

Application: 23-06-008
Exhibit No.: PGE-09
Date: September 18, 2024

PG&E-9 EXHIBIT

**PG&E 2023-2025 WILDFIRE MITIGATION PLAN R6, DATED
JULY 5, 2024**

VOLUME 3 OF 4

SEPTEMBER 18, 2024



2023-2025 Wildfire Mitigation Plan R6



***Pacific Gas and
Electric Company®***

Docket Title: 2023 to 2025 Electrical Corporation Wildfire Mitigation Plans
Docket #: 2023-2025-WMPs

July 5, 2024

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS

1. Executive Summary	2
1.1 Summary of the 2020-2022 WMP Cycle	5
1.2 Summary of the 2023-2025 Base WMP	9
2. Responsible Persons	14
3. Statutory Requirements Checklist.....	61
4. Overview of WMP	70
4.1 Primary Goal	70
4.2 Plan Objectives	71
4.3 Proposed Expenditures	73
4.4 Risk-Informed Framework	76
5. Overview of the Service Territory.....	82
5.1 Service Territory	82
5.2 Electrical Infrastructure.....	84
5.3 Environmental Settings	85
5.3.1 Fire Ecology	85
5.3.2 Catastrophic Wildfire History	99
5.3.3 High Fire Threat District	102
5.3.4 Climate Change	105
5.3.4.1 General Climate Conditions	105
5.3.4.2 Climate Change Phenomena and Trends	112
5.3.5 Topography.....	117
5.4 Community Values at Risk	120
5.4.1 Urban, Rural, and Highly Rural Customers	120
5.4.2 Wildland-Urban Interface	122

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

5.4.3	Communities at Risk From Wildfire	124
5.4.3.1	Individuals at Risk From Wildfire	124
5.4.3.2	Social Vulnerability and Exposure to Electrical Corporation Wildfire Risk.....	127
5.4.3.3	Sub-Divisions With Limited Egress or No Secondary Egress	130
5.4.4	Critical Facilities and Infrastructure at Risk From Wildfire	132
5.4.5	Environmental Compliance and Permitting	134
6.	Risk Methodology and Assessment.....	139
6.1	Methodology.....	139
6.1.1	Overview	139
6.1.2	Summary of Risk Models	144
6.2	Risk Analysis Framework	148
6.2.1	Risk and Risk Component Identification.....	154
6.2.2	Risk and Risk Components Calculation	164
6.2.2.1	Likelihood	165
6.2.2.2	Consequence	170
6.2.2.3	Risk	177
6.2.3	Key Assumptions and Limitations	181
6.3	Risk Scenarios	187
6.3.1	Design Basis Scenarios	187
6.3.2	Extreme-Event Scenarios	192
6.4	Risk Analysis Results and Presentation	194
6.4.1	Top Risk Areas Within the HFRA.....	194

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

6.4.1.1	Geospatial Maps of Top Risk Areas Within the HFRA	194
6.4.1.2	Proposed Updates to HFTD	199
6.4.2	Top Risk-Contributing Circuits/Segments	201
6.4.3	Other Key Metrics and Indicators	206
6.5	Enterprise System for Risk Assessment	208
6.6	Quality Assurance and Control.....	212
6.6.1	Independent Review	212
6.6.2	Model Controls, Design, and Review	216
6.7	Risk Assessment Improvement Plan.....	220
7.	Wildfire Mitigation Strategy Development	231
7.1	Risk Evaluation	231
7.1.1	Approach	231
7.1.2	Key Stakeholders for Decision Making.....	234
7.1.3	Risk-Informed Prioritization	243
7.1.4	Mitigation Selection Process	248
7.1.4.1	Identifying and Evaluating Mitigation Initiatives	248
7.1.4.2	Mitigation Initiative Prioritization	252
7.1.4.3	Mitigation Initiative Scheduling	264
7.2	Wildfire Mitigation Strategy.....	271
7.2.1	Overview of Mitigation Initiatives and Activities	271
Critical Issue RN-PG&E-23-01		301
7.2.2	Anticipated Risk Reduction	350
7.2.2.1	Projected Overall Risk Reduction.....	350

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

7.2.2.2	Risk Impact of Mitigation Initiatives	352
7.2.2.3	Projected Risk Reduction on Highest-Risk Circuits Over the 3-Year WMP Cycle	359
7.2.3	Interim Mitigation Initiatives	367
8.	Wildfire Mitigation	372
8.1	Grid Design, Operations, and Maintenance	372
8.1.1	Overview	372
8.1.1.1	Objectives	372
8.1.1.2	Targets	378
8.1.1.3	Performance Metrics Identified by the Electrical Corporation	395
8.1.2	Grid Design and System Hardening	398
8.1.2.1	Covered Conductor Installation – Distribution	399
8.1.2.2	Undergrounding of Electric Lines and/or Equipment – Distribution	404
	Critical Issue RN-PG&E-23-05	411
8.1.2.3	Distribution Pole Replacements and Reinforcements	437
8.1.2.4	Transmission Pole/Tower Replacements and Reinforcements	439
8.1.2.5	Traditional Overhead Hardening –Transmission Conductor and Distribution	441
8.1.2.5.1	Traditional Overhead Hardening – Transmission Conductor	441
8.1.2.5.2	Traditional Overhead Hardening – Distribution	443
8.1.2.6	Emerging Grid Hardening Technology Installations and Pilots.....	444

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.1.2.6.1	Distribution, Transmission, and Substation: Fire Action Schemes and Technology	444
8.1.2.6.2	Breakaway Connector	445
8.1.2.7	Microgrids.....	447
8.1.2.7.1	Remote Grids	448
8.1.2.7.2	Temporary Distribution Microgrids	450
8.1.2.7.3	Community Microgrid Enablement Program and Microgrid Incentive Program	451
8.1.2.7.4	Microgrid-Related Technology Pilots.....	453
8.1.2.8	Installation of System Automation Equipment	455
8.1.2.8.1	Installation of System Automation Equipment – Distribution Protective Devices	456
8.1.2.9	Line Removals (in the HFTD).....	457
	Overview of the Activity	457
8.1.2.9.1	Line Removal (in the HFTD) – Transmission.....	457
8.1.2.9.2	Line Removal (in the HFTD) – Distribution	459
8.1.2.10	Other Grid Topology Improvements to Minimize Risk of Ignitions.....	461
8.1.2.10.1	Downed Conductor Detection Devices	461
8.1.2.10.2	Installation of System Automation Equipment – Installation of Devices to Eliminate High Impedance Back-feed Conditions	462

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.1.2.10.3	Motor Switch Operator Switch Replacement.....	463
8.1.2.10.4	Surge Arresters	464
8.1.2.10.5	Non-Exempt Expulsion Fuses	465
8.1.2.11	Other Grid Topology Improvements to Mitigate or Reduce PSPS Events	466
8.1.2.11.1	Other Grid Topology Improvements to Mitigate or Reduce PSPS Events – Transmission.....	466
8.1.2.11.2	Other Grid Topology Improvements to Mitigate or Reduce PSPS Events – Distribution	468
8.1.2.11.3	Other Grid Topology Improvements to Mitigate or Reduce PSPS Events – Substation	469
8.1.2.12	Other Technologies and Systems	470
8.1.2.12.1	Other Technologies and Systems – Avian Protection Plan.....	470
8.1.2.12.2	Other Technologies and Systems – Substation Animal Abatement	471
8.1.3	Asset Inspections.....	473
8.1.3.1	Asset Inspections – Transmission	476
8.1.3.1.1	Ground Detailed Inspection.....	477
8.1.3.1.2	Aerial Detailed Inspection.....	478
8.1.3.1.3	Climbing Detailed Inspection.....	479
8.1.3.1.4	Infrared Inspection	480
8.1.3.1.5	Intrusive Pole Inspection	481
8.1.3.1.6	Switch Function Testing	481

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.1.3.1.7	Patrol Inspection	482
8.1.3.1.8	Pilot Inspections	482
8.1.3.2	Asset Inspections – Distribution	486
8.1.3.2.1	Detailed Ground Inspection	487
8.1.3.2.2	Infrared Inspections	490
8.1.3.2.3	Intrusive Pole Inspections	491
8.1.3.2.4	LiDAR-Based Pole Loading Assessments	492
8.1.3.2.5	Overhead Equipment Inspections	493
8.1.3.2.6	Patrol Inspections	494
8.1.3.2.7	Pilot Inspections	494
8.1.3.3	Asset Inspections – Substation	498
8.1.3.3.1	Substation Inspections	498
8.1.4	Equipment Maintenance and Repair	502
8.1.4.1	Capacitors Maintenance	503
8.1.4.2	Circuit Breakers Maintenance	504
8.1.4.3	Connectors Maintenance (Including Hotline Clamps)	506
8.1.4.4	Conductors (Including CCs)	508
8.1.4.5	Fuses (Including Expulsion Fuses)	510
8.1.4.6	Distribution Poles	511
8.1.4.7	Lightning Arrestors	512
8.1.4.8	Reclosers	513
8.1.4.9	Splices	515
8.1.4.10	Transmission Poles/Towers	516

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.1.4.11 Transformers	518
8.1.4.12 Other Equipment Not Listed	519
8.1.5 Asset Management and Inspection Enterprise System(s)	521
8.1.6 Quality Assurance and Quality Control	529
8.1.6.1 Quality Assurance	529
Critical Issue RN-PG&E-23-02	530
8.1.6.2 Quality Control	531
8.1.7 Open Work Orders	535
8.1.7.1 Open Work Orders – Transmission Tags	535
8.1.7.2 Open Work Orders – Distribution Tags	537
Critical Issue RN-PG&E-23-04	542
8.1.7.3 Open Work Orders – Substation Tags	565
8.1.8 Grid Operations and Procedures	567
8.1.8.1 Equipment Settings to Reduce Wildfire Risk	567
8.1.8.1.1 Protective Equipment and Device Settings	568
Critical Issue RN-PG&E-23-03	573
8.1.8.1.2 Automatic Recloser Settings	579
8.1.8.1.3 Settings of Other Emerging Technologies (e.g., Rapid Earth Fault Current Limiters)	580
8.1.8.2 Grid Response Procedures and Notifications	584
8.1.8.3 Personnel Work Procedures and Training in Conditions of Elevated Fire Risk	585
8.1.9 Workforce Planning	589
8.1.9.1 Workforce Planning – Asset Inspections	589

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.1.9.2	Workforce Planning – Grid Hardening	593
8.1.9.3	Workforce Planning – Risk Event Inspection	600
8.2	Vegetation Management and Inspections	602
8.2.1	Overview	602
8.2.1.1	Objectives	604
8.2.1.2	Targets	612
	Critical Issue RN-PG&E-23-06	614
8.2.1.3	Performance Metrics	626
8.2.2	Vegetation Management Inspections	629
	Critical Issue RN-PG&E-23-07	632
8.2.2.1	Vegetation Inspection – Transmission	661
8.2.2.1.1	Routine Transmission NERC and Non-NERC	663
8.2.2.1.2	Transmission Second Patrol	666
8.2.2.1.3	Integrated Vegetation Management (IVM)	668
8.2.2.2	Vegetation Inspections – Distribution	670
8.2.2.2.1	Distribution Routine Patrol	672
8.2.2.2.2	Distribution Second Patrol	675
8.2.2.2.3	VM for Operational Mitigations	678
8.2.2.2.4	Tree Removal Inventory	680
8.2.2.2.5	Focused Tree Inspections	681
8.2.2.2.6	Discontinued Programs	682
8.2.2.3	Vegetation Inspections – Substations	683
8.2.2.3.1	Defensible Space Inspection	683

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.2.3	Vegetation and Fuels Management	686
8.2.3.1	Pole Clearing.....	687
8.2.3.2	Wood and Slash Management	688
8.2.3.3	Clearance	689
8.2.3.4	Fall-In Mitigation	691
8.2.3.5	Substation Defensible Space (Mitigation).....	692
8.2.3.6	High-Risk Species	694
8.2.3.7	Fire Resilient ROWs.....	695
8.2.3.8	Emergency Response Vegetation Management	697
8.2.4	VM Enterprise System	699
8.2.5	Quality Assurance/Quality Control	701
8.2.5.1	Quality Assurance and Quality Verification	703
Critical Issue RN-PG&E-23-02		703
8.2.5.2	Quality Control	706
Response to Critical Issue RN-PG&E-23-02, Remedy # 2		708
8.2.6	Open Work Orders.....	713
8.2.7	Workforce Planning.....	716
8.2.7.1	Workforce Planning – Vegetation Inspections	716
8.2.7.2	Workforce Planning – VM Projects.....	722
8.3	Situational Awareness and Forecasting	723
8.3.1	Overview	723
8.3.1.1	Objectives	723
8.3.1.2	Targets	730

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.3.1.3	Performance Metrics Identified by the Electrical Corporation	733
8.3.2	Environmental Monitoring Systems	736
8.3.2.1	Existing Systems, Technologies, and Procedures	736
8.3.2.2	Evaluation and Selection of New Systems	744
8.3.2.3	Planned Improvements	744
8.3.2.4	Evaluating Mitigation Initiatives	745
8.3.3	Grid Monitoring Systems	746
8.3.3.1	Existing Systems, Technologies, and Procedures	746
8.3.3.2	Evaluation and Selection of New Systems	750
8.3.3.3	Planned Improvements	751
8.3.3.4	Evaluating Mitigation Initiatives	752
8.3.3.5	Enterprise System for Grid Monitoring	753
8.3.4	Ignition Detection Systems	755
8.3.4.1	Existing Ignition Detection Sensors and Systems	755
8.3.4.2	Evaluation and Selection of New Detection Systems	759
8.3.4.3	Planned Integration of New Ignition Detection Technologies	760
8.3.4.4	Evaluating Mitigation Initiatives	762
8.3.4.5	Enterprise System for Ignition Detection	762
8.3.5	Weather Forecasting	764
8.3.5.1	Existing Modeling Approach	764
8.3.5.2	Known Limitations of Existing Approach	770
8.3.5.3	Planned Improvements	771

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.3.5.4	Evaluating Mitigation Initiatives	773
8.3.5.5	Enterprise System for Weather Forecasting	773
8.3.6	Fire Potential Index	775
8.3.6.1	Existing Calculation Approach and Use	775
8.3.6.2	Known Limitations of Existing Approach	781
8.3.6.3	Planned Improvements	781
8.4	Emergency Preparedness	782
8.4.1	Overview	782
8.4.1.1	Objectives	784
8.4.1.2	Targets	791
8.4.1.3	Performance Metrics	794
8.4.2	Emergency Preparedness Plan	797
8.4.2.1	Overview of Wildfire and PSPS Emergency Preparedness	798
8.4.2.2	Key Personnel, Qualifications, and Training	810
8.4.2.2.1	Personnel Qualifications	810
8.4.2.2.2	Personnel Training	823
8.4.2.2.3	External Contractor Training	827
8.4.2.3	Drills, Simulations, and Tabletop Exercises	829
8.4.2.3.1	Internal Exercises	829
8.4.2.3.2	External Exercises	837
8.4.2.4	Schedule for Updating and Revising Plan	844
8.4.3	External Collaboration and Coordination	845
8.4.3.1	Emergency Planning	845

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

8.4.3.2	Communication Strategy with Public Safety Partners	849
8.4.3.3	Mutual Aid Agreements	853
8.4.4	Public Emergency Communication Strategy	856
8.4.4.1	Protocols for Emergency Communications	858
8.4.4.2	Messaging	861
8.4.4.3	Current Gaps and Limitations	863
8.4.5	Preparedness and Planning for Service Restoration	864
8.4.5.1	Overview of Service Restoration Plan	864
8.4.5.2	Planning and Allocation of Resources	867
8.4.5.3	Drills, Simulations, and Tabletop Exercises	870
8.4.5.3.1	Internal Exercises	871
8.4.5.3.2	External Exercises	873
8.4.6	Customer Support in Wildfire and PSPS Emergencies	875
8.5	Community Outreach and Engagement	881
8.5.1	Overview	881
8.5.1.1	Objectives	882
8.5.1.2	Targets	887
8.5.1.3	Performance Metrics Identified by the Electrical Corporation	892
8.5.2	Public Outreach and Education Awareness Program	894
8.5.3	Engagement With Access and Functional Needs Populations	902
8.5.4	Collaboration on Local Wildfire Mitigation Planning	909
8.5.5	Best Practice Sharing with Other Electrical Corporations	911

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

9	Public Safety Power Shutoff	913
9.1	Overview	913
9.1.1	Key PSPS Statistics	914
9.1.2	Identification of Frequently De-Energized Circuits	915
9.1.3	Objectives	920
9.1.4	Targets.....	924
9.1.5	Performance Metrics Identified by the Electrical Corporation	927
9.2	Protocols on PSPS.....	930
9.2.1	Risk Thresholds (e.g., WS, FPI, etc.) and Decision-Making Process That Determine the Need for a PSPS.	930
	Critical Issue RN-PG&E-23-08	939
9.2.2	Method Used to Compare and Evaluate the Relative Consequences of PSPS and Wildfires	942
9.2.3	Outline of Tactical and Strategic Decision-Making Protocol for Initiating a PSPS/PSPS (Such as Decision Tree)	945
9.2.4	Protocols for Mitigating the Public Safety Impacts of PSPS, Including Impacts on First Responders, Health Care Facilities, Operators of Telecommunications Infrastructure, and Water Electrical Corporations/Agencies	948
9.3	Communication Strategy for PSPS	950
9.4	Key Personnel, Qualifications, and Training for PSPS	950
9.5	Planning and Allocation of Resources for Service Restoration Due to PSPS	951
10.	Lessons Learned	953
11.	Corrective Action Program.....	965
12.	Notices of Violation and Defect.....	975

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

Appendix A – Definitions	978
Appendix A.1 – Energy Safety Definition of Terms	978
Appendix A.2 – Definitions of Initiatives – by Category	990
Appendix A.3 – PG&E Glossary of Additional Defined Terms	997
Appendix B – Supporting Documentation for Risk Methodology and Assessment	
Definitions	1003
Appendix B.1 – Summary Documentation	1003
Appendix B.2 – High-Level Bow Tie Schematics	1004
Appendix B.3 – High-Level Calculation Procedure Schematic	1007
Appendix B.3.1 – Ignition Probability Calculation Procedure Schematic	1008
Appendix B.3.2 – Wildfire Consequence Calculation Procedure Schematics	1008
Appendix B.4 – High-Level Narrative Describing the Calculation Procedure	1011
Appendix C – Additional Maps	1019
Appendix D – Areas for Continued Improvement	1022
PG&E provided responses to ACIs from the 2023 WMP Decision in Section B.5 of the 2025 WMP Update. Please refer to the 2025 WMP Update for more information.	1022
ACI PG&E-22-01 – Prioritized List of Wildfire Risks and Drivers	1022
ACI PG&E-22-02 – Collaboration and Research in Best Practices in Integrating Climate Change Impacts and Wildfire Risk and Consequence Modeling.....	1025
ACI PG&E-22-03 – Inclusion of Community Vulnerability in Consequence Modeling	1027
ACI PG&E-22-04 – Fire Suppression Considerations	1028
ACI PG&E-22-05 – 8-Hour Fire Spread Simulations	1029

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

ACI PG&E-22-06 – Addressing Increase in Risk Events	1030
ACI PG&E-22-07 – Applying Modeling Lessons – Learned from Third-Party Review.....	1032
ACI PG&E-22-08 – Better Application of Specific Lessons Learned From Utility-Caused Fires	1035
ACI PG&E-22-09 – Evaluation of Model Reprioritization and Fire Rebuild in High-Risk Areas	1052
ACI PG&E-22-10 – Justification of Weather Station Network Density	1061
ACI PG&E-22-11 – Covered Conductor Effectiveness Lessons Learned.....	1064
ACI PG&E-22-12 – Covered Conductor Inspection and Maintenance.....	1072
ACI PG&E-22-13 – New Technologies Evaluation and Implementation	1074
ACI PG&E-22-14 – Decreased Transmission Hardening Targets	1075
ACI PG&E-22-15 – Decreased Transmission/Distribution Sectionalization Device Targets	1077
ACI PG&E-22-16 – Progress and Updates on Undergrounding and Risk Prioritization	1078
ACI PG&E-22-17 – Future Quantitative Targets to Reduce the Backlog of Repairs.....	1080
ACI PG&E-22-18 – Retainment of Inspectors and Internal Workforce Development.....	1081
ACI PG&E-22-19 – Benchmarking With Other Utilities on Inspector Qualifications.....	1083
ACI PG&E-22-20 – Asset Inspection Drone Program Pilot.....	1085
ACI PG&E-22-21 – Asset Inspections QA/QC.....	1099
ACI PG&E-22-22 – Progress on Meeting Asset Inspection Regulatory Requirements.....	1103
ACI PG&E-22-23 – Reduce Necessity for the Utility Defensible Space Program	1104

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

ACI PG&E-22-24 – Progression of Vegetation Management Maturity	1105
ACI PG&E-22-25 – External Engagement for Vegetation Management	1106
ACI PG&E-22-26 – Auditing of Internal Pre-Inspectors	1107
ACI PG&E-22-27 – Vegetation Management Wildfire Inspection Guide – Stakeholder Engagement	1108
ACI PG&E-22-28 – Progression of Effectiveness of Enhanced Clearances Joint Study	1109
ACI PG&E-22-29 – Participation in Vegetation Management Best Management Practices Scoping Meeting	1123
ACI PG&E-22-30 – Response Operations for Potential Fault/Outages in its Highest Risk Areas	1124
ACI PG&E-22-31 – PSPS Wind Threshold Change Evaluations	1125
ACI PG&E-22-32 – Updates on EPSS Reliability Study	1130
ACI PG&E-22-33 – Progress on Filling Asset Inventory Data Gaps	1133
ACI PG&E-22-34 – Revise Process of Prioritizing Wildfire Mitigations	1136
ACI PG&E-22-35 – Quantify Mitigation Benefits of Reducing PSPS Scale, Scope, and Frequency	1140
Appendix E – Referenced Regulations, Codes, and Standards	1145
Appendix F – Supporting Documentation for Non-Risk Sections (Overflow Tables)	1162
Appendix F.1 – 1. Executive Summary	1162
Appendix F.2 – 5. Overview of Service Territory	1166
Appendix F.2.1 – 5.3.1 Fire Ecology	1166
Appendix F.3 – 8. Mitigation Initiatives	1169
Appendix F.3.1 – 8.4 Emergency Preparedness	1169
Appendix F.3.2 – 8.5 Community Outreach and Engagement	1475
Appendix F.4: 9. Public Safety Power Shutoff	1521

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

TABLE OF CONTENTS
(CONTINUED)

Appendix F.4.1: 9.1.2 Identification of Frequently De-Energized Circuits.....	1521
Appendix F.5 – Appendix D Areas of Continued Improvement.....	1600
Appendix F.5.1 – PG&E-22-33 Progress on Filling Asset Inventory Data Gaps.....	1600
Appendix G – All Other Supporting Documentation	1620
Appendix H – List of Acronyms and Abbreviations.....	1622
Appendix I – Confidential Information.....	1636

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES

TABLE OF CRITICAL ISSUES CRITICAL ISSUES IDENTIFIED BY THE OFFICE OF ENERGY INFRASTRUCTURE SAFETY RELATED TO PG&E'S 2023-2025 WMP	xli
TABLE PG&E-2-1: PROGRAM OWNERS FOR EACH COMPONENT OF PLAN	15
TABLE 3-1: STATUTORY REQUIREMENTS CHECKLIST	62
TABLE 4-1: SUMMARY OF WMP EXPENDITURES	73
TABLE 4-2: THE COMPONENTS OF PG&E'S RISK-INFORMED APPROACH	77
TABLE 5-1: SERVICE TERRITORY HIGH LEVEL STATISTICS.....	82
TABLE 5-2: ELECTRICAL INFRASTRUCTURE	84
TABLE 5-3: EXISTING VEGETATION TYPES IN THE SERVICE TERRITORY	87
TABLE 5-4: UTILITY-RELATED CATASTROPHIC WILDFIRES WITHIN PG&E'S SERVICE TERRITORY.....	100
TABLE 5-5: PG&E'S SERVICE TERRITORY IN THE HFTD TIER 1, TIER 2, AND TIER 3 AS OF DECEMBER 2022	103
TABLE PG&E-5.4.1-1: SQUARE MILES IN PG&E'S SERVICE TERRITORY CORRESPONDING TO POPULATION DENSITY OF HIGHLY RURAL, RURAL, AND URBAN CUSTOMERS (SUM OF SQUARE MILES).....	121
TABLE PG&E-5.4.2-1: SQUARE MILES IN PG&E'S SERVICE TERRITORY CORRESPONDING TO POPULATION DENSITY OF WUI (SUM OF SQUARE MILES)	122
TABLE PG&E-5.4.3-1: DISTRIBUTION OF PEOPLE AT RISK IN PG&E'S SERVICE TERRITORY	125
TABLE PG&E-5.4.4-1: PG&E'S CFI CUSTOMER COUNTY BY TIER 3, TIER 2, AND NON-HFTD	132
TABLE 5-6: RELEVANT STATE AND FEDERAL ENVIRONMENTAL LAWS, REGULATIONS, AND PERMITTING REQUIREMENTS FOR IMPLEMENTING THE WMP	134
TABLE 6-1: PG&E RISK MODELS	145
TABLE PG&E-6.2-1: ADDRESSING KEY LIKELIHOOD AND CONSEQUENCES IN RISK MODELS.....	153
TABLE PG&E-6.2.1-1: WDRM v3 SUBSET CHARACTERISTICS	159

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE PG&E-6.2.1-2: WDRM v3 TARGET DATASET	160
TABLE PG&E-6.2.2-1: WILDFIRE CONSEQUENCE FPI MODEL	174
TABLE PG&E-6.2.2-2: CRITICAL CUSTOMER WEIGHTINGS	176
TABLE PG&E-6.2.2-3: VM AND SYSTEM HARDENING COMPOSITING	179
TABLE 6-2: RISK MODELING ASSUMPTIONS AND LIMITATIONS	183
TABLE 6-3: SUMMARY OF DESIGN BASIS SCENARIOS	191
TABLE 6-4: EXAMPLE OF EXTREME EVENT SCENARIOS UNDER CONSIDERATION	193
TABLE 6-5: PG&E'S TOP RISK CIRCUIT SEGMENTS	203
TABLE 6-5.B: PG&E'S TOP RISK CIRCUIT SEGMENTS – 2025 UPDATE	205
TABLE 6-6: SUMMARY OF KEY METRICS BY STATISTICAL FREQUENCY FOR 2022 BY QUARTER	207
TABLE PG&E-6.6.2-1: WDRM MODEL DEVELOPMENT PROCESS	218
TABLE 6-7: PG&E'S RISK ASSESSMENT IMPROVEMENT PLAN	221
TABLE 7-1: STAKEHOLDER ROLES AND RESPONSIBILITIES IN DECISION MAKING PROCESS	237
TABLE 7-2: PRIORITIZED AREAS IN PG&E'S SERVICE TERRITORY BASED ON OVERALL UTILITY RISK	246
TABLE PG&E-7.1.4-1: MAPPING MITIGATION INITIATIVES TO WILDFIRE RISK DRIVER – MITIGATIONS DESIGNED TO REDUCE FREQUENCY OF RISK EVENTS	256
TABLE PG&E-7.1.4-2: MAPPING MITIGATION INITIATIVES TO WILDFIRE OUTCOMES – MITIGATIONS DESIGNED TO REDUCE RISK EVENT CONSEQUENCES	257
TABLE PG&E-7.1.4-3: MAPPING RISK DRIVERS, INITIATIVES AND CROSS DRIVERS	257
REVISED TABLE 7-3-1: PG&E'S WMP OBJECTIVES	289
TABLE 8-21: SITUATIONAL AWARENESS INITIATIVE OBJECTIVES (3-YEAR PLAN)	302

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE 8-22: SITUATIONAL AWARENESS INITIATIVE OBJECTIVES (10-YEAR PLAN).....	303
TABLE 8-21 (REVISED): REVISED SITUATIONAL AWARENESS INITIATIVE OBJECTIVES (3-YEAR PLAN)	306
TABLE 8-22 (REVISED): REVISED SITUATIONAL AWARENESS INITIATIVE OBJECTIVES (10-YEAR PLAN)	309
TABLE 8-23 (REVISED): REVISED SITUATIONAL AWARENESS INITIATIVE TARGETS BY YEAR.....	311
TABLE 8-33: EMERGENCY PREPAREDNESS INITIATIVE OBJECTIVES (3-YEAR PLAN).....	313
TABLE 8-34: EMERGENCY PREPAREDNESS INITIATIVE OBJECTIVES (10-YEAR PLAN).....	314
TABLE 8-33 (REVISED): REVISED EMERGENCY PREPAREDNESS INITIATIVE OBJECTIVES (3-YEAR PLAN)	317
TABLE 8-34 (REVISED): REVISED EMERGENCY PREPAREDNESS INITIATIVE OBJECTIVES (10-YEAR PLAN)	318
TABLE 8-53: COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (3-YEAR PLAN)	320
TABLE RN-PG&E-8-54: COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (10-YEAR PLAN)	321
TABLE 8-53 (REVISED): REVISED COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (3-YEAR PLAN)	324
TABLE PG&E-8-54 (REVISED): REVISED COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (10-YEAR PLAN).....	325
TABLE PG&E-9-3: PSPS INITIATIVE OBJECTIVES (3-YEAR PLAN)	327
TABLE PG&E 9-4: PSPS INITIATIVE OBJECTIVES (10-YEAR PLAN)	328
TABLE PG&E-9-3 (REVISED): REVISED PSPS INITIATIVE OBJECTIVES (3-YEAR PLAN).....	331

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE PG&E-9-4 (REVISED): REVISED PSPS INITIATIVE OBJECTIVES (10-YEAR PLAN).....	332
REVISED TABLE 7-3-2: PG&E'S WMP TARGETS	334
TABLE PG&E-7.2.2-1: RISK MODEL USED TO CALCULATE RISK REDUCTION FOR INDIVIDUAL INITIATIVES	353
TABLE PG&E-7.2.2-2: EXAMPLE CALCULATION – EYES-ON-RISK RELATED TO INSPECTION PROGRAMS	354
TABLE PG&E-7.2.2-3: EXAMPLE CALCULATION – OPERATIONAL MITIGATION	355
TABLE PG&E-7.2.2-4: EXAMPLE CALCULATION – SYSTEM RESILIENCE MITIGATION	356
TABLE PG&E-7.2.2-5: EXAMPLE CALCULATION – RISK REDUCTION RELATED TO REPLACEMENT AND MAINTENANCE BACKLOG PROGRAMS	358
TABLE 7-4: SUMMARY OF RISK REDUCTION FOR TOP RISK CIRCUIT SEGMENTS	360
REVISED TABLE 8-1: GRID DESIGN, OPERATIONS, AND MAINTENANCE OBJECTIVES (3-YEAR PLAN)	374
REVISED TABLE 8-2: GRID DESIGN, OPERATIONS, AND MAINTENANCE OBJECTIVES (10-YEAR PLAN)	377
REVISED TABLE 8-3: GRID DESIGN, OPERATIONS, AND MAINTENANCE TARGETS BY YEAR.....	381
TABLE 8-4: ASSET INSPECTIONS TARGETS BY QUARTER.....	394
TABLE 8-5: GRID DESIGN, OPERATIONS, AND MAINTENANCE PERFORMANCE METRICS RESULTS BY YEAR	397
UPDATED TABLE PG&E-8.1.2-1: OVERALL SYSTEM HARDENING MILEAGE FORECAST	402
UPDATED TABLE PG&E-8.1.2-2: PG&E UNDERGROUNDING MILEAGE FORECAST	408

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE PG&E-8.1.2-3: PG&E UNDERGROUNDING WORKPLAN 2023-2026 (DATA AS OF 6/26/24 TO REFLECT 2024 WMP CHANGE ORDER AND 2025 WMP UPDATE)	410
TABLE RN-PG&E-23-05-1: CIRCUIT SEGMENTS IN THE 2022 WMP UNDERGROUNDING WORKPLAN, BUT NOT LISTED IN THE 2023-2026 UNDERGROUNDING WORKPLAN.....	414
TABLE SRN-PG&E-23-05-2: COMPARING A 10,000 MILE PORTFOLIO SELECTED BASED ON RISK AND A PORTFOLIO INCORPORATING FEASIBILITY	419
TABLE RN-PG&E-23-05-2: PG&E'S UNDERGROUNDING WORKPLAN FOR TOP 20 PERCENT WFE COMPARED TO RISK MODEL OUTPUT (DATA AS OF 6/26/24 TO REFLECT 2024 WMP CHANGE ORDER AND 2025 WMP UPDATE)	422
TABLE RN-PG&E-23-05-3: EXAMPLE WCBA OUTPUT (MILLIONS OF DOLLARS)	427
TABLE SRN-PG&E-23-05-4: RESULTS OF ALTERNATIVE MITIGATION ANALYSIS 2023-2024 UNDERGROUNDING PROJECTS SELECTED USING WDRM V3	436
UPDATED TABLE PG&E-8.1.2-4: OVERALL SYSTEM HARDENING MILEAGE FORECAST.....	460
TABLE 8-6: ASSET INSPECTION FREQUENCY, METHOD, AND CRITERIA	474
TABLE PG&E-8.1.3-1: SUBSTATION INSPECTION TARGETS	500
TABLE 8-7-1 (REVISED): REVISED GRID DESIGN AND MAINTENANCE SYSTEM INSPECTION QA PROGRAM.....	531
TABLE 8-7-2 (REVISED): REVISED GRID DESIGN AND MAINTENANCE SYSTEM INSPECTION QC PROGRAM	534
TABLE RN-PG&E-23-02-1: GRID DESIGN AND MAINTENANCE SYSTEM INSPECTION QC PROGRAM PERFORMANCE.....	535
TABLE 8-8-1: NUMBER OF PAST DUE ASSET WORK ORDERS CATEGORIZED BY AGE (AS OF JANUARY 3, 2023).....	537
TABLE PG&E-8.1.7-1: ELECTRIC NOTIFICATIONS PRIORITY LEVELS	540

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE SRN-PG&E-23-04-1: COMPARISON OF TARGETED RISK REDUCTION FOR BUNDLING PLAN.....	544
TABLE RN-PG&E-23-04-1: 2023-2029 MAINTENANCE EXECUTION PLAN IN THE HFTD/HFRA ^{(a)(e)}	547
TABLE RN-PG&E-23-04-2: REVISED DISTRIBUTION OPEN TAG REDUCTION TARGETS BY YEAR.....	549
TABLE RN-PG&E-23-04-3: EXAMPLES OF FDA IGNITION RISK MAPPING	551
TABLE RN-PG&E-23-04-4: TAG FIND RATES, GROUND DETAILED INSPECTIONS (DATA AS OF 6/30/23).....	556
TABLE RN-PG&E-23-04-5: DRIVERS OF INCREASED FIND RATES, E TAGS IN THE HFTD	558
TABLE RN-PG&E-23-04-6: 2023-2025 FORECAST TAGS CREATED.....	559
TABLE RN-PG&E-23-04-7: 2023-2029 FORECAST FINDS BY INSPECTION TYPE	561
TABLE PG&E-8.1.7-2 (REVISED): REVISED ADDRESSING INFRACTIONS FOUND DURING INSPECTIONS.....	562
TABLE RN-PG&E-23-04-8: 2023-2029 RESOURCE ESTIMATES	563
TABLE PG&E-8.1.7-5: DISTRIBUTION SYSTEM WORK ORDERS OPENED/CLOSED IN 2022 BY QUARTER.....	565
TABLE PG&E-8.1.7-6: HFTD/HFRA DISTRIBUTION WORK ORDERS OPENED/CLOSED IN 2022 BY QUARTER.....	565
TABLE PG&E-8.1.7-7 NUMBER OF PAST DUE ASSET WORK ORDERS CATEGORIZED BY AGE (AS OF JANUARY 1, 2023)	567
TABLE PG&E-8.1.8-1: WILDFIRE RISK LEVELS.....	570
TABLE PG&E-8.1.8-2: SUMMARY OF EPSS CAPABLE MILES.....	572
TABLE RN-PG&E-23-03-1: COMPARING EPSS RESOURCES TO OTHER MITIGATION PROGRAMS	576
TABLE RN-PG&E-23-03-2: MITIGATION PRIORITIZATION CONSIDERING EPSS RISK.....	577

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE PG&E-8.1.8-3: WILDFIRE RISK LEVELS.....	586
TABLE PG&E-8-9: WORKFORCE PLANNING, ASSET INSPECTIONS.....	591
TABLE 8-10: WORKFORCE PLANNING, GRID HARDENING	596
TABLE 8-11: WORKFORCE PLANNING, RISK EVENT INSPECTION.....	601
REVISED TABLE 8-12: VEGETATION MANAGEMENT IMPLEMENTATION OBJECTIVES (3-YEAR PLAN)	606
REVISED TABLE 8-13: VEGETATION MANAGEMENT IMPLEMENTATION OBJECTIVES (10-YEAR PLAN)	607
REVISED TABLE 8-14: REVISED PG&E VM TARGETS	616
REVISED TABLE 8-15: REVISED VEGETATION INSPECTIONS TARGETS BY YEAR	623
TABLE 8-16: VM AND INSPECTION PERFORMANCE METRICS RESULTS BY YEAR	628
REVISED TABLE 8-17: VM INSPECTION FREQUENCY, METHOD, AND CRITERIA	630
TABLE RN-PG&E-23-07-1: PLANNED FTI SCHEDULE OF ACTIVITIES 2023-2025	635
TABLE RN-PG&E-23-07-2: FTI PROGRAM TARGET 2023-2025.....	637
TABLE RN-PG&E-23-07-3: PROGRAM STRUCTURE PG&E, SCE, AND SDG&E .	640
TABLE SRN-PG&E-23-07-4: PLANNED ENHANCEMENTS TO VEGETATION MANAGEMENT PROCESSES AND TOOLS.....	655
TABLE RN-PG&E-23-07-4: TRI RESIDUAL RISK	657
TABLE RN-PG&E-23-07-5: RISK REDUCTION OF EVM COMPARED TO FTI AND VMOM	659
TABLE PG&E-8.2.2-1: 2023 SUBSTATION DEFENSIBLE SPACE INSPECTIONS	683
TABLE PG&E-8.2.3-1: RADIAL CLEARANCES, GO 95, APPENDIX E.....	690
TABLE 8-18-1 (REVISED): REVISED VEGETATION MANAGEMENT QA PERFORMANCE (FORMERLY QV) PROGRAM	705
TABLE: 8-18-2 (REVISED): VEGETATION MANAGEMENT QC PERFORMANCE...	709

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE RN-PG&E-23-02-2: VEGETATION MANAGEMENT QC PROGRAM.....	710
TABLE 8-18-3: VM FIELD QC METRICS REPORT.....	712
TABLE 8-19: PRIORITY 1/PRIORITY 2 AND SECOND PATROL TREES CATEGORIZED BY AGE	714
TABLE 8-20: VM INSPECTIONS AND MANAGEMENT PROJECTS – QUALIFICATIONS AND TRAINING.....	717
TABLE PG&E-8.2.7-1: PG&E VMI BASIC WEB-BASED COURSES.....	720
REVISED TABLE 8-21: SITUATIONAL AWARENESS INITIATIVE OBJECTIVES (3-YEAR PLAN)	725
REVISED TABLE 8-23: SITUATIONAL AWARENESS INITIATIVE TARGETS BY YEAR	732
TABLE 8-24: SITUATIONAL AWARENESS AND FORECASTING PERFORMANCE METRICS RESULTS BY YEAR	735
TABLE 8-25: ENVIRONMENTAL MONITORING SYSTEMS.....	737
TABLE 8-26: PLANNED IMPROVEMENTS TO ENVIRONMENTAL MONITORING SYSTEMS	745
TABLE 8-27: GRID OPERATION MONITORING SYSTEMS	747
TABLE 8-28: PLANNING IMPROVEMENTS TO GRID OPERATION MONITORING SYSTEMS	752
TABLE 8-29: FIRE DETECTION SYSTEMS CURRENTLY DEPLOYED.....	756
TABLE 8-30: EXAMPLE OF PLANNING IMPROVEMENTS TO FIRE DETECTION AND ALARM SYSTEMS	761
TABLE PG&E-8.3.5-1: WEATHER VARIABLES	768
TABLE 8-31: PLANNED IMPROVEMENTS TO WEATHER FORECASTING SYSTEMS	772
TABLE 8-32: FIRE POTENTIAL INDEX MODEL FEATURES	779
TABLE PG&E-8.4.1-1 EXAMPLE ROTATING EOC TEAM SCHEDULE	783
REVISED TABLE 8-33: EMERGENCY PREPAREDNESS INITIATIVE OBJECTIVES (3-YEAR PLAN)	787

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

REVISED TABLE PG&E-8-34: EMERGENCY PREPAREDNESS INITIATIVE OBJECTIVES (10-YEAR PLAN)	789
TABLE 8-35: EMERGENCY PREPAREDNESS INITIATIVE TARGETS BY YEAR ..	793
TABLE 8-36: EMERGENCY PREPAREDNESS PERFORMANCE METRICS RESULTS BY YEAR	796
TABLE PG&E-8.4.2-1: INCIDENT CLASSIFICATION SCALE	800
TABLE 8-37: KEY GAPS AND LIMITATIONS IN INTEGRATING WILDFIRE AND PSPS SPECIFIC STRATEGIES INTO EMERGENCY PLAN	809
TABLE 8-38: EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS	813
TABLE 8-39: PG&E'S PERSONNEL TRAINING PROGRAMS FOR WILDFIRE AND PSPS EVENTS	825
TABLE PG&E-8-40: CONTRACTOR TRAINING PROGRAM	828
TABLE 8-41: INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM	832
TABLE 8-42: EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM	839
TABLE 8-44: PG&E'S STATE AND LOCAL AGENCY COLLABORATIONS	848
TABLE 8-45: KEY GAPS AND LIMITATIONS IN COLLABORATION ACTIVITIES WITH STATE AND LOCAL AGENCIES	848
TABLE 8-46: HIGH-LEVEL COMMUNICATION PROTOCOLS, PROCEDURES, AND SYSTEMS WITH PUBLIC SAFETY PARTNERS	852
TABLE 8-47: KEY GAPS AND LIMITATIONS IN COMMUNICATION COORDINATION WITH PUBLIC SAFETY PARTNERS	852
TABLE 8-48: PG&E'S MUTUAL AID AGREEMENTS FOR RESOURCES DURING A WILDFIRE OR DE-ENERGIZATION INCIDENT	855
TABLE 8-49: PG&E'S PROTOCOLS FOR EMERGENCY COMMUNICATION TO STAKEHOLDER GROUPS	860

