDS.
   a. Energy Safety has updated PG&E-22-23 and Section 4.6.5.4.
8. GPI recommends clarifying expectations for continued improvement to better reflect ongoing issues with undergrounding plans and the intersection of risk planning-model stability issues.

a. Energy Safety has updated PG&E-22-09 as well as PG&E-22-34.

9. PG&E recommends clarifying PG&E-22-34 regarding how RSE estimates and risk model outputs are prioritized in its decision-making process.
    a. Energy Safety has updated PG&E-22-34.
10. PG&E recommends clarifying how mitigations impact PSPS events reported in the Quarterly Data Report.
    a. Energy Safety has updated PG&E-22-35 and Section 4.7.3.

Appendix E. The Ten Maturity and Mitigation Initiative Categories

The following table presents the ten categories of questions on the Maturity Survey, and, where relevant, the version of the category name used in the 2022 WMP Guidelines or Decisions. All mitigation programs and initiatives should fit into one or more of the following categories. Some examples of activities or data products that fit under each category are listed.

Maturity and Mitigation Categories	Examples of Activities
1. Risk mapping and simulation; Per WMP Guidelines/this Decision document: Risk assessment and mapping	Risk and ignition probability mapping; match drop simulations; consequence mapping
2. Situational awareness and forecasting	Weather monitoring; weather station installation; fault indicator technology implementation; fire potential index
3. Grid design and system hardening	Capacitor maintenance and replacement; covered conductor installation and maintenance; expulsion fuse replacement; pole loading infrastructure hardening and replacement
4. Asset management and inspections	Infrared, LiDAR, or drone inspections and routine or detailed patrol inspections of distribution/transmission electric lines and equipment; intrusive pole inspections; pole loading assessments; quality assurance and quality control of inspections
5. Vegetation management and inspections	Fuel management and reduction of “slash”; LiDAR or drone inspections and routine or detailed patrol inspections of vegetation

	around distribution/transmission electric lines and equipment; inventory, remediation, or removal of hazardous vegetation; quality assurance and quality control of vegetation management inspections
6. Grid operations and protocols; Per this Decision document: Grid operations and operating protocols, including PSPS	Automatic recloser operations; protocols for re-energization after PSPS; mitigation of PSPS impacts; work procedures and training in conditions of elevated fire risk
7. Data governance	Centralized data repository; ignition/wildfire collaborative research; documentation/disclosure of wildfire-related data and algorithms; risk event data tracking and analysis
8. Resource allocation methodology	Method of allocation of resources; method of calculating the risk-spend efficiency of initiatives (not including PSPS, which is not considered a mitigation initiative within WMPs); risk reduction scenario development and analysis
9. Emergency planning and preparedness	Ensuring the utility has an adequate and trained workforce for service restoration; community outreach, public awareness, and communications efforts; customer support during emergencies
10. Stakeholder cooperation and community engagement	Cooperation with suppression agencies; community engagement efforts; sharing best practices and cooperating with agencies outside California; coordinating fuel management with the U.S Forest Service

Appendix F. Definition of Initiatives by Category

Category A. Risk Mapping and Simulation / Risk Assessment and Mapping

Category A. Risk Mapping and Simulation / Risk Assessment and Mapping Initiative Activity	Definition
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

Category A. Risk Mapping and Simulation / Risk Assessment and Mapping Initiative Activity	Definition
	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.).

Category B. Situational Awareness and Forecasting

Category B. Situational Awareness and Forecasting Initiative Activity	Definition
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.

Category B. Situational Awareness and Forecasting Initiative Activity	Definition
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.

Category C. Grid Design and System Hardening

Category C. Grid Design and System Hardening Initiative Activity	Definition
Capacitor maintenance and replacement program	Remediation, adjustments, or installations of new equipment to improve or replace existing capacitor equipment.

Category C. Grid Design and System Hardening Initiative Activity	Definition
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

Category C. Grid Design and System Hardening Initiative Activity	Definition
	(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

Category C. Grid Design and System Hardening Initiative Activity	Definition
	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

Category C. Grid Design and System Hardening Initiative Activity	Definition
	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.

Category C. Grid Design and System Hardening Initiative Activity	Definition
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 the HFTD	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 the HFTD.

Category D. Asset Management and Inspections

Category D. Asset Management and Inspections Initiative Activity	Definition
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

Category D. Asset Management and Inspections Initiative Activity	Definition
	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)

Category D. Asset Management and Inspections Initiative Activity	Definition
	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

Category D. Asset Management and Inspections Initiative Activity	Definition
	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

Category D. Asset Management and Inspections Initiative Activity	Definition
	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.

Category E. Vegetation Management and Inspections

Category E. Vegetation Management and Inspections Initiative Activity	Definition
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

Category E. Vegetation Management and Inspections Initiative Activity	Definition
Detailed inspections of vegetation around distribution electric lines and equipment	Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.
Detailed inspections of vegetation around transmission electric lines and equipment	Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.
Emergency response vegetation management due to red flag warning or other urgent conditions	Plan and execution of vegetation management activities, such as trimming or removal, executed based upon and in advance of forecast weather conditions that indicate high fire threat in terms of ignition probability and wildfire consequence.
Fuel management and reduction of “slash” from vegetation management activities	Plan and execution of fuel management activities that reduce the availability of fuel in proximity to potential sources of ignition, including both reduction or adjustment of live fuel (in terms of species or otherwise) and of dead fuel, including "slash" from vegetation management activities that produce vegetation material such as branch trimmings and felled trees.
Improvement of inspections	Identifying and addressing deficiencies in inspections protocols and implementation by improving training and the evaluation of inspectors.

Category E. Vegetation Management and Inspections Initiative Activity	Definition
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

Category E. Vegetation Management and Inspections Initiative Activity	Definition
	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,

Category E. Vegetation Management and Inspections Initiative Activity	Definition
	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.

Category E. Vegetation Management and Inspections Initiative Activity	Definition
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.

Category F. Grid Operations and Operating Protocols

Category F. Grid Operations and Operating Protocols Initiative Activity	Definition
Automatic recloser operations	Designing and executing protocols to deactivate automatic reclosers based on local conditions for ignition probability and wildfire consequence.
Crew-accompanying ignition prevention and suppression resources and services	Those firefighting staff and equipment (such as fire suppression engines and trailers, firefighting hose, valves, and water) that are deployed with construction crews and other electric workers to provide site-specific fire prevention and ignition mitigation during on-site work
Personnel work procedures and training in conditions of elevated fire risk	Work activity guidelines that designate what type of work can be performed during operating conditions of different levels of wildfire risk. Training for personnel on these guidelines and the procedures they prescribe, from normal operating

Category F. Grid Operations and Operating Protocols Initiative Activity	Definition
	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.

Category G. Data Governance

Category G. Data Governance Initiative Activity	Definition
Centralized repository for data	Designing, maintaining, hosting, and upgrading a platform that supports storage, processing, and utilization of all utility

Category G. Data Governance Initiative Activity	Definition
	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.

Category H. Resource Allocation Methodology

Category H. Resource Allocation Methodology Initiative Activity	Definition
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

Category H. Resource Allocation Methodology Initiative Activity	Definition
	implementation; analysis and application to utility decision-making.
Risk spend efficiency analysis	Tools, procedures, and expertise to support analysis of wildfire mitigation initiative risk-spend efficiency, in terms of MAVF and/ or MARS methodologies.

Category I. Emergency Planning and Preparedness

Category I. Emergency Planning and Preparedness Initiative Activity	Definition
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

Category I. Emergency Planning and Preparedness Initiative Activity	Definition
	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.

Category J. Stakeholder Cooperation and Community Engagement

Category J. Stakeholder Cooperation and Community Engagement Initiative Activity	Definition
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

Category J. Stakeholder Cooperation and Community Engagement Initiative Activity	Definition
	utility cooperation strategy and joint stakeholder roadmap (plan for coordinating stakeholder efforts for forest management and fuel reduction activities).

Appendix G. 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
CBO	Community-based organization
CEJA	California Environmental Justice Alliance
CNRA	California Natural Resources Agency
CPUC	California Public Utilities Commission
D.	Decision
DFA	Distribution fault anticipation
DR	Data request
EBMUD	East Bay Municipal Utility District
EFD	Early fault detection
EPIC	Electric Program Investment Charge

Term	Definition
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
GPI	Green Power Institute
GRC	General rate case
HFRA	High fire risk area
HFTD	High fire threat district
HWT or Horizon West	Horizon West Transmission
I.	Investigation
ICS	Incident command system or structure
IOU	Investor-owned utility

Term	Definition
ISA	International Society of Arboriculture
ITO	Independent transmission operator
IVM	Integrated vegetation management
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
Maturity Survey	Utility Wildfire Mitigation Maturity Survey
MARS	Multi-attribute risk score
MAVF	Multi-attribute value function
MBL	Medical Baseline
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

Term	Definition
OEIS or Energy Safety	Office of Energy Infrastructure Safety
OP	Ordering paragraph
OPD	Open phase detection
OPW	Outage-producing winds
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
PoF	Probability of failure
PoI	Probability of ignition
PRC	Public Resources Code
PSPS	Public Safety Power Shutoff
Pub. Util. Code or PU Code	Public Utilities Code
QA	Quality Assurance
QC	Quality Control
R.	Rulemaking
RAMP	Risk Assessment and Management Phase
RAR	Remote automatic reclosers

Term	Definition
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
SAWTI	Santa Ana Wildfire Threat Index
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, now the Risk-Based Decision-Making Framework Proceeding
SMJU	Small and multijurisdictional utility
SUI	Wildland-urban interface
TAT	Tree Assessment Tool
TBC	Trans Bay Cable
TURN	The Utility Reform Network
USFS	United States Forest Service

Term	Definition
VM	Vegetation management
VRI	Vegetation Risk Index
WMP	Wildfire Mitigation Plan
WRRM	Wildfire Risk Reduction Model
WSAB	Wildfire Safety Advisory Board
WSD	Wildfire Safety Division
WSIP	Wildfire Safety Inspection Program