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE 8-50: KEY GAPS AND LIMITATIONS IN PG&E'S PUBLIC EMERGENCY COMMUNICATION STRATEGY	863
TABLE 8-51: INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM FOR SERVICE RESTORATION.....	872
TABLE 8-52: EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM FOR SERVICE RESTORATION.....	874
REVISED TABLE 8-53: COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (3-YEAR PLAN)	885
REVISED TABLE PG&E-8-54: COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (10-YEAR PLAN)	886
TABLE 8-55: COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE TARGETS BY YEAR.....	889
TABLE 8-56: COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE TARGETS BY QUARTER.....	889
TABLE PG&E-8.5.1-1: AVAILABLE LANGUAGES FOR SURVEY	890
TABLE 8-57: COMMUNITY OUTREACH AND ENGAGEMENT PERFORMANCE METRICS RESULTS BY YEAR	893
TABLE 8-58: PG&E'S LIST OF TARGET COMMUNITIES	896
TABLE 8-60: PG&E'S COMMUNITY OUTREACH AND EDUCATION PROGRAMS	900
TABLE PG&E-8.5.3-1: IDENTIFYING AFN CUSTOMERS	903
TABLE 8-61: COLLABORATION IN LOCAL WILDFIRE MITIGATION PLANNING ..	910
TABLE 8-62: KEY GAPS AND LIMITATIONS IN COLLABORATING ON LOCAL WILDFIRE MITIGATION PLANNING	910
TABLE 8-63: SHARING BEST PRACTICES WITH OTHER UTILITIES	912
TABLE 9-1: PSPS EVENT STATISTICS.....	914
TABLE 9-2: LIST OF FREQUENTLY DE-ENERGIZED CIRCUITS	917
REVISED TABLE PG&E-9-3: PSPS INITIATIVE OBJECTIVES (3-YEAR PLAN)	922
REVISED TABLE PG&E-9-4: PSPS INITIATIVE OBJECTIVES (10-YEAR PLAN) ..	923

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE PG&E-9-5: PSPS TARGETS	926
TABLE 9-6: PROPOSED PSPS PERFORMANCE METRICS RESULTS BY YEAR	929
TABLE PG&E-9.2.2-1: PSPS RISK BENEFIT CONSEQUENCE MODELING CONSIDERATIONS	944
TABLE 10-1: LESSONS LEARNED	957
TABLE 12-1: LIST OF OPEN COMPLIANCE VIOLATIONS AND DEFECTS	976
TABLE PG&E-A-1: DEFINITION OF TERMS – ALPHABETICAL BY TERM	978
TABLE PG&E-A-2: DEFINITIONS OF INITIATIVES – BY CATEGORY	990
TABLE PG&E-A-3: PG&E GLOSSARY OF ADDITIONAL DEFINED TERMS – ALPHABETICAL BY TERM.....	997
TABLE PG&E-C-1: LIST OF GEOSPATIAL DATASETS	1020
TABLE PG&E-22-01-1: WILDFIRE RISK DRIVERS	1024
TABLE PG&E-22-06-1: CPUC-REPORTABLE FIRE IGNITIONS – COMPARING 2022 TO 3-YEAR AVERAGE (2019-2021).....	1031
TABLE PG&E-22-07-1: E3 IDENTIFIED AREAS FOR IMPROVEMENT	1034
TABLE PG&E-22-08-1: LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES.....	1036
TABLE PG&E-22-11-1: COVERED CONDUCTOR EFFECTIVENESS STUDY LESSONS LEARNED – GOALS AND TIMELINES.....	1065
TABLE PG&E-22-11-2: PRELIMINARY RECORDED EFFECTIVENESS ANALYSIS	1068
TABLE PG&E-22-11-3: 2022 COVERED CONDUCTOR SUMMARY	1071
TABLE PG&E-22-20-1: FIND RATES BY PRIORITY FOR GROUND AND AERIAL	1091
TABLE PG&E-22-20-2: TOP FDAs FOR DRONE ONLY AND CORRESPONDING GROUND INSPECTIONS (ALL TAG PRIORITIES).....	1093
TABLE PG&E-22-21-1: ASSET INSPECTION – 2022 QC AUDIT RESULTS AND 2023-2025 YTD PASS RATES	1099

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE PG&E-22-21-2: QUALITY MANAGEMENT – 2022 QUALITY VERIFICATION TRANSMISSION AND DISTRIBUTION SI AUDIT RESULTS.....	1100
TABLE PG&E-22-28-1: SCE – AVERAGE EVENTS PRE- AND POST-ENHANCED CLEARANCES	1120
TABLE PG&E-22-35-1: PSPS EVENTS LOOKBACK ANALYSIS	1142
TABLE PG&E-22-35-2: TARGET REDUCTIONS AS A RESULT OF PG&E’S WMP MITIGATIONS	1143
REVISED TABLE PG&E-E-1: LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND OTHER REFERENCED DOCUMENTS	1145
TABLE PG&E-1.1-1: PG&E’S PERFORMANCE AGAINST 2020-2022 QUANTITATIVE WMP INITIATIVE TARGETS	1163
TABLE PG&E-5.3.1-1: LIST OF DOCUMENTS REFERENCED IN THE FIRE ECOLOGY DISCUSSION	1167
TABLE PG&E-8.4.2-2: EMERGENCY OPERATIONS CENTER POSITION REQUIRED TRAINING MATRIX – OCTOBER 1, 2022	1170
TABLE PG&E-8.4.2-3: MYTEP APRIL TO JUNE 2022 WILDFIRE AND PSPS EXERCISES.....	1174
TABLE PG&E-8.4.2-4: COMPANY EMERGENCY RESPONSE PLAN (CERP) ANNEX MAINTENANCE AND DEADLINES	1175
TABLE PG&E-8.4.2-5: 2020 CERP CHANGE RECORD	1176
TABLE 8-43: WILDFIRE-SPECIFIC UPDATES TO THE EMERGENCY PREPAREDNESS PLAN	1187
TABLE 8-44: STATE AND LOCAL AGENCY COLLABORATION(S).....	1203
TABLE 8-46: HIGH-LEVEL COMMUNICATION PROTOCOLS, PROCEDURES, AND SYSTEMS WITH PUBLIC SAFETY	1226
TABLE 8-59: PG&E’S LIST OF COMMUNITY PARTNERS.....	1476
TABLE 8-61: COLLABORATION IN LOCAL WILDFIRE MITIGATION PLANNING	1483
TABLE 8-63: SHARING BEST PRACTICES WITH OTHER UTILITIES	1514

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF TABLES
(CONTINUED)

TABLE 9-2: LIST OF FREQUENTLY DE-ENERGIZED CIRCUITS	1522
TABLE PG&E-22-33-1: CURRENT FILL RATES	1601
TABLE PG&E-22-33-2: ASSET DATA MANAGEMENT PROGRAMS	1602
TABLE PG&E-22-33-3: IN-PROGRESS ASSET DATA QUALITY PROJECTS	1605
SUPPLEMENTAL TABLE PG&E-22-33-4: ID 180, TRANSMISSION AFL BUILD 2022 (AIC)	1614
SUPPLEMENTAL TABLE PG&E-22-33-5: DATA QUALITY PROJECTS COMPLETED IN 2022	1616
SUPPLEMENTAL TABLE PG&E-22-33-6: ID 42, PT&T AGE DATA CORRECTIONS	1618
REVISED TABLE PG&E-G-1 9: OTHER SUPPORTING DOCUMENTATION	1620
REVISED TABLE PG&E-H-1: LIST OF ACRONYMS AND ABBREVIATIONS	1622
TABLE 8-44: STATE AND LOCAL AGENCY COLLABORATIONS (CONFIDENTIAL)	1637
TABLE 8-46: HIGH-LEVEL COMMUNICATION PROTOCOLS, PROCEDURES, AND SYSTEMS WITH PUBLIC SAFETY	1669

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES

FIGURE PG&E-1.1-1: PG&E'S 2020-2022 WMP OVERALL OBJECTIVES AND RISK MITIGATION STRATEGY COMPONENTS	6
FIGURE PG&E-1.2-1: PG&E'S 2023-2025 WMP FRAMEWORK AND OBJECTIVES	10
FIGURE PG&E-4.3-1: SUMMARY OF WMP EXPENDITURES.....	74
FIGURE PG&E-5.1-1: POPULATION DENSITY MAP OF HIGHLY RURAL, RURAL, AND URBAN CUSTOMERS	83
FIGURE PG&E-5.3.1-1: PROPORTIONS OF PG&E SERVICE TERRITORY OCCUPIED BY EXISTING VEGETATION TYPES, AGGREGATED BY PFR GROUP	94
FIGURE PG&E-5.3.1-2: FRIs FOR PRE-EURO AMERICAN FIRE REGIME GROUPS (A)	95
FIGURE 5.3.2-1: UTILITY-RELATED CATASTROPHIC WILDFIRES WITHIN PG&E'S SERVICE TERRITORY MAP	101
FIGURE PG&E-5.3.3-1: HFTD TIER 2 AND TIER 3, AND PG&E's HFRA, NOVEMBER 2022	104
FIGURE 5-2-1: AVERAGE TEMPERATURE IN CALIFORNIA 1990-2020	106
FIGURE 5-2-2: MAXIMUM TEMPERATURE IN CALIFORNIA 1998-2021	107
FIGURE 5-2-3: MINIMUM TEMPERATURE IN CALIFORNIA 1998-2021	108
FIGURE 5-2-4: AVERAGE ANNUAL PRECIPITATION ACCUMULATION.....	110
FIGURE 5-2-5: NORTHERN SIERRA WATER TOTALS 1921-2021	111
FIGURE PG&E-5.3.5-1: TOPOGRAPHIC MAP OF PG&E SERVICE TERRITORY AND ADJACENT PORTIONS OF CALIFORNIA WITH GEOMORPHIC PROVINCE BOUNDARIES	119
FIGURE PG&E-5.4.2-1: POPULATION DENSITY MAP OF WILDLAND URBAN INTERFACE.....	123
FIGURE PG&E-5.4.3-1: 2020 CENSUS POPULATION.....	127
FIGURE PG&E-5.4.3-2: EXPOSURE AND SOCIAL VULNERABILITY MAP	129
FIGURE PG&E-5.4.3-3: SUBDIVISIONS WITH LIMITED EGRESS OR NO SECONDARY EGRESS.....	131

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE PG&E-5.4.4-1: CRITICAL FACILITIES COUNT BY COUNTY.....	133
FIGURE PG&E-6.1.1-1: OVERVIEW OF PG&E’S RISK MANAGEMENT PROCESS	140
FIGURE PG&E-6.1.1-2: RISK BOW-TIE FOR WILDFIRE RISK, TRANSMISSION AND DISTRIBUTION SYSTEM	142
FIGURE PG&E 6.1.1-3: RISK BOW-TIE FOR WILDFIRE RISK, HFTD DISTRIBUTION SYSTEM	142
FIGURE PG&E-6.2-1: PG&E’s RISK ANALYSIS FRAMEWORK	149
FIGURE PG&E-6.2-2: WILDFIRE DISTRIBUTION RISK ANALYSIS FRAMEWORK	150
FIGURE PG&E-6.2-3: WILDFIRE TRANSMISSION RISK ANALYSIS FRAMEWORK	151
FIGURE PG&E-6.2-4: WILDFIRE TRANSMISSION RISK MODEL	152
FIGURE 6-1: IDENTIFICATION PG&E’s OVERALL UTILITY RISK.....	155
FIGURE PG&E-6.2.1-1: PROBABILITY	156
FIGURE PG&E-6.2.1-2: PROBABILITY AND CONSEQUENCE	161
FIGURE PG&E-6.2.1-3: PSPS CONSEQUENCE MODEL	163
FIGURE 6-2-1: CALCULATING LoRE	165
FIGURE PG&E-6.2.2-1: WILDFIRE DISTRIBUTION RISK MODEL V3 INPUTS, ALGORITHMS, AND TRAINING DATA SETS	166
FIGURE PG&E-6.2.2-2: WTRM COMPONENT GROUPS.....	168
FIGURE PG&E-6.2.2-3: OVERALL FRAMEWORK OF PG&E’S WILDFIRE TRANSMISSION RISK MODEL	168
FIGURE PG&E-6.2.2-4: PSPS BACKCAST EVENTS STARTING 2010	169
FIGURE 6-2-2: CALCULATING CoRE.....	170
FIGURE PG&E-6.2.2-5: CoRE PROCESS STEPS.....	171
FIGURE PG&E-6.2.2-6: FPI R SCORE AND DESTRUCTIVE FIRE RELATIONSHIP	172

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE PG&E-6.2.2-7: TECHNOSYLVA SIMULATION AND DESTRUCTIVE FIRE RELATIONSHIP	173
FIGURE PG&E-6.2.2-8: DESTRUCTIVE POTENTIAL CLASSIFIER.....	174
FIGURE PG&E-6.2.2-9: WILDFIRE CONSEQUENCE PIXEL MAP.....	175
FIGURE PG&E-6.2.2-10: COMPOSITING MODEL SUBSET RISK.....	178
FIGURE PG&E-6.2.2-11: SYSTEM HARDENING COMPOSITE RISK.....	180
FIGURE PG&E-6.3.2-1: CLIMATE-DRIVEN RISK OF EXTREME WILDFIRE IN CALIFORNIA.....	193
FIGURE PG&E-6.4.1-1: WDRM OUTPUTS MAP	196
FIGURE PG&E-6.4.1-2: WTRM OUTPUTS MAP.....	197
FIGURE PG&E-6.6.1-1: HFRA WDRM v3 SYSTEM HARDENING BUYDOWN.....	213
FIGURE PG&E-6.6.2-1: RISK MODEL DEVELOPMENT	217
FIGURE PG&E-6.7-1: TECHNOSYLVA'S TERRAIN DIFFICULTY INDEX	224
FIGURE PG&E-6.7-2: LOCATION OF PEOPLE LIKELY TO HAVE MOBILITY ISSUES	225
FIGURE PG&E-7.1.2-1: WILDFIRE RISK GOVERNANCE STEERING COMMITTEE CHARTER.....	235
FIGURE PG&E-7.1.4-1A: DEVELOPING THE BALANCED MITIGATION PORTFOLIO	253
FIGURE PG&E-7.1.4-2: EXPOSURE AREAS AND EXAMPLES OF MITIGATION COVERAGE.....	266
FIGURE PG&E-7.1.4-3: COMPREHENSIVE MONITORING AND DATA COLLECTION MITIGATIONS IMPLEMENTATION SCHEDULE.....	267
FIGURE PG&E-7.1.4-4: OPERATIONAL MITIGATIONS IMPLEMENTATION SCHEDULES	268
FIGURE PG&E-7.1.4-5: SYSTEM RESILIENCE MITIGATIONS IMPLEMENTATION SCHEDULE.....	269
FIGURE 7-1: PROJECTED OVERALL SYSTEM TERRITORY RISK.....	351

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE PG&E-7.2.2-1b: PG&E'S OVERALL UTILITY RISK CALCULATION FRAMEWORK	353
FIGURE RN-PG&E-23-05-1: EXAMPLES OF TERRAIN FEATURES THAT IMPACT PROJECT FEASIBILITY	417
FIGURE PG&E-22-34-1: CORRELATING WILDFIRE RISK AND FEASIBILITY	418
FIGURE SRN-PG&E-23-05-3: 2023-2024 UNDERGROUNDING WORKPLAN MILES BY HIGH RISK CATEGORY	428
FIGURE SRN-PG&E-23-05-04: 2023 2024 PLANNED UNDERGROUNDING MILES BY YEAR, BY RISK MODEL/TYPE WORKPLAN AS OF 1/3/23 FILED IN THE 2023 2025 WMP	429
FIGURE SRN PG&E 23-05-5: 2023 2024 PLANNED UNDERGROUNDING MILES BY RISK MODEL/TYPE, BY YEAR WORKPLAN AS OF 1/3/23 FILED IN THE 2023 2025 WMP	430
FIGURE SRN-PG&E-23-05-06: SYSTEM HARDENING DECISION TREE.....	431
FIGURE SRN-PG&E-23-05-6A: MITIGATION DECISION TREE (1 OF 2)	432
FIGURE SRN-PG&E-23-05-6B: MITIGATION DECISION TREE (2 OF 2)	433
FIGURE SRN-PG&E-23-05-7: SAMPLE EASOP OUTPUT	434
FIGURE PG&E-8.1.3-1: TRANSMISSION OVERHEAD ASSET INSPECTION PROCESS.....	484
FIGURE PG&E-8.1.3-2: TRANSMISSION OVERHEAD CONDUCTOR INSPECTION PROCESS.....	485
FIGURE PG&E-8.1.3-3: ASSIGNING WILDFIRE CONSEQUENCE TO ASSETS AND PLAT MAPS	488
FIGURE PG&E-8.1.3-4: DISTRIBUTION ASSET INSPECTION PROCESS	496
FIGURE PG&E-8.1.3-5: DISTRIBUTION AERIAL INSPECTION PROCESS	497
FIGURE PG&E-8.1.3-6: SUBSTATION INSPECTION PROCESS	501
FIGURE PG&E-8.1.5-1: ELECTRIC ASSET DATA FRAMEWORK.....	522
FIGURE PG&E-8.1.7-1: OPEN WORK ORDERS OVER TIME AS REPORTED IN THE QDRs	537

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE RN-PG&E-23-04-1: COMPARING PLANS TO CLOSE ELECTRIC CORRECTIVE MAINTENANCE NOTIFICATIONS	543
FIGURE PG&E-8.1.8-1: EPSS SAFETY OVERVIEW.....	568
FIGURE PG&E-8.1.8-2: FPI EPSS ENABLEMENT CRITERIA	571
FIGURE PG&E-8.1.8-3: EPSS CAPABLE SERVICE TERRITORY MAP	572
FIGURE PG&E-8.1.8-4: CPUC REPORTABLE IGNITIONS IN HFTDS.....	573
FIGURE PG&E-8.2.2-1: PG&E’S VM TRANSMISSION INSPECTION PROCESS ..	665
FIGURE PG&E-8.2.2-2: PG&E’S VM TRANSMISSION SECOND PATROL PROCESS	667
FIGURE PG&E-8.2.2-3: PG&E’S IVM PROCESS.....	669
FIGURE PG&E-8.2.2-4: PG&E’S VM DISTRIBUTION INSPECTION PROCESS.....	674
FIGURE PG&E-8.2.2-5: PG&E’S VM DISTRIBUTION SECOND PATROL PROCESS	677
FIGURE PG&E-8.2.2-6: PG&E’S VM SUBSTATION PROCESS.....	685
FIGURE PG&E-8.2.5-1: VM QUALITY MANAGEMENT	702
FIGURE PG&E-8.2.7: OPEN WORK ORDERS OVER TIME	715
FIGURE PG&E-8.3.2-1: MADIS SCHEMATIC	738
FIGURE PG&E-8.3.2-2: PG&E’S WEATHER STATION COVERAGE AS OF DECEMBER 1, 2022	739
FIGURE PG&E-8.3.2-3: DECEMBER 2022 SAMPLE LFM REPORT	742
FIGURE PG&E-8.3.2-4: SAMPLE LFM SEASONAL TRENDS.....	743
FIGURE PG&E-8.3.3-1: ILLUSTRATIVE FAULT EVENTS WORKFLOW	749
FIGURE PG&E-8.3.5-1: WEATHER RANGE FORECAST, 2 KM RESOLUTION, OF ENSEMBLED PRESSURE GRADIENT FORECAST BETWEEN ARCATA (ACV) AND SAN FRANCISCO, CALIFORNIA (SFO), FOR 2 DEC. 2022.....	766
FIGURE PG&E-8.3.5-2: WEATHER RANGE FORECAST, 2 KM RESOLUTION, OF ENSEMBLED PRESSURE GRADIENT FORECAST BETWEEN ARCATA (ACV) AND SAN FRANCISCO, CALIFORNIA (SFO), FOR 20 DEC. 2022.....	767

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE PG&E-8.3.5-3: DIAGRAM OF NESTED DOMAIN CONFIGURATION WITH NESTED GRIDS	769
FIGURE PG&E-8.3.6-1: FPI MODEL FEATURES	776
FIGURE PG&E-8.3.6-2: FPI RANDOM FOREST MODEL	777
FIGURE PG&E-8.3.6-3: FPI MODEL SCHEMATIC	778
FIGURE PG&E-8.4.2-1: ALL HAZARD INCIDENTS AND PSPS EVENTS PROCESS COMPARISON	802
FIGURE PG&E-8.4.2-2: SUPPLIERS, INPUTS, PROCESSES, OUTPUTS BY SECTION, AND CUSTOMERS AREAS	802
FIGURE PG&E-8.4.2-3: ALL-HAZARD TIMELINE	803
FIGURE PG&E-8.4.2-4: WILDFIRE ACTIVATION, RESPONSE, RECOVERY, AND RESTORATION PROCESS	804
FIGURE PG&E 8.4.2-5: PG&E PSPS KEY PROCESS DECISIONS	805
FIGURE PG&E-8.4.4-1: PSPS NOTIFICATION TIMELINE	857
FIGURE PG&E-8.4.4-2: HOW AND WHEN STAKEHOLDERS ARE NOTIFIED	862
FIGURE PG&E-8.4.5-1: PROTOCOL AND DECISION FLOW FOR SERVICE RESTORATION PLAN	865
FIGURE PG&E-8.4.5-2: RESOURCE PLANNING REQUIREMENTS	868
FIGURE PG&E-8.5.1-1: PG&E OUTREACH EFFECTIVENESS SURVEY PRE-SEASON WAVES COMMUNICATIONS RECALL TIER 2 AND 3 HFTD	891
FIGURE PG&E-9.1.2-1: DE-ENERGIZED CIRCUITS BY FREQUENCY WITH HFTD CONTOUR OVERLAYS	919
FIGURE PG&E-9.2.1-1: VISUAL REPRESENTATION OF DISTRIBUTION PSPS DECISION-MAKING	932
FIGURE PG&E-9.2.1-2: SCENARIOS BASED ON IPW AND FPI VALUES	935
FIGURE PG&E-9.2.1-3: FIRELINE INTENSITY ANALYSIS	936
FIGURE PG&E-9.2.1-4: FLAME LENGTH COMPONENTS	936
FIGURE PG&E-9.2.1-5: PRIORITY 1 AND PRIORITY 2 TREE TAGS	937

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE PG&E-9.2.1-6: VISUAL REPRESENTATION OF TRANSMISSION SCOPING	938
FIGURE PG&E-9.2.2-1: VISUAL REPRESENTATION OF PSPS RISK BENEFIT TOOL	945
FIGURE PG&E-9.2.3-1: THE PSPS DECISION MAKING PROCESS	947
FIGURE PG&E-B-1: IGNITION PROBABILITY MODEL BOW-TIE	1004
FIGURE PG&E-B-2: WILDFIRE CONSEQUENCE MODEL BOW-TIE	1005
FIGURE PG&E-B-3: PSPS CONSEQUENCE MODEL BOW-TIE	1006
FIGURE PG&E-B-4: EXAMPLE CALCULATION SCHEMATIC	1007
FIGURE PG&E-B-5: IGNITION PROBABILITY CALCULATION PROCEDURE SCHEMATIC	1008
FIGURE PG&E-B-6: WILDFIRE CONSEQUENCE CALCULATION PROCEDURE SCHEMATIC	1009
FIGURE PG&E-B-7: PSPS CALCULATION SCHEMATIC	1010
FIGURE PG&E-B-8: OVERALL FRAMEWORK OF PG&E'S WILDFIRE TRANSMISSION RISK MODEL	1013
FIGURE PG&E-B-9: COMPOSITING OF RISK OVERVIEW	1015
FIGURE PG&E-B-10: RISK MODEL DEVELOPMENT SCHEDULE	1016
FIGURE PG&E-22-01-1: WILDFIRE RISK BOWTIE MAPPING RISK DRIVERS TO CONSEQUENCE OUTCOMES	1023
FIGURE PG&E-22-09-1: EVOLUTION AND IMPROVEMENTS – WDRM V1 THROUGH WDRM V3 130	1053
FIGURE PG&E-22-09-2: SANKEY VIEW SYSTEM HARDENING CIRCUIT SEGMENT RISK, v2 VS. v3	1056
FIGURE PG&E-22-09-3: CIRCUIT SEGMENTS IN THE TOP 20% IN v2, BUT NOT IN THE TOP 20% IN v3	1057
FIGURE PG&E-22-09-4: SANTA YNEZ 1104CB – LARGE CONSEQUENCE CHANGE, SMALL MILEAGE CHANGE	1058

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE PG&E-22-09-5: POSO MOUNTAIN 2103CB – SMALL CONSEQUENCE CHANGE, LARGE MILEAGE CHANGE.....	1059
FIGURE PG&E-22-10-1: STATEWIDE STATION SIMILARITY SCORES	1062
FIGURE PG&E-22-11-1: COVERED CONDUCTOR EFFECTIVENESS – EXAMPLE 1	1069
FIGURE PG&E-22-11-2: COVERED CONDUCTOR EFFECTIVENESS – EXAMPLE 2	1070
FIGURE PG&E-22-11-3: COVERED CONDUCTOR EFFECTIVENESS – EXAMPLE 3	1070
FIGURE PG&E-22-12-1: EXAMPLE OF DAMAGE FROM JOB AID TD-2305M JA02	1073
FIGURE PG&E-22-20-1: RESULTS OF AERIAL PILOT PROJECT	1090
FIGURE PG&E-22-20-2: COMPLEMENTARY CONDITION DETECTION ACROSS DRONE ONLY AND CORRESPONDING GROUND CONDITIONS.....	1095
FIGURE PG&E-22-20-3: FDAs FOR DRONE ONLY A AND B TAGS	1096
FIGURE PG&E-22-28-1: SDG&E – PERCENT OF TREES ENHANCED VS. NON-ENHANCED 2006-2022.....	1114
FIGURE PG&E-22-28-2: SDG&E – VEGETATION-RELATED OUTAGES 2006-2022	1115
FIGURE PG&E-22-28-3: SDG&E – OUTAGE COMPARISON	1115
FIGURE PG&E-22-28-4: PG&E – 2022 VEGETATION OUTAGES COMPARED WITH 2021 AND 3-YEAR AVERAGE	1117
FIGURE-22-28-5: PG&E – VEGETATION MANAGEMENT NON-MED OUTAGE RUNNING TOTAL DASHBOARD	1118
FIGURE PG&E-22-28-6: PG&E – VEGETATION MANAGEMENT ALL OUTAGE RUNNING TOTAL DASHBOARD	1118
FIGURE PG&E-22-28-7: PG&E – VEGETATION OUTAGES 2016-2022.....	1119
FIGURE PG&E-22-28-8: SCE – TIME SERIES PF TCCI EVENTS (2019 AND PRIOR – PRE-ENHANCED)	1121

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN

LIST OF FIGURES
(CONTINUED)

FIGURE PG&E-22-28-9: SCE – TIME SERIES PF TCCI EVENTS (2020 AND PRIOR – PRE-ENHANCED)	1121
FIGURE PG&E-22-28-10: SCE – COUNT OF GROW IN, BLOW IN, AND FALL IN TCCIS BY REGION FOR POST ENHANCED CLEARANCE (2020-2022)	1122
FIGURE PG&E-22-31-1: COMPONENTS AND CONFIGURATIONS USED WITHIN THE SIMULATIONS	1127
FIGURE PG&E-22-31-2: STRESS MAPS ON THE INDIVIDUAL SYSTEM HARDENED COMPONENTS BASED ON MAXIMUM WIND LOADING	1128
FIGURE PG&E-22-31-3: STRESS MAP ON THE INDIVIDUAL SYSTEM HARDENED COMPONENTS BASED ON MAXIMUM WIND LOADING	1128
FIGURE PG&E-22-32-1: CIRCUITS BY NUMBER OF EPSS OUTAGES 2022	1131
FIGURE PG&E-22-34-1: CORRELATING WILDFIRE RISK AND FEASIBILITY	1138

8.4.1.3 Performance Metrics

Performance metrics indicate the extent to which an electrical corporation's WMP is driving performance outcomes. Each electrical corporation must:

- *List the performance metrics the electrical corporation uses to evaluate the effectiveness of its emergency preparedness in reducing wildfire and PSPS risk.*

For each of these performance metrics listed, the electrical corporation must:

- *Report the electrical corporation's performance since 2020 (if previously collected);*
- *Project performance for 2023-2025; and*
- *List method of verification.*

The electrical corporation must ensure that each metric's name and values are the same in its WMP reporting as its QDR reporting (specifically, QDR Table 2 and QDR Table 3). Metrics listed in this section that are the same as performance metrics required by Energy Safety and reported in QDR Table 2 (Performance Metrics) must match those reported in QDR Table 2. Metrics listed in this section that are not the same as any of the performance metrics identified by Energy Safety and reported in QDR Table 2 must match those reported in QDR Table 3.

The electrical corporation must:

- *Summarize its self-identified performance metric(s) in tabular form; and*
- *Provide a brief narrative that explains trends in the metrics.*

Table 8-36 provides an example of the minimum acceptable level of information.

[Table 8-36](#) below shows our Emergency Preparedness performance metrics results from 2020-2022 and projected results from 2023-2025.

PG&E tracks the number of distribution outages while Enhanced Powerline Safety Settings (EPSS) is enabled. Recognizing that there is year-to-year variability in outage activity, we are taking steps to reduce the number of outages that occur while EPSS is enabled. PG&E launched EPSS as a pilot project in 2021 and in 2022 expanded the scope of EPSS to all High Fire Risk Areas (HFRA) and select adjacent EPSS buffer zones. We are projecting a decrease in the number of events by approximately 2 percent each year from 2023-2025 compared to the number of events in 2022.

Performance metrics related to frequency, scope, and duration of PSPS events are largely weather dependent and customer impact will fluctuate depending on the meteorological conditions and grid configuration at the time of each event.

Using our 2023 workplans for undergrounding and Motorized Switch Operator replacements, PG&E projected PSPS metrics into 2023 and keeps those values static

for 2024-2025. PG&E anticipates continued improvement from 2023-2025, but we do not yet have final workplans and analysis on the value of those improvements for the following years.

Notifying customers prior to initiation of PSPS event ensures customers are aware of the potential outages and the resources available to them. The metric “number of customers notified prior the initiation of PSPS event” is largely weather dependent as this metric will correlate with the frequency, scope, and duration of PSPS events.

**TABLE 8-36:
EMERGENCY PREPAREDNESS PERFORMANCE METRICS RESULTS BY YEAR**

Performance Metrics	2020	2021	2022	2023 Projected	2024 Projected	2025 Projected	Method of Verification (e.g., Third-Party Evaluation, QDR)
Number of EPSS Events	(a)	(a)	2,375	2,350	2,300	2,250	QDR ^(b)
Duration of PSPS Events (in Customer Hours)	22.3 million	2.5 million	0	12.3 million	12.2 million	12.0 million	QDR ^(c)
Number of Customers Notified Prior to Initiation of PSPS Events	869,000	181,000	0	457,000	451,000	445,000	QDR ^(d)
_____ (a) No data available as PG&E's EPSS program started only from 2022. (b) QDR Table 10, QDR No. 1d. (c) QDR Table 10, QDR No. 1c. (d) QDR Table 10, QDR No. 4c.							

8.4.2 Emergency Preparedness Plan

In this section, the electrical corporation must provide an overview of how it has evaluated, developed, and integrated wildfire- and PSPS-specific emergency preparedness strategies, practices, policies, and procedures into its overall emergency plan based on the minimum standards described in GO 166. The electrical corporation must provide the title of its latest emergency preparedness report, the date of the report, and an indication of whether the plan complies with CPUC R.15-06-009, D.21-05-019, and GO 166. The overview must be no more than two paragraphs.

In addition, the electrical corporation must provide a list of any other relevant electrical corporation documents that govern its wildfire and PSPS emergency preparedness planning for response and recovery efforts. This must be a bullet point list with document title, version (if applicable), and date. For example:

- *Electrical Corporation's Emergency Response Plan (ECERP), Third Edition, dated January 1, 2021.*

Reference the Utility Initiative Tracking ID where appropriate.

On April 29, 2022, PG&E filed our ARC with GO 166²³⁷ for the period July 1, 2020, through December 31, 2021. The report complies with R.15-06-009, D.21-05-019, and GO 166. PG&E evaluates, develops, and integrates GO 166 requirements through ongoing threat, hazard, risk and incident assessments. This helps inform how we conduct AARs and corrective actions aligned with frameworks provided by the [National Incident Management System \(NIMS\)](#), [California Standardized Emergency Management System \(SEMS\)](#), and the [NIMS/SEMS component Incident Command System \(ICS\)](#).

Other relevant CPUC R.15-06-009, D.21-05-019 and GO 166 compliant emergency preparedness plan documents include the *PG&E CERP* and supporting annexes.

Documents that govern PG&E's wildfire and PSPS emergency response and recovery efforts include:²³⁸

- *PG&E Company Emergency Response Plan (CERP), Version 8.1, dated January 1, 2023;*
- *PG&E Wildfire Annex to the Company Emergency Response Plan, Version 3.0, dated April 1, 2022;*
- *PG&E Emergency Communications Annex to the Company Emergency Response Plan, Version 6, dated June 23, 2022; and*

²³⁷ [PG&E GO 166 2020 – 2021 Annual Compliance Report](#). See [Appendix E](#).

²³⁸ See [Appendix E](#).

- *PG&E Public Safety Power Shutoff Annex to the Company Emergency Response Plan, Version 6.0, dated August 25, 2022.*

8.4.2.1 Overview of Wildfire and PSPS Emergency Preparedness

In this section of the WMP, the electrical corporation must provide an overview of its wildfire- and PSPS-specific emergency preparedness plan. At a minimum, the overview must describe the following:

- *Purpose and scope of the plan;*
- *Overview of protocols, policies, and procedures for responding to and recovering from a wildfire or PSPS event (e.g., means and methods for assessing conditions, decision- making framework, prioritizations). This must include:*
 - *An operational flow diagram illustrating key components of its wildfire- and PSPS-specific emergency response procedures from the moment of activation to response, recovery, and restoration of service; and*
 - *Separate overviews and operational flow diagrams for wildfires and PSPS events.*
- *Key personnel, qualifications, and training;*
- *Resource planning and allocation (e.g., staffing);*
- *Drills, simulations, and Tabletop Exercises (TTX);*
- *Coordination and collaboration with public safety partners (e.g., emergency planning, interoperable communications);*
- *Notification of and communication to customers during and after a wildfire or PSPS event; and*
- *Improvements/updates made since the last WMP submission.*

The overview must be no more than six pages.

In addition, the electrical corporation must provide a table with a list of current gaps and limitations in evaluating, developing, and integrating wildfire- and PSPS-specific preparedness and planning features into its overall emergency preparedness plan(s). Where gaps or limitations exist, the electrical corporation must provide a remedial action plan and the timeline for resolving the gaps or limitations. Table 8-37 provides an example of the minimum level of content and detail required.

Purpose and Scope of Plan

PG&E's CERP provides guidance to our teams who deliver safe, efficient, and coordinated responses to all hazard emergency incidents affecting gas or electric generation, distribution, storage, transmission systems or any other emergency incident in the PG&E service area. The CERP and its annexes contain: Introduction; Emergency Organization and Responsibilities; Concept of Operations; and Coordination and Communication Instructions. PG&E's CERP and related information is listed in [Appendix E](#).

PG&E's Wildfire Annex to the CERP (Wildfire Annex) covers actions and strategies to prepare for, mitigate, respond to, and recover from incidents related to wildfires that impact PG&E or its customers.

PG&E's Public Safety Power Shutoff Annex to the CERP (PSPS Annex) covers actions and strategies to prepare for, respond to and recover from risk of wildfire ignition related to PG&E assets leading to de-energization for public safety during dry severe weather conditions.

Both the Wildfire Annex and PSPS Annex describe PG&E's internal and external coordination and communication plans and provide an organized and comprehensive approach to wildfire incident support.

PG&E's Emergency Communications Annex to the CERP provides an overview of our communications plans and strategies applicable to any type of emergency.

Overview of Protocols, Policies, and Procedures for Responding to and Recovering from a Wildfire or PSPS event

PG&E has developed a 5-tier incident classification scale that summarizes the severity of an incident and our response to it. The scale ranges from Level 1, which represents a smaller, localized incident, to Level 5, which represents a larger, more complex incident. The incident classification scale is shown in [Table PG&E-8.4.2-1](#) below and it is applicable to wildfires incidents. The incident classification scale is described in CERP subsection 8.1, Emergency Plan Activation.

**TABLE PG&E-3.4.2-1:
INCIDENT CLASSIFICATION SCALE**

Color	Description	Response
Red	Catastrophic	• Incident includes multiple emergencies, affects many customers, business operations. • Significant cost and infrastructure risk damage. • Full mobilization of PG&E, contractor, and mutual aid resources. • May have heavy media interest and actual reputational risk. • EOC and Executive Team are activated.
Amber	Severe	• Incident includes extended multiple incidents and affects many customers. • Escalating Company impact. • Resources, contractors, and mutual aid may be shared between regions. • May have heavy media interest and potential reputational risk.
Yellow	Serious	• Incident involves large numbers of customers. • Resources may need to move between regions. • Potential increased, actual, or imminent negative media interest.
Green	Elevated	• A pending or local incident that requires more than routine operations. • Resources may need to move within the region. • Increased media interest.
Blue	Routine	• Incident involves a relatively small number of customers. • Local resources are sufficient. • Little to no media coverage.

The incident classification scale summarizes the actions that may be required in responding to an incident, including interactions with our Meteorology Operations and Analytics team and reliance on our Hazard Awareness and Warning Center (HAWC) situational assessment and awareness capabilities. PG&E uses the California SEMS ICS framework for resource allocation and prioritization from activation to response, recovery, and restoration of services.

Generally, PG&E does not activate the Company EOC for wildfire incident support that can be managed out of one of the 19 division-level Operations Emergency Centers (OEC), or at a regional level Regional Emergency Center (REC) activated in support of one or more OECs. PG&E uses the same framework as the SEMS Operational Area concept for emergency organization and structure, with emergencies beginning at the local level (Level 1), which is our base emergency posture.

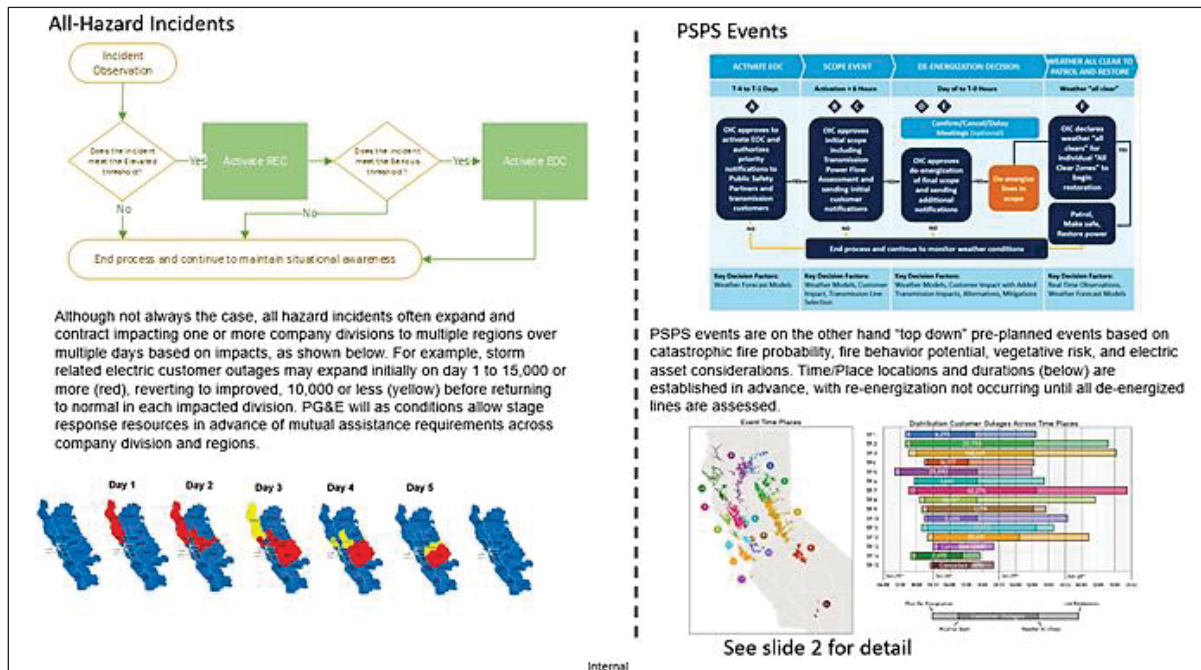
PSPS events are different from all-hazards incidents, including wildfires, where OECs, RECs and the Company EOC are activated as needed in response to incident complexity. PSPS events are “top down” pre-planned events based on catastrophic fire probability, fire behavior potential, vegetative risk, and electric asset considerations. For PSPS events, PG&E’s PSPS Officer in Charge, with input from the Company’s Vice President-EP&R, on-call EOC Commander, and a representative from our Meteorology department will determine whether conditions warrant activation of the EOC for event management aimed at eliminating fire ignition potential.

Operational Flow Diagrams

Wildfires, like most All-Hazard incidents which are due to factors largely outside of PG&E’s control, scale from the “bottom up,” working their way from the Company OECs to the RECs, and then to the EOC when certain guidance thresholds are exceeded (e.g., customers outages, etc.).

This is fundamentally different than PSPS events, which are similarly managed out of the EOC, but based on modelled (not necessarily actual) impacts using a “top down” pre-determined “time/places” approach which dictates the location(s), duration(s) and scale of the event. For details on the difference between these processes see [Figure PG&E-8.4.2-1](#) below.

**FIGURE PG&E-8.4.2-1:
ALL HAZARD INCIDENTS AND PSPS EVENTS PROCESS COMPARISON**



With the above in mind, there are similar linear aspects which apply to All-Hazard incidents and PSPS events alike. One is in the Suppliers, Inputs, Processes, Outputs by Section, and Customers (SIPOC) areas, as shown below in [Figure PG&E-8.4.2-2](#).

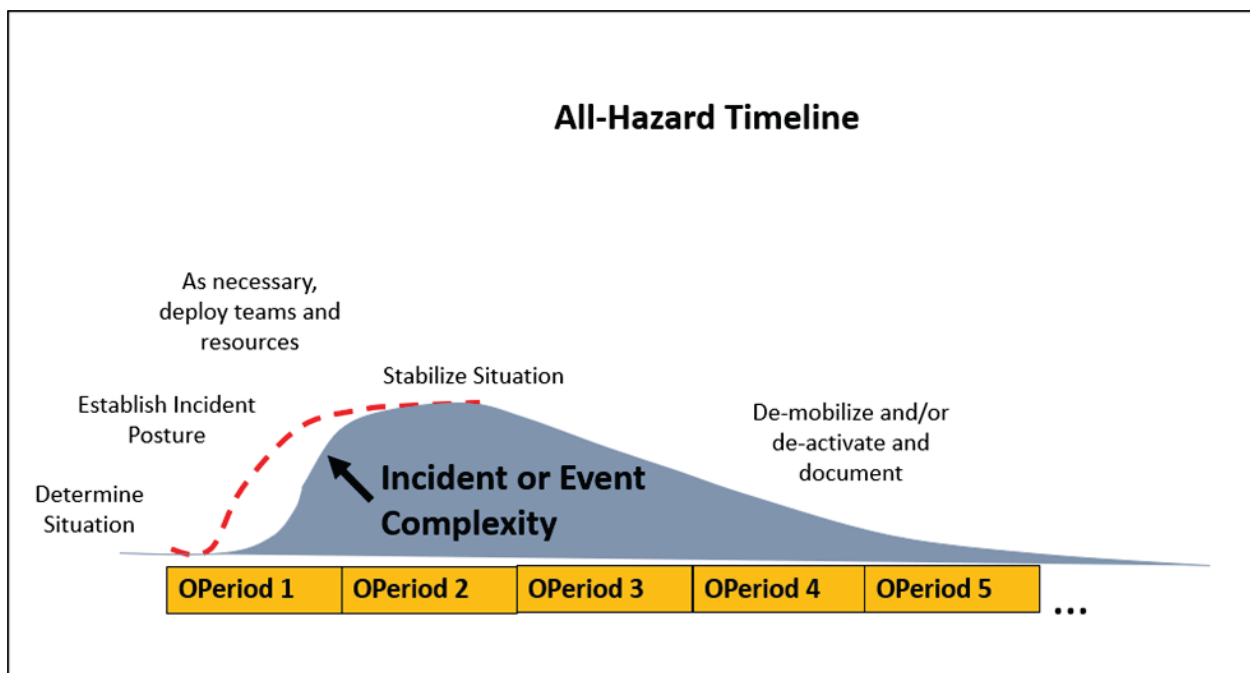
**FIGURE PG&E-8.4.2-2:
SUPPLIERS, INPUTS, PROCESSES, OUTPUTS BY SECTION, AND CUSTOMERS AREAS**

Suppliers	Inputs	Processes	Outputs by Section	Customers
Lines of Business Government Agencies	Customers Remote Sensing Analytics (Meterology Geomorphology Seismology & other Environmental Threats) Lines of Business Government Agencies	Trigger or Starting Point Determine Situation Establish Incident Posture As necessary, deploy Teams and Resources Stabilize Situation Demobilize and/or Deactivate & Document Ending Point	Plans - Situation Report Command - ICS 210 incident Briefing Operations-Resources engaged in Proportion to Need Operations - Incidents Gaps filled EP&R - After Action Report	Customers Lines of Business Leadership Government Agencies

Another similar linear aspect between All-Hazard incidents and PSPS events is in the “wave” pattern in the All-Hazard Timeline, as illustrated in [Figure PG&E-8.4.2-3](#), below.

This diagram also highlights another essential difference between All-Hazard and PSPS events. In it, the dashed red line shows how for All-Hazard incidents we are often needing to catch up on resource requirements, thus the gap which eventually closes with incident stabilization. Here, the smaller the gap the better. As it is not possible to predict where damages will occur, we are often challenged with moving resources to areas of greatest need. This is fundamentally different than PSPS events, which because they are planned, do not tend to suffer this gap in resources.

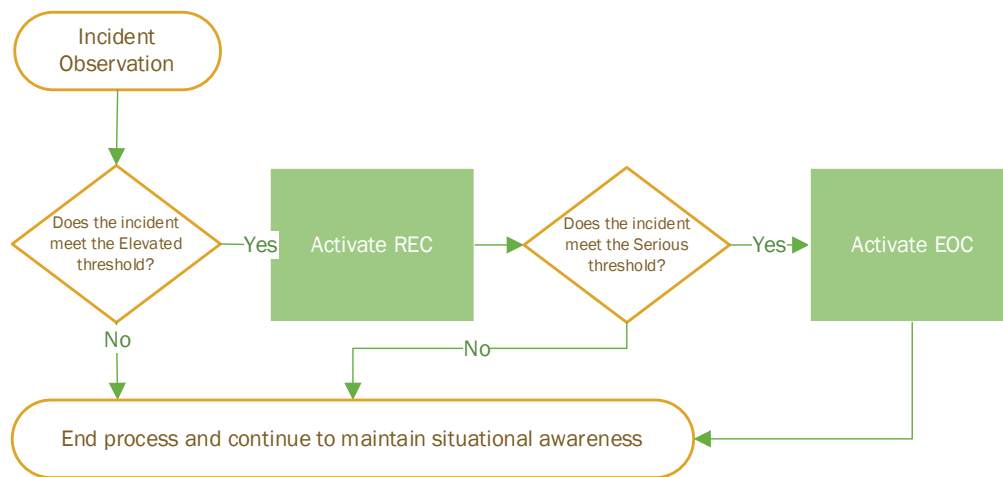
**FIGURE PG&E-8.4.2-3:
ALL-HAZARD TIMELINE**



Operational Flow Diagram for Wildfires

Key components of PG&E's wildfire emergency response procedures are shown in [Figure PG&E-8.4.2-4](#) below. These actions apply to wildfires and all-hazards incidents generally.

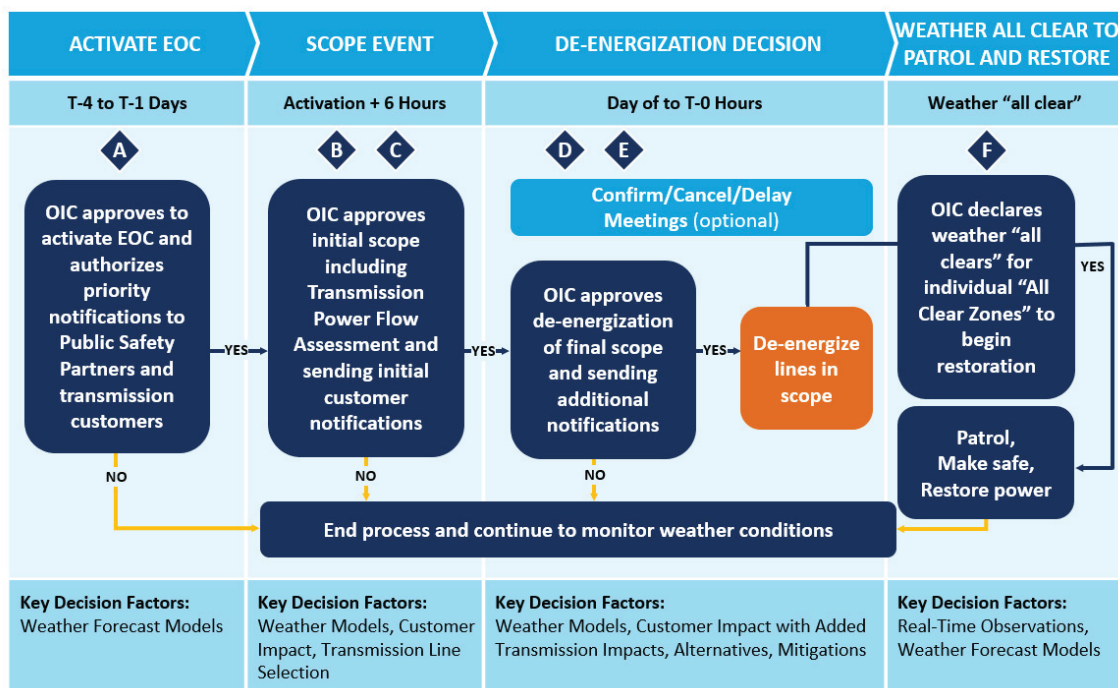
**FIGURE PG&E-8.4.2-4:
WILDFIRE ACTIVATION, RESPONSE, RECOVERY, AND RESTORATION PROCESS**



Operational flow diagram for PSPS events

Key process decisions for PG&E PSPS activation, de-energization and restoration of service are shown in [Figure PGE-8.4.2-5](#) below.

**FIGURE PG&E 8.4.2-5:
PG&E PSPS KEY PROCESS DECISIONS**



Key Personnel, Qualifications and Training

Key Personnel

PG&E's Director of EP&R Strategy and Execution (SE) maintains a rotating 24-hour (day/night) EOC Team schedule with contact information for emergency response key personnel, including, but not limited to the following.

- EOC Commander and the Deputy EOC Commander – Responsible for the overall command of the incident/event; ensuring the safety of all employees involved in the EOC; coordinating readiness of activities related to readiness posture, among others.
- Liaison Officer and Assistant Liaison Officer – Responsible for leading the team that serves as the primary contact for external partners such as representatives of local, tribal, state, and federal governments.
- Customer Strategy Officer: Responsible for sending customer notifications before, during and after an event, prioritizing notifications to critical public safety-related facilities and Medical Baseline customers, among others. The Customer Strategy

officer is also responsible for identifying and opening Customer Resource Centers to support impacted customers.

- Public Information Officer (PIO)/ Assistant PIO – Responsible for providing strategic communications counsel to the EOC commander.

For additional information on key PG&E EOC personnel roles and responsibilities, please see [Section 8.4.2.2.1 Personnel Qualifications](#). Teams for other PG&E emergency centers and facilities (e.g., Control Centers, Support and Coordination Centers) are found in PG&E functional area plans and CERP functional annexes.

Day shift and night shift teams may be activated at the discretion of the EOC Commander.

Qualifications

PG&E maintains rigorous qualification standards for wildfire and PSPS emergency personnel who must be trained on the basics of Incident Command Systems to be certified to work in one of our Emergency Operation Centers. Depending on their level of responsibility within the EOC, personnel also receive expanded and specialized training to build upon their basic learning. For more details on qualifications, focusing on specific roles, incident types, and responsibilities, please refer to [Section 8.4.2.2.1 Personnel Qualifications](#).

Training

PG&E has multifaceted training programs for staff that support outages related to wildfires and PSPS that include Emergency Preparedness and Response Training, CERP Training; PSPS -Specific Training; and PSPS Field Personnel Training.

For more information on our training curriculum, please see Table PG&E-8.4.2-2 in [Appendix F](#) which shows the different training courses EOC personnel are required to take based on their EOC responsibilities:

- IS-100 – Introduction to the Incident Command System, ICS 100;
- IS-200 – Basic Incident Command System for Initial Response, ICS-200;
- IS-700 – An Introduction to the National Incident Management System;
- IS-800 – National Response Framework, An Introduction;
- G606 – Standardized Emergency Management System Introductory Course;
- IS-368 – Including People with Disabilities & Others with Access & Functional Needs in Disaster Operations;
- G-775 – EOC Management and Operations;
- G-191 – ICS/EOC Interface;

- G626 – EOC Action Planning;
- ICS-300 - Intermediate Incident Command System for Expanding Incidents;
- ICS-400 – Advanced ICS for Command and General Staff;
- IS-702 PIO - National Incident Management System (NIMS) Public Information Systems;
- ICS-402 - NIMS Overview for Senior Officials;
- IS-230d – Fundamentals of Emergency Management; and
- G-611- EOC Section/Position Specific Training.

Resource Planning and Allocation

EOC and Field Incident Commanders (IC) have the authority to make decisions and commit resources consistent with the scale of the emergency and PG&E's delegation of authority. The EOC develops and executes a resource mobilization strategy considering resource availability in coordination with Operations, the base resource plan, and anticipated staffing requirements. The team uses a resource tracker to build staffing plans and signal the need for additional resources. As part of the EOC On-call Teams program, EP&R SE maintains a list of predesignated qualified Incident Commanders. Consistent with PG&E's delegations of authority, the Director of EP&R SE may activate the EOC. Predesignated ICs from different functional areas have been assigned to on-call teams and may serve in any type of emergency at the discretion of the Director of EP&R SE.

Drills, Simulations, and TTXs

From January 1, 2022, to December 31, 2022, PG&E's Public Safety Specialists (PSS) team²³⁹ conducted a series of First Responder Workshops with local public safety agencies. A total of 2,879 representatives, from 187 local public safety agencies attended.

For more details on PG&E's training programs, including the use of drills, simulations, and TTXs, please see [Section 8.4.2.3](#).

Coordination and Collaboration With Public Safety Partners (e.g., Emergency Planning, Interoperable Communications)

PG&E engages in extensive outreach and engagement with our public safety partners. For more details on our collaboration with these entities, please see [Section 8.4.3.1](#) and [Section 8.4.3.2](#).

²³⁹ PG&E PSS personnel serve as contacts for city and county representatives at outreach meetings held in accordance with Pub. Util. Code, § 768.6.

Notification and Communication with Customers During and After a Wildfire or PSPS Event

PG&E's strategy for communicating with the customers regarding wildfires and PSPS events is described in the CERP and the Emergency Communications Annex to the CERP. In an emergency, primary points of contact for customers can be found on the pge.com website in the [PG&E Customer Service Center Brochure](#).

Additionally, there are two Contact Service Centers open to help customers. These centers continue to be the primary avenue customers use to report emergencies. Information on how to reach these centers can be found by visiting the [Contact Us](#) page on the pge.com website.

Contact Service Centers also provide multilingual, telephonic services, including California Relay Service and/or Telecommunications Device for the Deaf/Teletypewriter (TDD/TTY) for customers who are speech and hearing-impaired. These centers also respond to email contacts that may be made through the Company website.

For more information on PG&E's outreach to stakeholders see [Section 8.4.4.1](#).

Improvements/Updates Made Since the Last WMP Submission

PG&E's use of multiple, standing day and night EOC rosters has improved service reliability and safety by clarifying roles and responsibilities for separate but staggered PSPS events. Standing rosters is considered a best practice approach.

PG&E's EP&R staff, EOC Command, and General staff can, when needed, operate in a virtual environment. This approach is efficient because it reduces commute times and physical facility footprints, improves real-time communications, and enables leaner EOC operations.

PG&E has implemented the PSPS Situational Intelligence Platform (PSIP). This platform is built on the Palantir Foundry system. The PSIP is connected to more than 50 source systems containing billions of records relevant to asset health analytics. It is PG&E's central PSPS decision-making, reporting, and communications platform. The PSIP is described in more detail in the CERP PSPS Annex.

PG&E has continued to reduce the size and duration of PSPS events. This is an indicator of increased operational maturity, flexibility, and system resilience.

Gaps and Limitations

PG&E hosted the 2022 PSPS and Wildfire Full-Scale Exercise (FSE) beginning with readiness posture in June 2022. The FSE simulated R5-Plus extreme weather wildfire risk conditions designed to test our ability to prepare for, respond to, and recover from a PSPS event, concurrent with an ignition of a rapidly expanding Wildfire. Exercise operations were carried out per the CERP, PSPS Annex, Wildfire Annex, and other PG&E functional area plans. Gaps, limitations, and remedial action strategies coming out of that exercise are listed in [Table 8-37](#), below.

**TABLE 8-37:
KEY GAPS AND LIMITATIONS IN INTEGRATING WILDFIRE AND PSPS SPECIFIC STRATEGIES INTO EMERGENCY PLAN**

Gap or Limitation Subject	Remedial Brief Description	Remedial Action Plan
Planning	Practiced routinely and effectively during gas asset “dig in” accidents and exercises, PG&E is working to further apply California SEMS incident management and support principles to integrate internal and external EOC level wildfire response and PSPS event management operations. Use of SEMS optimizes command, control, and coordination externally and internally across PG&E functional areas.	For 2023, PG&E will work to achieve Type III California Specialized Training Institute SEMS credentialing for all EOC Command and General staff personnel.
Operational Coordination and Communication	Although effective, PG&E’s PSPS Communications Coordinator Comms Huddle process requires further refinement in the areas of sequencing materials, roles, problem solving, and overall operational communications clarity.	In 2023, PG&E will pilot a new All-hazards Incident Management Dashboard, including four common operating picture information elements: assets, outages, incident command, and resources
Public Information and Warning	2022 EOC exercises activities evidenced a lack of standardized Joint Information System (JIS) use across all EOC-level incident and event types. Consistent with the California SEMS and applicable to public and private sector organizations, the JIS provides standardized process, procedures, and tools that facilitate communication to the public, incident personnel, the media, and other stakeholders.	The JIS integrates incident information and public affairs into a unified organization to provide consistent, coordinated, accurate, accessible, timely and complete information to the public and stakeholders during incident and event operations. In 2023, PG&E will evaluate standardized, formalized use of the JIS across all EOC-level incident and event types.
Critical Resources	2022 EOC exercises activities evidenced ineffective resource allocation communications regarding the allocation and staging of Mutual Assistance resources.	Use of the ICS-204 Assignment List process enables the expansion and contraction of incident resource assignments in a scalable, predictable manner, thus ensuring resource availability in relation to need. In 2023, PG&E will train incident command and support Resource Unit personnel on the use of ICS-204 Assignment List and related iterative ICS-215 operational planning worksheet process.

8.4.2.2 Key Personnel, Qualifications, and Training

In this section, the electrical corporation must provide an overview of the key personnel constituting its emergency planning, preparedness, response, and recovery team(s) for wildfire and PSPS events. This includes identifying key roles and responsibilities, personnel resource planning (internal and external staffing needs), personnel qualifications, and required training programs.

To meet the challenges of wildfire and PSPS-related events, PG&E provides ongoing, robust, and comprehensive training programs for our personnel and external contractors. This includes identifying key roles and responsibilities, personnel resource planning, personnel qualifications, and required training programs. For more details, please see [Section 8.4.2.2.1](#), [Section 8.4.2.2.2](#), and [Section 8.4.2.2.3](#).

8.4.2.2.1 Personnel Qualifications

The electrical corporation must report on the various roles, responsibilities, and qualifications of electrical corporation and contract personnel tasked with wildfire emergency preparedness planning, preparedness, response, and recovery, and those tasked for PSPS-related events. This may include representatives from administration, information technology (IT), human resources, communications, electrical operations, facilities, and any other mission-critical units in the electrical corporation. As part of this section, the electrical corporation must provide a brief narrative on how it determined its personnel resource planning for various key roles and responsibilities. The narrative must be no more than two to four pages.

Table 8-38 provides an example of the minimum level of content and detail required.

Scalable by design, PG&E staffs our EOC for wildfires and other all-hazard incidents using the standard SEMS ICS Command and General Staff incident management staffing pattern with representatives from multiple organizations: Business Finance; Information Technology; Human Resources; Gas and Electric Operations; Supply Chain and Materials; Customer and Communications; Government Relations; Safety; Meteorology; and EP&R.

The key driver for PG&E emergency personnel resource planning is the ICS founded on Firefighting Resources of California Organized for Potential Emergencies (FIRESCOPE). The ICS is a standardized, hierarchical incident/event management structure that allows for cooperative emergency response without compromising decision authority at the local level. The ICS structure is built around five major management activities or Command and General Staff functional areas.

- Command: Includes Incident Commander (IC), Safety, Liaison, and Communication. It sets priorities and objectives and is responsible for overall control of the incident.

- Operations: Accountable for all tactical operations necessary to carry out the incident or event action plan.
- Planning: Responsible for the collection, evaluation, and distribution of information regarding incident development and the availability of resources.
- Logistics: Responsible for providing the necessary facilities, services, and materials to meet incident or event needs.
- Finance/Administration: Responsible for monitoring and documenting all costs while providing the necessary financial support related to the incident.

PG&E uses the ICS as a basis for emergency personnel resource planning roles, responsibilities, and qualifications.

For a PSPS event, the EOC organization consists of the standard ICS Command and General Staff positions as outlined in the CERP and includes the use of an additional Intelligence and Investigation Section, which is established within the General Staff organization. Along with the standard ICS roles, PG&E's PSPS processes includes the use of several PSPS specific EOC functional roles listed below:

- Officer-in-Charge (OIC);
- Deputy Planning Section PSPS Chief;
- PSPS Technical Unit Leader;
- PSPS Technical Specialist;
- PSPS Distribution Asset Health Specialist (DAHS);
- PSPS Transmission Asset Health Specialist (TAHS);
- PSPS Portal Unit Leader;
- PSPS Portal Unit Support;
- PSPS Process Unit Leader;
- PSPS Recorder;
- PSPS Communications Coordinator;
- PSPS Risk Analyst;
- Digital Strategy Lead;
- Digital Strategy Publisher;
- Digital Strategy Assistant;

- Primary Voltage Generation Division Lead; and
- Secondary Voltage Generation Division Lead.

The OIC is a role specific to PSPS events and was created to engage higher-level management accountability in the decision given the magnitude and impact of PSPS, while also enabling rapid decision-making during a real-time PSPS event. The OIC receives situational awareness from the Command Staff and General Staff of PG&E's EOC, including from the Meteorology, Planning, and Customer Sections.

For more information on key PG&E EOC personnel roles, responsibilities, and qualifications, please see [Table 8-38](#), below.

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
EOC Commander/ Deputy EOC Commander	Wildfires PSPS	The EOC IC is responsible for the overall command of the incident/event. This includes: • Ensuring the safety of all employees involved; • Initiating, and approving the IAP; and • Acting as a liaison with agency executives, governing boards, and other organizations. In addition, during a PSPS the on-call EOC Commander (EC) is responsible for: • Coordinating readiness of activities related to Readiness Posture; • Advising OIC on decisions; • Reviewing OIC decision records and documentation; and • Executing decisions made by OIC.	• ICS 100 • ICS-200 • ICS-700 • ICS-800 • SEMS G606 • IS-368 • G-775 • G-191 • G-626 • ICS 300 • ICS 400 • IS230d • G-611 M	16	14	0	0

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
Liaison Officer/ Assistant Liaison Officer	Wildfires PSPS	The Liaison Officer (LNO) is responsible for: - Leading the team that serves as the primary contact for representatives of local, tribal, state, and federal governments. - Participating in weather briefings, planning meetings, command and general staff meetings, and OIC decision meetings. - Informing the LNO team when key decisions are made or are expected. The LNO makes real-time decisions on behalf of the LNO Team. - The LNO oversees PSPS event notifications and interactions with external partners such as tribes, cities, counties, state, and federal agencies. Additional responsibilities include: - Coordinating with Tribes, cities, counties, and other agencies to help ensure PG&E has the latest contact information for each agency. - Working with tribal, city, county, and state contacts during PSPS events to coordinate and align operations and response. - Sending notifications (before, during, and after a PSPS event) to Cal OES, the CPUC, tribes, cities, counties, first responders, and other external stakeholders. - Responding to and tracking inquiries from external stakeholders.	- ICS 100 - ICS-200 - ICS-700 - ICS-800 - SEMS G606 - IS-368 - G-775 - G-191 - G-626 - ICS 300 - IS230d - G-611 M	16	22	0	0

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
		- Facilitating and managing a once-daily State Executive Briefing and a once-daily Cooperator call for county, city, utility, and emergency management partners for external situational awareness. - Supporting requests and serving as single point of contact from third-party representatives to embed in PG&E's EOC					
Customer Strategy Officer	Wildfires PSPS	- Sending customer notifications before, at de-energization, during, and after an event to all customers—initially prioritizing notifications to critical public safety-related facilities and transmission customers, followed by notifications to Medical Baseline customers and to general customers in the PSPS scope. - Identifying and opening Community Resource Centers (CRC) to support impacted customers. Coordinating with CRC leads to gather real-time local intelligence for Customer Service Office/Logistics to respond; accordingly, managing customer escalations; and aggregating daily reports from each CRC for timely reporting. - Coordinating with local Independent Living Centers (ILC) and Community-Based Organizations (CBO) to support Access and Functional Needs (AFN) customers in attendance as appropriate.	- ICS 100 - ICS-200 - ICS-700 - ICS-800 - SEMS - G606 - IS-368 - G-775 - G-191 - G-626 - ICS 300 - IS230d - G-611 M	8	10	0	0

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
		- Facilitating doorbell rings to notify Medical Baseline (MBL) customers and Self-Identified Vulnerable customers that were not successfully contacted through initial automated notifications (i.e., e-mails, phone calls, and text messages). - Coordinating with Community Choice Aggregators (CCA) relations teams to engage with potentially impacted CCAs during event. - Managing customer escalations including commercial critical customers and those within the AFN population (i.e., MBL, Life Support, Self-Identified Vulnerable). - Coordinating with the Customer Contact Emergency Coordination Center to provide event intelligence for staffing and communication needs. - Working with OECs to gather real-time local intelligence to fully inform IC and identifying escalations, challenges, and events that could impact the scope of the PSPS event. - Communicating with critical public safety-related customers, addressing customer escalations, and providing intelligence to the OIC for consideration when determining de-energization scope and prioritizing restoration. - Coordinating with the Temporary Generation Branch team on prioritization of customer requests for temporary back-up power during an event. - Coordinating with Billing Operations and Credit, Demand Response teams and additional internal partners regarding customer impacts. - Coordinating with Electric Operations on Estimated Time of Restoration (ETOR) notifications and restoration priorities.					

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
Public Information Officer (PIO)/ Assistant PIO	Wildfires PSPS	The PIO's role is to provide strategic communications counsel to the EOC Commander. The PIO's responsibilities during a PSPS event include: • Developing main narrative for talking points. • Developing and implementing communications strategy to ensure "one voice" communications. • Coordinating with Customer team, Liaison, and any other Lines of Business (LOB) stakeholders on communication materials. • Coordinating emergency communication activities with other agencies, media, customers and others through verbal replies, on-camera interviews, written statements, press releases, and social media. • Providing early warning of a potential PSPS event when possible, using a combination of direct communication and traditional and social media. • Informing employees through internal communications about the PSPS event. • Responding to real-time media requests for information, interviews, and status reports. • Conducting press conferences and managing press questions and queries.	• ICS 100 • ICS-200 • ICS-700 • ICS-800 • SEMS G606 • IS-368 • G-775 • G-191 • G-626 • ICS 300 • IS230d • G-611 M • IS 702	16	26	0	0

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
Safety Officer/ Assistant Safety Officer	Wildfires PSPS	The Safety Officer's responsibilities during a PSPS event include: • Preparing safety messaging on potential hazards for line/office personnel, substation personnel, Field Observers, and contractors as well as disseminating safety messages to "EO EOC out" mailbox. • Confirming Safety staff availability for EOC field support and availability of protective equipment and supplies as appropriate. • Finalizing Field Safety Specialist deployment plans based on Operational needs, operations crew deployment plans • Accompanying Field Observers, crews, and patrols to support safe working and driving conditions as well as safe restoration activities as appropriate. • Incorporating field observations into safety messaging.	• ICS 100 • ICS-200 • ICS-700 • ICS-800 • SEMS G606 • IS-368 • G-775 • G-191 • G-626 • ICS 300 • IS230d • G-611 M	16	17	0	0

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
Operations Section Chief/ Deputy Operations Section Chief	Wildfires PSPS	The Operations Section Chief implements the de-energization and restoration strategy for PSPS events and achieves the incident objectives set by EOC Commander and communicated in the IAPs. The Operations Section Chief ensures coordination with other EOC sections and emergency centers (such as REC and OEC).	- ICS 100 - ICS-200 - ICS-700 - ICS-800 - SEMS G606 - IS-368 - G-775 - G-191 - G-626 - ICS 300 - IS230d - G-611 O	16	15	0	0
Planning Section Chief/ Deputy Planning Section Chief/ PSPS Deputy Planning Section Chief	Wildfires PSPS	- The Planning Section Chief is responsible for directing Planning Section staff and developing their respective documentation. They also focus on leading/ participating in meetings, representing the Planning Section perspective in OIC Decision meetings, and reviewing all Planning-developed external materials. - For PSPS, the Planning Section Chief has two deputies: a Deputy Planning Section Chief and a PSPS Deputy Planning Section Chief. These deputies work with staff to confirm activities are being performed according to procedures. They work together closely, dividing leadership responsibilities in alignment with ICS. - The Deputy Planning Chief leads the standard ICS Units (Documentation Unit, Situation Unit, Resource Unit, Resource Management Unit and Demobilization Unit).	- ICS 100 - ICS-200 - ICS-700 - ICS-800 - SEMS G606 - IS-368 - G-775 - G-191 - G-626 - ICS 300	24	21	0	0

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
		- The Deputy Planning Chief leads the standard ICS Units (Documentation Unit, Situation Unit, Resource Unit, Resource Management Unit and Demobilization Unit). - The PSPS Deputy Planning Chief leads the group of specific PSPS units established within the Planning Section (PSPS Technical Unit Leader, PSPS DAHS, PSPS TAHS, PSPS Portal Unit Leader, PSPS Process Unit Leader, and the PSPS Risk Analyst). - The Planning Section is responsible for collecting, evaluating, and displaying event intelligence and information, and is the source of all event impact data. Updates are communicated broadly through the EOC. Additional responsibilities include: - Preparing and maintaining event documentation including the Situation Report, Cal OES Notification Form, and event Playbooks. - Documenting circuits potentially in de-energization scope, customers potentially in de-energization scope, and customers proactively de-energized by PSPS event. - Developing PSPS event impact maps in various formats to be used by Public Safety Partners and critical public safety-related customers. - Developing long-range resource, contingency, and demobilization plans.	- IS230d - G-611 P				

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
Logistic Section Chief/ Deputy Logistics Section Chief	Wildfires, PSPS	The Logistics Section Chief oversees the Logistics Section which consists of the Deputy Logistics Section Chief, the Service and Support branches, the Logistics Reporting Unit, and may include the Materials and Transportation Coordination Center depending on the scope and nature of the emergency. The Logistics Section secures resources, supplies, food, lodging, vehicles and equipment rentals, fuel, security, and medical services, as well as maintains equipment for incident personnel	- ICS 100 - ICS-200 - ICS-700 - ICS-800 - SEMS G606 - IS-368 - G-775 - G-191 - G-626 - ICS 300 - IS230d - G-611 L	16	16	0	0
Finance & Admin Section Chief/ Deputy F&A Chief	Wildfires PSPS	Human Resources (HR) and Finance coworkers are assigned to Finance and Administration Section emergency roles HR and Finance coworkers share the assignment responsibility for the Section Chief and Deputy Section Chief emergency roles to ensure HR and Finance subject matter expertise is included at this leadership level. The Finance and Administration (F&A) Section Chief is an EOC General Staff emergency role. During all-hazard response incidents, the F&A Section Chief is responsible for finance and human resource support. The Section Chief and Section Deputy Chief activate and perform the consolidated section leadership and administrative actions.	- ICS 100 - ICS-200 - ICS-700 - ICS-800 - SEMS G606 - IS-368 - G-775 - G-191 - G-626 - ICS 300 - IS230d - G-611 F	16	23	0	0

**TABLE 8-38:
EMERGENCY PREPAREDNESS STAFFING AND QUALIFICATIONS
(CONTINUED)**

Role	Incident Type	Responsibilities	Qualifications	# of Dedicated Staff Required	# of Dedicated Staff Provided	# of Contract Workers Required	# of Contract Workers Provided
PSPS Intel & Investigation Section Chief	Wildfires PSPS	The Intelligence and Investigation (I&I) Section Chief, in conjunction with the PSPS I&I Section Process Manager, ensures compliance with the regulatory requirements that PG&E reports on any wind-related damage or hazards sustained by PG&E facilities during a PSPS event including Resolution ESRB-8, Ordering Paragraph 1 of D.19-05-042 (Phase 1), and Ordering Paragraph 1 of D.20-05-051 (Phase 2) in addition to investigation of any other incidents arising out of the PSPS event (e.g., Fire/ignition). The I&I Sections responsibilities during a PSPS event include: • Maintaining the PSPS Damage Hazard Form via Inspect App and/or paper form to record damages and hazards observed in the post de-energization patrol; • Receiving and aggregating the reports of damages and hazards (including photos) into a master table; • Quality-control review of the damages and hazards documentation to verify they are PSPS qualified and reportable; • Managing a PSPS Damage/Hazard dashboard to provide situational awareness to the damages/hazards identified during patrol, ensuring the dashboard is actionable by stakeholders; • Drafting the language for the damage documentation section of the CPUC Deenergization Post-Event Report; and • Providing validated and structured damage and hazard data to satisfy data requests from external and internal stakeholders.	• ICS 100 • ICS-200 • ICS-700 • ICS-800 • SEMS G606 • IS-368 • G-775 • G-191 • G-626 • ICS 300 • IS230d • G-611 P	8	8	0	0

For more information on our training curriculum, please see [Table PG&E-8.4.2-2](#) in [Appendix F](#).

8.4.2.2.2 Personnel Training

The electrical corporation must report on its internal personnel training program(s) for wildfire and PSPS emergency events. This training must include, at a minimum, training on relevant policies, practices, and procedures before, during, and after a wildfire or PSPS event. The reporting must include, at a minimum:

- *The name of each training program;*
- *A brief narrative on the purpose and scope of each program;*
- *The type of training method;*
- *The schedule and frequency of training programs;*
- *The percentage of staff who have completed the most current training program; and*
- *How the electrical corporation tracks who has completed the training programs.*

Table 8-39 provides an example of the minimum acceptable level of information.

Personnel Training Overview

PG&E has multifaceted training programs for staff that support outages related to wildfires and PSPS. These include:

- EP&R Emergency Preparedness Training CERP;
- PSPS-Specific Training Program; and
- PSPS Field Personnel Training.

EP&R Emergency Preparedness Training and CERP

The EP&R organization sets priorities for training and exercises considering PG&E's priorities, legal and other requirements, stakeholder feedback, threats, hazards and risk assessment data, and our ability to perform and deliver core capabilities during training exercises and actual events.

PSPS Specific Training Program

Personnel who respond to PPS outages are required to take PPS specific training. This includes high-level, overview courses and role-specific trainings that focus on the responsibilities that staff assume during PPS outages.

PSPS Field Personnel Training

In 2022, PG&E updated PSPS Procedure PSPS-1000P-01 (“Public Safety Power Shutoff for Electric Transmission and Distribution”) to improve operational response based on feedback/improvements from 2021 PSPS Events.

[Table 8-39](#) below lists PG&E’s training programs related to PSPS and wildfires, the purpose of each program, the training method, frequency, the position or title of personnel required to take the training, and the number of PG&E team members who have taken each course.

**TABLE 8-39:
PG&E'S PERSONNEL TRAINING PROGRAMS FOR WILDFIRE AND PSPS EVENTS**

Training Topic	Purpose and Scope	Training Method	Training Frequency	Position or Title of Personnel Required to Take Training	# Personnel Requiring Training	# Personnel Provided with Training	Form of Verification or Reference
EP&R Emergency Preparedness Training Program	The purpose of this training is to give employees with an emergency role the tools to deliver the right response during an activation. The training is aligned to California SEMS and FEMA standards.	Online web-based training and virtual instructor lead courses	One time	EOC staff	756	655	Training certificates on file and training transcripts
CERP Training	This training provides an overview of the CERP, the blueprint for Company policies and strategies for emergency response	Online Web Based Training	Annually	EOC Staff	828	598 completed this year 217 on track to meet annual completion requirement	Training Transcripts
PSPS Specific Training Program	Prepare EOC personnel on how to respond during a PSPS activation.	Online Web Based Training courses and in-person training, including PPT, exercises and activities, Performance Support tools, Knowledge and Skill Checks, Drills	Annually	Planning Section personnel with PSPS-specific duties	76	66	Training Transcripts

**TABLE 8-39:
PG&E'S PERSONNEL TRAINING PROGRAMS FOR WILDFIRE AND PSPS EVENTS
(CONTINUED)**

Training Topic	Purpose and Scope	Training Method	Training Frequency	Position or Title of Personnel Required to Take Training	# Personnel Requiring Training	# Personnel Provided with Training	Form of Verification or Reference
PSPS Restoration Process	To ensure compliance with PSPS-1000P-01 (Public Safety Power Shutoff for Electric Transmission and Distribution)	Online courses	Annually (12-month rolling requirement per person)	Division OEC Personnel	1,632 (2022)	1,607 (2022) ^(a)	Learning Services group (PSPS-0001 WBT PSPS Restoration Process)
PSPS Execution for Distribution Control Center (DCC) Operators	To ensure compliance with PSPS-1000P-01 (Public Safety Power Shutoff for Electric Transmission and Distribution)	Online courses	Annually (12-month rolling requirement per person)	Distribution Control Center Operators	126 (2022)	125 (2022) ^(a)	Learning Services group (PSPS-0002 WBT PSPS Execution for DCC Operators)
(a) The discrepancy between required and completed training is because trainings being completed on a 12-month rolling basis. All personnel requiring this training will complete the training within their 12-month time period.							

8.4.2.2.3 External Contractor Training

The electrical corporation must report on its external contractor training program(s) for wildfire and PSPS emergency events. This training must include, at a minimum, training on relevant policies, practices, and procedures before, during, and after a wildfire or PSPS event. The reporting must include, at a minimum:

- The name of each training program;*
- A brief narrative on the purpose and scope of each program;*
- The type of training method;*
- The schedule and frequency of training programs;*
- The percentage of contractors who have completed the most current training program; and*
- How the electrical corporation tracks who has completed the training programs.*
- Table 8-40 provides an example of the minimum acceptable level of information.*

PG&E does not use contractors in the EOC, therefore, there are no contractors who receive the EOC training described in the previous two sections. PG&E does use contractors for Patrol and for Wildfire and PSPS damage restoration. These field contractors receive training in wildfire ignition prevention. Please see [Table 8-40](#) below.

**TABLE PG&E-8-40:
CONTRACTOR TRAINING PROGRAM**

Training Topic	Purpose and Scope	Training Method	Training Frequency	Position or Title of Personnel Required to Take Training	# Contractors Requiring Training	# Contractors Completed Training	Form of Verification or Reference
TD-1464S contractor training is conducted through SAFE 1503 WBT Fire Danger Precautions course	SAFE-1503 WBT (Fire Danger Precautions Training) is PG&E's fire danger safety training course. The course is designed to reduce the number of wildfires started by PG&E employees and contract partners performing work in hazardous fire areas by educating them on how to take the proper precautions and implement fire mitigation measures. The course covers the Fire Potential Index daily forecast; how to consult the Wildfire Mitigation Matrix & the Wildfire Risk Checklist to apply mitigation strategies according to the FPI rating; how to prepare for work by implementing required mitigation strategies and adjust if FPI ratings or weather conditions change; and how to use fire mitigation tools.	Contract partners complete this course via the ISNetworld portal as a web-based training course.	This training is profiled to the target audience as mandatory, generally to be completed annually between January 1 and April 1	All PG&E employees and contract partners performing PG&E work which may result in a spark, fire, or flame on or near any forest-brush-, or grass-covered lands are required to take this training.	Due to a database maintenance issue from a third-party provider, we are currently unable to produce this information in an accurate manner. However, we are working with our third-party contractor to refine their database tracking methodology. Our standard requires new hires to complete the training within 90 days of the assignment date, and for existing contractors to complete the training annually between January 01 and April 01. We have created the Contractor-Specific Training Improvements Project Team to help enforce this policy. Their efforts will result in the development and publication of related guidance document(s).	11,036	We track our contractor training through ISNetworld

8.4.2.3 Drills, Simulations, and Tabletop Exercises

Discussion-based and operational-based exercises enhance knowledge of plans, allow personnel to improve their own performance, and identify opportunities to improve capabilities to respond to real wildfire emergency events and PSPS events. Exercises also provide a method to evaluate an electrical corporation's emergency preparedness plan and identify planning and/or procedural deficiencies.

Throughout our service territory, we conduct PSPS field exercises to prepare utility personnel to restore services after the event has ended. Prior to the field exercises, personnel complete two courses (PSPS-0001WBT PSPS Restoration Process and PSPS-0002WBT PSPS Execution for Distribution Control Centers Operators) to ensure compliance with PSPS-1000P-01 (Public Safety Power Shutoff for Electric Transmission and Distribution) which provides focused alignment with the overall PSPS efforts.

These PSPS courses and field exercises are conducted for all PG&E divisions in the HFTD and HFRA areas, with the focus on safe and efficient service restoration following emergencies.

8.4.2.3.1 Internal Exercises

The electrical corporation must report on its program(s) for conducting internal discussion-based and operations-based exercises for both wildfire and PSPS emergency events. This must include, at a minimum:

- *The types of discussion-based exercises (e.g., seminars, workshops, TTXs, games) and operations-based exercises (e.g., drills, Functional Exercises (FE), FSEs);*
- *The purpose of the exercises;*
- *The schedule and frequency of exercise programs;*
- *The percentage of staff who have completed/participated in exercises; and*
- *How the electrical corporation tracks who has completed the exercises.*

Table 8-41 provides an example of the minimum acceptable level of information.

Utility Initiative Tracking ID: EP-01

PG&E's EP&R Strategy and Execution team is responsible for developing and facilitating corporate level exercises.

These emergency preparedness exercises allow participants to practice the duties, tasks, and operations they are expected to perform in a real emergency. They are

adapted from the HSEEP to serve a utility and test emergency plans on an ongoing basis at least once per calendar year.

The common, core capabilities evaluated for every exercise are:

- Situational Assessment;
- Operational Communications;
- Operational Coordination;
- Public Information and Warning;
- Logistics and Supply Chain Management;
- Planning; and
- Safety.

The Director of EP&R Strategy and Execution is responsible for ensuring that exercises mandated by regulatory agencies are performed at least annually, or more frequently if required, to meet regulatory timelines.

Exercise planners from each functional area develop their portion of the exercise following all planning guidelines and timelines. Exercise planners and support staff participate in the full-scale or FE as a controller, evaluator, or a simulator. In the TTXs, the planner will serve to help develop the questions and evaluate their player's response for their functional area.

PG&E's CERP and related annex exercises are based on emergency management program priorities and test the specific operational components included in the CERP and annexes.

PG&E's PSPS FSE includes division-level field exercises which consist of physical field patrols (both ground and air) on pre-determined circuits.

PG&E's EP&R SE Exercise Team plans, coordinates, and conducts emergency preparedness exercises that are consistent with the HSEEP, the California SEMS, and the NIMS methodologies. They include:

- Seminars;
- Workshops;
- TTXs;
- Games;
- Drills;
- FE; and

- FSEs.

PG&E's Company-wide, multi-year training and exercise program is described in the EP&R MYTEP. PG&E conducted multiple wildfire and PSPS exercises in 2022. For more details see [Table PG&E-8.4.2-3](#) in [Appendix F](#).

Division-Level Exercises

PG&E provided an annual Division-Level field exercise platform for participating field employees using updated 2022 restoration protocols.

Division-Level field exercises were conducted in the 18 PG&E divisions that are in the HTFD and/or HFRA areas.

- Day 1: PSPS protocols/procedure refresher regarding execution criteria, scoping, de-energization, segmenting (preparation for step restoration), communication alignment and collateral procurement (segment guides, PSPS maps, etc.).
- Day 2: Physical field patrols (both air and ground of pre-determined circuits) and simulated re-energization using circuit-based hierarchy supporting step restoration methodology following the declared end of the weather event. Participants included both field level and distribution control center personnel.

Participation Tracking

Participation in the field level exercises was documented through PG&E Learning Services, course code PSPS-0320. The total number of staff who completed/participated in other exercises is tracked via a participant roster and a check in check out system.

For more details on internal drills, simulations, and TTXs, please see [Table 8-41](#), below:

**TABLE 8-41:
INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM**

Category	Exercise Title and Type	Purpose	Exercise Freq.	Position or Title of Personnel Required to Participate	# Personnel Participation	# Personnel Participation Completed^(a)	Form of Verification or Reference
Discussion Based	Wildfire Response Seminar	Provide an overview of PG&E's plans, procedures, and tools used to respond to and mitigate the effects of a Wildfire.	Annually	• EOC team members • Emergency Field Operations • Electric Distribution Emergency Center (EDEC) • Electric Transmission Emergency Center (ETEC) • Gas Emergency Center (GEC) staff • PSS • PSPS Project Management Office (PMO)	0 ^(b)	205	Attendance record and Outlook invitation
Discussion Based	PSPS Response Seminar	Understand the PSPS Program and the history of the PSPS Regulation requirements and how we are making these required improvements. Explain the PSPS Process at a "High Level." Understand the importance of Meteorology's role before and during a PSPS event. Learn how "Scoping" comes into play and how it sets the tone for the event. Understand the roles and responsibilities of PGE's other LOBs and more specifically how each program Communicates, Prepares, Responds, and Recovers from an incident.	Annually	• EOC team members • Emergency Field Operations • EDEC • ETEC • GEC staff • PSS • PSPS PMO	0	232 ^(a)	Attendance record and Outlook invitation

**TABLE 8-41:
INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Freq.	Position or Title of Personnel Required to Participate	# Personnel Participation	# Personnel Participation Completed ^(a)	Form of Verification or Reference
Discussion Based	PSPS event TTX	The TTX is aimed at discussing the various stages of the PSPS Procedural Flow (ProFlow) process with internal LOBs and External Agencies. PSPS TTX simulates R5-Plus weather conditions to test PG&E's ability to prepare for, respond to, and recover from a PSPS event. TTX aims to help PG&E response teams apply the PSPS specific knowledge provided by the training series in a realistic scenario. The TTX requires participants to review and use the CERP, PSPS Annex, and other LOB-specific plans to answer discussion-based scenario questions.	Annually	• Electric Distribution • Transmission Grid Operations • Electric Transmission • Electric Field Operations • Information Technology • Electric Incident Investigations • Corporate Safety • Corporate Security • Corporate Real Estate Strategy and Services (CRESS) • Aviation Services • Corporate Affairs • Supply Chain Customer Care • Human Resources • Marketing & Communications • PSPS Technology/Operations • Meteorology • Public Affairs • Temporary Generation • HAWC • Finance • Supply Chain • Vegetation Management • Power Generation	54	97	Exercise situation manual, attendance records, and After-Action Report

**TABLE 8-41:
INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Freq.	Position or Title of Personnel Required to Participate	# Personnel Participation	# Personnel Participation Completed ^(a)	Form of Verification or Reference
				- Gas Operations - PSPS PMO - Safety and Infrastructure Protection Teams (SIPT)			
Operations Based	Wildfire FE	Provide electrical corporation a way to determine its readiness to respond to a wildfire. Identify gaps or problems with existing policies and plans. Help personnel understand roles during a wildfire emergency. Serve as a training tool	Annually (before July 1)	- Electric Distribution - Transmission Grid Operations - Electric Transmission - Electric Field Operations - Information Technology - Electric Incident Investigations - Corporate Safety - Corporate Security - CRESS - Aviation Services - Corporate Affairs - Supply Chain Logistics Customer Care - Human Resources - Marketing & Communications - PSPS Technology/ Operations - Meteorology - Public Affairs - Temporary Generation - HAWC - Finance	248	310	Exercise Plan, player documentation, attendance rosters, AAR

**TABLE 8-41:
INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Freq.	Position or Title of Personnel Required to Participate	# Personnel Participation	# Personnel Participation Completed ^(a)	Form of Verification or Reference
				• Vegetation Management • Power Generation • Gas Operations • PSPS PMO • SIPTs			
Operations Based	PSPS FSE	Simulate R5-Plus weather and extreme wildfire risk conditions to test PG&E's ability to prepare for, respond to, and recover from a PSPS event in alignment with the CERP, PSPS Annex, and other LOB-specific plans. Challenge players to respond in real-time to solve operational concerns. Identify gaps or problems with existing policies and plans Help personnel understand roles during a wildfire emergency. Serve as a training tool.	Annually (before July 1)	• Electric Distribution • Transmission Grid Operations • Electric Transmission • Electric Field Operations • Information Technology • Electric Incident Investigations • Corporate Safety • Corporate Security • CRESS • Aviation Services • Corporate Affairs • Supply Chain Logistics Customer Care • Human Resources • Marketing & Communications • PSPS Technology/Operations • Meteorology • Public Affairs • Temporary Generation	248	310	Exercise Plan, player documentation, attendance rosters, AAR

**TABLE 8-41:
INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Freq.	Position or Title of Personnel Required to Participate	# Personnel Participation	# Personnel Participation Completed ^(a)	Form of Verification or Reference
				• HAWC • Finance • Vegetation Management • Power Generation • Gas Operations • PSPS PMO • SIPTs			
(a) # of Personnel Participation Completed is based on 2022 figures. (b) PG&E does not require attendance at seminars.							

8.4.2.3.2 External Exercises

The electrical corporation must report on its program(s) for conducting external discussion-based and operations-based exercises for both wildfire and PSPS emergency events. This must include, at a minimum:

- *The types of discussion-based exercises (e.g., seminars, workshops, TTXs, games) and operations-based exercises (e.g., drills, FEs, FSEs);*
- *The schedule and frequency of exercise programs;*
- *The percentage of public safety partners who have participated in these exercises; and*
- *How the electrical corporation tracks who has completed the exercises.*

Table 8-42 provides an example of the minimum acceptable level of information.

External discussion-based and operations-based exercises may include participation from PG&E Functional Areas (Customer, PSPS, PMO, etc.) and from external, public agencies. Generally, PG&E invites representatives from federal, state, and local agencies to participate in or observe the annual CERP exercise. The agencies that are invited may include:

- Local emergency management agencies and offices of emergency services;
- CPUC;
- California Independent System Operator;
- California Energy Commission;
- Cal OES;
- Non-Governmental Organizations;
- Voluntary Organizations; and
- CBOs.

External partners from various regions of our service territory are invited to participate in the functional or FSE planning meetings for both PSPS and wildfire exercises. These planning meetings include the external partners listed above. The scope of the exercise scenario includes transmission and distribution level customers in the counties wanting to participate, so they can practice their response to a PSPS or wildfire event. Many external partners also choose to observe the exercise and understand how PG&E practices their response to such emergencies, while other external partners may prefer to participate in our discussion-level TTXs.

Participation Tracking

Participation in the field level exercises was documented through PG&E Learning, course code PSPS-0320. The percentages of staff who have completed/participated in the exercises are not available because there was not a targeted number to measure against. A total participant count is available.

For more details on external drills, simulations, and TTXs, please see [Table 8-42](#), below:

**TABLE 8-42:
EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM**

Category	Exercise Title and Type	Purpose	Exercise Frequency	Position or Title of Personnel Required to Participate	# Personnel Participation Required^(a)	# Personnel Participation Completed	Form of Verification or Reference
Discussion Based	Wildfire Response Seminar	Provide an overview of PG&E's plans, procedures, and tools used to respond to and mitigate the effects of a Wildfire.	Annually	• EOC team members • Emergency Field Operations • Electric Distribution • Emergency Center (EDEC) • Electric Transmission • Emergency Center (ETEC) • Gas Emergency Center (GEC) staff • PSS • PSPS PMO	0 ^(b)	46	Attendance record and Outlook invitation
Discussion Based	PSPS Response Seminar	Understand the PSPS Program and the history of the PSPS regulation requirements and how we are making these required improvements Explain the PSPS Process at a high level Understand the importance of Meteorology's role before and during a PSPS event Learn how "Scoping" comes into play and how it sets the tone for the event Understand the roles and responsibilities of PG&E's other LOBs and more specifically, how each program communicates, prepares, responds, and recovers from an incident.	Annually	• EOC team members • Emergency Field Operations • EDEC • ETEC • GEC staff • PSS • PSPS PMO	0	126	Attendance records and Outlook invitation

**TABLE 8-42:
EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Frequency	Position or Title of Personnel Required to Participate	# Personnel Participation Required^(a)	# Personnel Participation Completed	Form of Verification or Reference
Discussion Based	PSPS Event TTX	The TTX is aimed at discussing the various stages of the PSPS Procedural Flow (ProFlow) process with internal LOBs and External Agencies PSPS TTX simulates R5-Plus weather conditions to test PG&E's ability to prepare for, respond to, and recover from a PSPS event. TTX aims to help PG&E response teams apply the PSPS specific knowledge provided by the training series in a realistic scenario. • CERP • PSPS Annex • Other LOB-specific plans	Annually	• Electric Distribution • Transmission Grid Operations • Electric Transmission • Electric Field Operations • Information Technology • Electric Incident Investigations • Corporate Safety • Corporate Security • CRESS • Aviation Services • Corporate Affairs • Supply Chain Customer Care • Human Resources • Marketing & Communications • PSPS Technology/Operations • Meteorology • Public Affairs • Temporary Generation	0	130	Exercise situation manual, attendance records, and After-Action Report

**TABLE 8-42:
EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Frequency	Position or Title of Personnel Required to Participate	# Personnel Participation Required^(a)	# Personnel Participation Completed	Form of Verification or Reference
				• HAWC • Finance • Supply Chain • Vegetation Management • Power Generation • Gas Operations • PSPS PMO • SIPTs			
Operations Based	Wildfire FE	• Provide electrical corporation a way to determine its readiness to respond to a wildfire. • Identify gaps or problems with existing policies and plans • Help personnel understand roles during a wildfire emergency. • Serve as a training tool.	Annually	• Electric Distribution • Transmission Grid Operations • Electric Transmission • Electric Field Operations • Information Technology • Electric Incident Investigations • Corporate Safety • Corporate Security • CRESS • Aviation Services • Corporate Affairs • Supply Chain Logistics • Customer Care	0	298	Exercise Plan, player documentation, attendance rosters, AAR

**TABLE 8-42:
EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Frequency	Position or Title of Personnel Required to Participate	# Personnel Participation Required^(a)	# Personnel Participation Completed	Form of Verification or Reference
				- Human Resources - Marketing & Communications - PSPS Technology/Operations - Meteorology - Public Affairs - Temporary Generation - HAWC - Finance - Vegetation Management - Power Generation - Gas Operations - PSPS PMO - SIPTs			
Operations Based	PSPS FSE	Simulate R5-Plus weather and extreme wildfire risk conditions to test PG&E's ability to prepare for, respond to, and recover from a PSPS event in alignment with the CERP, PSPS Annex, and other LOB-specific plans.	Annually	- Electric Distribution - Transmission Grid Operations - Electric Transmission - Electric Field Operations - Information Technology - Electric Incident Investigations - Corporate Safety	0	298	Exercise Plan, player documentation, attendance rosters, AAR

**TABLE 8-42:
EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM
(CONTINUED)**

Category	Exercise Title and Type	Purpose	Exercise Frequency	Position or Title of Personnel Required to Participate	# Personnel Participation Required^(a)	# Personnel Participation Completed	Form of Verification or Reference
		- Challenge players to respond in real-time to solve operational concerns. - Identify gaps or problems with existing policies and plans - Help personnel understand roles during a PSPS emergency - Serve as a training tool		- Corporate Security - CRESS - Aviation Services - Corporate Affairs - Supply Chain Logistics Customer Care - Human Resources - Marketing & Communications - PSPS - Technology/Operations - Meteorology - Public Affairs - Temporary Generation - HAWC - Finance - Vegetation Management - Power Generation - Gas Operations - PSPS PMO - SIPTs			
Note: PG&E does not require attendance at seminars. (a) # of Personnel Participation Completed is based on 2022 figure. (b) PG&E does not require external participation in our exercises. External participants are invited and encouraged to participate, but not required.							

8.4.2.4 Schedule for Updating and Revising Plan

The electrical corporation must provide a log of the updates to its emergency preparedness plan since 2019 and the date of its next planned update.

Updates should occur every two years, per R.15-06-009 and D.21-05-019. For each update, the electrical corporation must provide the following:

- *Year of updated plan;*
- *Revision type (e.g., addition, modification, elimination);*
- *Component modified (e.g., communications, training, drills/exercises, protocols/procedures, MOAs);*
- *A brief description of the lesson learned that informed the revision; and*
- *A brief description of the specific addition, modification, or elimination.*

Table 8-43 provides an example of the minimum acceptable level of information.

PG&E maintains an annual update schedule for the CERP and its associated annexes including PG&E's Wildfire and PSPS annexes in its Company Emergency Response Plans Standard (EMER-2001S). Last updated on April 26, 2022, EMER-2001S provides a CERP hazard and functional annex update schedule. For more details, please see [Table PG&E-8.4.2-4](#) in [Appendix F](#).

Updates to the CERP can be found in the Change Record logs. For more details on the logs from 2019 through August 4, 2021 (the date of the currently published CERP document, version 7.0) please see [Table PG&E-8.4.2-5](#) in [Appendix F](#).

Details on wildfire-specific updates to the Emergency Preparedness Plan see [Table 8-43](#) in [Appendix F](#).

8.4.3 External Collaboration and Coordination

8.4.3.1 Emergency Planning

In this section, the electrical corporation must provide a high-level description of its wildfire and Public Safety Power Shutoff (PSPS) emergency preparedness coordination with relevant public safety partners at state, county, city, and tribal levels within its service territory. The electrical corporation must indicate if its coordination efforts follow California's Standardized Emergency Management System (SEMS) or, where relevant for multi-jurisdictional electrical corporations (e.g., PacifiCorp), the Federal Emergency Management Agency National Incident Management Systems, as permitted by General Order (GO) 166. The description must be no more than a page.

In addition, the electrical corporation must provide the following information in tabular form, with no more than one page of information in the main body of the Wildfire Mitigation Plan (WMP) and a full table, if needed, in an appendix:

- List of relevant state, city, county, and tribal agencies within the electrical corporation's service territory and key points of contact, with associated contact information. Where necessary, contact information can be redacted for the public version of the WMP.*
- For each agency, whether the agency has provided consultation or verbal or written comments in preparation of the most current wildfire- and PSPS-specific emergency preparedness plan. If so, the electrical corporation should provide the date, time, and location of the meeting at which the agency's feedback was received.*
- For each agency, whether it has a Memorandum of Agreement (MOA) with the electrical corporation on wildfire or PSPS emergency preparedness, response, and recovery activities. The electrical corporation must provide a brief summary of the MOA, including the agreed roles and responsibilities of the external agency before, during, and after a wildfire or PSPS emergency.*
- In a separate table, a list of current gaps and limitations in the electrical corporation's existing collaboration efforts with relevant state, county, city, and tribal agencies within its territory. Where gaps or limitations exist, the electrical corporation must indicate the remedial action plan and the timeline for resolving the gaps or limitations.*
- For all requested information, a form of verification that can be provided upon request for compliance assurance.*

The electrical corporation must reference the Utility Initiative Tracking ID where appropriate.

Utility Initiative Tracking IDs: EP-02; EP-04; EP-06; EP-07; EP-08; EP-09

As part of PG&E's wildfire and PSPS emergency preparedness efforts, we regularly engage with public safety partners at the state, county, city, and tribal levels throughout our service area. Some of our key outreach channels are described below. We follow the engagement standards set forth by the California SEMS.

- Public Safety Specialist (PSS) Team Engagements: Our PSS Team provides personalized engagements (e.g., meetings, calls) with local agencies to discuss and coordinate emergency preparedness. These engagements include: regulatory compliance support; first responder workshops; wildfire safety town halls; California Governor's Office of Emergency Services (Cal OES) Mutual Aid Regional Advisory Committees and general regional coordinator meetings; professional group meetings; and trainings, exercises, and drills. During a wildfire emergency or in-scope for a PSPS event, we follow California's SEMS for communicating through county OES channels.
- Local Government Forums: We offer to hold an annual meeting to every city and county to discuss our operational plans that could impact emergency planning; highlight programs of interest; review accomplishments; receive feedback; and discuss upcoming city and county work that may impact emergency planning.
- PSPS Regional Working Groups: We hold quarterly forums to learn about the previous wildfire and PSPS season and share feedback on wildfire safety work; and discuss lessons learned and stakeholder concerns.
- Tabletop and Functional Exercises (FE): Drills that to test our communication strategies during wildfire and PSPS outages and identify areas for improvement.
- Community Wildfire Safety Program Trainings and Workshops (Ad-hoc): Trainings and workshops for agencies and other public safety partners.
- Review of PG&E's Emergency Preparedness Plans: We give local governments an opportunity to conduct a bi-annual review of our Electric Annex, pursuant to Public Utilities Code (Pub. Util. Code) 768.6(b)(1)(c), and in compliance with Standard 10 of GO 166. The last bi-annual review was conducted in 2021. Beginning in March 2023 we will meet with cities and counties to give them an opportunity to review PG&E's Company Emergency Response Plan (CERP), ensuring we are complying with engagement standards set forth by the California SEMS.

In response to Critical Issue [RN-PG&E-23-01](#), PG&E replaced our 10-year objectives related to maintaining and expanding our hazards planning (objectives EP-03 and EP-05). PG&E's complete response to Critical Issue [RN-PG&E-23-01](#) is in [Section 7.2.1](#), following [Revised Table 7-3-1](#).

[Table 8-44](#) shows how we collaborate with state and local agencies. The information provided in [Table 8-44](#) is an excerpt and the completed table, including contact information for the entities listed in this table, is provided in Confidential [Appendix I](#).

We have not encountered any gaps and limitations when collaborating with state and local agencies as shown in [Table 8-45](#) below.

**TABLE 8-44:
PG&E'S STATE AND LOCAL AGENCY COLLABORATIONS**

Name of State or Local Agency	Point of Contact and Information	Emergency Preparedness Plan Collaboration – Last Version of Plan Agency Collaborated	Emergency Preparedness Plan Collaboration – Collaborative Role	Memorandum of Agreement?	Brief Description of MOA
Alameda County	Derrick Thomas, ACFD Div Chief/ Emergency Management	Regional Working Group: Bay Area (12/9/22)	Review and provide feedback	No	N/A

**TABLE 8-45:
KEY GAPS AND LIMITATIONS IN COLLABORATION ACTIVITIES WITH STATE AND LOCAL AGENCIES**

Gap or Limitation Subject	Remedial Brief Description	Remedial Action Plan
N/A	N/A	N/A

8.4.3.2 Communication Strategy with Public Safety Partners

The electrical corporation must describe at a high level its communication strategy to inform external public safety partners and other interconnected electrical corporation partners of wildfire, PSPS, and re-energization events as required by GO 166 and Pub. Util. Code Section 768.6. This must include a brief description of the policies, practices, and procedures the electrical corporation adopts to establish appropriate communication protocols with public safety partners for both wildfire- and PSPS-specific incidents to ensure timely, accurate, and complete communications. The electrical corporation must refer to its emergency preparedness plan, as needed, to provide more detail. The narrative must be no more than two pages.

As each public safety partner will have its own unique communication protocols, procedures, and systems, the electrical corporation must coordinate with each entity individually. The electrical corporation must summarize the following information in tabulated format:

- *All relevant public safety partner groups (such as fire, law enforcement, OES, municipal governments, Energy Safety, California Public Utilities Commission (CPUC or Commission), and other electrical corporations) at every level of administration (state, county, city, or tribe), as needed.*
- *The names of individual public safety entities.*
- *For each entity, the point of contact for emergency communications coordination, and the contact information, which may be redacted as needed.*
- *Key protocols for ensuring the necessary level of voice and data communications such as interoperability channels, methods for information exchange, format for each data typology, communication capabilities, data management systems, backup systems, common alerting protocols, and messaging, along with associated references in the emergency plan for more details.*
- *Frequency of prearranged communication review and updates.*
- *Date of last discussion-based or operations-based exercises on public safety partner communication.*

In a separate table, the electrical corporation must list the current gaps and limitations in its public safety partner communication strategy coordination. Where gaps or limitations exist, the electrical corporation must indicate the remedial action plan and the timeline for resolving the gaps or limitations. For all requested information, the electrical corporation must indicate a form of verification that can be provided upon request for compliance assurance.

Tables 8-46 and 8-47 provide examples of the minimum level of content and detail required.

PG&E is not the lead agency for wildfires. However, PG&E does communicate with Public Safety Partners regarding assets in wildfire impacted areas, outages due to wildfire, and PSPS outages and service restoration. Below is a high-level overview of PG&E's communication efforts with Public Safety Partners during these events.

- Notifying Cal OES and CPUC when PG&E's Emergency Operations Center (EOC) is activated and again at key milestones, including de-energization and restoration.
- Sending automated notifications to public safety partners at key milestones throughout the event so they can begin implementing their emergency response plans, ahead of customer notifications and know when service restoration is anticipated.
- Live calls from our Grid Control Center to transmission-level entities before de-energization and re-energization.
- Providing localized support for Public Safety Partners, such as water agencies and emergency hospitals, to confirm they have a mitigation plan in place or if backup generation support is needed.
- Conducting ongoing coordination with local County OES and tribal contacts through dedicated Agency Representatives, following the protocols outlined in PG&E's "PSPS Policy & Procedures Guide for Emergency Managers" ([Appendix E](#)). These Agency Representatives are directly connected to our EOC and coordinate internally to gather critical, timely, and location-specific information when requested.
- Embedding a PG&E Agency Representative into the Cal OES State Operations Center to answer questions in real-time, at the request of Cal OES.
- Allowing Public Safety Partners to be embedded into our EOC, per CPUC requirements, and joining agencies in their local EOCs.
- Providing event-specific maps and reports via a secure data portal, as appropriate.
- For PSPS events only, we host the following calls:
 - Live Calls to Public Safety Answer Points or Dispatch Centers when our EOC is first activated for a PSPS to inform them of a potential event as their call volume may increase as customer notifications begin.
 - State Executive Briefings with agencies to provide the latest outage and restoration information and to answer questions.
 - Systemwide Cooperators Calls, where Public Safety Partners in the service territory are invited to join and hear the latest event information.
 - Tribal Cooperator Calls with potentially impacted tribes to provide the latest event information and answer questions in real-time.

PG&E follows communications policies and procedures outlined in the documents listed below. Each document can be located in [Appendix E](#).

- PSPS Policy & Procedures Guide for Emergency Managers;
- CERP;
- PSPS Annex;
- Wildfire Annex; and
- Electric Annex.

Pursuant to Pub. Util. Code 768.6(b)(1)(c) and in compliance with Standard 10 of GO 166, PG&E provides local government stakeholders an opportunity to provide input into our emergency and disaster preparedness plans, ahead of wildfire season. In addition, when in wildfire emergency posture or in-scope for a PSPS event, our Public Safety Specialist Team follows California's SEMS as required by GO 166 and Pub. Util. Code Section 768.6.

[Table 8-46](#) below provides an example of the high-level communication coordination with other public safety partners. The completed table is in [Appendix F](#).

We have not encountered any gaps and limitations when collaborating with public safety partners as shown in [Table 8-47](#) below.

**TABLE 8-46:
HIGH-LEVEL COMMUNICATION PROTOCOLS, PROCEDURES, AND SYSTEMS WITH PUBLIC SAFETY PARTNERS**

Public Safety Partner Group	Name of Entity	Point of Contact and Information	Key Protocols	Frequency of Prearranged Communication Review and Update	Communication Exercise(s): Date of Last Completed	Communication Exercise(s): Date of Planned Next
City	City of Amador	Joyce Davidson, City Clerk	See 8.4.3.2 narrative for key protocols.	Annually	N/A	N/A

**TABLE 8-47:
KEY GAPS AND LIMITATIONS IN COMMUNICATION COORDINATION WITH PUBLIC SAFETY PARTNERS**

Gap or Limitation Subject	Remedial Brief Description	Remedial Action Plan
N/A	N/A	N/A

8.4.3.3 Mutual Aid Agreements

In this section, the electrical corporation must provide a brief overview of the Mutual Aid Agreements (MAA) it has entered into regarding wildfire emergencies and/or disasters, as well as PSPS events. The overview narrative must be no more than one page.

In addition, the electrical corporation must provide the following wildfire emergency information in tabulated format:

- *List of entities with which the electrical corporation has entered into an MAA;*
- *Scope of the MAA; and*
- *Resources available from the MAA partner.*

Table 8-48 provides an example of the minimum level of content and detail required.

Mutual assistance is an essential part of the PG&E's service restoration process and contingency planning. It consists of coordinated agreements among cooperating agencies and/or utility companies to provide personnel, equipment, and material assistance during emergencies.

Mutual assistance can be inbound or outbound and implemented for gas, electric, cybersecurity, or Information Technology skilled workers, and any line of business or functional area needing assistance.

In times of service disruptions caused by storms, fires, or other types of emergencies, PG&E may request mutual assistance from other utilities (inbound). Conversely, PG&E may provide mutual assistance to other utility companies requesting aid (outbound). In all cases, mutual assistance is provided with the expectation that the responding utilities are reimbursed.

The mutual assistance network is supported by Statewide/Intrastate Mutual Assistance agreements. These are agreements, coordinated through the state, incorporate both state and local governmental and non-governmental resources. All available emergency restoration resources (including contractors) will be pooled and allocated to participating utilities in a safe, efficient, transparent, and equitable manner without regard to Regional Mutual Assistance Groups affiliation.

PG&E works with both the California Utilities Emergency Association (CUEA) and the Western Region Mutual Assistance Group (WRMAG) for inbound and outbound resource needs. The CUEA serves as a point-of-contact for critical infrastructure utilities and the Cal OES and other Governmental Agencies before, during and after an event. As the CUEA members are in California, these are the companies that we approach first for a new event. While the WRMAG implements the Edison Electric Institute (EEI) mutual assistance program in the Western United States and Canada.

For more details on PG&E's mutual assistance partners, the scope of each MAA, and the available resources from each partner, please see [Table 8-48](#) below.

**TABLE 8-48:
PG&E'S MUTUAL AID AGREEMENTS FOR RESOURCES DURING A WILDFIRE OR DE-ENERGIZATION INCIDENT**

Mutual Aid Partner	Scope of Mutual Assistance Agreement	Available Resources from Mutual Aid Partner
CUEA	In the event of an emergency affecting electrical generation, electrical or natural gas transmission, distribution, or related facilities owned or controlled by a party, such party ("requesting party") may request another party ("assisting party") to provide assistance.	Personnel, material, equipment, supplies, or tools, or any other matter made by one party to another requesting party.
Western Region Mutual Assistance Group/ Western Energy Institute (WRMAA/WEI)	The WRMAA agreement, facilitated by WEI, is designed as a tool for all gas and electric utilities throughout the Western United States and Canada. WRMAA is a recognized group implementing the EEI mutual assistance program in the Western United States and Canada.	Personnel, material, equipment, supplies or tools, or any other matter made by one party to another requesting party.
EEI	EEI's mutual assistance program is a voluntary partnership of investor-owned electric companies across the country committed to helping restore power whenever and wherever assistance is needed.	Personnel, material, equipment, supplies or tools, or any other matter made by one party to another requesting party.
American Gas Association (AGA)	This agreement will enhance the collaboration across the natural gas industry with the understanding that our combined resources can quickly restore comfort to communities that are hit by disasters, ensuring Americans have the energy they need and expect for comfortable homes, warm food, and hot showers. Members are committed to the safe and reliable delivery of natural gas and are proud to assist other utilities and communities in their time of need.	Personnel, material, equipment, supplies or tools, or any other matter made by one party to another requesting party.

8.4.4 Public Emergency Communication Strategy

The electrical corporation must describe at a high level its comprehensive communication strategy to inform essential customers and other stakeholder groups of wildfires, outages due to wildfires, and PSPS and service restoration, as required by Pub. Util. Code Section 768.6. This should include a discussion of the policies, practices, and procedures the electrical corporation adopts to establish appropriate communication protocols to ensure timely, accurate, and complete communications. The electrical corporation may refer to its Pub. Util. Code Section 768.6 emergency preparedness plan to provide more detail. The narrative must be no more than one page.

In the following sections, the electrical corporation must provide an overview of the following components of an effective and comprehensive communication strategy:

- *Protocols for emergency communications;*
- *Messaging; and*
- *Current gaps and limitations.*

Reference the Utility Initiative Tracking ID where appropriate.

PG&E is not the lead agency for wildfires, and we do not communicate to Public Safety Partners regarding the status of wildfires.

Our primary objective is to provide our public safety partners and customers who may be impacted by a PSPS event with accurate notifications as soon as possible. This is in accordance with the minimum timelines set forth by the CPUC PSPS Phase 1 Guidelines.²⁴⁰ These notifications are designed to help ensure that customers have enough time to prepare for, respond to, and stay safe during PSPS outages.

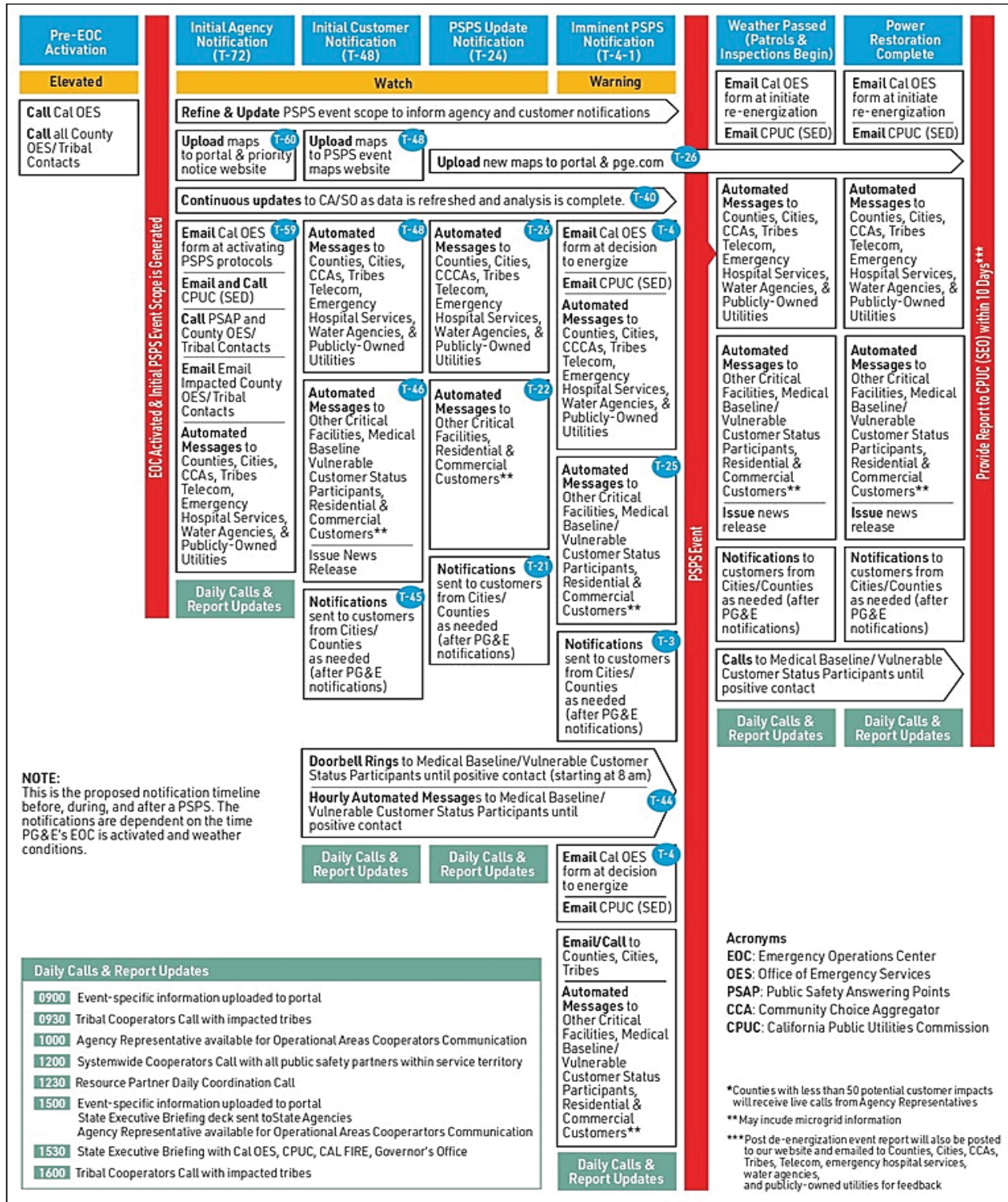
Our annual PSPS notification planning strategy is founded on feedback collected via public safety partner surveys, customer surveys, stakeholder engagement, and regularly scheduled meetings (described in [Section 8.4.3.1](#)) or PSPS After Action Review.

The strategy for outages due to a wildfire follows our emergency outage communications strategy in accordance with GO 166.

Please refer to [Section 8.4.3.2](#) for information about how PG&E communicates with Public Safety Partners to inform them of outages due to wildfires and PSPS and service restoration. An overview of PSPS notification, including PSPS restoration notifications are also included in [Figure PG&E-8.4.4-1](#) below.

²⁴⁰ D.19-05-042. See [Appendix E](#).

**FIGURE PG&E-8.4.4-1:
PSPS NOTIFICATION TIMELINE**



8.4.4.1 Protocols for Emergency Communications

The electrical corporation must identify the relevant stakeholder groups in its service territory and describe the protocols, practices, and procedures used to provide notification of wildfires, outages due to wildfires and PSPS, and service restoration before, during, and after each incident type. Stakeholder groups include, but are not limited to, the general public, priority essential services, Access and Functional Needs (AFN) populations, populations with limited English proficiency (LEP), tribes, and people in remote areas. The narrative must include a brief discussion of the decision-making process and use of best practices to ensure timely, accurate, and complete communications. The narrative must be no more than one page.

The electrical corporation must also provide, in tabular form, details of the following:

- *Communication methods; and*
- *Message receipt verification mechanisms.*

Table 8-49 provides an example of the minimum level of content and detail required.

PG&E conducts extensive outreach to stakeholders following activation of the PG&E EOC. Key stakeholders include: (1) city, county, state and federal agencies; (2) tribal governments; (3) First Responders; (4) Medical Baseline (MBL) Program and Self-Identified Vulnerable (SIV) Customers; (5) customers with LEP and other needs; (6) Community-Based Organization (CBO) in-event support and resources; (7) critical facilities and infrastructure; (8) telecommunications and water providers; (9) transmission-level entities; (10) third-party commodity suppliers; (11) paratransit agencies; (12) media; and (13) the general public.

When PG&E's EOC activates for a potential PSPS event notifications are sent to the CPUC and Cal OES and sent again at key milestones throughout the process. In addition to automated notifications, PG&E conducts supplemental outreach and verification of message receipt to each stakeholder group. This outreach is frequent, tailored to the stakeholder's needs, and focuses on providing the latest event information.

PG&E's Liaison and Customer Teams manage most notifications to key stakeholders during a PSPS outage. We send automated calls, texts, and email notifications to public safety partners, customers, and to those that sign up for Address Alerts. We record and send ad-hoc automated calls in English and Spanish to impacted customers and public safety partners. We work with CBOs (In-Language Support) who also provide PSPS notifications to the public through in-person, social media, and local radio.

Our dedicated CBO team maintains communications with CBOs and resource partners before, during, and after PSPS, wildfires, and other emergencies.

During PSPS events, PG&E invites all CBOs to participate in the daily Systemwide Cooperators Call hosted by EOC staff to share PSPS updates. CBOs are also provided

courtesy e-mail notifications throughout the event with updates and access to a dedicated e-mail box. CBO resource partners are also sent PSPS priority/advance notifications to prepare resources for deployment, and PG&E's dedicated EOC team hosts a CBO Resource Partner coordination call which allows resource CBOs supporting the PSPS event or other emergency, to ask questions and share best practices.

PG&E summarizes our protocols for emergency communications to stakeholder groups in [Table 8-49](#) below.

**TABLE 8-49:
PG&E'S PROTOCOLS FOR EMERGENCY COMMUNICATION TO STAKEHOLDER GROUPS**

Stakeholder Group	Event Type	Method(s) for Communicating	Means to Verify Message Receipt
Local and State Agencies and First Responders	PSPS	Live calls Automated phone calls, texts, and e-mails.	Agency Representative Vendor delivery report
General Residential and SMB Customers	PSPS	Automated phone calls, texts, and e-mails.	Vendor delivery report
MBL Customers, Self-Identified Vulnerable Customers and Electricity Dependent Customers	PSPS	Automated phone calls, texts, and e-mails. If needed, live calls and/or in-person visit from PG&E representative.	Vendor delivery report; Confirmation from PG&E Representative for live calls. Completed Field Order for doorbell rings.
CBOs	PSPS	E-mail	Vendor delivery report
Critical Facilities and Infrastructure	PSPS	Automated phone calls, texts, and e-mails. Live calls as needed.	Vendor delivery report
Telecommunications and Water Providers	PSPS	Automated phone calls, texts, and e-mails. Live calls as needed.	Vendor delivery report
Transmission-level Entities	PSPS	Automated phone calls, texts, and e-mails. Live calls from Grid Control Center/Critical Infrastructure Lead.	Vendor delivery report
Paratransit Agencies	PSPS	Courtesy e-mail.	Zero "bounce back" emails received.
All customers of record	EPSS Outage Notification	Automated phone, text, and e-mails based on communications preference.	Vendor delivery report
All customers of record	Outage due to a wildfire	Automated phone, text, and e-mails based on communications preference.	Vendor delivery report

8.4.4.2 Messaging

In this section, the electrical corporation must describe its procedures for developing effective messaging to reach the largest percentage of stakeholders in its service territory before, during, and after a wildfire, an outage due to wildfire, or a PSPS event.

In addition, the electrical corporation must provide an overview of the development of the following aspects of its communication messaging strategy:

- *Features to maximize accessibility of the messaging (such as font size and color contrast analyzer);*
- *Alert and notification schedules;*
- *Translation of notifications;*
- *Messaging tone and language; and*
- *Key components and order of messaging content (such as hazard, location, and time).*

The narrative must be no more than one page.

PG&E increases public awareness about emergency planning and preparedness using language that is accurate, clear, specific, consistent, and confident in tone. We provide the most current information about our emergency response efforts, rebuilding and recovery, available customer resources, and protection protocols. Content includes news releases, media interviews, and social media posts. We maximize accessibility to this critical information by translating PG&E's website and other critical wildfire safety and PSPS preparedness materials into 16 non-English-languages. Our Contact Center provides translation support in over 240 languages. For customers who have not indicated a designated language preference, we provide notifications in English, with information on how to receive event information in translated languages. We also conduct extensive testing, including dial-test focus groups, to understand the ways to best communicate across demographics.

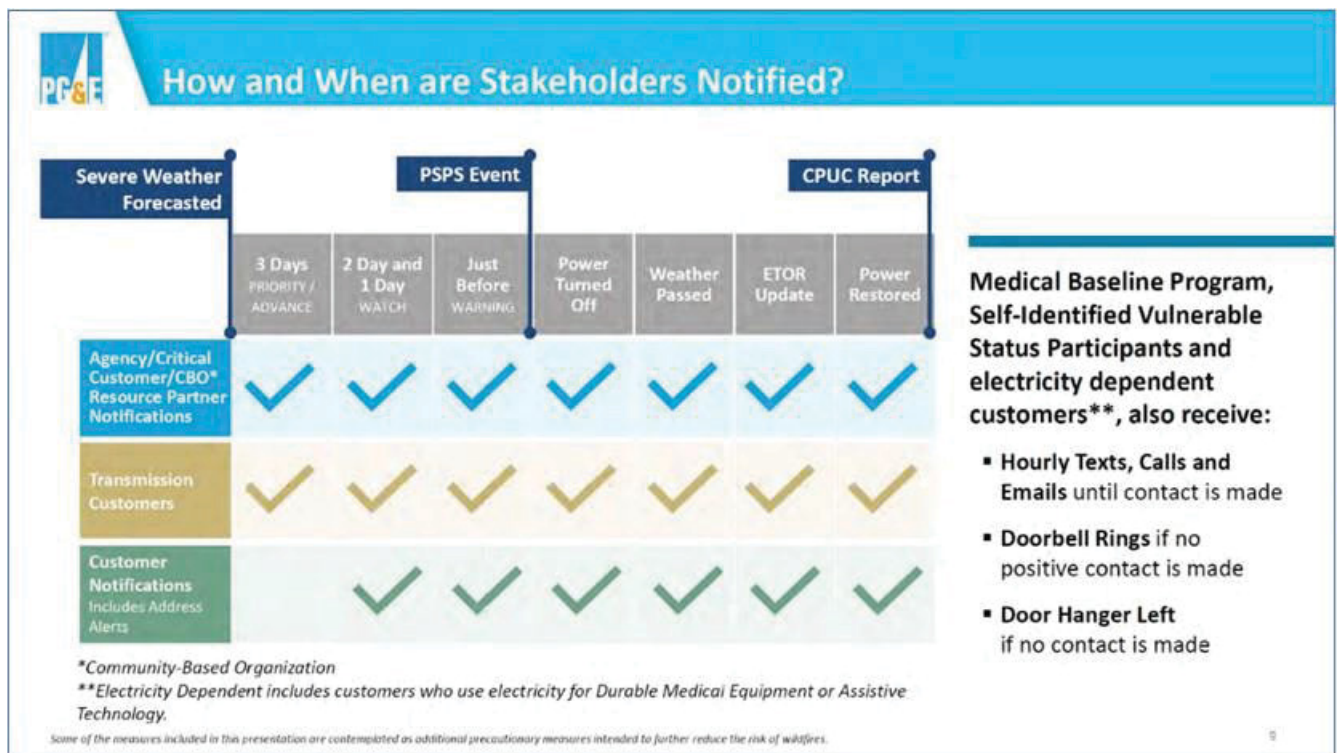
For the deaf/hearing impaired community, PG&E produced a video in American Sign Language (ASL) that explains the PSPS process and is available on our social media channels. Mailed correspondence includes a subject box informing customers what the letter is about and includes key information in bold and large print. Alternate formats in Braille, large print, or audio are available upon request. Our online customer communications, including our website and PSPS customer notification emails, meet Web Content Accessibility Guidelines (WCAG) 2.0 AA accessibility standards. In 2022, new content was tested to WCAG 2.1 AA accessibility standards. Online videos meet WCAG 2.0 AA accessibility standards, with audio description, closed captioning, and written transcripts. Online videos published 2022 and beyond meet WCAG 2.1 AA accessibility standards.

To the extent possible, PG&E schedules notifications for potentially impacted customers two days, one day, and just prior to power shutoff. Customers are also notified upon power restoration. Priority notifications are also made to Public Safety Partners 72-48 hours in advance of de-energization. Our automated notifications comply with the CPUC PSPS Guidelines.²⁴¹ Notifications include potentially impacted locations, forecasted date and time of power shutoff, estimated restoration date and time, and links to maps and event-specific information.

Our MBL, self-certifying SIV, and self-identifying dependent medical technology customers receive additional notifications (including calls, texts, and emails) before a PSPS and must confirm receipt, or PG&E sends hourly notifications via phone and text message and conducts a doorbell ring. A door hanger is left if no contact is made during doorbell rings. For more details, see [Figure PG&E-8.4.4-2](#) below.

Additional information including sample messaging and notification sequence are provided in the PG&E October 2022 Public Safety Power Shutoff Event Notifications material, see [Appendix E](#).

**FIGURE PG&E-8.4.4-2:
HOW AND WHEN STAKEHOLDERS ARE NOTIFIED**



²⁴¹ D.19-05-042. See [Appendix E](#).

8.4.4.3 Current Gaps and Limitations

In tabulated format, the electrical corporation must provide a list of current gaps and limitations in its public communication strategy. Where gaps or limitations exist, the electrical corporation must indicate the remedial action plan and the timeline for resolving the gaps or limitations. For all requested information, the electrical corporation should indicate a form of verification that can be provided upon request for compliance assurance. Table 8-50 provides an example of the minimum level of content and detail required.

[Table 8-50](#) is a list of current gaps and limitations in our public communications strategy along with the remedial action plan and proposed timeline for resolving them.

**TABLE 8-50:
KEY GAPS AND LIMITATIONS IN PG&E'S
PUBLIC EMERGENCY COMMUNICATION STRATEGY**

Gap or Limitation Subject	Remedial Brief Description	Remedial Action Plan
De-energization, weather-clear and restoration timing updates	PG&E's objective is to share accurate information with our partners in a timely manner, however some partners have reported receiving missing or incorrect information regarding de-energization, weather all-clear and restoration timing.	In 2023, PG&E plans to examine areas for improvement to ensure the most accurate information is shared with our partners. It is important to note that conditions can change quickly, impacting our ability to provide exact times.
Cancellation Notifications	PG&E makes every attempt to provide notification of the cancellation of a PSPS event, or removal from scope, by notifying all affected entities, including public safety partners. However, these cancellations were not consistently delivered within the target of two hours of the decision to cancel for all portions of the event scope.	In 2023, PG&E plans to examine areas of improvement both from a technology and a process perspective with the intention of delivering cancellation notifications within two hours of a decision to cancel. We expect to identify interim, incremental solutions for use in 2023 by 9/1/2023.
Braille and Large Print Door Hangers	PG&E is developing the process to ensure that customers who request Braille or large print materials receive PSPS doorbell ring materials in their preferred format.	PSPS doorbell ring materials have been developed. However, the processes need to be modified to identify customers requesting information in their preferred format. PG&E is working towards a long-term solution by 6/30/2023.

8.4.5 Preparedness and Planning for Service Restoration

8.4.5.1 Overview of Service Restoration Plan

In this section of the WMP, the electrical corporation must provide an overview of its plan to restore service after an outage due to a wildfire or PSPS event. At a minimum, the overview must include a brief description of the following:

- Purpose and scope of the restoration plan;
- Overview of protocols, policies, and procedures for service restoration (e.g., means and methods for assessing conditions, decision-making framework, prioritizations, degree of customization). This must include:
 - An operational flow diagram illustrating key components of the service restoration procedures from the moment of the incident to response, recovery, and restoration of service.
- Resource planning and allocation (e.g., staffing, equipment);
- Drills, simulations, and tabletop exercises (TTX);
- Coordination and collaboration with public safety partners (e.g., interoperable communications); and
- Notification of and communication to customers during and after a wildfire- or PSPS-related outage.

The electrical corporation may refer to its Pub. Util. Code Section 768.6 emergency preparedness plan to provide more detail. Where the electrical corporation has already reported the requested information in another section of the WMP, it must provide a cross- reference with a hyperlink to that section. The overview must be no more than one page.

Reference the Utility Initiative Tracking ID where appropriate.

Purpose and Scope of the Restoration Plan

PG&E's purpose is to provide safe and effective re-energization of any area that is de-energized due to PSPS protocol.

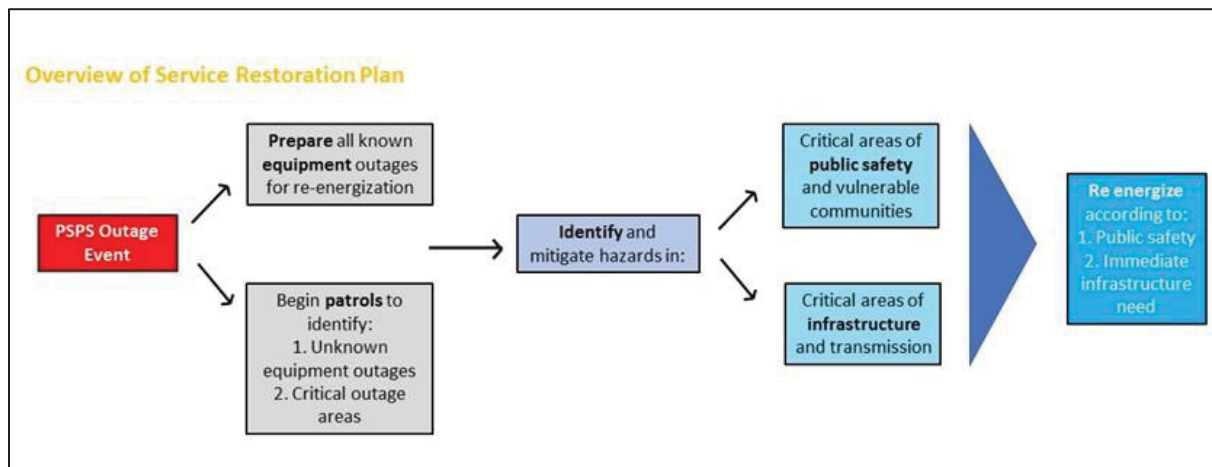
The scope of our re-energization plan is to first prepare all known equipment outages for re-energization. Simultaneously we conduct patrols of affected areas based on outage information (e.g., critical versus non-critical). Next, we identify and mitigate hazards first in critical areas with infrastructure and transmission lines with risk to customers and public safety. Impact to vulnerable communities is considered. Some

communities may have less infrastructure and transmission damage but still represent critical need.²⁴²

Overview of Protocols, Policies, and Procedures for Service Restoration

Figure PG&E-8.4.5-1 illustrates key components of the service restoration procedures from the start of the incident to response, recovery, and restoration of service.

**FIGURE PG&E-8.4.5-1:
PROTOCOL AND DECISION FLOW FOR SERVICE RESTORATION PLAN**



Resource Planning and Allocation

PG&E uses a relevant and rapid training approach to build and maintain an internal workforce that is in a state of readiness, with skills and abilities to react and respond to any incident within the service territory.²⁴³

Drills, Simulations, and Tabletop Exercises

PG&E develops exercises based on regulatory requirements and schedules them by holding a MYTEP workshop with all Functional Areas. The dates, type, and scope of exercises are tracked via the MYTEP. Attendance at seminars and exercises is tracked. Objectives are defined for each emergency exercise and drill and are tracked accordingly.

Coordination and Collaboration with Public Safety Partners (e.g., Interoperable Communications)

Our primary objective is to provide our public safety partners and customers who may be impacted by a PSPS event with accurate notifications as soon as possible. This is in

²⁴² See [Appendix E](#) for more information on post-PSPS protocols.

²⁴³ See [Appendix E](#) for more information on Adequate and Trained Workforce for Service Restoration.

accordance with the minimum timelines set forth by the CPUC PSPS Phase 1 Guidelines.²⁴⁴ These notifications are designed to help ensure that customers have enough time to prepare, respond to and stay safe during PSPS outages.

Notifications and Communications to Customers During and After a Wildfire- or PSPS-Related Outage

PG&E makes this critical information accessible by translating in-event notifications, PG&E's website, and other critical wildfire safety and PSPS preparedness materials into 16 non-English-languages. Our Contact Center provides translation support in over 240 languages. For customers who have not indicated a designated language preference, we provide notifications in English, with information on how to receive event information in translated languages. We also conduct extensive testing, including dial-test focus groups, to understand the ways to best communicate across demographics.

²⁴⁴ D.19-05-042. See [Appendix E](#).

8.4.5.2 Planning and Allocation of Resources

The electrical corporation must briefly describe its methods for planning appropriate resources (e.g., equipment, specialized workers), and allocating those resources to assure the safety of the public during service restoration

In addition, the electrical corporation must provide an overview of its plans for contingency measures regarding the resources required to respond to an increased number of reports concerning unsafe conditions and expedite a response to a wildfire- or PSPS-related power outage.

This must include a brief narrative on how the electrical corporation:

- *Uses weather reports to pre-position manpower and equipment before anticipated severe weather that could result in an outage;*
- *Sets priorities;*
- *Facilitates internal and external communications; and*
- *Restores service.*

The narrative for this section must be no more than two pages.

Uses Weather Reports to Pre-Position Manpower and Equipment Before Anticipated Severe Weather That Could Result in an Outage

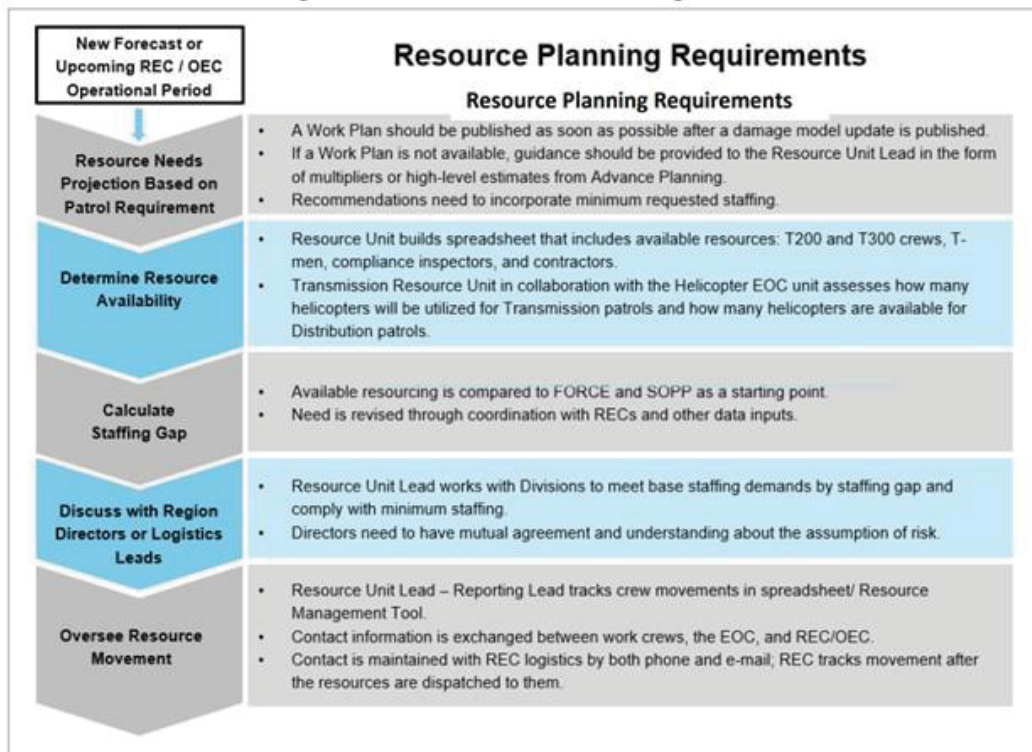
PG&E uses our Distribution System Operation Storm Outage Prediction Project (SOPP) model that our Meteorology team produces to forecast system outages. The SOPP informs staffing for response to PSPS outages.

Sets Priorities

For PSPS outages, the EOC allocates Qualified Electric Worker (QEW) crew resources based on the Field Operations Resource Calculator Estimated Time of Restoration (FORCE) tool outputs and Regional Emergency Center (REC) crew requests. Each Patrol Unit (air, vehicle, or foot) must have a QEW. The FORCE tool provides a starting point for staffing models, but actual staffing may vary depending on available resources. When the demand exceeds the available resources (including mutual aid resources), the Resource Unit will allocate resources based on the FORCE and/or SOPP outputs.

The RECs are accountable for assessing the local situation in collaboration with their local Operations Emergency Center (OEC) resource planning teams. The REC/OEC process is illustrated in [Figure PG&E-8.4.5-2](#) below:

**FIGURE PG&E-8.4.5-2:
RESOURCE PLANNING REQUIREMENTS**



PG&E has a large, geographically distributed workforce that can mobilize throughout our service territory in response to PSPS outages. To ensure they are prepared, PG&E has built and maintains an internal workforce that is in a constant state of readiness. This includes internal crews and contract crew resources.

PG&E maintains an active PSPS Aviation Program, which is made up of exclusive use helicopter contracts guaranteeing access to as many as 50 helicopters during peak PSPS season. Access to these helicopters allows us to significantly shorten the patrol time for circuits leading to an “all clear,” thereby reducing the duration of a PSPS event.

When an outage occurs involving a critical or essential customer, it is noted in PG&E’s Outage Management Tool, and those circuits are considered for priority assessment and restoration.

In addition, PG&E maintains three pre-identified Electric Incident Management Teams (IMT). These teams help eliminate ad hoc resource/staffing challenges when multiple events occur simultaneously. An Incident Management Team is comprised of an EOC Commander (Incident Commander) and the Command and General Staff personnel assigned to an incident. Incident teams, when assembled, have direct authority to plan and execute a response. The three teams may deploy anywhere within the service territory where incident management is needed. Pre-identified IMT increase operational capabilities that are scalable and flexible and ensures adequate continuous coverage.

Facilitates Internal and External Communications

PG&E engages in extensive internal and external communications, before, during and after PSPS events. For more information on PG&E's PSPS outreach communications, please see [Section 8.4.2.2](#).

Restores Service

PG&E uses different assessment and restoration strategies based on the complexity of each incident. If there is a small number of outages during a routine response, PG&E uses an order-based strategy in which crews are assigned to each individual outage, as appropriate.

In larger incidents with a greater number of outages, PG&E may use a distribution circuit, transmission line or area-based strategy. In these cases, work is assigned by group/location to highly-impacted circuits, lines, or areas. These strategies improve coordination and assessment/restoration time.

IMT may be activated to support wildfires or other large incidents (e.g., when an incident reaches, or is anticipated to reach, emergency activation level four or higher based on the PG&E CERP incident levels matrix).

PG&E has entered into a number of MAAs with entities who provide resources to assist with service restoration. Under these agreements, entities provide additional personnel, equipment, and materials to support the restoration efforts. PG&E conducts pre-planning with these entities to ensure resources can be deployed quickly. For more details on MAAs, please see [Section 8.4.3.3](#).

In response to Critical Issue [RN-PG&E-23-01](#), PG&E created a new 3-year objective (PS-11) related to evaluating whether or not drones can be used to support PSPS restoration efforts. PG&E's complete response to Critical Issue [RN-PG&E-23-01](#) is in [Section 7.2.1](#), following [Revised Table 7-3-1](#).

8.4.5.3 Drills, Simulations, and Tabletop Exercises

Discussion-based and operational-based exercises enhance knowledge of plans, allow personnel to improve their own performance, and identify opportunities to improve capabilities to respond to wildfire- and PSPS-related service outages. Exercises also provide a method to evaluate an electrical corporation's emergency preparedness plan and identify planning and/or procedural deficiencies.

PG&E uses a progressive exercise approach to train emergency personnel and incorporates Business Continuity and Recovery Planning to test, practice, and strengthen incident preparedness and response. Our approach is described in our Multi-Year Training and Exercise Plan (MYTEP) ([Appendix E](#)).

Through the progressive exercise approach, we test and improve our ability to effectively respond to, and recover from, prioritized risks. We accomplish this by using all-hazards capabilities, developing strategies, communicating, collaborating with internal functional units, and coordinating with local, state, and federal partners. The MYTEP lays out a combination of progressive exercises and training requirements to validate our plans and operational readiness in an all-hazards environment. We maintain this integrated training and exercise program for all functional units. Capabilities are typically introduced through a progressive approach, first by a training opportunity such as a seminar or workshop and then exercised in a TTX, FE, or Full-Scale Exercise (FSE). Training and exercises include both Business Continuity and Recovery Planning to enhance emergency personnel's effectiveness in supporting recovery and continuity of operations.

For more details, please see [Section 8.4.2.3](#), which describes the exercises PG&E conducts that allow participants to practice the duties, tasks, and operations they would be expected to perform in a real emergency.

8.4.5.3.1 Internal Exercises

The electrical corporation must report on its program(s) for conducting internal discussion-based and operations-based exercises for service restoration. This must include, at a minimum:

- *The types of discussion-based exercises (e.g., seminars, workshops, TTXs, games) and operations-based exercises (e.g., drills, FEs, FSEs);*
- *The purpose of the exercises;*
- *The schedule and frequency of exercise programs;*
- *The percentage of staff who have completed/participated in exercises; and*
- *How the electrical corporation tracks who has completed the exercises.*

Table 8-51 provides an example of the minimum acceptable level of information.

The information requested in [Table 8-51](#) is provided in [Section 8.4.2.3.1](#).

TABLE 8-51:
INTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM FOR SERVICE RESTORATION

Category	Exercise Title and Type	Purpose	Exercise Frequency	Position of Title of Personnel Required to Participate	Personnel Required	Personnel Completed	Form of Verification or Reference
Note: Information for this table is provided in Section 8.4.2.3.1.							

8.4.5.3.2 External Exercises

The electrical corporation must report on its program(s) for conducting external discussion- based and operations-based exercises for service restoration due to wildfire. This must include, at a minimum:

- *The types of discussion-based exercises (e.g., seminars, workshops, TTXs, games) and operations-based exercises (e.g., drills, FEs, FSEs);*
- *The schedule and frequency of exercise programs;*
- *The percentage of public safety partners who have participated in these exercises; and*
- *How the electrical corporation tracks who has completed the exercises.*

Table 8-52 provides an example of the minimum acceptable level of information.

The Information requested in [Table 8-52](#) is provided in [Section 8.4.2.3.2](#).

TABLE 8-52:
EXTERNAL DRILL, SIMULATION, AND TABLETOP EXERCISE PROGRAM FOR SERVICE RESTORATION

Category	Exercise Title and Type	Purpose	Exercise Frequency	Position of Title of Personnel Required to Participate	Personnel Required	Personnel Completed	Form of Verification or Reference
Note: Information for this table is provided in Section 8.4.2.3.2.							

8.4.6 Customer Support in Wildfire and PSPS Emergencies

In this section of the WMP, the electrical corporation must provide an overview of its programs, systems, and protocols to support residential and non-residential customers in wildfire emergencies and PSPS events. The overview for each emergency service must be no more than one page. At a minimum, the overview must cover the following customer emergency services, per Pub. Util. Code Section 8386(c)(21):

- *Outage reporting;*
- *Support for low-income customers;*
- *Billing adjustments;*
- *Deposit waivers;*
- *Extended payment plans;*
- *Suspension of disconnection and nonpayment fees;*
- *Repair processing and timing;*
- *List and description of community assistance locations and services;*
- *MBL support services; and*
- *Access to electrical corporation representatives.*

Reference the Utility Initiative Tracking ID where appropriate.

PG&E implements programs, systems, and protocols to support residential and non-residential customers in the event of wildfire emergencies and PSPS events. An overview of the emergency services that PG&E provides in these events are described below.

Outage Reporting

During wildfires, PG&E follows the established emergency communication framework outlined in our CERP, GO 166 standards, and the Electric Emergency Plan ([Appendix E](#)). PG&E uses notification systems to alert customers and public safety partners of planned or unplanned electric outages, such as those related to wildfires. We send automated notifications via call, text message, and e-mail to notify recipients of major events affecting their area and at key milestones in the outage and restoration process. Notifications provide incident-related updates if long duration outages are anticipated, which may include the cause of the outage, estimated times of restoration, and notification once power is restored (where possible). Customers with language preference selected in their PG&E accounts receive in-language notifications. If a customer has notification preferences set to receive outage related updates, that

customer will receive automated notifications with status of the outage. See [Section 8.4.4](#) for additional information related to PSPS event notifications.

Support for Low-Income Customers

PG&E provides support for low-income customers, including freezing California Alternate Rates for Energy (CARE) eligibility standards and high usage post enrollment verification requests, increasing the assistance cap for emergency assistance program, and modifying qualification requirements for the Energy Savings Assistance Program by allowing customers to self-certify that they meet income qualifications. PG&E leverages our CARE community outreach contractors to inform customers of the support and resources available to them. Additionally, PG&E coordinates with the program administrator of the Relief for Energy Assistance Through Community Help (REACH), a PG&E and customer funded emergency assistance program, to request increasing the assistance cap amount for red tagged customers. This assistance allows customers who lost their homes to receive additional financial assistance to pay their current utility bill or to set up new service. PG&E informs all REACH agencies of this financial support for customers.

Billing Adjustments

Discontinue Billing and Prorate Minimum Delivery Charges

Customers whose service has been disrupted or degraded because of wildfire have their billing discontinued without being assessed a disconnection charge. PG&E also prorates any monthly access charge or minimum charges for affected customers.

Stop Estimated Usage for Billing Attributed to the Period When a Home/Unit Was Unoccupied Due to a Disaster

During natural disasters, PG&E identifies general areas that were evacuated and reassesses our approach for any bills in the area requiring estimation.

In accordance with our Emergency Consumer Protection Plan (Decision (D.) 19-07-015), PG&E also allows customers whose homes or businesses were red tagged and had been served under a rate that has since been closed to new customers, to re-establish service under their prior rate schedule at their current location or an alternative location, regardless of the current applicability of their prior rate schedule, as long as the rate schedule is still available and has not been retired.²⁴⁵ D.19-07-015 also requires PG&E to expedite move-in and move-out service requests for affected

²⁴⁵ The Commission approved PG&E's proposal in AL 4014 G/5378 E to revise Electric Rule 12 to allow customer to reestablish service under a prior rate schedule as part of our Emergency Consumer Protection Plan. See [Appendix E](#).

customers.²⁴⁶ PG&E expedites these requests based on the date requested by the customer,²⁴⁷ consistent with our Emergency Consumer Protection Plan.

Deposit Waivers

PG&E waives security deposit requirements to re-establish service for customers whose home(s) or small business(es) were destroyed by the disaster. In addition to offering this protection, the Commission adopted D.20-06-003 in June 2020, which prohibits PG&E from requiring re-establishment of service deposits from residential customers.²⁴⁸ PG&E stopped requiring such deposits from customers, consistent with this decision.

Extended Payment Plans

Following a disaster, PG&E offers impacted and red tagged customers our most lenient payment arrangement term, which requires a 20 percent down payment and a repayment period of 12 months for red tagged customers and 20 percent down payment and a repayment period of 8 months for impacted accounts. All residential customers are eligible for payment arrangements up to 12 months in accordance with D.20-06-003. Customers are eligible to pay off their arrearage sooner if preferred. In addition, customers who indicate that their employment was impacted by the disaster are also eligible for favorable payment plans.

The Commission approved PG&E Advice Letter (AL) 4145-G/5643-E on October 30, 2019. This AL revised PG&E's Emergency Consumer Protection Plan under Gas and Electric Rule 1 in compliance with D.19-05-037, OP 24.²⁴⁹

Suspension of Disconnection and Nonpayment Fees

PG&E suspends disconnections for all red tagged customers for up to 12 months from the Governor or President's emergency proclamation. PG&E waives deposits as described previously and does not charge late fees.

Repair Processing and Timing

D.19-07-015 requires PG&E to offer repair processing and timely assistance to utility customers pursuant to CPUC Section 8386(c)(18). PG&E works with the impacted community to communicate priorities and timelines for repairs and restoration. Specifically, PG&E calls red tagged customers directly to notify them of the services available and to provide a single point of contact at PG&E for related support, including providing information on the process for receiving temporary power. In addition to

²⁴⁶ D.19-07-015, pp. 58-59, COL 14. See [Appendix E](#).

²⁴⁷ This does not include any meter sets, including multi-unit meter sets or any other requests that require inspections, and/or criteria as required in the PG&E Electric and Gas Service Requirements Handbook.

²⁴⁸ D.20-06-003, p. 147, OP 9. See [Appendix E](#).

²⁴⁹ D.19-05-037, p. 64, OP 24. See [Appendix E](#).

directly contacting red tagged customers, impacted customers have access to utility representatives through multiple channels, such as PG&E's call center, public affairs and customer account representatives, and field teams.

List and Description of Community Assistance Locations and Services

Community Resource Centers

During a PSPS event, PG&E will open Community Resource Centers (CRC) where community members can access basic resources including:

- A safe location to charge electronic devices and medical equipment;
- Up-to-date information about the PSPS event; and
- Bottled water, snacks, blankets, Americans with Disabilities Act-accessible restrooms, and Wi-Fi when possible.

Additionally, indoor CRCs have heating/cooling, bagged ice, and privacy screens for nursing mothers and other medical needs.

PG&E continues to build out our [portfolio of contracted CRC locations](#), including indoor and outdoor sites, which can be quickly opened when needed. Sites were identified in collaboration with counties, Tribal governments, and other key stakeholders and are reviewed annually. as of November 22, 2022, our portfolio has 114 indoor sites and 287 outdoor sites.

When a PSPS event is imminent, PG&E evaluates the scope of the event and proposes CRC sites to activate based on estimated customer impact. Once the proposed sites are approved by impacted counties' Offices of Emergency Management and impacted Tribal governments, PG&E takes the required steps to make the sites operational.

PG&E's website lists CRCs by county and provides details on the resources available at each CRC. Each CRC location is also mapped onto the outage map, so visitors can easily identify which CRC is closest to them by looking up their address. We also communicate CRC site locations through press releases, social media posts, and local government outreach. Lastly, customer text and email notifications include a hyperlink to PG&E's PSPS webpage, where customers can find all relevant CRC information.

PG&E has taken steps to make CRCs accessible to all visitors. This includes ongoing engagement and coordination with community stakeholders, site and material preparation, and in-event considerations. While PG&E is proud of the efforts to date, we continue to solicit feedback from AFN customers and stakeholders and implement improvements for CRC accessibility.

Information cards for visitors are available in Braille and information cards and other digital resources are available in 15 non-English languages and large print, which can be printed on-site. Staff with language skills other than English self-identify on their nametags and are strategically assigned to CRCs based on local demographics and feedback from community partners. If additional in-language support is needed, customer staff have a phone number to call where translation services are available in

over 200 languages. Language Line, an online service for video remote interpreting calls is available on laptop computers located at every CRC, allowing for visitors who may be Deaf or hard of hearing to use ASL for communication. For details on PG&E's Community Resource Center program, see our [CRC plan](#) submitted as [Appendix A](#) of the [2022 Pre-Season Report](#).

Wildfire Support

When a wildfire occurs, PG&E evaluates the scope of the event and partners with CBOs to activate services based on the wildfire footprint and estimated customer impact. PG&E works with lead agencies such as CalFire and OES to determine the appropriate assistance programs based on community needs and guidance from the lead agency, including support for Access and Functional Needs (AFN) and Medical Baseline (MBL) customers. CRCs are used where applicable. Please refer to PG&E's [2023 AFN Plan](#) for a list of current community assistance partnerships.

Medical Baseline Support Services

Medical Baseline Marketing, Education & Outreach: MBL Program is an assistance program for residential customers with extra energy needs due to qualifying medical equipment and conditions. Our MBL Program applies to both wildfire and PSPS events. PG&E encourages customers to participate in the MBL Program throughout the year with targeted acquisition emails and letters, digital media advertisement, as well as radio ads.²⁵⁰ Pursuant to D.20-06-003, PG&E, along with other IOUs with MBL programs, provides annual MBL training to In-Home Support Services providers before the end of the first quarter each year.

PG&E will continue using all available communication channels prior to and during PSPS, including phone calls, texts, and email notifications to notify potentially impacted MBL customers. Potentially impacted MBL customers will continue to receive doorbell rings if they do not acknowledge notifications before PSPS. To ensure that PG&E has accurate customer contact information, we will send out Contact Information Update reminder postcards and email to MBL customers in the HFRA who may be impacted by PSPS, prior to wildfire season in 2023. We will continue to identify and reach out to MBL customers in the HFRA who have missing or invalid information through a variety of channels to update or obtain contact information.

D-MEDICAL 12 percent Discount for Non-tiered Electric Rates: Historically, the financial benefits received by PG&E's MBL customers have only been available to customers taking service on a tiered rate schedule like PG&E's default Time-of-Use (TOU) rate, Schedule E-TOU-C, or its simple tiered (non-TOU) rate, Schedule E-1. This

²⁵⁰ Res.E-5169 (Sept. 23, 2021), "Implementing Improvements to MBL Programs and Affirming Compliance with SB 1338." Pursuant to this resolution, PG&E, Southern California Edison Company, and San Diego Gas & Electric Company will establish a goal to increase MBL enrollment relative to 2018 levels by 7 percent in 2021, 8 percent above 2018 levels in 2022, and 9 percent above 2018 levels in 2023. As of June 2022, PG&E has surpassed its MBL enrollment targets for 2022.

is because the financial benefits were provided to MBL customers solely via augmented baseline allowances that are applicable only to tiered rates.

PG&E filed Application (A.) 20-10-006 where it proposed to offer an additional option for MBL customers who wish to take service on non-tiered TOU rates called “D-MEDICAL.” This option retains the approximate value of the financial benefits MBL customers receive on tiered rates via a 12 percent line-item discount. Subsequently, PG&E and the other parties to the proceeding negotiated an all-party settlement agreement that was approved by the Commission and that endorsed PG&E’s proposed option for its MBL customers to receive a 12 percent line-item discount on non-tiered TOU rates.

D-MEDICAL will be implemented in multiple phases. In the initial phase, PG&E will implement D-MEDICAL to coincide with the launch of its new electrification rate, Electric Home (Schedule E-ELEC), which will also be implemented in phases. PG&E anticipates that D-MEDICAL will be available to all eligible customers on the E-ELEC rate by the end of 2023. Additionally, PG&E will implement D-MEDICAL for the remaining open non-tiered rates, EV2-A and E-TOU-D, via a subsequent AL. That AL will also include a plan to update all relevant MBL forms and existing outreach to reflect the availability of D-MEDICAL on all open non-tiered rates.

Joint IOU Petition to Modify MBL Renewal Process: Previously, D.02-04-026 directed the IOUs to require customers with a permanent disability to self-certify their MBL program eligibility every two years and to require customers without a permanent disability to self-certify each year and provide a doctor’s certification every two years. On August 3, 2022, the IOUs jointly filed a petition to modify D.02-04-026 requesting to change the renewal requirements. The intent of the petition was to update the rules to provide administrative relief to MBL customers while also removing the potential for eligible MBL customers to be inadvertently dropped from the program due to failing to respond to outreach by the IOUs.

The CPUC ruled that the proposed modifications to D.02-04-026 were consistent with the Disability Rights Advocates’ recommendations and would enable customers currently enrolled in the MBL program to remain enrolled more easily than the current requirements. Pursuant to D.22-11-033 which was issued on November 17, 2022, the IOUs are required to submit Tier 2 ALs containing implementation plans, timelines, needed tariff revisions, and estimated incremental costs associated with implementing the modifications adopted by the decision.

Access to Electrical Corporation Representatives

D.19-07-015 requires PG&E to offer repair processing and timing assistance and timely access to utility customers pursuant to CPUC Section 8386(c)(18).

PG&E works with impacted communities to communicate priorities and timelines for repairs and restoration. Specifically, PG&E calls red tagged customers directly to notify them of the protections available and to provide a single point of contact at PG&E for related support. This includes providing information on the process for receiving temporary power. In addition to directly contacting red tagged customers, impacted-customers have access to utility representatives through multiple channels, such as PG&E’s call center, customer account representatives, and field teams.

8.5 Community Outreach and Engagement

8.5.1 Overview

In accordance with California Public Utilities Code (Pub. Util. Code)

Section 8386(c)(19)(B) each electrical corporation must provide its plans for community outreach and engagement before, during, and after a wildfire. The electrical corporation must also provide its plans for outreach and engagement related to Public Safety Power Shutoff (PSPS), outages from protective equipment and device settings, and Vegetation Management (VM).

In this section, the electrical corporation must identify objectives for the next 3- and 10-year periods, targets, and performance metrics related to the following community outreach and engagement mitigation initiatives:

- *Public outreach and education awareness for wildfires, PSPS, outages from protective equipment and device settings, and VM;*
- *Public engagement in the Wildfire Mitigation Plan (WMP) decision-making process;*
- *Engagement with Access and Functional Needs (AFN) populations, local governments, and tribal communities;*
- *Collaboration on local wildfire mitigation and planning; and*
- *Best practice sharing with other electrical corporations from within and outside of California.*

Community outreach and public awareness are key components of emergency planning and preparedness. These efforts help to ensure customers and communities are informed and adequately prepared prior to a wildfire or wildfire safety outage like PSPS or Enhanced Powerline Safety Settings (EPSS). Pacific Gas and Electric Company (PG&E) leverages the Safety Partner, Community-Based Organizations (CBO) and customer engagement opportunities described in [Section 8.4.3](#) to gather feedback on the engagement plans for PSPS and EPSS outages. Targeted and general outreach is then developed and conducted in advance of, during, and after peak wildfire season to ensure all customers and stakeholders understand the programs, their wildfire safety benefits, the potential impacts, and support that is available to them.

8.5.1.1 Objectives

Each electrical corporation must summarize the objectives for its 3-year and 10-year plans for implementing and improving its community outreach and engagement. These summaries must include the following:

- Identification of which initiative(s) in the WMP the electrical corporation is implementing to achieve the stated objective, including Utility Initiative Tracking IDs;*
- Reference(s) to applicable codes, standards, and best practices/guidelines and an indication of whether the electrical corporation exceeds an applicable code, standard, or regulation;*
- Method of verifying achievement of each objective;*
- A completion date for when the electrical corporation will achieve the objective; and*
- Reference(s) to the WMP section(s) or appendix, including page numbers, where the details of the objective(s) are documented and substantiated.*

This information must be provided in Table 8-53 for the 3-year plan and Table 8-54 for the 10- year plan. Examples of the minimum acceptable level of information are provided below.

Community Events

PG&E recognizes the importance of engaging with customers and communities on key wildfire safety programs and to do this we are committed to holding informational and interactive events with our customers. We also recognize the need to ensure these events are focused on relevant topics and in areas where they will produce the most customer safety benefits. Events like webinars allow PG&E to disseminate important and current information about fire safety and preparedness, to hear and respond to customer questions, and to provide an open and immediate channel for resolving concerns.

This is why safety-focused events will continue in 2023 and beyond. For 2023, we are planning a variety of different events such as regional town halls and community webinars so we can engage directly with our customers.

As part of our Regional Service Model, PG&E will be holding quarterly Regional Town Halls in each of PG&E's five regions. We will use these events to convey local wildfire safety information in advance of wildfire season. PG&E will make a good-faith effort to have an officer present at each of these events, as appropriate.

In addition, we are planning to hold the equivalent of monthly community events, based on the impacts that wildfire safety efforts have had on the community (i.e., PSPS, EPSS, Undergrounding, VM, etc.). These events could include, but are not limited to: webinars, in-person open houses, safety fairs, and in-person answer centers. This flexibility will allow us to be targeted in our outreach approach so we can respond

effectively to the needs of each community. Due to the continuing Coronavirus (COVID-19) pandemic, PG&E will continue to follow prevailing public health guidelines, including holding meetings virtually when possible. In years' past, PG&E has been able to collaborate with agencies, critical facilities, and other stakeholders on outreach forums, including designing in-person meetings and community town halls. The COVID-19 pandemic prevented most in-person engagement efforts for most of 2021 and 2022 and likely will impact in-person engagements in 2023 as well.

In addition to general wildfire safety engagement events, PG&E will continue to hold webinars for specific audiences, including: customers with AFN; K-12 schools; in-language webinars for customers who speak Spanish, Chinese, Hmong, and Tagalog; large commercial customers including hospitals and health care providers; CBOs; and customers and communities impacted frequently by outages on circuits with EPSS.

To maximize the opportunity for community engagement at these meetings, we will continue to employ outreach efforts that have proven effective at drawing customers to them. Outreach will include: direct-to-customer e-mail; promotion on social media channels; informing local and regional news and information media outlets; coordinating with local, regional, and tribal elected officials, other agencies, and CBOs; and providing Spanish and Chinese captions and audio translation, as well as American Sign Language (ASL) interpreters.

- Revised [Table 8-53](#) and Revised [Table 8-54](#) Information Summary: In Revised [Table 8-53](#) and Revised [Table 8-54](#), we are providing the objective name (Objective Name), a description of the objective (Objective Description), the anticipated outlook of the objective (3-Year/10-Year Outlook), the planned due date for the objective (Completion Date), the applicable Initiative Tracking ID (Initiative Tracking ID), "Applicable Regulations, Codes, Standards, and Best Practices", "method of verification", and "section and page #" references. As noted in [Section 7.2.1](#), "Applicable Regulations, Codes, Standards, and Best Practices," "method of verification," and "section and page #" columns are not a part of the objective. Instead, the controlling objective information is in the "Objective Description" and "Completion Date" columns.
- Reporting: Unless changed through Office of Energy Infrastructure Safety's (Energy Safety) Change Order process, PG&E will use the objectives in Revised [Table 8-53](#) and Revised [Table 8-54](#) below for quarterly compliance reporting including the Quarterly Data Report (QDR), Quarterly Notification (QN), and the Annual Report on Compliance (ARC). We note that throughout this 2023-2025 WMP, we discuss current plans for wildfire-related activities beyond the objectives in Revised [Table 8-53](#) and Revised [Table 8-54](#). The timing and scope of these additional activities and work may change. We will not be reporting on these plans or activities in our QDR, QN, or ARC because they are not objectives but are descriptions of plans and activities in our 2023-2025 WMP to provide a complete picture of our wildfire mitigation activities.
- External Factors: All objectives in the below Revised [Table 8-53](#) and Revised [Table 8-54](#) are subject to External Factors which represent reasonable circumstances which may impact execution against objectives including, but not

limited to: physical conditions, landholder refusals, environmental delays, customer refusals or non-contacts, permitting delays/restrictions, weather conditions, removed or destroyed assets, active wildfire, exceptions or exemptions to regulatory/statutory requirements, and other safety considerations.

- Utility Initiative Tracking ID: We are including Initiative Tracking IDs in each section that has associated targets and objectives. Revised [Table 8-53](#) and Revised [Table 8-54](#) display the Tracking IDs we are implementing to tie the objectives to the narratives and initiatives in the WMP. The Initiative Tracking IDs will also be used for reporting in the QDR.

In response to Critical Issue [RN-PG&E-23-01](#), PG&E updated our 3-year and 10-year Community Outreach objectives as shown in [Revised Table 8-53](#) and [Revised Table 8-54](#) below. PG&E's complete response to Critical Issue [RN-PG&E-23-01](#) is in [Section 7.2.1](#), following [Revised Table 7-3-1](#).

**REVISED TABLE 8-53:
COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (3-YEAR PLAN)**

Objective Name	Objective Description	Applicable Initiative(s), Tracking ID(s)	Applicable Regulations, Codes, Standards, and Best Practices	Method of Verification (i.e., Program)	Completion Date	Reference (Section and Page #)
Community Engagement – Meetings	For 2023-2025, PG&E will hold annually a total of 22 community engagement meetings within the five regions of service that will include, but are not limited to, a mix of webinars, open houses, town halls, and/or answer centers.	CO-01	Continued from 2022 WMP – Investigation 19-06-015: 2017 North Bay Fires/ 2018 Camp Fire Oil	1) Meeting summary for In-Person meetings 2) Recording of session for Virtual meetings	9/30/2023 9/30/2024 9/30/2025	Section 8.5.2 Page 894

**REVISED TABLE PG&E-8-54:
COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE OBJECTIVES (10-YEAR PLAN)**

Objective Name	Objective Description	Applicable Initiative(s), Tracking ID(s)	Applicable Regulations, Codes, Standards, and Best Practices	Method of Verification (i.e., Program)	Completion Date	Reference (Section and Page #)
Community Engagement – Outreach to HFRA Infrastructure Customers	PG&E will perform outreach via e-mail and/or phone to assigned Critical Infrastructure customers in the HFRA through Business Energy Solutions (assigned account managers). Outreach will cover the CWSP, including potential PSPS and EPSS impacts, and updating contact information for critical accounts in the HFRA.	CO-04	Ongoing lessons learned from the WMP and proceedings pertaining to stakeholder engagement and wildfire safety.	1) Report of assignments and completed tasks 2) List of critical infrastructure customers	12/31/2032	Section 8.5.2 Page 894
Community Engagement – Outage Preparedness Campaign	PG&E will also conduct at least one direct-to-customer outage preparedness campaign annually via email and/or direct mail targeting residential customers in the PSPS more likely or EPSS Program scope.	CO-05	Ongoing lessons learned from the WMP and proceedings pertaining to stakeholder engagement and wildfire safety.	1) Letter content (sample letter) 2) Customer lists for distribution	12/31/2032	Section 8.5.2 Page 894

8.5.1.2 Targets

Initiative targets are forward-looking quantifiable measurements of activities identified by each electrical corporation in its WMP. Electrical corporations will show progress toward completing targets in subsequent reports, including QDRs and WMP Updates.

The electrical corporation must list all targets it will use to track progress on its community outreach and engagement for the three years of its Base WMP. Energy Safety's Compliance Assurance Division and third parties must be able to track and audit each target. For each initiative target, the electrical corporation must provide the following:

- *Utility Initiative Tracking IDs;*
- *Projected targets for each of the three years of the Base WMP and relevant units;*
- *Quarterly, rolling targets for 2023 and 2024 (PSPS outreach only);*
- *The expected "x% risk impact." for each of the three years of the base WMP. The expected x% risk impact is the expected percentage risk reduction per year, as described in Section 7.2.2.2; and*
- *Method of verifying target completion.*

The electrical corporation's targets must provide enough detail to effectively inform efforts to improve the performance (i.e., reduction in ignition probability or wildfire consequence) of the electrical corporation's community outreach and engagement initiatives.

Table 8-55 and Table 8-56 provide examples of the minimum acceptable level of information.

-
- [Table 8-55 Information Summary](#): In [Table 8-55](#), we are providing the target name (Target Name), the applicable Initiative Tracking ID (Initiative Tracking ID) and a description of the Target for each applicable year (2023 Target & Unit, 2024 Target & Unit, 2025 Target & Unit), the "% Risk Impact" for each respective year, and the method of verification. As noted in [Section 7.2.1](#), the % Risk Impact and method of verification columns are not a part of the Target. Instead, the controlling target information is in the "Target & Unit" columns for each respective year.
 - [Table 8-56 Information Summary](#): [Table 8-56](#) contains the Q2 and Q3 quarterly targets for 2023 and 2024 as well as the year end targets for 2023, 2024, and 2025 for inspections. Please note, the end-of-year (EOY) targets in [Table 8-56](#) are also represented in [Table 8-55](#). For readability and efficiency, the annual targets in [Table 8-55](#) include additional language to provide more context on the quantitative target values, as well as all other required information associated with targets (i.e., method of verification, % risk Impact). Therefore, if additional context is needed to better understand the quarterly target values in [Table 8-56](#), please refer to the

2023 Target & Unit, 2024 Target & Unit, 2025 Target & Unit columns in [Table 8-55](#) that have the same associated target name (Target Name).

- Utility Initiative Tracking ID: We are including Initiative Tracking IDs in each section that has associated targets and objectives. [Table 8-55](#) and [Table 8-56](#) display the Tracking IDs we are implementing to tie the targets to the narratives and initiatives in the WMP. The Initiative Tracking IDs will also be used for reporting in the QDR.
- Reporting: Unless changed through Energy Safety's Change Order process, PG&E will use the Targets in [Table 8-55](#) and [Table 8-56](#) below for quarterly compliance reporting including the QDR, QN, and the ARC. It is also important to note that throughout this 2023-2025 WMP, we discuss current plans for wildfire-related activities in addition to the Targets in [Table 8-55](#) and [Table 8-56](#). The timing and scope of these additional activities and work may change. We will not be reporting on these plans or activities in our QDR, QN, or ARC because they are not Targets but are descriptions of plans and activities in our 2023-2025 WMP to provide a complete picture of our mitigation activities.
- % Risk Impact: The % Risk Impact provided in [Table 8-55](#) is calculated based on the risk reduction of the mitigation initiative divided by total overall utility risk as defined in [Section 6.4.2](#), [Section 7.2.2.2](#), and [Section 7.2.2.3](#). The % Risk Impact provided is an estimate based on the best available workplans applied against the latest risk models as of time of this filing. Please note, in many cases, the workplans contain units exceeding the target presented to ensure target completion is feasible. We anticipate that as mitigation work takes place and as risk models and workplans are updated, the estimated % Risk Impact projections could change. Additionally, for inspection and line sensor related targets, since inspections in of themselves do not reduce risk, instead we provided an "Eyes-on-Risk" value to provide insights into the level of risk being assessed.
- External Factors: All targets in the below [Table 8-55](#) and [Table 8-56](#) are subject to External Factors which represent reasonable circumstances which may impact execution against targets including, but not limited to, physical conditions, landholder refusals, environmental delays, customer refusals or non-contacts, permitting delays/restrictions, weather conditions, removed or destroyed assets, active wildfire, exceptions or exemptions to regulatory/statutory requirements, and other safety considerations.
- High Fire Threat District (HFTD), High Fire Risk Area (HFRA), Buffer Areas: Unless stated otherwise, all initiative work described in [Table 8-55](#) involves work or audits on units or equipment located in, traversing, energizing, or protecting units or equipment in HFTD, HFRA, or Buffer Zone areas.

TABLE 8-55:
COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE TARGETS BY YEAR

Target Name	Initiative Activity Tracking ID	Reference Section	2023 Target and Unit	x% Risk Impact 2023	2024 Target and Unit	x% Risk Impact 2024	2025 Target and Unit	x% Risk Impact 2025	Method of Verification
Community Engagement – Surveys	CO-02	8.5.2	PG&E will complete two PSPS education and outreach surveys.	N/A	PG&E will complete two PSPS education and outreach surveys.	N/A	PG&E will complete two PSPS education and outreach surveys.	N/A	Survey results and analyses.

TABLE 8-56:
COMMUNITY OUTREACH AND ENGAGEMENT INITIATIVE TARGETS BY QUARTER

Target Name	Initiative Activity Tracking ID	Reference Section	Target End of Q2 2023 and Unit	Target End of Q3 2023 and Unit	End of Year Target 2023 and Unit	x% Risk Impact 2023 ^(a)	Target End of Q2 2024 and Unit	Target End of Q3 2024 and Unit	EOY Target 2024 and Unit	x% Risk Impact 2024 ^(a)	EOY Target 2025 and Unit	x% Risk Impact 2025 ^(a)	Method of Verification
Community Engagement – Surveys	CO-02	8.5.2	1 Survey	1 Survey	2 Surveys	N/A	1 Survey	1 Survey	2 Surveys	N/A	2 Surveys	N/A	Survey results and analyses.

(a) Surveys help PG&E understand the effectiveness of our community outreach and engagement initiatives but do not reduce system risk.

PG&E conducts a pre-wildfire season survey (Pre) and a post-wildfire season survey (Post) of the public to evaluate the effectiveness of our education and outreach efforts prior to, during, and immediately after peak PSPS and wildfire seasons. The Pre-season survey is typically conducted in or around August/September. The field period for the Post-season survey begins soon after peak wildfire season, typically from mid-November to mid-December. The survey has been updated to include questions related to the EPSS Program. With a sample size of over 2,200 completed interviews, the survey is robust enough to conduct analyses at various levels including HFTD tiers, Designated Market Areas, Spanish speakers, and customers with AFN.

The Pre/Post outreach effectiveness surveys are conducted both online and over the phone. The survey is offered in 17 languages for both the online and phone versions.²⁵¹

**TABLE PG&E-8.5.1-1:
AVAILABLE LANGUAGES FOR SURVEY**

English	Tagalog/Filipino	Arabic	Punjabi
Spanish	Farsi/Persian	Armenian	Russian
Chinese	Japanese	Hindi	Portuguese
Vietnamese	Hmong	Khmer	Thai
Korean			

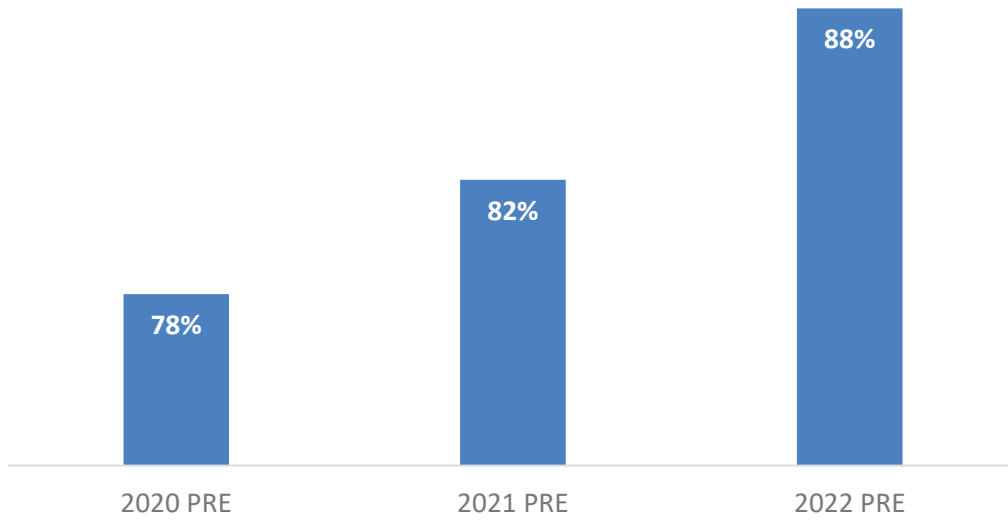
Despite being offered in 16 non-English languages in 2021, only 13 percent of “Pre-Season” survey respondents and 8 percent in the “Post-Season” survey respondents elected to complete the survey in a language other than English. Of those, the overwhelming majority were in Spanish. In 2022, PG&E added an additional language: Armenian.

Recall of the outreach just prior to peak Wildfire/PSPS season in the most impacted areas (HFTD Tiers 2 and 3) has steadily increased, from 78 percent in 2020 to 88 percent in the 2022 Pre-Season survey. Because this is already a high level of recall, we would not expect it to increase much. We will strive to either maintain or increase this level within the survey’s margin of error ($\pm 5\%$). “Recall” is defined as the percentage of survey respondents who answer “Yes” to the following question:

In the past few months do you recall any communications of any type (i.e., mail, TV, radio, social media, etc.) from PG&E about the threat of wildfires and how you can prepare for them?

²⁵¹ Based on PG&E’s assessment, this meets the prevalent language requirement as defined in Decision (D.) 20-03-004, further outlined in PG&E Wildfire and PSPS Outreach Workplan and Budget Advice Letter (AL) 4249 G/5827 E2 (PG&E ID U 39 M), p. 14, filed with the California Public Utilities Commission (CPUC) on May 15, 2020. Following this filing, additional languages were added per the CPUC’s direction. See [Appendix E](#).

**FIGURE PG&E-8.5.1-1:
PG&E OUTREACH EFFECTIVENESS SURVEY PRE-SEASON WAVES COMMUNICATIONS RECALL
TIER 2 AND 3 HFTD**



8.5.1.3 Performance Metrics Identified by the Electrical Corporation

Performance metrics indicate the extent to which an electrical corporation's WMP is driving performance outcomes. Each electrical corporation must:

- *List the performance metrics the electrical corporation uses to evaluate the effectiveness of its community outreach and engagement in reducing wildfire and PSPS risk.*

For each of those performance metrics listed, the electrical corporation must:

- *Report the electrical corporation's performance since 2020 (if previously collected);*
- *Project performance for 2023-2025; and*
- *List method of verification.*

The electrical corporation must ensure that each metric's name and values are the same in its WMP reporting as its QDR reporting (specifically, QDR Table 2 and QDR Table 3). Metrics listed in this section that are the same as performance metrics required by Energy Safety and reported in QDR Table 2 (Performance Metrics) must match those reported in QDR Table 2. Metrics listed in this section that are not the same as any of the performance metrics identified by Energy Safety and reported in QDR Table 2 must match those reported in QDR Table 3.

The electrical corporation must:

- *Summarize its self-identified performance metric(s) in tabular form; and*
- *Provide a brief narrative that explains trends in the metrics.*

Table 8-57 provides an example of the minimum acceptable level of information.

[Table 8-57](#) provides recorded and projected data regarding the number of customers notified prior to initiation of a PSPS event. Notifying customers prior to initiation of PSPS event ensures customers are aware of the potential outages and the resources available to them. The metric "number of customers notified prior the initiation of PSPS event" is largely weather dependent as this metric will correlate with the frequency, scope, and duration of PSPS events.

**TABLE 8-57:
COMMUNITY OUTREACH AND ENGAGEMENT PERFORMANCE METRICS RESULTS BY YEAR**

Performance Metrics	2020	2021	2022	2023 Projected	2024 Projected	2025 Projected	Method of Verification (e.g., Third-Party Evaluation, QDR)
Number of customers notified prior to initiation of PSPS event	869,000	181,000	0	457,000	451,000	445,000	QDR ^(a)
(a) QDR Table 10, QDR No. 4c.							

8.5.2 Public Outreach and Education Awareness Program

The electrical corporation must provide a high-level overview of its public outreach and education awareness program(s) for wildfires; outages due to wildfires, PSPS events, and protective equipment and device settings; service restoration before, during, and after the incidents (as required by Pub. Util. Code Section 8386[c][19][B]); and VM. This includes outreach efforts in English, Spanish, Chinese (including Cantonese, Mandarin, and other Chinese languages), Tagalog, and Vietnamese, as well as Korean and Russian where those languages are prevalent within the service territory.

At a minimum, the overview must include the following:

- *A description of the purpose and scope of the program(s).*
 - *References to the Utility Initiative Tracking ID where appropriate.*
 - *A brief narrative followed by a tabulated list of all the different target communities it is trying to reach across the electrical corporation's service territory. The target communities list must include AFN and other vulnerable or marginalized populations, but they may also include other target populations, such as communities in different geographic locations (e.g., urban areas, rural areas), age groups, language and ethnic groups, transient populations, or Medical Baseline (MBL) customers. In addition, the electrical corporation must summarize the interests or concerns each community may have before, during, or after a wildfire or PSPS event to help inform outreach and education awareness needs. Table 8-58 provides an example of the minimum acceptable level of information.*
 - *A tabulated list of community partners the electrical corporation is working with or intends to work with to support its community outreach and education programs. Table 8-59 provides an example of the minimum acceptable level of information.*
 - *A table of the various outreach and education awareness programs (i.e., campaigns, informal education, grant programs, participatory learning) that the electrical corporation implements before, during, and after wildfire, VM, and PSPS events, including efforts to engage with partners in developing and exercising these programs. In addition, the electrical corporation must describe how it implements its overall program, including staff and volunteer needs, other resource needs, method for implementation (e.g., industry best practice, latest research in methods for risk communication, social marketing), long-term monitoring and evaluation of each program's success, need for improvement, etc. The narrative for this section is limited to two to three pages. The electrical corporation must also provide the information on its outreach and education awareness programs in tabulated format. Table 8-60 provides an example of the minimum acceptable level of information.*
-

Utility Initiative Tracking ID: CO-01; CO-02; CO-04; CO-05

Prior to peak wildfire season, PG&E designs and executes a comprehensive wildfire safety and PSPS preparedness community outreach strategy, using lessons learned and feedback received from customers and stakeholders. Furthermore, PG&E conducts community outreach to educate agencies, customers, and property owners on aspects of our wildfire mitigation practices, such as EPSS, community resilience, and system hardening, and the role they play in helping to reduce wildfire risks in their communities.

We recognize that a one-size-fits-all approach to engagement does not necessarily consider a community's specific priorities, and that localized outreach will better inform and engage customers and community groups throughout the territory. Key community groups include: AFN; residential and unassigned Small Medium Business (SMB) customers; property owners and property managers; critical facilities, such as water agencies, communications providers, and hospitals; and CBOs. We incorporate multiple channels and tactics into our engagement approach that enable us to regularly hear and act upon feedback from agencies, CBOs and other community stakeholders, agencies, and communities impacted in prior fire seasons.

While PG&E's engagement for the PSPS Program has advanced in maturity, and will remain an area of focus, other key wildfire mitigation programs are driving additional needs for engagement including EPSS and Undergrounding. In 2023 we will focus on further integrating awareness and education about the EPSS Program into broader Community Wildfire Safety Program (CWSP) customer messaging about wildfire safety outages resulting from programs like PSPS and EPSS. Direct-to-customer mail, e-mail, and other outreach materials outlined in [Table 8-60](#) below are updated to provide overall awareness of the CWSP and programs such as PSPS and EPSS.

PG&E monitors customers and communities who have been impacted by multiple outages on EPSS-enabled circuits. PG&E may leverage automated outage notifications, follow-up Interactive Voice Recording (IVR) messages, customer e-mails, e-mails to elected officials, social media posts, community webinars, and in-person community meetings, as appropriate, to communicate with highly impacted customers to explain outages and actions PG&E is taking to reduce future impacts. As the peak wildfire season passes, PG&E communicates with customers served by EPSS enabled circuits to summarize the program's benefits for the year and acknowledge program successes and opportunities for improvement.

PG&E coordinates with critical facilities, such as hospitals, telecommunication providers, and transportation agencies, among others, to further understand and more effectively plan for the impacts of wildfire and PSPS events, with a focus on how to safely operate these facilities during a wildfire or outage event. Engagement with Critical Facilities and Infrastructure (CFI) is conducted annually to validate contact information, and coordinate resiliency planning efforts associated with backup generation. In addition, we send an annual letter reminding CFIs that PG&E is not responsible for providing backup power before or during PSPS and wildfire events. We provide critical facilities, including transmission level customers, with advanced notifications and prioritized restoration as outlined in PG&E's 2022 Revised WMP (Section 8.2.5, p. 1049) and additional communications and other resources before and

during outages. In alignment with other Investor-Owned Utilities (IOU), CFIs can request a backup power assessment and we provide them online resources, tools, and preparedness information related to their business needs. We do not provide backup generation to individual facilities. However, our policy allows exceptions for CFIs when an outage could have a significant adverse impact to public safety, or if the individual critical customer facility's backup generation and emergency plan fails. To maintain accurate contact information and backup generation needs, we rely heavily on collaboration through engagement with local government and Public Safety Partners by our Account Representatives and PSS related to CFI identification and validation of contact information. Resiliency planning efforts associated with backup generation is conducted annually.

PG&E also follows best practice guidelines and seeks input from the other California IOUs and through our advisory committees to identify additional community groups to include in our public outreach and awareness efforts.

[Table 8-58](#) below lists the communities we engage with around wildfire safety and PSPS preparedness through our comprehensive community outreach strategy.

**TABLE 8-58:
PG&E'S LIST OF TARGET COMMUNITIES**

Target Community	Interests or Concerns Before, During, and After Wildfire and PSPS Events
MBL Allowance Program Participants (including individuals reliant on Life Support)	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications and the importance of notification acknowledgement to confirm receipt. Continuous power, including portable battery options and backup generation rebates for qualified customers, and overall resilience support available.
Self-identified Vulnerable (SIV) or reliant on electricity for durable medical equipment or assistive technology	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications and the importance of notification acknowledgement to confirm receipt. Continuous power, including portable battery options and backup generation rebates for qualified customers, and overall resilience support available.
Income Qualified	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications. Available backup generation rebates for qualified customers, food replacement options, MBL Allowance Program and overall resilience support available.
Limited English Proficiency	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information and indicate language preference to receive notifications in preferred language. Available backup generation rebates for qualified customers and overall resilience support available. Education materials available in preferred language.

**TABLE 8-58:
PG&E'S LIST OF TARGET COMMUNITIES
(CONTINUED)**

Target Community	Interests or Concerns Before, During, and After Wildfire and PSPS Events
Blind or Low Vision	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications. Available backup generation rebates for qualified customers and overall resilience support available. Education materials available in large print or Braille.
Deaf or Hard of Hearing	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications. Available backup generation rebates for qualified customers and overall resilience support available. Education materials available in ASL.
Disabled (Physical, Cognitive or Developmental) or Age 65+	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications. Available backup generation rebates for qualified customers, food replacement options, MBL Allowance Program and overall resilience support available.
Residential and SMB Unassigned Customers of Record	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications. Available backup generation rebates for qualified customers.
Property Owners and Property Managers	How to educate tenants to drive awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to sign up for Address Level Alerts to receive direct notification of possible PSPS for non-account holders and promotion of the MBL Program. Available backup generation rebates for qualified customers.
Critical Facilities	Awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information to receive notifications. Available backup generation resources and coordination of resilience plan with the utility.
CBO	How to educate consumers to drive awareness of and preparation for potential PSPS, wildfire or unplanned outages where EPSS is enabled, including how to update contact information (account holders) or sign up for Address Level Alerts to receive direct notification of possible PSPS (non-account holders) and promotion of applicable programs such as the MBL Program, continuous power options, including portable battery options and backup generation rebates, and overall resilience support available.

One of PG&E's highest priorities during wildfire-related emergencies, including PSPS, is to protect the health and safety of our vulnerable/AFN customers and communities. We conduct outreach related to emergency preparedness, provide an improved notification experience before and during PSPS events, and offer additional services and resources to these customers in advance of and during PSPS events and wildfires. Outreach to our vulnerable/AFN customers and communities is conducted in accordance with the *Enhanced Customer and Community Support During All Hazards Standard* (EMER-7001S),²⁵² either directly or in partnership with CBOs.

In 2023, PG&E plans to continue our partnerships with CBOs (67 resource partner CBOs, 38 multicultural media partners, and 299 informational partner CBOs) to increase wildfire safety outreach and education to support our vulnerable/AFN customers. More specifically, PG&E is focused on customers with identified language preference and customers who have an individual in the household who self-identifies as vulnerable (e.g., self-certified vulnerable, self-identified reliant on power for durable medical equipment or assistive technology) and/or identifies as AFN (see [Section 8.5.3](#) for more details about PG&E AFN demographics). PG&E's 2022 PSPS AFN Plan,²⁵³ filed January 31, 2022, provides more details on PG&E's goals, strategies, and tactics to support AFN customers and communities before, during, and after PSPS events. Additional details for 2023 will be included in PG&E's 2023 AFN Plan to be filed January 31, 2023.²⁵⁴

CBO Resource Partners have agreed to receive information and assist with outreach to the people they work with before, during and after wildfire season to assist with preparations for wildfire safety outages such as PSPS or EPSS. Informational CBOs have agreed to receive information from PG&E and will share as appropriate with the people they work with.

[Table 8-59](#) in [Appendix F](#) lists the community groups we work with to help provide services and resources to our vulnerable/AFN customers and communities before and during PSPS events and wildfires.

PG&E executes a multi-touch Emergency Preparedness Safety Awareness campaign to provide education to customers, non-account holders, visitors, and communities throughout our service territory—before, during, and after events. This campaign helps them prepare for emergency situations by updating contact information to ensure delivery of PG&E notifications, signing up for the MBL Program, and/or self-certifying for Vulnerable Customer status or self-identifying as AFN. PG&E takes a collaborative approach to our public awareness initiatives by partnering with local public safety officials and community stakeholders to expand the reach of our activities. PG&E uses

²⁵² See [Appendix E](#).

²⁵³ Please refer to Rulemaking (R.)18-12-005, PG&E's 2022 Access and Functional Needs (AFN) Plan for Public Safety Power Shutoff (PSPS) Support, (January 31, 2022). See [Appendix E](#).

²⁵⁴ R.18-12-005, PG&E's Access and Functional Needs (AFN) Plan for Public Safety Power Shutoff (PSPS) Support, (January 31, 2023). See [Appendix E](#).

the tactics described in [Table 8-60](#) below to increase public awareness about emergency preparedness.

**TABLE 8-60:
PG&E'S COMMUNITY OUTREACH AND EDUCATION PROGRAMS**

Core Activity	Event Type	Period of Application (Before, During, After Incident)	Name of Outreach or Education Program	Description of Program	Target Audience	Reference/ Link
Awareness and Preparedness Education	PSPS, Wildfire Safety, EPSS	Before, During, After Incident	CWSP	Virtual education about PSPS, wildfire safety, EPSS, etc. To educate all customers to be prepared.	Customers	www.pge.co.m/firesafetywebinars
Awareness and Preparedness Education	PSPS, Wildfire Safety, EPSS	Before, During, After Incident	CWSP	Virtual or in person education about PSPS, wildfire safety, EPSS, etc. To educate all customers to be prepared.	Customers	N/A
Awareness and Preparedness Education	PSPS, Wildfire Safety, EPSS	Before	CWSP	Virtual education about PSPS, wildfire safety, EPSS, etc. To educate partner agencies and organizations for message amplification.	IHSS, Regional Centers, CFILC, and other CBO Informational Partners	www.pge.co.m/firesafetywebinars
Awareness and Preparedness Education	PSPS, Wildfire Safety, EPSS	Before	CWSP	Virtual education about PSPS, wildfire safety, EPSS, etc. To educate partner agencies and organizations for message amplification.	Multi-cultural media partners	N/A
Awareness and Preparedness Education	PSPS, EPSS, MBL	Before, during	CWSP	Radio, online and social media education about PSPS, EPSS, MBL, and other preparedness and resource information.	Customers, AFN, Master Meter, MBL, visitors, multi-cultural	N/A
Awareness and Preparedness Education	PSPS, Wildfire Safety, EPSS	Before	CWSP	E-mail outreach with awareness, preparedness and resources information about PSPS, wildfire safety, EPSS, contact information, etc.	Customers, AFN, Master Meter, MBL, CBOs	N/A
Awareness and Preparedness Education	PSPS, Wildfire Safety, EPSS	Before	CWSP	Direct mail outreach with awareness, preparedness and resources information about PSPS, wildfire safety, EPSS, contact information, etc.	Customers, AFN, MBL	N/A
Awareness and Preparedness Education	PSPS, Wildfire Safety, EPSS	Before	CWSP	Bill inserts with awareness, preparedness and resources information about PSPS, wildfire safety, EPSS, contact information, etc.	MBL	N/A

**TABLE 8-60:
PG&E'S COMMUNITY OUTREACH AND EDUCATION PROGRAMS
(CONTINUED)**

Core Activity	Event Type	Period of Application (Before, During, After Incident)	Name of Outreach or Education Program	Description of Program	Target Audience	Reference/ Link
MBL Acquisition	MBL	Before	MBL	Acquisition outreach via paid media, social media, e-mail and direct mail for the MBL program.	AFN/MBL	N/A
EPSS Multiple Outage Follow-Up	Wildfire Safety	After	CWSP	Acknowledgement of recent outages and actions PG&E is taking to improve reliability in the community.	Customers	N/A
EPSS Multiple Outage Follow-Up	Wildfire Safety	After	CWSP	Acknowledgement of recent outages and actions PG&E is taking to improve reliability in the community.	Customers	N/A
EPSS Multiple Outage Follow-Up	Wildfire Safety	After	CWSP	Acknowledgement of recent outages and actions PG&E is taking to improve reliability in the community.	Elected Officials	N/A
EPSS Multiple Outage Follow-Up	Wildfire Safety	After	CWSP	Acknowledgement of recent outages and actions PG&E is taking to improve reliability in the community.	Customers	N/A
EPSS Multiple Outage Follow-Up	Wildfire Safety	After	CWSP	Acknowledgement of recent outages and actions PG&E is taking to improve reliability in the community.	Customers	www.pge.com/firesafety/webinars
EPSS Multiple Outage Follow-Up	Wildfire Safety	After	CWSP	Acknowledgement of recent outages and actions PG&E is taking to improve reliability in the community.	Customers, Elected Officials	N/A

In response to Critical Issue [RN-PG&E-23-01](#), PG&E updated its 3-year and 10-year Community Outreach and Engagement objectives. PG&E's complete response to Critical Issue [RN-PG&E-23-01](#) is in [Section 7.2.1](#), following [Revised Table 7-3-1](#).

8.5.3 Engagement With Access and Functional Needs Populations

In this section, the electrical corporation must provide an overview of its process for understanding, evaluating, designing, and implementing wildfire and PSPS risk mitigation strategies, policies, and procedures specific to AFN customers across its territory. The electrical corporation must also report, at a minimum, on the following:

- *Summary of key AFN demographics, distribution, and percentage of total customer base.*
- *Evaluation of the specific challenges and needs during a wildfire or PSPS event of the electrical corporation's AFN customer base.*
- *Plans to address specific needs of the AFN customer base throughout the service territory specific to the unique threats that wildfires and PSPS events may pose for those populations before, during, and after the incidents. This Section 8.5.5 should include high-level strategies, policies, programs, and procedures for outreach, engagement in the development and implementation of the AFN-specific risk mitigation strategies, and ongoing feedback practices.*

Reference the Utility Initiative Tracking ID where appropriate.

PG&E has updated Target PS-06 of this initiative for 2025. See Section B.2.1.2 in the 2025 WMP Update for more information. Additionally, see response to ACI-23-24 in Section B.5 of the 2025 WMP Update for more information about PG&E's plans to evaluate and address AFN customer needs.

Utility Initiative Tracking ID: PS-05; PS-06

Key Access and Functional Needs Demographics, Distribution, and percent of Total Customer Base

It is important for us to identify vulnerable AFN customers to ensure that we provide them the information and help that they need to stay safe during a PSPS event. PG&E identifies customers and/or households that are considered AFN using the following data from our internal databases.

**TABLE PG&E-8.5.3-1:
IDENTIFYING AFN CUSTOMERS**

Customer Group	Number of Customers
Customers enrolled in the MBL program; .	276,626
Residential customers on tiered rate plans; ^(a)	Redundant with MBL
Energy Savings Assistance (ESA) Program participants; ^(b)	12,343
Customers enrolled in California Alternative Rates for Energy (CARE) Program or Family Electric Rate Assistance (FERA);	37,058
Customers that self-identify to receive an in-person visit before disconnection for non-payment (e.g., vulnerable);	16,892
Customers that self-identify as having a person with a disability in the household (e.g., disabled);	45,832
Customers who self-select to receive utility communications in non-standard format (e.g., in braille or large print); and	922
Customers who indicate a non-English language preference.	1,571,171
In 2022, PG&E added six additional categories for which customers can self-identify including:	
Customers that self-identify as having a person in the household that uses durable medical equipment;	53,904
Customers that self-identify as having a person in the household that uses Assistive Technology;	9,316
Customers that self-identify as having a person in the household that has a hearing disability (e.g., deaf, or hard of hearing);	26,242
Customers that self-identify as having a person in the household that has a vision disability (e.g., Low Vision);	17,591
Customers that self-identify as having a person in the household that is blind; and	1,367
Customers that self-identify as having a person in the household that is 65+ years old.	82,766
(a) These customers receive an allotment of energy every month at the lowest price available on their rate, called the Baseline Allowance. Customers who are eligible for MBL receive an additional allotment of electricity and/or gas per month (approximately 500 kilowatt-hours of electricity and/or 25 therms of gas per month). This helps ensure that more energy to support qualifying medical devices is available at a lower rate. (b) To qualify for the ESA Program, a residential customer's household income must be at or below 200 percent of Federal Poverty Guidelines, as per D.05-10-044. See Appendix E.	

Customers who identify with one or more of the fourteen categories described above represent approximately 30 percent distribution of our residential customer base.

Evaluating Specific Challenges and Needs During a Wildfire or PSPS Event Related to the AFN Customer Base

PG&E works hard to identify customer challenges and needs during a wildfire or outage event through several stakeholder forums and focus groups. PG&E describes specific

challenges and needs in the Annual AFN Plan for PSPS Support. PG&E has identified our AFN customers during a Wildfire or PSPS event and reports this quarterly in the AFN Quarterly Progress Reports. Both the Annual AFN Plan for PSPS Support and the AFN Quarterly Progress Reports are available at the following link:
www.pge.com/pspsreports.

People with Disabilities and Aging Council

Provides a forum for gathering information about the needs of the AFN populations related to emergency preparedness and to create solutions and identify resources to help these customers before, during, and after an event. The People with Disabilities and Aging Council is a diverse group of CBO leaders that supports people with developmental or intellectual disabilities, physical disabilities, chronic conditions, injuries, and older adult communities. The council meets quarterly to gather feedback and provide information on resources, services, and programs.

Joint IOU Statewide AFN Advisory Council

The Joint IOUs established the Statewide IOU AFN Advisory Council to engage with members, advocates, and leaders representing vulnerable populations to develop strategies for helping the many constituencies served by the utilities. The Joint IOUs will convene with the Council no less than four times per year.

- AFN Collaborative (Leadership) Council:²⁵⁵ The Joint IOUs, together with state and local agency and community AFN leaders, established regular meetings to discuss how the IOUs can better identify and target AFN customers and address their needs during PSPS events. Attendees include IOU senior executives, leaders from State Council on Developmental Disabilities, Disability Rights California, CFILC, Disability Rights Education and Defense Fund, California Governor's Office of Emergency Services, CPUC, Liberty Utilities, Bear Valley Electric, and Pacific Corp. PG&E will continue to meet with stakeholders to improve access to resources during PSPS events for AFN customers.
- Joint IOU AFN Core Planning Team: The IOUs have created an AFN Core Planning team to develop the 2023 AFN Plan. PG&E and the AFN Core Planning team followed the six steps outlined by the Federal Emergency Management Agency (FEMA) Comprehensive Preparedness Guide (CPG).^{256,257} We filed our 2023 AFN Plan on January 31, 2023.

²⁵⁵ A continuation of the AFN Panel Discussion included in the CPUC Joint IOU PSPS Workshop (March 29, 2021).

²⁵⁶ FEMA Developing and Maintaining Emergency Operations Plans CPG 101 6-Step Process. See [Appendix E](#).

²⁵⁷ D.21-06-034. See [Appendix E](#).

Other Advisory Councils

PG&E will also continue to engage with and solicit feedback on wildfire and PSPS-related outreach from other existing advisory groups.

- Disadvantaged Communities Advisory Group: An advisory group that meets quarterly, led by the CPUC and California Energy Commission, with representatives from disadvantaged communities. The purpose of this group is to review and provide advice on proposed clean energy and pollution reduction programs and determine whether those proposed programs will be effective and useful in disadvantaged communities. PG&E engages with this group to provide information and gain input about wildfire mitigation activities, including PSPS.
- Low Income Oversight Board: A board established to advise the CPUC on low-income electric and gas customer issues and programs. PG&E also engages with this group to provide information and gain input about wildfire mitigation activities, including PSPS.
- Local Government Advisory Councils and Working Groups: PG&E includes representatives from the AFN community on both the PSPS Regional Working Groups. Additionally, PG&E hosts local wildfire safety sessions with each county Office of Emergency Services (OES) in advance of wildfire season. PG&E's plans to ensure AFN populations are included in these sessions for awareness and opportunity for feedback.
- Communities of Color Advisory Group: PG&E will continue to solicit input from Communities of Color Advisory Group which assists PG&E in crafting outreach and engagement with communities of color on a variety of issues impacting diverse communities.

Addressing AFN Customer Needs Before, During, and After a Wildfire or PSPS Event

One of PG&E's highest priorities during wildfire-related emergencies is to protect the health and safety of our vulnerable/AFN customers and communities. PG&E conducts outreach related to emergency preparedness, provides enhanced notifications during PSPS events, and offers additional services and resources to these customers in advance of and during PSPS events—either directly or in partnership with CBOs.

During PSPS, MBL customers and SIV customers receive automated calls, texts, and e-mails at the same intervals as the general customer notifications. PG&E provides unique PSPS Watch and PSPS Warning notifications to MBL program customers and SIV customers. These customer segments also receive additional calls and texts at hourly intervals until the customer acknowledges the automated notifications by either answering the phone, responding to the text, or opening the e-mail. If acknowledgement is not received, a PG&E representative attempts to visit the customer's home to ensure the customer is aware of the upcoming PSPS (referred to as the "doorbell ring" process) while hourly notification retries continue. During the doorbell ring visit, if the customer requires assistance, the PG&E field representative will request resources from the AFN Strategy Lead in the EOC. If the customer does not answer the door, the representative leaves a door hanger at the home to indicate PG&E

visited. The notification is considered successful if the customer is contacted in-person or a door hanger is left. In some cases, PG&E may also make Live Agent phone calls along with the automated notifications and doorbell rings as an additional attempt to reach the customer prior to and/or after de-energization.²⁵⁸

PG&E continues to deliver on our goal of making PSPS events less burdensome for our customers. We provide:

- Portable Battery Program: We work with CBOs to provide free portable backup battery solutions as well as mini-fridges and insulin cooler wallets for medications to MBL customers in Tier 2 and 3 HFTD or who are on EPSS-capable circuits that have experienced PSPS in 2021 or who were impacted by 5 or more EPSS outages in 2022. We will explore the transition of the Portable Battery Program to permanent battery solutions to help mitigate outages over a longer time-period than portable solutions for PG&E customers as reflected in our Objective PS-05. Additionally, we have set a target of providing new or replacement portable batteries to 12,000 PG&E customers at risk of PSPS or EPSS for 2023-2025. This initiative is aligned to Target PS-06. We have updated the target unit for 2025. See Section B.2.1.2 of the 2025 WMP Update for more information.
- Generator and Battery Rebate Program: We provide a \$300 rebate to customers located in Tier 2 or 3 HFTDs or who are served by an EPSS circuit and were part of 2 or more PSPS events. Customers are eligible for an additional \$200 rebate if enrolled in PG&E's CARE or FERA program.
- Backup Power Transfer Meter (BPTM): We install a BPTM device for customers who reside in Tier 2 or 3 HFTDs or who are served by an EPSS circuit. The BPTM device is a meter that is also a transfer switch that will automatically connect power to a generator when it detects the grid is offline and switch back to the utility once the grid back on.
- Self-Generation Incentive Program (SGIP): As an SGIP Program administrator, we provide financial incentives for targeted customers to install permanent battery storage, with a focus on supporting qualified customers in HFTDs.
- Fixed Power Solutions (FPS): A new initiative launched in 2022, FPS supports permanent, long-term backup power solutions for customers frequently impacted by PSPS and EPSS outages. These permanent solutions can help customers mitigate outages over a longer time horizon than portable solutions. We intend to significantly scale-up the FPS offering in 2023 and beyond—specifically, for

²⁵⁸ SIV is inclusive of customers who have indicated they are “dependent on electricity for durable medical equipment or assistive technology,” as well as customers that are not enrolled or qualify for the MBL program and “certify that they have a serious illness or condition that could become life threatening if service is disconnected.” In accordance with D.21-06-034, PG&E includes customers who have indicated they are “dependent on electricity for durable medical equipment or assistive technology” to identify customers “above and beyond those in the MBL population” to include persons reliant on electricity to maintain necessary life functions including for durable medical equipment and assistive technology. This designation remains on their account indefinitely.

residential battery storage—to help ensure that the risks of PSPS and EPSS are minimized for the most impacted customers.

We partner with several organizations to provide services during wildfires or PSPS outages. These partnerships include:

- 23 food banks;
- 26 Meals on Wheels organizations;
- 15 Disability Disaster Access and Resources (DDAR) Centers;
- 5 Low Income Home Energy Assistance Program providers;
- 4 accessible transportation providers;
- 3 outreach organizations (In language, ASL, and Blind/Low Vision);
- The California Network of 211;
- A grocery delivery organization;
- A hot meal organization;
- A family resource center;
- A fresh produce provider;
- A portable shower/laundry service provider; and
- 38 Multi-Cultural Media Partners (see [Table 8-59](#) List of Community Partners, in [Section 8.5.2](#)).

PG&E opens Community Resource Centers (CRC) during a PSPS event to provide customers with basic power and other needs. We describe our CRCs and the services we offer at them in [Section 8.4.6](#). Accommodations for customers with AFN are available, such as accessible restrooms and privacy screens for individuals who need to complete medical treatments.

In collaboration with the CFILC, the DDAR Program was launched as a joint effort to serve customers with AFN who also have medical and independent living needs and older adults. CFILC administers the program through partnerships with participating DDAR Centers in local communities throughout the PG&E service territory. DDAR enables local DDAR Centers to provide qualifying customers who use electric medical devices with access to backup portable batteries through a grant, lease-to-own, or the low interest financial loan program. DDAR uses a live intake process to understand individual customer needs, discuss emergency plan preparedness, and develop solutions for each customer during a PSPS. PSPS resources provided by DDAR include accessible transportation, lodging, food vouchers, and gas cards for generator fuel. Throughout the year, DDAR assists customers with disabilities and independent

living needs with emergency planning and education and outreach about PG&E programs.

PG&E has an agreement with the California Network of 211 (211) to provide customers with AFN with a single source of information and connection to available resources in their communities. This agreement provides PSPS education, outreach, and emergency planning in advance of a PSPS event. The program connects those with AFN to critical resources like transportation, food, batteries, and other social services during a PSPS event. Outside of active PSPS events, 211 will focus on outreach to at-risk customers, including those living in each IOU's HFRAs who are eligible for income-qualified assistance programs and rely on life-sustaining medical equipment. The focus during these times will be to evaluate these customers' resiliency plans, connect them with existing programs that can help them prepare for outages, and to assist them in completing applications for these programs.

8.5.4 Collaboration on Local Wildfire Mitigation Planning

In this section, the electrical corporation must provide a high-level overview of its plans, programs, and/or policies for collaborating with communities on local wildfire mitigation planning (e.g., wildfire safety elements in general plans, community wildfire protection plans, local multi-hazard mitigation plans) within its service territory. The narrative must be no more than one page.

In addition, the electrical corporation must provide the following information in tabular form, providing no more than one page of tabulated information in the main body of the WMP and the full table in an Appendix as needed.

- *List of county, city, and tribal agencies and non-governmental organizations (e.g., nonprofits, fire safe councils) within the service territory with which the electrical corporation has collaborated or intends to collaborate on local wildfire mitigation planning efforts (i.e., non-wildfire emergency planning activities):*
 - *For each entity, the local wildfire mitigation planning program/plan/document, level of collaboration (e.g., meeting attendance, verbal, or written comments), and date the electrical corporation provided its last feedback. Table 8-61 provides an example of the minimum acceptable level of information. Reference the Utility Initiative Tracking ID where appropriate.*
- *In a separate table, the electrical corporation must provide a list of current gaps and limitations in its collaboration efforts with local partners on local wildfire planning efforts. Where gaps or limitations exist, the electrical corporation must indicate proposed means and methods to increase collaborative efforts. Table 8-62 provides an example of the minimum acceptable level of information.*

PG&E understands this question is asking us to describe how we coordinate with agencies related to wildfire plans developed by local jurisdictions. PG&E is not the lead authority for wildfires, and we cannot require local jurisdictions to create wildfire plans. However, if requested, PG&E reviews and provides feedback on local wildfire plans, specifically as it relates to electric and gas impacts during a wildfire.

[Table 8-61](#) in [Appendix F](#) lists more than 600 engagements conducted by PG&E's Public Safety Specialists in 2022 that focused on emergency preparedness. Our Public Safety Specialists met with local fire departments, emergency services organizations, CAL FIRE, local governments, and the US Forest Service to discuss topics related to wildfire preparedness such as Pub. Util. Code 956.5 (referred to as Assembly Bill 56 (AB56) in [Appendix E](#)) and to review contingency plans with local fire departments for emergencies involving interstate transmission and distribution lines within the jurisdiction of the local fire department. Other topics include PG&E's Preventing and Mitigation Fires While Performing PG&E Work (TD-1464S), OES coordination and evacuation planning.

PG&E develops our annual WMP focused on preventing wildfires due to electrical assets or equipment and shares its plans with local jurisdictions for feedback. See [Section 8.4.3.1](#) for more information about PG&E's outreach.

[Table 8-62](#) lists key gaps and limitations in collaborating on local wildfire mitigation planning.

**TABLE 8-61:
COLLABORATION IN LOCAL WILDFIRE MITIGATION PLANNING**

Name of County, City, or Tribal Agency or Civil Society Organization (e.g., Non-Governmental Organization, Fire Safe Council)	Program, Plan, or Document	Last Version of Collaboration	Level of Collaboration
Note: See complete Table 8-61 in Appendix F .			

**TABLE 8-62:
KEY GAPS AND LIMITATIONS IN COLLABORATING ON
LOCAL WILDFIRE MITIGATION PLANNING**

Subject of Gap or Limitation	Brief Description of Gap or Limitation	Strategy for Improvement
PG&E roles and responsibilities	PG&E is not the lead authority for wildfires, nor can we require local jurisdictions to create wildfire plans.	<u>Strategy:</u> PG&E remains committed to helping our partners. PG&E will continue to review and provide feedback on local wildfire plans, as it relates to electric and gas impacts during a wildfire, if requested by the local jurisdiction. <u>Target Timeline:</u> Ongoing.

8.5.5 Best Practice Sharing with Other Electrical Corporations

In this section, the electrical corporation must provide a high-level overview of its policy for sharing best practices and collaborating with other electrical corporations on technical and programmatic aspects of its WMP Program. The narrative must be no more than one page.

In addition, the electrical corporation must provide a list in tabular form of relevant electrical corporations and other entities it has shared or collaborated or intends to continue to share or collaborate or begin sharing or collaborating, with on best practices for technical or programmatic aspects of its WMP Program.

For each entity, the best practice subject, date(s) of collaboration, whether the collaboration is technical or programmatic, list of electrical corporation partners, a description of the best practice sharing/collaborative activity with a reference, and any outcomes from that sharing or activity.

Reference the Utility Initiative Tracking ID where appropriate.

The overview and table must be no longer than two pages in the main body of the WMP. The full table can be included as an appendix as needed.

Table 8-63 provides an example of the minimum acceptable level of information.

Policy for Sharing Best Practices:

PG&E shares information related to best practices for the technical and programmatic aspects of our wildfire mitigation programs with the other California IOUs and other electrical corporations. Since we understand how important it is to work with other utilities and share best practices, we look for and take advantage of these opportunities. Sharing best practices takes on different forms from participating in technical working groups as part of regulatory proceedings to more informal calls and meetings among our Subject Matter Experts and their counterparts at other electric utilities. PG&E encourages all our team members to participate in these activities.

Sharing best practices is an opportunity for us to learn from other utilities and incorporate new practices and procedures into our wildfire mitigation programs. It helps us meet our goal to continuously improve how we mitigate ignition risk and reduce customer impacts due to wildfires and wildfire-related outages.

In [Table 8-63](#) below we provide an example of who we share best practices with, the type of information shared, and the outcomes of that exchange. The full table exceeds the page limit and is provided in [Appendix F](#).

**TABLE 8-63:
SHARING BEST PRACTICES WITH OTHER UTILITIES**

Best Practice Subject	Dates of Collaboration	Technical or Programmatic	Corporation Partner(s)	Description of Best Practice Sharing or Collaborating	Outcome
Covered Conductor Effectiveness Study	2021-present	Technical	- PG&E - Southern California Edison Company (SCE) - San Diego Gas & Electric Company (SDG&E) - PacifiCorp - Bear Valley - Liberty Utilities	Coordinate to develop a consistent approach to evaluating the long-term risk reduction and cost-effectiveness of covered conductor deployment, including: - The effectiveness of covered conductor in the field in comparison to alternative initiatives; and - How covered conductor installation compares to other initiatives in its potential to reduce PSPS risk.	Developed Joint IOU Failure Modes and Effects Analysis (FMEA) for covered conductors. Benchmarking report for historic testing informing performance of Covered Conductor. Collaborative and complementary testing reports from SCE and PG&E, with SDG&E testing report expected in 2023. Continue work on lessons learned in 2023.

Note: The full table can be found in [Appendix F](#).

9 Public Safety Power Shutoff

9.1 Overview

In Sections 9.1-9.7 of the Wildfire Mitigation Plan (WMP), the electrical corporation must:

- *Provide a high-level overview of key Public Safety Power Shutoff (PSPS) statistics;*
- *Identify circuits that have been frequently de-energized and provide measures for how the electrical corporation will reduce the need for, and impact of, future PSPS implementation on those circuits;*
- *Describe expectations for how the electrical corporation's PSPS Program will evolve over the next 3 and 10 years;*
- *Describe any lessons learned for PSPS events occurring since the electrical corporation's last WMP submission; and*
- *Describe the electrical corporation's protocols for PSPS implementation.*

Our objective when initiating a PSPS event is to keep our customers safe. High winds can cause tree branches and debris to contact energized electric lines, damage our equipment, and cause a wildfire. As a result, we may need to turn off power during severe weather to help prevent wildfires. We know that losing power disrupts lives, which is why we are working year-round to make our system safer and more resilient and reduce the impact of PSPS for our customers and communities.

Pacific Gas and Electric Company (PG&E) remains committed to executing our PSPS Program in a manner that complies with California Public Utilities Commission (CPUC) guidelines in accordance with [Resolution ESRB-8](#), [D.19-05-042](#), [D.20-05-051](#), and [D.21-06-034](#).

9.1.1 Key PSPS Statistics

In this section, the electrical corporation must include a summary table of PSPS event data. These data must be calculated from the same source used in the Geographic Information System (GIS) data submission (i.e., they should be internally consistent). If it is not possible to provide these data from the same source, the electrical corporation must explain why. Table 9-1 provides an example of the minimum acceptable level of information for a summary of PSPS event data.

[Table 9-1](#) below lists the 2022 PSPS event data. This information was gathered using the same source used in the GIS data submission. For additional PSPS metrics, please see Table 10 of the 2023 QDR.

**TABLE 9-1:
PSPS EVENT STATISTICS**

Year	Number of Events Where De-energization Was Initiated ^(a)	Total Circuits De-energized ^(b)	Total Customers Impacted ^(c)	Total Customer Minutes of Interruption (CMI) ^(d)
2018	1	43	55,864	87,878,279
2019	8	1,842	2,036,019	5,513,240,050
2020	6	817	649,685	1,336,601,298
2021	5	237	80,391	147,807,660
2022 ^(e)	—	—	—	—

(a) Number of Events Where De-energization Was Initiated: Number of instances where utility operating protocol requires de-energization of a circuit thereof to reduce ignition probability per year. Only for events in which de-energization ultimately occurred.

(b) Circuits De-energized: Cumulative sum of circuits de-energized by each PSPS event per year. If the same circuit was impacted by two different PSPS events, the circuit will be counted twice.

(c) Customers Impacted: The cumulative sum of customers impacted by each PSPS event per year. If multiple PSPS events impact the same customer, the customer is counted each time in the overall impact.

(d) CMI: The cumulative number sum of customer minutes of de-energization due to PSPS events per each year (if multiple PSPS events impact the same customer, the customer minutes of de-energization is accounted for in each of the events for the given customer).

(e) In 2022, we did not have an event where de-energization was initiated.

9.1.2 Identification of Frequently De-Energized Circuits

Public Utilities Code Section 8386(c)(8) requires the Identification of circuits that have frequently been de-energized pursuant to a PSPS event to mitigate the risk from wildfire and the measures taken, or planned to be taken, by the electrical corporation to reduce the need for, and impact of, future PSPS of those circuits, including, but not limited to, the estimated annual decline in circuit PSPS and PSPS impact on customers, and replacing, hardening, or undergrounding any portion of the circuit or of upstream transmission or distribution lines.” To comply, the electrical corporation is required to populate Table 9-2 and provide a map showing the frequently de-energized circuits.

The map must show the following:

- *All circuits listed in Table 9-2, colored or weighted by frequency of PSPS; and*
- *High Fire Threat District (HFTD) Tiers 2 and 3 contour overlays.*

Examples of the minimum acceptable level of information is provided in Table 9-2.

Utility Initiative Tracking ID: Objectives PS-01; PS-02; PS-05; PS-08, PS-09, PS-10, and PS-11; Targets PS-06 and PS-07²⁵⁹.

For the list of frequently de-energized circuits,²⁶⁰ PG&E identified circuits de-energized three or more times in any calendar year from 2018 to 2022. These circuits are listed in [Table 9-2](#) below (see [Appendix F](#) for complete Frequently De-energized Circuit Table). This table also includes the mitigation measures taken, or planned to be taken, to reduce the likelihood of PSPS on those circuits. These mitigations include:

- Past Mitigations;
- Grid Hardening;
- PSPS Protocols;
- Sectionalizing Devices;
- Temporary Generation;
- Transmission Tags;

²⁵⁹ PG&E updated Targets PS-06 and PS-07 for 2025. See Section B.2 of the 2025 WMP Update for more information about the target changes.

²⁶⁰ PG&E updated the list of frequently de-energized list from the 2022 WMP by combining the October 26, 2019 event and the October 29, 2019, event into one October 26, 2019 event to align with the Table 10 data tables. This change removed 17 Transmission circuits from the minimum three de-energizations that occurred between 2018-2022. No changes were made to the listed Distribution circuits.

- Transmission Island;
- Transmission Segmentation;
- Vegetation Management (VM);
- Planned Mitigations;
- Undergrounding; and
- Motor Switch Operator (MSO) Replacement.

PG&E's PSPS Protocols were updated in 2021 as compared to the 2020 and 2019 PSPS Protocols. Based on our updated 2021 PSPS Protocols, some of the circuits below would not have been de-energized three or more times in any calendar year from 2019 to 2022. These circuits are noted below as "mitigated with PSPS Protocols." Additionally, some planned mitigations are still being analyzed so we cannot identify the impact of those plans on a per circuit basis.

We provide an estimated annual decline in customer impact on PSPS in Areas for Continued Improvement [ACI PG&E-22-35](#). The analysis uses the most recent five years lookback to quantify the expected customer impacts of our planned mitigations. Additional analysis will need to be performed to estimate the annual decline in circuits impacted by PSPS.

Undergrounding may mitigate PSPS activity in areas where lines are relocated underground because the lines themselves do not pose an ignition risk during the extreme weather conditions that drive PSPS events. However, undergrounding does not always eliminate PSPS risk for the directly connected customers, especially when the undergrounded line remains connected to an overhead line either upstream or downstream in an area subject to PSPS. For additional details on undergrounding, see [Section 8.1.2.2](#).

**TABLE 9-2:
LIST OF FREQUENTLY DE-ENERGIZED CIRCUITS**

Entry Number	ID of Circuit	Circuit Name	Transmission (Tx) / Distribution (Dx)	County	Dates of Outages	Number of Customers Served by Circuit (as of December 1, 2022)	Number of Customers affected	Measures Taken, or Planned to Be Taken, to Reduce the Need for and Impact of Future PSPS of Circuit
1	152101101	ALLEGHANY 1101	Dx	SIERRA	10/9/2019	1,036	1,043	1 Sectionalizing device added or replaced - Temporary Generation deployed that benefited 994 customers
					10/23/2019		1,038	
					10/26/2019		1,037	
					9/7/2020		1,028	
					9/27/2020		1,032	
					10/14/2020		957	
					10/25/2020		1,033	
2	152101102	ALLEGHANY 1102	Dx	NEVADA	10/9/2019	151	151	0.4 miles of overhead hardening completed - Planned underground hardening
					10/23/2019		151	
					10/26/2019		152	
					9/7/2020		151	
					9/27/2020		153	
					10/25/2020		153	
3	163561101	ALPINE 1101	Dx	ALPINE	10/9/2019	278	278	553 customer-events mitigated by PSPS protocols
					10/23/2019		278	
					10/26/2019		277	
					9/7/2020		276	
					9/27/2020		278	
					10/25/2020		278	
4	163561102	ALPINE 1102	Dx	ALPINE	10/9/2019	306	303	596 customer-events mitigated by PSPS protocols
					10/23/2019		303	
					10/26/2019		304	
					9/7/2020		303	
					9/27/2020		303	
					10/25/2020		304	

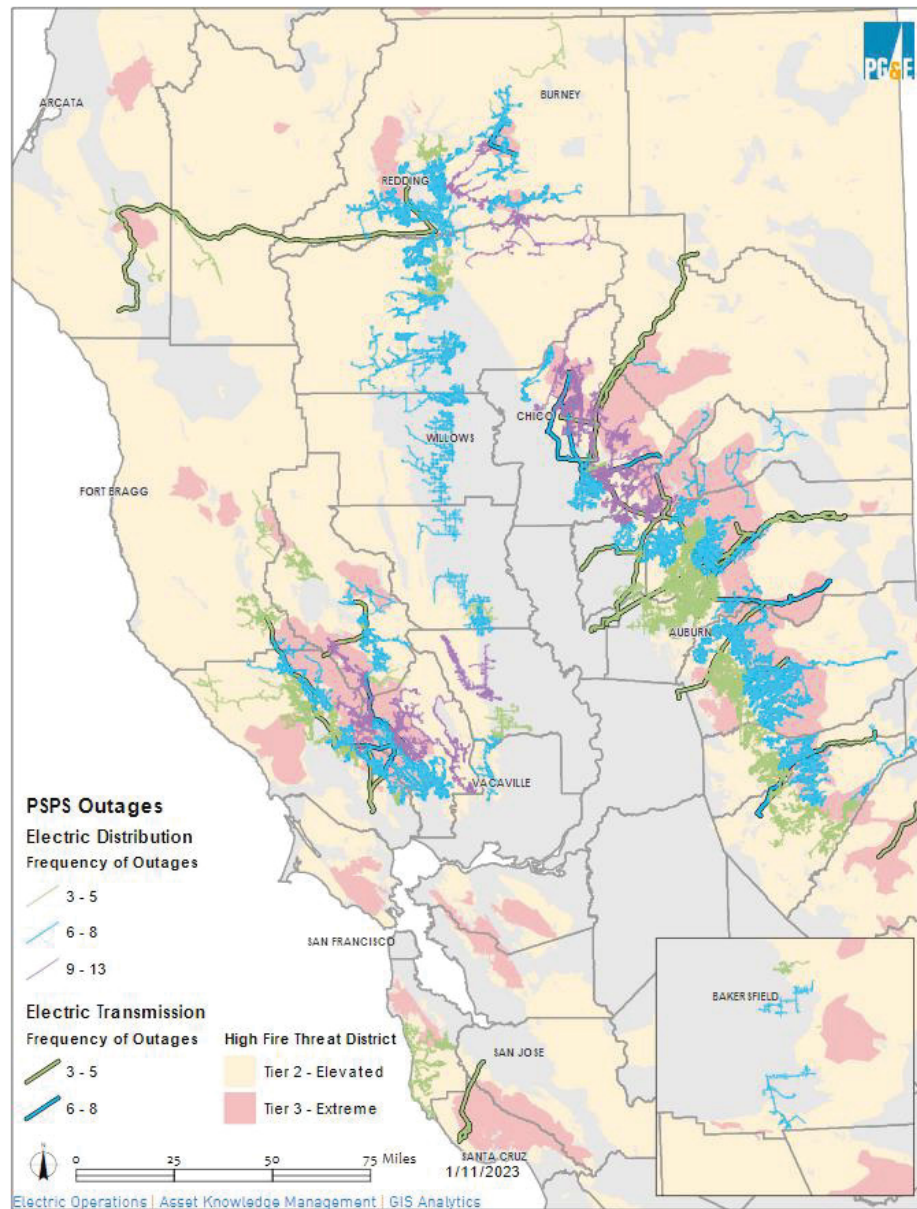
**TABLE 9-2:
LIST OF FREQUENTLY DE-ENERGIZED CIRCUITS
(CONTINUED)**

Entry Number	ID of Circuit	Circuit Name	Transmission (Tx) / Distribution (Dx)	County	Dates of Outages	Number of Customers Served by Circuit (as of December 1, 2022)	Number of Customers affected	Measures Taken, or Planned to Be Taken, to Reduce the Need for and Impact of Future PSPS of Circuit
5	103261103	ANDERSON 1103	Dx	SHASTA	10/9/2019	895	886	• 3 Sectionalizing devices added or replaced
					10/26/2019		886	• Planned overhead hardening
					11/20/2019		436	• Planned underground hardening
					10/21/2020		437	• 2492 customer-events mitigated by PSPS protocols
					10/25/2020		438	
					8/17/2021		68	
					10/11/2021		68	
6	42861101	ANNAPOLIS 1101	Dx	SONOMA	10/9/2019	223	219	• 445 customer-events mitigated by PSPS protocols
					10/23/2019		9	
					10/26/2019		218	
					10/25/2020		222	

Notes: The 2019 temporary generation mitigation data does not include customers mitigated because some data such as temporary microgrid circuits was not recorded at the circuit level. Additionally, in some examples the customer count that was energized by temporary microgrids via temporary generation may have combined customer count without separate count by circuit.
This table includes circuits de-energized three or more times in any calendar year from 2019-2022. For the full list of frequently de-energized circuits see [Appendix F](#).

Figure PG&E-9.1.2-1²⁶¹ below shows de-energized circuits, color-weighted by PSPS frequency, with HFTD Tier 2 and 3 contour overlays.

**FIGURE PG&E-9.1.2-1:
DE-ENERGIZED CIRCUITS BY FREQUENCY WITH HFTD CONTOUR OVERLAYS**



Note: Circuits shown in the map represent the entire line and do not account for sectionalization.

²⁶¹ For additional map viewing instructions, please refer to [Appendix C](#).

9.1.3 Objectives

Each electrical corporation must summarize the objectives for its 3-year and 10-year plans to reduce the scale, scope, and frequency of PSPS events. These summaries must include the following:

- Identification of which initiative(s) in the WMP the electrical corporation is implementing to achieve the stated objective, including Utility Initiative Tracking IDs;*
- Reference(s) to applicable codes, standards, and best practices/guidelines and an indication of whether the electrical corporation exceeds an applicable code, standard, or regulation;*
- Method of verifying achievement of each objective;*
- A completion date for when the electrical corporation will achieve the objective; and*
- Reference(s) to the WMP section(s) or appendix, including page numbers, where the details of the objective(s) are documented and substantiated.*

This information must be provided in Table 9-3. Example of PSPS Objectives (3-year plan) for the 3-year plan and Table 9-4. Example of PSPS Objectives (10-year plan) for the 10-year plan. Examples of the minimum acceptable level of information are provided below.

We are evaluating if Fire Potential Index (FPI) and the Ignition Probability Weather (IPW) updates can reduce the scale, scope, and frequency of PSPS events. See [Table 8-21](#) in [Section 8.3.1.1](#) and [Section 8.3.6](#) for more information.

- Revised [Table 9-3](#) Information Summary: In Revised [Table 9-3](#) and Revised [Table 9-4](#) we are providing the objective name (Objective Name), a description of the objective (Objective Description), the anticipated outlook of the objective (3-Year/10-Year Outlook), the planned due date for the objective (Completion Date), the applicable Initiative Tracking ID (Initiative Tracking ID), “Applicable Regulations, Codes, Standards, and Best Practices”, “method of verification”, and “section and page #” references. As noted in [Section 7.2.1](#), “Applicable Regulations, Codes, Standards, and Best Practices,” “method of verification,” and “section and page #” columns are not a part of the objective. Instead, the controlling objective information is in the “Objective Description” and “Completion Date” columns.
- Reporting: Unless changed through Office of Energy Infrastructure Safety’s (Energy Safety) Change Order process, PG&E will use the objectives in Revised [Table 9-3](#) and Revised [Table 9-4](#) below for quarterly compliance reporting including the Quarterly Data Report (QDR), Quarterly Notification (QN), and the Annual Report on Compliance (ARC). We note that throughout this 2023-2025 WMP, we discuss current plans for wildfire-related activities beyond the objectives in Revised [Table 9-3](#) and Revised [Table 9-4](#). The timing and scope of these additional activities and work may change. We will not be reporting on these plans or

activities in our QDR, QN, or ARC because they are not objectives but are descriptions of plans and activities in our 2023-2025 WMP to provide a complete picture of our wildfire mitigation activities.

- External Factors: All objectives in the below Revised [Table 9-3](#) and Revised [Table 9-4](#) are subject to External Factors which represent reasonable circumstances which may impact execution against objectives including, but not limited to: physical conditions, landholder refusals, environmental delays, customer refusals or non-contacts, permitting delays/restrictions, weather conditions, removed or destroyed assets, active wildfire, exceptions or exemptions to regulatory/statutory requirements, and other safety considerations.
- Utility Initiative Tracking ID: We are including Initiative Tracking IDs in each section that has associated targets and objectives. Revised [Table 9-3](#) and Revised [Table 9-4](#) display the Tracking IDs we are implementing to tie the objectives to the narratives and initiatives in the WMP. The Initiative Tracking IDs will also be used for reporting in the QDR.

In response to Critical Issue [RN-PG&E-23-01](#), PG&E updated our 3-year and 10-year Public Safety Power Shutoff objectives as shown in [Revised Table 9-3](#) and [Revised Table 9-4](#) below. PG&E's complete response to Critical Issue [RN-PG&E-23-01](#) is in [Section 7.2.1](#), following [Revised Table 7-3-1](#).

**REVISED TABLE PG&E-9-3:
PSPS INITIATIVE OBJECTIVES (3-YEAR PLAN)**

Objective Name	Objective Description	Applicable Initiative(s), Tracking ID(s)	Applicable Regulations, Codes, Standards, and Best Practices (See Note)	Method of Verification (i.e., program)	Completion Date	Reference (Section and Page #)
Evaluate enhancements for the PSPS Transmission guidance	Evaluate enhancements for the PSPS Transmission guidance to enhance focus of PSPS events.	PS-01	Industry best practice across California utilities is to run and improve their own models.	Documentation on evaluation of update to PSPS guidance	12/31/2025	Section 9.2.1 Page 930
Evaluate incorporation of approved IPW enhancements into the PSPS Distribution guidance	Evaluate incorporation of approved IPW enhancements into the PSPS Distribution guidance to enhance focus of PSPS events.	PS-02	D.19-05-042 and OIR 18-12-005 and Revision Notice 22-12 from 2022 WMP, industry best practice across California utilities is to run and improve their own models.	Documentation on evaluation of update to PSPS guidance	12/31/2025	Section 9.2.1 Page 930
Continue sharing PSPS lessons learned	Continue sharing PSPS lessons learned and best practices with CA IOUs through monthly meetings focused on PSPS.	PS-10	Industry best practice across California utilities is to run and improve their own models. I.19-06-015 (Wildfire OII Settlement) D.20-06-017 (PSPS OII) D.21-06-014 (PSPS OII)	Monthly meeting notes submitted to CPUC by utility hosting joint IOU meeting	12/31/2025	Section 9.1.2 Page 915
Pilot using drones for PSPS restoration	Pilot using drones for PSPS restoration and/or damage assessment to improve PSPS outage restoration time.	PS-11	All flight operations will be conducted under FAA Part 107 and Part 91 rules.	Documentation presented to the Wildfire Risk Governance Steering Committee (WRGSC) to show results of the pilot program effectiveness.	12/31/2024	Section 9.1.2 Page 915

**REVISED TABLE PG&E-9-4:
PSPS INITIATIVE OBJECTIVES (10-YEAR PLAN)**

Objective Name	Objective Description	Applicable Initiative(s), Tracking ID(s)	Applicable Regulations, Codes, Standards, and Best Practices (See Note)	Method of Verification (i.e., program)	Completion Date	Reference (Section and Page #)
Evaluate the transition of the Portable Battery Program to permanent battery solutions	Evaluate the transition of the Portable Battery Program to permanent battery solutions for PG&E customers at risk of PSPS or EPSS, focusing on but not limited to AFN, MBL, and self-identified vulnerable populations.	PS-05	CPUC R.12-11-005, D.19-09-027, CPUC R.12-11-005, D.20-01-021	Documentation of the assessment for transitioning to permanent battery solutions	12/31/2032	Section 8.5.3 Page 902
Evaluate emerging technologies to reduce PSPS customer impact	Evaluate emerging technologies for transmission and distribution that may further reduce scale, scope, or frequency of PSPS.	PS-08	N/A	Documentation of recommendations made to the Wildfire Risk Governance Steering Committee (WRGSC).	12/31/2032	Section 9.1.2 Page 915
Reduce PSPS impacts via Undergrounding	Reduce PSPS size, duration, or frequency over the next ten years as part of our 10,000-mile undergrounding program.	PS-09	N/A	Using the static 5 years (2018-2022) back cast analysis under the 2022 PSPS protocols, generate a report of the impact of undergrounding to reducing size, duration, or frequency of PSPS.	12/31/2032	Section 9.1.2 Page 915

9.1.4 Targets

Initiative targets are forward-looking quantifiable measurements of activities identified by each electrical corporation in its WMP. Electrical corporations will show progress toward completing targets in subsequent reports, including QDRs and WMP Updates.

The electrical corporation must list all targets it uses to track progress on reducing the scope, scale, and frequency of PSPS for the three years of the Base WMP. Energy Safety's Compliance Assurance Division and third parties must be able to track and audit each target. For each initiative target, the electrical corporation must provide the following:

- *Utility Initiative Tracking IDs;*
- *Projected targets for the three years of the Base WMP and relevant units;*
- *The expected "x%" risk impact for each of the three years of the Base WMP. The expected "x%" risk impact is the expected percentage risk reduction per year, as described in Section 7.2.2.2; and*
- *Method of verifying target completion.*

The electrical corporation's targets must provide enough detail to effectively inform efforts to improve the performance of the electrical corporation's initiatives aimed at reducing the scope, scale, and frequency of its PSPS events.

Table 9-5 is an example of the minimum acceptable level of information.

To reduce the scale, scope, and frequency of PSPS outages, PG&E's plans include the following initiatives:

- Undergrounding (see [Section 8.1.2.2](#)): Installing 10,000 miles of distribution powerlines underground in and near high fire-risk areas.

In response to Critical Issue [RN-PG&E-23-01](#) PG&E created a new 10-year objective related to evaluating PSPS reduction through undergrounding (PS-09). PG&E's complete response to Critical Issue [RN-PG&E-23-01](#) is in [Section 7.2.1](#), following [Revised Table 7-3-1](#).

- MSO Device Replacements (see [Section 8.1.2.8](#)): PG&E is replacing existing MSO devices with suitable load-break capable devices. This will allow PG&E to use the new devices during PSPS events to better sectionalize circuits, thus mitigating the number of customers impacted during PSPS outages.

See [Section 8.1.1.2](#) for undergrounding and MSO replacement Targets.

- Table 9-5 Information Summary: In [Table 9-5](#), we are providing the target name (Target Name), the applicable Initiative Tracking ID (Initiative Tracking ID) and a description of the Target for each applicable year (2023 Target & Unit, 2024 Target & Unit, 2025 Target & Unit), the “% Risk Impact” for each respective year, and the method of verification. As noted in [Section 7.2.1](#), the % Risk Impact and method of verification columns are not a part of the Target. Instead, the controlling target
- Utility Initiative Tracking ID: We are including Initiative Tracking IDs in each section that has associated targets and objectives. [Table 9-5](#) displays the Tracking IDs we are implementing to tie the targets to the narratives and initiatives in the WMP. The Initiative Tracking IDs will also be used for reporting in the QDR.
- Reporting: Unless changed through Energy Safety’s Change Order process, PG&E will use the Targets in [Table 9-5](#) for quarterly compliance reporting including the QDR, QN, and the ARC. It is also important to note that throughout this 2023-2025 WMP, we discuss current plans for wildfire-related activities in addition to the Targets in [Table 9-5](#). The timing and scope of these additional activities and work may change. We will not be reporting on these plans or activities in our QDR, QN, or ARC because they are not Targets but are descriptions of plans and activities in our 2023-2025 WMP to provide a complete picture of our mitigation activities.
- External Factors: All targets in the below [Table 9-5](#) are subject to External Factors which represent reasonable circumstances which may impact execution against targets including, but not limited to, physical conditions, landholder refusals, environmental delays, customer refusals or non-contacts, permitting delays/restrictions, weather conditions, removed or destroyed assets, active wildfire, exceptions or exemptions to regulatory/statutory requirements, and other safety considerations.
- High Fire Threat District (HFTD), High Fire Risk Area (HFRA), Buffer Areas: Unless stated otherwise, all initiative work described in [Table 9-5](#) involves work or audits on units or equipment located in, traversing, energizing, or protecting units or equipment in HFTD, HFRA, or Buffer Zone areas.

**TABLE PG&E-9-5:
PSPS TARGETS**

Target Name	Initiative Activity Tracking ID	Reference Section	2023 Target & Unit	x% Risk Impact 2023	2024 Target & Unit	x% Risk Impact 2024	2025 Target & Unit	x% Risk Impact 2025	Method of Verification
Provide 12,000 cumulative new or replacement portable batteries to PG&E customers at risk of PSPS or EPSS, focusing on but not limited to AFN, MBL, and self-identified vulnerable populations	PS-06	Section 8.5.3	Provide 4,000 cumulative new or replacement portable batteries to PG&E customers	N/A	Provide 4,000 cumulative new or replacement portable batteries to PG&E customers	N/A	Provide 3,300 ^(a) cumulative new or replacement portable batteries to PG&E customers	N/A	Annual tracking and reporting
Reduce PSPS impacts by ~38k customer events (2.4% ^{b)} for 2023-2025 period by completing planned Wildfire mitigation projects including but not limited to MSO switch replacements and undergrounding ^(d)	PS-07	Section 9.1.5 ACI PG&E-22-35	15,000 customer events based on Wildfire mitigation projects including but not limited to MSO replacements and Undergrounded miles planned for 2023	N/A	9,980 customer events mitigated based on Wildfire mitigation projects including but not limited to MSO replacements and Undergrounded miles planned for 2024 ^(c)	N/A	13,000 ^(a) customer events based on Wildfire mitigation projects including but not limited to MSO replacements and Undergrounded miles planned for 2025 ^(c)	N/A	Annual/ quarterly reporting and tracking

(a) The target has been updated for 2025. See PG&E's 2025 WMP Update for more information about the target change.

(b) The approximate cumulative number of 38k and 2.4% reflect the 2025 target reduction and the approved 2024 Change Order Decision.

(c) Target units in 2024 and 2025 are incremental. The target language is clarified to reflect the target year.

(d) Target reduction of PSPS impacts by customers are dependent on completion of planned MSO replacements and undergrounded miles each year.

9.1.5 Performance Metrics Identified by the Electrical Corporation

Performance metrics indicate the extent to which an electrical corporation's WMP is driving performance outcomes. Each electrical corporation must:

- *List the performance metrics the electrical corporation uses to evaluate the effectiveness of reducing reliance on PSPS.*

For each of these performance metrics listed, the electrical corporation must:

- *Report the electrical corporation's performance-since 2020 (if previously collected);*
- *Project performance for 2023-2025; and*
- *List method of verification.*

The electrical corporation must ensure that each metric's name and values are the same in its WMP reporting as its QDR reporting (specifically, QDR Table 2 and QDR Table 3). Metrics listed in this section that are the same as performance metrics required by Energy Safety and reported in QDR Table 2 (Performance Metrics) must match those reported in QDR Table 2. Metrics listed in this section that are not the same as any of the performance metrics identified by Energy Safety and reported in QDR Table 2 must match those reported in QDR Table 3.

The electrical corporation must:

- *Summarize its self-identified performance metric(s) in tabular form; and*
- *Provide a brief narrative that explains trends in the metrics.*

Table 9-6 provides an example of the minimum acceptable level of information.

In addition to the table, the electrical corporation must provide a narrative (two pages maximum) explaining its method for determining its projected performance on these metrics (e.g., PSPS consequence modeling, retrospective analysis).

PG&E has been updated Target PS-07 of this initiative for 2025. See Section B.2.1.1.3 of the 2025 WMP Update for more information.

Utility Initiative Tracking ID: PS-07

PG&E uses many performance metrics to evaluate the effectiveness of our PSPS Program. Some of these metrics include tracking the frequency, scope, and duration of PSPS events, as well as customer hours of PSPS per Red Flag Warning Overhead (RFW OH) circuit mile days. [Table 9-6](#) provides historic recorded data and an analysis of the past 5 years of weather data as a basis for the forecasted metrics.

Performance metrics related to frequency, scope, and duration of PSPS events are largely weather dependent and customer impact will fluctuate depending on the

meteorological conditions and grid configuration at the time of each event. The inclusion of the customer hours of PSPS per RFW OH circuit mile day metric is intended to normalize the customer hours using RFW to remove the unpredictability of weather in the metric and demonstrate improvements to the PSPS Program.

Notifying customers prior to initiation of PSPS event ensures customers are aware of the potential outages and the resources available to them. The metric “number of customers notified prior the initiation of PSPS event” is largely weather dependent as this metric will correlate with the frequency, scope, and duration of PSPS events. Using our 2023 workplans for undergrounding and MSO replacements, PG&E projected PSPS metrics into 2023 and keeps those values static for 2024-2025. PG&E anticipates continued improvement from 2023-2025 which includes reducing PSPS impact of approximately 38,000 customer events.²⁶² This reduction calculation was built using planned MSO replacement projects and undergrounding projects based on the 2022 PSPS guidance and protocols as described in the 2023 Wildfire Mitigation Plan when applied to the 5-year lookback of historic weather and simulated PSPS events as calculated in [Table 22-35-1](#), not on future weather events. This initiative is aligned to Target PS-07.

PG&E has also outlined the past and forecasted PSPS metrics in Table 10 of the QDR.

²⁶² The approximate cumulative customer events of 38,000 assumes approval of 9,980 from the 2024 Change Order, and 13,000 from the 2025 WMP Update.

**TABLE 9-6:
PROPOSED PSPS PERFORMANCE METRICS RESULTS BY YEAR**

Performance Metrics^(e)	2020	2021	2022	2023 Projected	2024 Projected	2025 Projected	Method of Verification (e.g., Third-Party Evaluation, QDR)
Frequency of PSPS Events	6	5	0	4	4	4	QDR ^(a)
Total Number of Customers Impacted by PSPS	649,685	80,319	0	317,151	313,527	309,138	QDR ^(b)
Duration of PSPS Events (in customer hours)	22.3 million	2.5 million	0	12.3 million	12.2 million	12.0 million	QDR ^(c)
Customer Hours of PSPS per RFW OH Circuit Mile Day	25.1	6.1	0	25.1	24.8	24.5	QDR ^(d)

(a) QDR Table 10, QDR No. 1a.

(b) QDR Table 10, QDR No. 4a.

(c) QDR Table 10, QDR No. 1c.

(d) QDR Table 10, QDR No. 1c/5-year historical average RFW OH Mile Days (not identified in Table 10).

(e) Based on the required metrics that are reported in the QDR, we calculated the projected metrics based on a single year average of the five-year lookback. However, in our target PS-07, we measured based on the entire five-year lookback. Data in this table cannot be used to replicate the projected mitigated customers in Target PS-07 due to following reasons: first, projected mitigated customers in Target PS-07 is calculated based on the entire five-year (2018-2022) lookback, whereas the 2023-2025 projected customer counts in this table are calculated from using a single average year using the five-year (2018-2022) lookback (for QDR purposes). Secondly, Target PS-07 is calculated based on the cumulative benefit of 2023-2025 planned WMP mitigations. This table displays 2023-2025 projected customer counts, and the 2023 projected customer count already incorporates the benefits of 2023 planned WMP mitigations. This metric does not include what the customer count would have been without any 2023-2025 planned WMP mitigations; this means taking the difference of the 2023 projected customer count and the 2025 projected customer count would only show the mitigation benefits of 2024 and 2025 planned WMP mitigations and would not account for the mitigation benefit of 2023 planned WMP mitigations. As a result, this would underrepresent the benefits of 2023-2025 planned WMP mitigations compared to Target PS-07.

9.2 Protocols on PSPS

The electrical corporation must describe its protocols on PSPS implementation including:

- *Risk thresholds, such as wind speed (WS), FPI, and so on, and a decision-making process that determine the need for a PSPS. Where the electrical corporation provides this information in another section of the WMP, it must provide a cross-reference here rather than duplicating responses;*
- *Method used to compare and evaluate the relative consequences of PSPS and wildfires;*
- *Outline of the strategic decision-making process for initiating a PSPS, such as, a decision tree. Where the electrical corporation provides this information in another section of the WMP, it must provide a cross-reference here rather than duplicating responses; and*
- *Protocols for mitigating the public safety impacts of PSPS, including impacts on first responders, health care facilities, operators of telecommunications infrastructure, and water electrical corporations/agencies.*

9.2.1 Risk Thresholds (e.g., WS, FPI, etc.) and Decision-Making Process That Determine the Need for a PSPS.

Utility Initiative Tracking ID: PS-01; PS-02

PG&E carefully monitors data from multiple sources to determine if conditions require an outage for public safety. These sources include weather data and federal forecasts, including:

- High-resolution forecasts of the FPI Model, IPW Model and Technosylva fire spread simulations;
- Weather model forecast data from external sources, including American, European, and Canadian weather models;
- Red Flag Warnings from the National Weather Service;
- Real-time data from weather stations;
- Live feeds from our wildfire cameras;
- High-risk forecasts of Significant Fire Potential from the Geographic Area Coordination Centers;
- Fire weather outlooks from the Storm Prediction Center, which is part of the National Weather Service and National Oceanic and Atmospheric Administration; and

- Information received on interagency conference calls during high-risk periods.

Steps for Determining if a PSPS is Necessary

Distribution PSPS Decision-Making

PG&E starts with our distribution system when deciding whether to turn off power for safety. The distribution powerlines are closer to communities and are generally more susceptible to dry, windy weather threats. We use 10+ years of PG&E high-resolution climate data to help quantify the wildfire risk and potential impacts of PSPS. This process is shown in [Figure PG&E-9.2.1-1](#).

**FIGURE PG&E-9.2.1-1:
VISUAL REPRESENTATION OF DISTRIBUTION PSPS DECISION-MAKING**

Steps for determining if a PSPS is necessary

When determining whether to turn off power for safety, we start with the distribution system. These powerlines are closer to communities and are generally more susceptible to dry, windy weather threats. We use 10 years of PG&E high-resolution climate data to help understand wildfire risk and potential customer impacts of PSPS.

STEP 1

If all of the minimum fire conditions are met...



High fire potential



Low relative humidity



High wind speeds



Low fuel moisture

STEP 2

...we conduct an in-depth review of fire risk using three separate measures:

A. Catastrophic Fire Probability

PG&E uses machine learning to assess the likelihood of equipment failure during a given weather event and the risk of catastrophic wildfire if a failure occurs. This model uses a combination of the IPW Model and the FPI Model.

B. Catastrophic Fire Behavior

Even if the probability of a powerline or equipment failure is unlikely, we may still turn off power where the consequence of a wildfire would be extreme.

C. Vegetation and Electric Asset Criteria Considerations

We identify areas where tree or electric compliance issues may increase the risk of ignition.

STEP 3

If any of the three measures in Step 2 are met, we turn off power for safety.

Determining the power outage area

Each of the three measures is evaluated within a small geographic area (four square kilometers). If any of the measures are met, circuits within that area are de-energized. Because powerlines travel across long distances, customers outside the affected area may also be impacted.

The following thresholds are taken into consideration when evaluating minimum fire potential conditions:

- Sustained WS above 19 miles per hour;
- Dead fuel moisture (DFM) 10 hour less than 9 percent;²⁶³
- DFM 100-hour, 1,000 hours less than 11 percent;²⁶⁴
- Relative Humidity (RH) below 30 percent;
- Herbaceous live fuel moisture below 65 percent;
- Shrub (Chamise) Live Fuel Moisture below 90 percent; and
- FPI above 0.7.

We do not use WS thresholds on a circuit basis as a gauge of outage or ignition probability.

In addition to assessing the areas that meet minimum fire potential conditions, PG&E conducts an in-depth review of fire risk using three separate measures:

(1) Catastrophic Fire Probability (CFP), (2) Catastrophic Fire Behavior (CFB), and (3) Vegetation and Electric Asset Criteria Considerations.

Catastrophic Fire Probability

The CFP Model is the primary method used to determine if PSPS is necessary. This model combines the probability of fire ignitions due to weather impacting the electric system with the probability that a fire will be catastrophic if it starts. The CFP is derived by combining outputs from our FPI and the IPW Models.

FPI Model

The FPI Model determines the probability that a fire will become large or catastrophic, which is considered as part of the PSPS decision-making process. FPI is used as an hourly and daily tool to drive operational decisions to reduce the risk of utility-caused ignitions and wildfires.

²⁶³ 10-hour DFM represents the modeled moisture content in dead fuels in the 0.25 to 1-inch diameter class and the layer of the forest floor about one inch below the surface.

²⁶⁴ 100-hour DFM represents the modeled moisture content of dead fuels in the 1 to 3-inch diameter class.

In 2019, and again in 2021, the FPI Model was enhanced with additional data and improved analytical capabilities. The current FPI Model combines the following information to predict the probability that an ignition could grow into a large and/or catastrophic fire:

- Fire weather parameters (WS, temperature, vapor pressure deficit);
- Fuel moisture data (dead fuel: dead grass and fallen branches; live fuel: grass and growing shrubs);
- Topography (terrain ruggedness, slope, wind-terrain alignment); and
- Fuel type data (grass, shrub, timber, or urban).

Ignition Probability Weather Model

The IPW Model is a machine learning model that uses ten or more years of weather data, outage, and historical ignition data to determine the likelihood of an outage for specific circuits during past weather events. The model also uses historical data to identify the outage causes. Some tracked causes include vegetation, structural failures, electrical malfunctions, and animal or third-party damage. The IPW model then analyzes the potential for that outage to be the source of an ignition. IPW learns from, and accounts for, changes on the grid from year-to-year.

To account for the hardening work performed, our IPW framework analyzes positive and negative changes in grid performance and reliability year-over-year and applies a timeweighted approach to weigh more recent years of learned performance more heavily in the final model output. The model learns the performance of local grid areas hour-by-hour based on the WS observed at that hour and if outages or ignitions occurred or not.

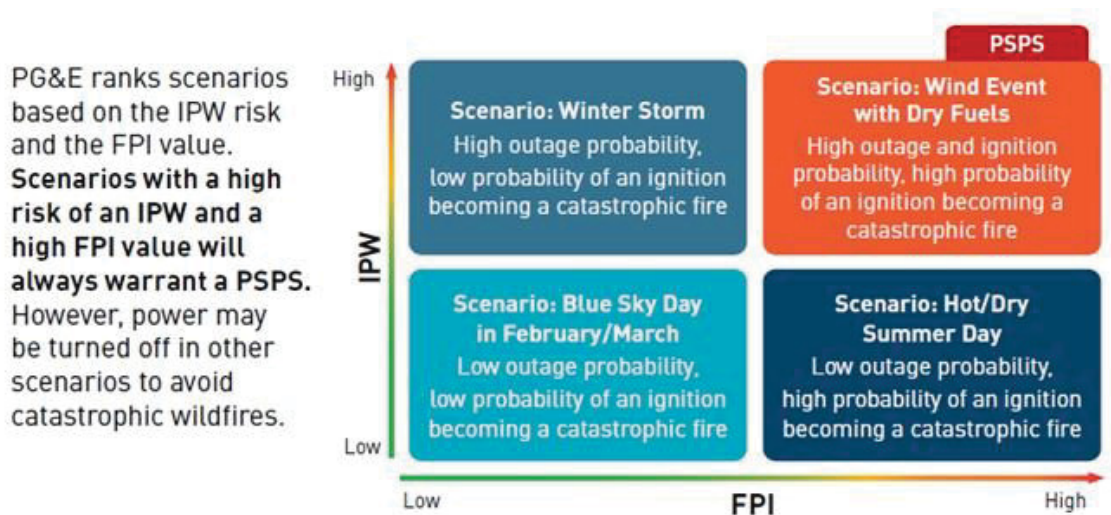
The guidance values PG&E uses when making a PSPS decision is a CFP_D ($IPW \times FPI$) value greater than 9. This value was determined by running 70 PSPS sensitivity studies from 2008 through 2020. Through this 13-year historical analysis, PG&E evaluated the customer impacts by: (1) multiple dimensions (size, duration, frequency, repeat events, etc.), (2) the days when PSPS events would have occurred, and (3) whether historic fires caused by utility infrastructure could have been avoided due to the lines being de-energized in this analysis.

We will continue to explore if new features such as covered conductors and EPSS in the IPW model used for the PSPS Distribution guidance will provide benefits. This is reflected in our objectives PS-02.

Machine Learning and Tree Considerations

PSPS protocols use a machine learning model to include the potential for trees to strike the lines. This helps our meteorology teams more accurately analyze risk posed by trees and how that translates to increased ignition probability. [Figure PG&E-9.2.1-2](#) is an illustration of different scenarios based on IPW risk and FPI values.

**FIGURE PG&E-9.2.1-2:
SCENARIOS BASED ON IPW AND FPI VALUES**



For additional information about the FPI and IPW model enhancements, see response to ACI PG&E-23-25 in Section B.5 of the 2025 WMP Update.

Catastrophic Fire Behavior

In addition to using historical data and machine learning models to assess the increased probability of utility caused ignitions and wildfire events, we also consider output from millions of fire events simulated by using a state-of-the-art fire simulation technology. This allows us to also evaluate areas where the probability of an outage and ignition event may be low, but the consequences of any ignition could be catastrophic. These locations are only considered for PSPS once the minimum fire potential conditions are met.

By leveraging a large set of fire spread simulations from 2000-2020, published agency literature, workshops with fire scientists, and sensitivity studies, we established our CFB guidance for PSPS decision making starting August 1, 2021. This guidance takes advantage of the fire behavior outputs from fire spread simulations to identify locations where fires are less likely to be contained should a fire ignition occur. The final CFB guidance selected aligns with USFS published research, presented below.

The United States Forest Service Rocky Mountain Research Station, a federal hub of wildfire research, has published documentation relating the observed and modeled fire behavior to the type of fire suppression efforts that may be effective or ineffective. This includes a study of fire line intensity, which analyzes how wildfires can grow and spread. [Figure PG&E-9.2.1-3](#) summarizes the fireline intensity analysis.

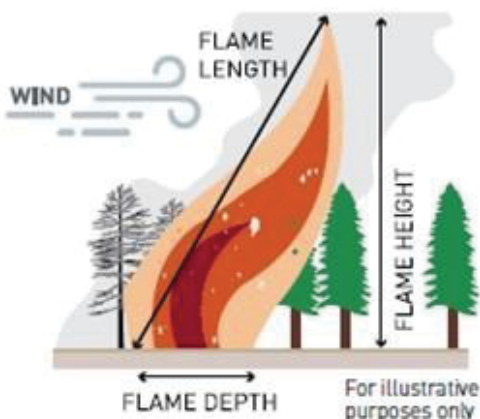
**FIGURE PG&E-9.2.1-3:
FIRELINE INTENSITY ANALYSIS**

The two rows outlined are considered catastrophic fire behavior, which would necessitate a PSPS.

FLAME LENGTH (L)	FIRELINE INTENSITY	INTERPRETATION
ft	Btu/ft/s	
<4	<100	- Fires can generally be attacked at the head by using hand tools - Hand line should hold the fire
4-8	100-500	- Fires are too intense for direct attack on the head using hand tools - Hand line cannot be relied on to hold the fire - Equipment such as dozers, pumpers and retardant aircraft can be effective
8-11	500-1,000	- Fires may present serious control problems — torching out, crowning and spotting - Control efforts at the fire head will probably be ineffective
>11	>1,000	- Crowning spotting and major fire runs are probable - Control efforts at head of fire are ineffective

Fireline intensity is determined by the size and components of flames. It is measured as the rate of heat energy released (British thermal unit (BTU)) per unit length of the fire line (feet) per unit times. It can also be calculated by estimating the flame length, which is the distance measured from the average flame tip to the middle of the base of the fire, as shown in [Figure PG&E-9.2.1-4](#).

**FIGURE PG&E-9.2.1-4:
FLAME LENGTH COMPONENTS**



PG&E uses flame length and rate of a fires spread from fire simulations in an operational setting to evaluate the potential need to turn off power. As shown in [Figure PG&E-9.2.1-4](#), flame lengths of 8-11 and >11 poses a serious control problem and therefore, are considered CFB and require a PSPS.

Vegetation and Electric Asset Criteria Considerations

We review locations where high-priority trees or electric compliance tags may increase the risk of ignition. We make every effort to address these conditions in advance so that turning off power is only initiated as a last resort.

Priority 1 or Priority 2 Tree Tags

We will turn off power if there are trees with open maintenance tags in areas that also surpass our minimum fire potential conditions. [Figure PG&E-9.2.1-5](#) describes Priority 1 and 2 tree tags. These locations are only considered for PSPS once the minimum fire potential conditions are met.

**FIGURE PG&E-9.2.1-5:
PRIORITY 1 AND PRIORITY 2 TREE TAGS**



Electric Asset Criteria

PG&E will turn off power if there is equipment with open high-risk safety-related compliance tags. We actively inspect for and schedule work to address these tags. To the extent possible, we fix these issues in the areas that may be within a severe weather footprint before a potential PSPS so we do not have to turn off power. These locations are only considered for PSPS once the minimum fire potential conditions are met.

Transmission PSPS Decision Making

In addition to analyzing distribution circuits, we also review transmission lines and structures in areas experiencing dry, windy weather conditions.

There is no single factor or threshold that will require turning off power for a transmission circuit. When determining whether to turn off power for safety on transmission lines, we review the same minimum fire potential conditions as with distribution lines. If these conditions are met, we will then look to the criteria in

[Figure PG&E-9.2.1-6](#) below to determine whether a transmission line must be turned off.

**FIGURE PG&E-9.2.1-6:
VISUAL REPRESENTATION OF TRANSMISSION SCOPING**



We will continue to use findings from Transmission sensitivity studies and incorporate into the PSPS Transmission guidance which is reflected in our Objective PS-01.

Asset Health

The Operability Assessment (OA) model determines the probability that an asset (a tower or pole structure including the equipment and conductors it supports) will fail during wind gusts of a given speed. While WS is the intensity measure used to determine this probability, the OA considers damage mechanisms, such as corrosion, fatigue, wear, and decay that could lower the capacity of an asset to resist extreme winds.

Vegetation Risk

The Strike Tree model identifies locations where specific trees may be within striking distance of the transmission line. It uses Light Detection and Ranging (LiDAR)

information for specific tree attributes and combines that with the FPI to identify sections of lines that have higher risk than others.

Catastrophic Fire Behavior (Consequence)

The CFB is determined using Technosylva's fire spread modeling. Technosylva inputs PG&E weather data, and then runs over 100 million fire spread simulations at 3-hour time intervals for the territory, out multiple days, creating a dataset of potential consequence of new ignitions. To meet CFB guidance, an ignition must meet a set Flame Length, Rate of Spread, and 8 hour burned acreage, in addition to a minimum asset fragility from the OA model. The use of CFB helps PG&E identify areas where the potential consequence from an ignition is high, but where the IPW score may be low due to high circuit resiliency.

Additional Criteria

Vegetation and Asset Hazard Consideration is the last scoping criteria. It is met by the presence of certain transmission asset tags or tree tag designations. Transmission structures that meet minimum Fire Potential Conditions and that also contain trees within striking distance of the line with high priority tags or certain high priority transmission asset tags, and which cannot be mitigated in the time before the weather start, are also recommended for inclusion in PSPS scope.

Public Safety Impact

Low Impact lines are also considered in transmission. The Transmission Asset Health Specialist reviews the system to identify if there are lines that did not meet any of the above scoping criteria but can be deenergized without incremental impact to customers or other adverse effects to the grid.

Critical Issue RN-PG&E-23-08

Critical Issue Title: *PG&E's PSPS decision-making process does not accurately account for EPSS enabled circuits, which could potentially lead to more PSPS events than needed.*

Remedy # 1: *PG&E must revise its WMP with a detailed plan and timeline on how it will accurately account for EPSS enabled circuits in its PSPS decision-making process.*

Responses to Critical Issue Remedy # 1:

In our response to [RN-PG&E-23-08](#), we provide an overview of our current PSPS protocols and models, the EPSS Program, and a framework and timeline for how we are considering accounting for changes in ignition probability due to EPSS or any program that reduces ignition probability. We are modifying our existing commitment, SA-05, which speaks to improvements to the Ignition Probability Weather (IPW) modeling framework to explicitly refer to EPSS. Enhancements to SA-05 that address the Revision Notice concerns are planned to be completed in 2024. The updates to

IPW will then be incorporated into PSPS protocols, which are tied to commitment PS-02.²⁶⁵

We describe our PSPS decision making protocols in detail in Section 9.2.1 of our 2023-2025 WMP. The decision to inform when PSPS is necessary is a multi-step process where we first determine if minimum fire potential conditions are met followed by an in-depth evaluation of three measures that could warrant turning off power proactively for public safety. The three measures for distribution PSPS protocols are shown in Figure 9.2.1-1, Visual Representation of Distribution PSPS Decision-Making, as follows:

- A) Catastrophic Fire Probability (CFP);
- B) Catastrophic Fire Behavior; and
- C) Vegetation and Electric Asset Criteria Consideration.

The CFP Model is the primary method used to determine if PSPS is necessary. This model combines the probability of an ignition given an outage due to weather and the probability that a fire will be catastrophic. The CFP is derived by computing the product of Fire Potential Index (FPI) model and the IPW models in both space and time. It is a risk-based assessment of the probability of an ignition multiplied by the impact and is given by the equation below:

$$CFP_{Distribution(x,y,t)} = IPW_{(x,y,t)} \bullet FPI_{(x,y,t)}$$

Note: In this equation, x and y are grid cell locations in the west-east and north-south directions, respectively, and t is time in hours.

Given its design and purpose, the FPI Model is not influenced by grid-related operations like EPSS²⁶⁶ as it seeks to determine how environmental factors influence fire spread. Thus, the effectiveness of any program that aims to mitigate outages and ignitions would be addressed through IPW.

The IPW Model is a machine learning model that leverages sustained and momentary outage data back to 2008 and historical utility ignition data across five outage-ignition classes to determine the likelihood of an ignition given an outage. IPW is given by

²⁶⁵ For additional information on commitments PS-02 and SA-05, see response to RN-PG&E-23-01.

²⁶⁶ The FPI model is a fuels-, weather- and topography-based model that estimates the probability of large and catastrophic fire growth given an ignition, and therefore FPI is not influenced nor adjusted by grid-related operations like EPSS. 2023-2025 WMP, R1, pp. 613-618.

$$IPW = P(\text{utility ignition}_{x,y,t}) = \sum_{class}^{cause\ classes} P(\text{Outage}_{class,x,y,t}) * P(\text{Ignition}_{class} | \text{Outage}_{class}).$$

IPW is trained on actual grid performance leveraging a robust historical weather dataset at 2 x 2 km spatial and hourly temporal resolution. The model is passed hourly weather data (e.g., wind speed, turbulence, temperature), vegetation, and outage and ignition data. This enables hourly predictions of outage and ignition probabilities across the entire PG&E domain accounting for the heterogeneous nature of assets and vegetation exposure. This is an extension to a similar approach to utilize wind speed thresholds on a circuit-by-circuit basis for PSPS decisions.

We point out that EPSS, like any program that would reduce the probability of ignitions, would be expressed through IPW in our current PSPS protocols. EPSS is a relatively new program, which was launched as a pilot in 2021 and expanded in 2022 to cover 44,000 line-miles including all high fire-risk areas. While EPSS has demonstrated promising ignition mitigation results, EPSS does not fully eliminate the potential for ignitions as we still observed 31 HFTD CPUC Reportable Ignitions on circuits where EPSS was enabled in 2022.

We acknowledge that any ignition, with the appropriate fuels and weather conditions, could grow into a large or catastrophic fire if not suppressed. During PSPS events, fuels are typically critically dry, Red Flag Warnings are in effect and a Diablo wind event is occurring. Even with EPSS enabled during these events, if circuits are not de-energized, there remains a possibility that ignitions may occur when there is an increased probability of extreme consequences.

Thus, very thoughtful, and careful consideration should be applied to any adjustments to our PSPS models and protocols, as the goal of PSPS is to mitigate relatively low probability yet very high to extreme consequence fire events. The approach outlined below will allow us to leverage a broader set of results to inform if critical adjustments to our PSPS protocols can and should be made.

Our plan to consider and potentially account for EPSS enablement and ignition mitigation into our PSPS models through IPW is described below.

- Through 2023, we plan to evaluate ignition to outage rates in the HFRA during the summer into fall Diablo wind season. A year-over-year analysis of the ignition to outage rates will allow an assessment of the variability of ignition to outage rates and any general trends. As ignition occurrence is relatively sparse in a given year, we need to consider if trends and results are statistically reliable.
- In 2023, we will also evaluate EPSS' capability of reducing ignitions during high wind events as the majority of EPSS ignitions in 2022 occurred in low-wind cases. Due to favorable weather in 2022, there were no strong offshore wind events and no PSPS events. The efficacy of EPSS in a high-wind scenario versus low-wind scenario is an area for further study. We anticipate very limited data in any statistical analyses of high wind ignitions cases given the short time frame the EPSS Program has been in effect and general lack of high-wind ignitions.

- Near the end of 2023, we plan to present initial findings to PG&E's Wildfire Risk Governance Steering Committee (WRGSC) for guidance and feedback on any analyses and studies.
- By September 1, 2024, or earlier, if possible, we may operationalize an update to IPW that considers EPSS enablement from studies in 2023 into 2024 if approved by the PG&E WRGC. This update would likely be based on our preferred method of utilizing actual performance data of outages and ignitions and not adjusting final outputs based on an individual programs' effectiveness calculation.

9.2.2 Method Used to Compare and Evaluate the Relative Consequences of PSPS and Wildfires

PSPS Risk vs. Benefit Tool

PG&E's PSPS Risk-Benefit Tool addresses the CPUC's requirements that California IOUs quantify the risk and benefits associated with initiating or not initiating a PSPS event for our customers.²⁶⁷

We incorporated the risk-benefit analysis into our PSPS execution process to help inform our PSPS decision-making process. The risk-benefit tool aligns with California IOUs and the current Commission-mandated MAVF framework, defined by the S-MAP Settlement Agreement, which specifies how various consequences are factored into a risk calculation.²⁶⁸ Using this framework, PG&E incorporates event forecast information into our PSPS Risk-Benefit Tool which is further described under the Risk Assessment Section below.

After the potential de-energization scope is determined, including the identification of impacted circuits, the scope and the Technosylva wildfire simulation outputs are used as inputs into the Risk-Benefit tool. The Risk-Benefit tool quantifies the potential public safety risk and wildfire risk resulting from the forecasted impacts of the pending weather/PSPS event. The Officer in Charge reviews the output of this analysis to help decide whether to de-energize the areas in consideration to protect public safety.

Risk Assessment

PG&E's PSPS Risk-Benefit Tool uses a California IOU standard MAVF framework that captures the safety, reliability, and financial impacts of identified potential risk events, as outlined in our Enterprise Risk Register.²⁶⁹ PG&E's MAVF uses a non-linear scaling of consequences reflecting our focus on low-frequency/high-consequence risk events without neglecting high-probability/low-consequence risk events. The PSPS Risk-Benefit Tool outputs MAVF scores which compare the potential de-energization

²⁶⁷ D.21-06-014, pp. 283-284, Ordering Paragraph 1.

²⁶⁸ D.18-12-014.

²⁶⁹ Full details of the MAVF methodology are provided in A.20-06-012, PG&E's 2020 RAMP Report, p. 3-3, line 5 to p. 3-15, line 9.

risk from a forecasted PSPS event to the potential risk of catastrophic wildfires if circuits considered for PSPS were to remain energized.

The following inputs are used in calculations to build MAVF risk scores for PSPS events and wildfires, which are weighed against one another.

- Technosylva Wildfire Simulation Data: Fire simulation forecasts on the consequence of a potential wildfire's impact on customers, wildlife, and infrastructure on each circuit for every three hours. These values are based on Technosylva's proprietary and sophisticated wildfire modeling, using real-time weather models, state-of-the-art fuel, and 8-hour fire spread modeling.
- Forecasted Circuits: The final list of the distribution circuits and transmission lines identified as in-scope for a potential PSPS.
- Customer Minutes: Forecasted outage duration that customers will face during the potential PSPS.
- Customers Impacted: Forecasted number of customers to be impacted by the potential PSPS.
- Customer Category and Critical Customer Adjustment Factor: The type of customer (e.g., CC1, MBL, Low-Income, etc.) is incorporated into the analysis using a "critical customer adjustment factor" which is applied to the customer outage duration to reflect a higher risk score for customers who may be more adversely impacted by a potential de-energization event. This scoring adjustment has the potential to change the risk ratio and does not recommend de-energizing a particular circuit during an event. This critical weighting component was included in PG&E's risk scoring to prioritize more vulnerable populations and act as an intermediate solution to account for customer resiliency risk that will be further developed jointly with the other IOUs during the S-MAP process.

Once the data is incorporated into the tool, the modeling considerations described below are used to estimate the consequences of the: (1) potential wildfire risk; and (2) PSPS risk at the per-circuit level. A variety of modeling considerations are made using the tool to facilitate calculations, which are included in [Table PG&E-9.2.2-1](#) and summarized in [Figure PG&E-9.2.2-1](#).

**TABLE PG&E-9.2.2-1:
PSPS RISK BENEFIT CONSEQUENCE MODELING CONSIDERATIONS**

Consequence Type	Wildfire Consequence Considerations	PSPS Consequence Considerations
Safety	Calculated based on maximum population impacts derived from Technosylva wildfire simulation models and a fatality ratio based on National Fire Protection Association data.	Calculated from an estimate of Equivalent Fatalities (EF) per million Customer Minutes Interrupted (MCMI). EF/MCMI ratio is estimated from previous PG&E PSPS and other large external outage events. ^(a)
Reliability	N/A	Calculated directly from the potential number of customers impacted and outage duration based on customer minutes interrupted.
Financial	Calculated based on maximum building impacts derived from Technosylva wildfire simulation models, and a cost per structure destroyed previously evaluated in 2020 RAMP Report. ^(b)	Calculated based on two financial estimates: (1) distribution of a lump sum cost of execution across all relevant circuits, and (2) an estimated proxy cost per customer per PSPS event. ^(c)
(a) Previous PG&E PSPS events include 2019-2021 PSPS events, and other large external outage events include the 2003 Northeast Blackout in New York City, 2011 Southwest Blackout in San Diego, 2012 Derecho Windstorms, 2012 Superstorm Sandy, and 2017 Hurricane Irma, 2021 Texas Blackout event. (b) PG&E's 2020 RAMP Report, A.20-06-012 (June 30, 2020). (c) The assumptions used in these calculations, including the proxy cost per customer per PSPS event, will be updated and are not intended to prejudge or create precedent regarding the development of more precise values of resiliency or cost of PSPS metrics being considered in other ongoing proceedings at the CPUC, such as the Risk Based Decision Making Rulemaking, Rulemaking 20-07-013, and the Microgrid and Resiliency Strategies.		

Potential Wildfire Risk

Wildfire consequence impacts are calculated based on the outputs from the Technosylva simulations. Variables include: (1) population impacted by wildfire; and (2) structures impacted by wildfire used to calculate natural unit values for two consequence components:

- Wildfire Safety Consequence: EF; and
- Wildfire Financial Consequence: Financial Cost of Wildfire (in dollars).

Potential PSPS Risk

PSPS consequence impacts are based on the following values: duration of de-energization by circuit; and the number of customers impacted by de-energization on each circuit. These input values are used to calculate natural unit values for three consequence components:

- PSPS Safety Consequence: EF as an output of Customer Minutes interrupted;
- PSPS Electric Reliability Consequence: Customer Minutes Interrupted × Critical Customer Adjustment Factor; and
- PSPS Financial Consequence: Financial Cost of PSPS event (in dollars) × Critical Customer Adjustment Factor.

These risk attributes align with how the other IOUs calculate PSPS risk. PG&E continually looks to improve the tool and the accuracy of our PSPS risk calculations. This includes improving our customer risk accounting while ensuring that research into the impact of resiliency is better documented and validated. We are working to improve our consequence estimations by better aligning with our meteorology teams' forecasts and modeling.

After the consequence values (safety, reliability, and financial) are estimated, they are converted into MAVF risk scores. The Risk-Benefit tool then calculates the impacts of a PSPS event and a wildfire, showing if the adverse impact from a PSPS event outweighs the risk of a wildfire. [Figure PG&E-9.2.2-1](#) below depicts the PSPS risk/benefit tool.

**FIGURE PG&E-9.2.2-1:
VISUAL REPRESENTATION OF PSPS RISK BENEFIT TOOL**



9.2.3 Outline of Tactical and Strategic Decision-Making Protocol for Initiating a PSPS/PSPS (Such as Decision Tree)

We know that losing power disrupts lives, especially for our most vulnerable customers. Therefore, we use rigorous, data-driven internal decision-making protocols prior to initiating a PSPS.

PG&E's Internal Decision-Making Process

Officer-in-Charge

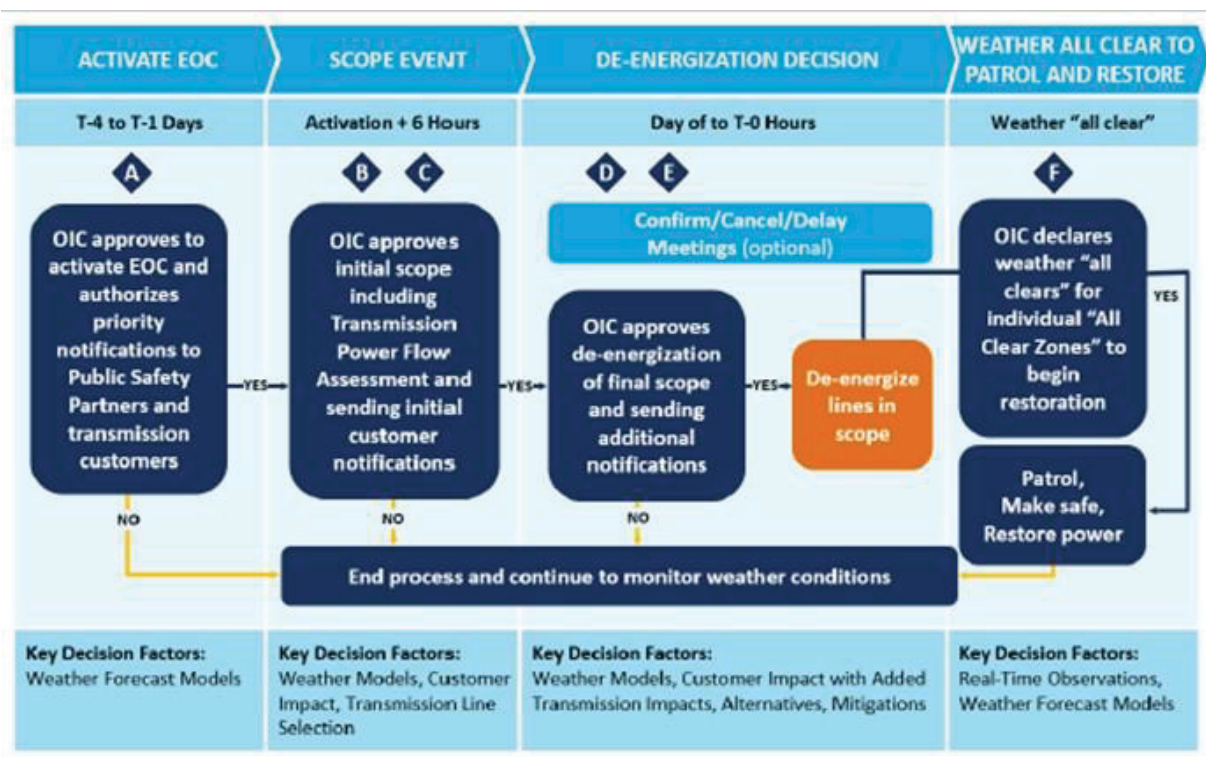
PG&E involves both the Emergency Operations Center (EOC) Commander and our senior management in the decision to initiate PSPS protocols. The Officer-in-Charge (OIC) is a role created for PSPS events to engage senior management in making decisions given the impact of a PSPS event.

During a PSPS event, the OIC is responsible for making the following decisions:

- Activating the PG&E EOC in response to a forecasted PSPS event;
- Approving the list of transmission lines determined to be directly within the scope of the PSPS event;
- Approving initial customer notifications;
- Approving de-energization of distribution and transmission lines within the final event scope (including indirectly affected transmission circuits outside the weather polygon);
- Approving additional customer notifications; and
- Approving weather “all clear” announcements after weather conditions subside and beginning the process of patrols and restoration.

In making these decisions, the OIC receives situational awareness from several PG&E teams including Meteorology, PSPS Technical Engineers, Customer Strategy, the Hazard Awareness Warning Center, and Field Operations. [Figure PG&E-9.2.3-1](#) shows the PSPS decision-making process.

**FIGURE PG&E-9.2.3-1:
THE PSPS DECISION MAKING PROCESS**



Decision to De-Energize

The OIC will review the information provided by our SMEs and determine when there is an imminent and significant risk of strong winds impacting PG&E assets and a significant risk of large, destructive wildfires should ignition occur. The OIC will determine whether alternatives to de-energization are inadequate to reduce this risk and that the public safety risk of catastrophic wildfire outweighs the adverse impacts of de-energization within the given scope. If the OIC determines that de-energization is necessary to protect public safety, they will approve the decision to de-energize and the final scope of the event and send warning notifications to the customers in scope.

In making this decision, the OIC considers alternatives to de-energization and our ability to mitigate the adverse impacts on customers and communities in areas planned for shutoff. These mitigating steps include warning customers through notifications, mobilizing community assistance locations, implementing sectionalization and microgrids where possible, and providing back up power support under exception circumstances.

If there is a potential transmission PSPS event, we weigh the benefits of de-energizing the transmission lines against the public safety risks. If we determine that the benefits of de-energization outweigh the risks, PG&E will de-energize the identified transmission lines in coordination with the California Independent System Operator, following approval by PG&E's OIC.

Confirm/Cancel/Delay Meetings

After the decision to de-energize is made, PG&E continues to actively monitor weather forecasts up until the planned de-energization time. The EOC Commander, Field Operations, and the Meteorology teams monitor approaching weather, and may hold a series of “Confirm/Cancel/Delay” meetings to:

- Confirm: Confirm that weather has materialized, and de-energization can proceed per plan;
- Cancel: Confirm that the weather threat did not materialize, in all or certain areas, and the de-energization should be cancelled; and
- Delay: Confirm that the weather threat is still imminent but has materialized slower than expected and the final decision to de-energize areas in question needs to be delayed.

This final set of meetings held immediately before the anticipated de-energization allows PG&E to adjust course and reduce or expand the scope, as necessary, if there is an emergent change in the weather.

9.2.4 Protocols for Mitigating the Public Safety Impacts of PSPS, Including Impacts on First Responders, Health Care Facilities, Operators of Telecommunications Infrastructure, and Water Electrical Corporations/Agencies

PG&E mitigates public safety impacts of PSPS through various initiatives such as temporary generation, standing up Community Resource Centers, partnering with CBOs, and sending advanced notifications to Public Safety Partners, critical customers, and others to provide time to prepare for outages.

Temporary Generation

PG&E mitigates potential PSPS customer impact through temporary generation, which can include:

- Distribution Microgrids: Designed to support frequently impacted communities by using temporary generators to power microgrids that safely provide electricity to central corridors (i.e., “Main Street”), critical facilities, and shared community resources.
- Backup Generation: PG&E does not offer backup generation to individual facilities. However, our policy allows certain exceptions for critical facilities when an outage could have a significant impact to public safety or the individual critical customer facility’s backup generation and/or emergency plan fails. These exceptions include:
 - High risk to public safety, such as hospitals with active trauma units, critical water or wastewater asset, and city or county EOC;

- High risk of environmental hazard, such as chemical plants which risk toxic spill into local rivers; and
- High risk to essential emergency response and support facilities, such as 911 call centers, water pump availability compromising firefighting, and critical telecommunications equipment or other support businesses that directly affect emergency services provision.

Community Resource Centers

To minimize PSPS outage impacts and serve our communities and vulnerable customers during a PSPS event, PG&E opens Community Resource Centers (CRC) in impacted communities. We describe CRCs in [Section 8.4.6](#).

Community Based Organizations

PG&E partners with CBOs to help mitigate PSPS impacts on customers. These organizations provide a range of support services including assistance with applications for backup portable batteries, emergency preparedness education, accessible transportation resources, hotel stays, and food stipends during a PSPS. More information about how we work with CBOs can be found in [Section 8.5.1.1](#), [Section 8.5.2](#), and [Section 8.5.3](#).

Notifications

Public Safety Partners and Critical Facilities

Throughout PSPS events, PG&E makes special effort to notify Public Safety Partners and critical facilities ahead of PSPS outages. This is to ensure agencies are aware of the potential outage and have sufficient time to prepare and communicate within their community.

During a PSPS outage, Public Safety Partners and critical facilities including transmission-level customers and Publicly Owned Utilities, are notified via:

- Automated notifications via email, text, and telephone. If these customers do not confirm receipt of the automated notification, PG&E representatives from the local EOC, Customer Relationship Managers, or the Critical Infrastructure Lead (CIL) make direct calls to the Public Safety Partners and critical facility contacts to ensure they are aware of the potential PSPS outage;
 - For transmission-level impacts, we attempt to notify within 48-72 hours, depending on scoping; and
 - PG&E's Grid Control Center operators make live calls to transmission-level entities before de-energization and re-energization.

For more information on PG&E's outreach efforts to Public Safety Partners during a PSPS outage, see [Section 8.4.3](#). For more information on PG&E's outreach to critical customers during a PSPS outage, see [Section 8.4.4](#).

Telecommunication Services

PG&E works closely with telecommunication service providers throughout events to coordinate and share information during the weather event. PG&E also provides telecommunications service providers with a dedicated PG&E contact in the EOC known as the CIL, who shares up-to-date event information with them. These partners can reach the CIL 24/7 during an event by e-mail or phone. In addition, PG&E reaches out to telecommunications service providers via email or phone as weather changes or new information regarding the PSPS becomes available.

Transit- or Paratransit-Dependent Persons

PG&E also provides proactive notifications and impacted zip code information to paratransit agencies that serve known transit- or paratransit-dependent persons that may need access to a CRC during an event. All notifications to paratransit agencies include a link to the [PSPS emergency website event updates page](#), and a section called “Additional Resources” with a link to a map showing areas potentially affected by the shutoff.

9.3 Communication Strategy for PPS

In [Section 8.4.4](#) of the WMP, the electrical corporation must discuss all public communication strategies for wildfires, outages due to wildfires and PPS, and service restoration. Thus, in this section, the electrical corporation is only required to provide a cross-reference to [Section 8.4.4](#) and any other section of the WMP providing details of the emergency public communication strategy for PPS implementation.

PG&E is not the lead agency for wildfires and does not communicate to Public Safety Partners regarding the status of wildfires.

For an overview of PG&E’s public communication strategies for outages due to wildfires and PPS, and service restoration, please refer to [Section 8.4.3.2](#), [Section 8.4.4](#), and [Section 8.4.4.1](#).

9.4 Key Personnel, Qualifications, and Training for PPS

In [Section 8.4.2.2](#) of the WMP the electrical corporation must discuss all key personnel planning, qualifications, and training for wildfires, outages due to wildfires, and PPS, and service restoration. Thus, in this section, the electrical corporation is only required to provide a cross-reference to [Section 8.4.2.2](#) and any other section of the WMP providing details of key personnel, qualifications, and training for PPS implementation.

For information regarding PG&E’s PPS key personnel planning, qualifications, and training, please see [Section 8.4.2.2](#).

9.5 Planning and Allocation of Resources for Service Restoration Due to PPS

In [Section 8.4.5.2](#) of the WMP, the electrical corporation must address planning of appropriate resources (e.g., equipment, specialized workers) and allocation of those resources to assure the safety of the public during service restoration. Thus, in this section, the electrical corporation is only required to provide a cross-reference to [Section 8.4.5.2](#) and any other section of the WMP providing details of resource planning for PPS implementation.

For information regarding PG&E's planning of appropriate resources and allocations of those resources during PPS restoration, see [Section 8.4.5.2](#).

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
SECTION 10
LESSONS LEARNED

10. Lessons Learned

An electrical corporation must use lessons learned to drive continuous improvement in its WMP. Electrical corporations must include lessons learned due to ongoing monitoring and evaluation initiatives, collaboration with other electrical corporations and industry experts, and feedback from Energy Safety and other regulators.

The electrical corporation must provide a summary of new lessons learned since its most recent WMP submission, and any ongoing improvements to address existing lessons learned. This must include a brief narrative describing the new key lessons learned and a status update on any ongoing improvements due to existing lessons learned. The narrative should be limited to two pages.

The electrical corporation must also provide a summary of how it continuously monitors and evaluates its wildfire mitigation efforts to identify lessons learned. This must include various policies, programs, and procedures for incorporating feedback to make improvements.

Lessons learned can be divided into the three main categories: (1) internal monitoring and evaluation, (2) external collaboration with other electrical corporations, and (3) feedback from Energy Safety or other authoritative bodies. The following are examples of specific potential sources of lessons learned:

- *Internal monitoring and evaluation initiatives:*
 - *Tracking of risk events;*
 - *Findings from root cause analyses and after-action reviews;*
 - *Drills and exercises;*
 - *Feedback from community engagement;*
 - *PSPS events;*
- *Feedback from Energy Safety or other authoritative bodies:*
 - *Areas of continued improvement identified by Energy Safety in the previous WMP evaluation period;*
 - *Findings from wildfire investigations;*
 - *Findings from Energy Safety Compliance Division assessments; and*
- *Collaborations with other electrical corporations.*

In addition to the above potential sources of lessons learned, the electric corporation must detail lessons learned from any and each catastrophic wildfire ignited by its facilities or equipment in the past 20 years, as listed in Section 5.3.2. The electric corporation must also detail specific mitigation measures implemented as a result of these lessons learned and demonstrate how the mitigation measures are being integrated into the electric corporation's wildfire mitigation strategy.

For each lesson learned, the electrical corporation must identify the following in Table 10-1:

- *Year the lesson learned was identified;*
- *Subject of the lesson learned;*
- *Specific type or source of lesson learned (as identified in the bullet lists above);*
- *Brief description of the lesson learned that informed improvement to the WMP;*
- *Brief description of the proposed improvement to the WMP and which initiative(s) or activity(s) the electrical corporation intends to add or modify;*
- *Estimated timeline for implementing the proposed improvement;*
- *Reference to the documentation that describes and substantiates the need for improvement including:*
 - *Where relevant, a hyperlinked section and page number in the appendix of the WMP;*
 - *Where relevant, the title of the report, date of report, and link to the electrical corporation web page where the report can be downloaded; and*
 - *If any lessons learned were derived from quantifiable data, visual/graphical representations of these lessons learned in the supporting documentation.*

Our 2023 Wildfire Strategy has been influenced by our response to lessons learned from various sources. A few of the most impactful been:

- Ongoing internal monitoring and evaluations initiatives: We continue to reinforce and expand our situational awareness, customer outreach and support, and refine operational practices to reduce wildfire potential and impacts to customers.
- Feedback from Energy Safety, industry experts, and Stakeholders: We are enhancing our risk modeling, fire consequence modeling, operational practices, and reporting (e.g., remediations for tracking and reporting identified by the CPUC and Energy Safety).
- Collaboration with other electrical corporations: We participate in workshops with other IOUs to address remedies, fuse replacements, covered conductor effectiveness, EPSS settings, and to share other best practices.

Below, we summarize lessons learned since our 2022 WMP and provide an update on ongoing improvements that have been integrated into this WMP. We also provide updates on how we are monitoring and evaluating the lessons learned.

See [Table 10-1](#) below for an overview of lessons learned. To avoid repetition, the lessons learned from catastrophic wildfires ignited by our facilities or equipment listed in [Section 5.3.2](#) are further discussed in [ACI PG&E-22-08](#). Following [Table 10-1](#) is a brief narrative regarding the lessons learned from catastrophic wildfires.

Ongoing Internal Monitoring and Evaluations Initiatives

PG&E regularly monitors community feedback via Regional Working Groups, Advisory Councils and Wildfire Safety Webinars/Town Halls. Feedback is also received during industry-specific meetings and other community events (see [Section 8.4.3.1](#) and [Section 8.5.1.2](#)). Recently, we received feedback that customers need more resources to mitigate outage impacts from our wildfire mitigation programs (PSPS/EPSS). We enhanced customer education about resources for Access and Functional Needs (AFN) customers before, during, and after a wildfire or wildfire safety outage. We are also evaluating expanding programs and eligibility in 2023.

An ongoing improvement has been addressing our inability to provide California Governor's Office of Emergency Services (Cal OES) partners automated customer communications in certain localities where there were 50 or fewer customer impacts. Since 2022, we improved the PSPS communication process with external Office of Emergency Services (OES) partners ensuring they received direct, live calls from their respective Public Safety Specialists in counties with 50 or fewer customer impacts where the customers were to receive automated calls from PG&E. This provided greater situational awareness to the county OES partners and ensured they had visibility into the customer messaging process.

Feedback from Energy Safety, Industry Experts, and Stakeholders

One of the most recent areas of feedback we received from Energy Safety have been areas for continuous improvement, specifically relating to asset inspections. During a 12-week period in 2022, we conducted over 3,000 distribution field QC reviews. While we had set an internal target of 65 percent of reviews achieving a perfect field review, the 3,000-plus field reviews averaged 43.5 percent achieving a perfect review. A separate quality verification of the distribution system inspections found from Week 14 to Week 23, 77.35 percent of the inspections received a pass rate, which was below the internal target pass rate of 90 percent.

During the quality verification process, we found that the most commonly occurring identification failures (which can lead to potential ignitions) relate to improper conductor splices, pole damage, missing/loose/damaged guy wires, exposed/broken/damaged grounds, service connections, missing inspection photos, incorrect tap clamp installations, damaged insulators and king pins, and damaged anchor rods. Starting in 2023, we will transition to 1-3 year inspection cycles for plat maps in HFTD, with frequency assignments based on the Wildfire consequence scores from WDRM v3. (See [Section 8.1.3.2.1](#))

Update Regarding 2021 WMP Remedy 5.4A

In response to 2021 WMP Remedy 5.4.A, discussed in our 2022 WMP, we explained that our Enhanced Ignition Analysis (EIA) Program and supporting asset management

teams were primarily focused on equipment failure ignition rates in HFTD to ensure that ignitions in the riskiest geographic regions are prioritized.

In 2022, the EIA Program expanded to include ignition-fault data collection and analysis for most reportable ignition events in HFTD and HFRA, regardless of cause. This has resulted in asset protection corrective actions at the subject circuit level (i.e., modifying protective device settings to better suit conditions at the circuit and help prevent future ignition events) and informed broader wildfire mitigation strategies. We completed 72 fault data reviews in 2022. There was no prior precedent to perform this analysis.

In 2022, PG&E developed procedure documents, implemented field-based mobile applications, and developed process management dashboards to drive adherence to this critical sub-process.

Collaboration With Other Electrical Corporations

Since our 2022 WMP, we have worked with other electric corporations to share best practices. For example, after visits to our Applied Technology Services (ATS) Lab and assessments of our equivalent EPSS programs we learned that San Diego Gas & Electric Company's (SDG&E) findings indicated that including EPSS specific buffer zones in the enablement criteria increased overall safety. We have since updated our EPSS Enablement Criteria based on SDG&E's criteria for Fast Trip activation on Red Flag Warning days only.

In [Table 10-1](#) below we provide an overview of recent lessons learned through internal monitoring and evaluation, external collaboration with other electrical corporations, and feedback from Energy Safety or other authoritative bodies.

**TABLE 10-1:
LESSONS LEARNED**

ID #	Year of Lesson Learned	Subject	Type or Source of Lesson Learned	Description of Lesson Learned	Proposed WMP Improvement	Timeline for Implementation	Reference
1	2022	Internal monitoring and evaluation initiatives	- Feedback from Community Engagement Joint IOU AFN - Collaborative Planning Team (Federal Emergency Management Agency 6-step Planning Process to develop 2022 AFN Plan) - Joint IOU Statewide AFN Council - Customers participating via Q&A during PG&E Wildfire Safety Webinars/Safety Town Halls)	Customers need more resources to mitigate outage impacts due to wildfire or wildfire safety programs (PSPS/EPSS)	Enhance customer education and awareness of resources for customers with AFN before during and after a wildfire or wildfire safety outage. Evaluate the expansion of programs and eligibility for 2023.	2023	PG&E's 2022 Q1, Q2, and Q3 AFN Plans, dated April 29, 2022, July 29, 2022, and October 31, 2022. ^(a)
2	2022	Internal monitoring and evaluation initiatives	Tracking of Risk Events/ Finding from Fire Root Cause Analysis ignitions within HFTD	Given EPSS implementation, high-impedance fault is one failure mode where EPSS may not prevent the ignition and there is a high probability of ignition. In 2022, out of the 89 CPUC reportable ignitions in HFTD there were 30 reportable EPSS ignitions in HFTD, 16 were characterized by high-impedance faults.	Install system protection equipment with Down Conductor Detection (DCD), where feasible in higher-risk areas.	2023-2024	2023-2025 WMP Section 8.1.2.10 ; DCD standard has not yet been published.
3	2022	Internal monitoring and evaluation initiatives	Tracking of Risk Events/Finding from Fire Root Cause Analysis	A portion of service-related ignitions in HFTD occurred due to a mechanical force, which resulted in source side wire downs and ignition events. In 2022, out of the 89 CPUC reportable ignitions in HFTD, 15 occurred on a secondary or service facility, and of those, 9 occurred due to a mechanical force.	Require break-away service-connectors in the construction standard for new rebuilds.	2023	2023-2025 WMP, Section 8.1.2.6.2 ; Break-away standard has not yet been published.
4	2022	Internal monitoring and evaluation initiatives	Tracking of Risk Events/Finding from Fire Root Cause Analysis	PG&E monitored fires outside the service territory and assessed whether PSPS thresholds would have put circuits in the Colorado Fire in Monterey, California and the Coastal Fire in Laguna Niguel, California in scope. This prompted PG&E to look at the thresholds around WS, DFM, and RH that guide EPSS enablement.	Update the EPSS Enablement criteria to be more conservative by adding additional wind and RH criteria and subsequently continuing to reduce to the R2 criteria and the RH/DFM/WS criteria.	Implemented in 2022	Wildfire Risk Governance Committee Decision Outcomes, 3/2/2022 and 6/6/2022 ^(b)

**TABLE 10-1:
LESSONS LEARNED
(CONTINUED)**

ID #	Year of Lesson Learned	Subject	Type or Source of Lesson Learned	Description of Lesson Learned	Proposed WMP Improvement	Timeline for Implementation	Reference
5	2021	Internal monitoring and evaluation initiatives	PSPS events	Cal OES partners were not able to receive automated customer communications in some small localities where there were 50 or fewer customer impacts. OES partners requested that they have visibility into external customer communications related to PSPS messaging during events.	During 2022, the PSPS communication process was improved with external OES partners. This included ensuring county OES partners received direct, live calls from their respective Public Safety Specialists in those counties with 50 or fewer customer impacts, where those customers where to receive automated calls from PG&E. This effort provided greater situational awareness to the county OES partners and ensured they had visibility into the customer messaging process.	Completed in 2022; Ongoing	2022 PSPS Policies and Procedures Guide for Emergency Managers (Section 5) ^(c)
6	2022	Internal monitoring and evaluation initiatives	PSPS events	During the October 2022 Weather Event, PG&E made every attempt to provide notification of the cancellation of a PSPS event by notifying all affected entities; however, we did not perform these cancellations within the target of two hours of the decision to cancel for portions of the overall 10/22 PSPS event scope. There were limited opportunities to reduce this timeline in event as there were challenges with technology and event complexity, including overlapping notification windows for multiple customer populations.	For future events, PG&E plans to examine areas of improvement to minimize issues arising from overlapping notification windows and improve response time that may be addressed by streamlining processes and making technology upgrades to account for event complexity.	Planned for 2023	PG&E PSPS Report to the CPUC, October 22-24, 2022 Weather Event, dated November 7, 2022 ^(c)

**TABLE 10-1:
LESSONS LEARNED
(CONTINUED)**

ID #	Year of Lesson Learned	Subject	Type or Source of Lesson Learned	Description of Lesson Learned	Proposed WMP Improvement	Timeline for Implementation	Reference
7	2021	Feedback from Energy Safety or other authoritative bodies	Areas of Continuous Improvement – Operations	After EPSS was initiated, CPUC reportable ignitions were reduced by about 80 percent on EPSS enabled circuits compared to the prior 3-year average. However, the averted ignitions have impacted customers' electric reliability. PG&E recognizes that it could have done a better job of communicating these changes to customers before they were implemented. After implementing the EPSS program, PG&E held more than a dozen informational webinars for communities experiencing these outages and heard first-hand from customers who had experienced hardships from EPSS.	PG&E has expanded the EPSS mitigation across all HFRA and EPSS buffer area distribution circuits, while minimizing and mitigating power loss impacts on customers by applying learnings from 2021 and optimizing device settings at the outset including adjusting settings in a more coordinated and individualized manner to reduce outages, using helicopters to more rapidly check lines that have tripped, installing animal protection on equipment, and targeted asset hardening.	Implemented in 2022; Ongoing	Response to Request for a Final Report, Case No. 14-CR-00175-WHA, Document 1519, dated November 17, 2021 (discussing the EPSS program). ^(e)
8	2021	Feedback from Energy Safety or other authoritative bodies	Areas of Continuous Improvement – Modeling Prioritization & Verifiable Records/Data Improvement	Based on recommendations from the continual examination of all aspects of the PSPS Program, including the performances of its models, power-restoration teams and customer notification processes, PG&E's PSPS models incorporated Tree Overstrike as an independent trigger for de-energization. The machine-based learning assessment indicated that PG&E should integrate a given grid cell's Tree Overstrike into the broader calculation of the probability of an outage and associated potential ignition.	For 2021, PG&E's models were improved to consider the relative amount of Tree Overstrike (the approximate linear distance of trees that are tall enough to fall on PG&E lines, as estimated based on aerial LiDAR scans) as well as outstanding high-priority vegetation and asset maintenance tags. PG&E expects that each year we will evaluate potential changes to our program to make the program's targeting of wildfire risk more effective. This includes altering the models' parameters, incorporating additional data or making other changes. Any such changes would be subject to a robust weather-backcasting analysis to confirm that the models would have effectively prevented catastrophic wildfires.	Continuous	Response to Request for a Final Report, Case No. 14-CR-00175-WHA, Document 1519, dated November 17, 2021 (discussing tree overstrike and PSPS protocols). ^(f)

**TABLE 10-1:
LESSONS LEARNED
(CONTINUED)**

ID #	Year of Lesson Learned	Subject	Type or Source of Lesson Learned	Description of Lesson Learned	Proposed WMP Improvement	Timeline for Implementation	Reference
9	2020	Feedback from Energy Safety or other authoritative bodies	Areas of Continuous Improvement – Inspections	In response to a condition of probation agreed upon by PG&E and the Federal Monitor, PG&E stood up our Vegetation Management Inspector (VMI) program, now known as Construction Management. The organization includes PG&E-employed supervisors and management and 95 Senior VMI, formerly known as VMIs, including 30 employed by PG&E. A routine VM program inspecting overhead electric distribution facilities at least annually will help identify and clear vegetation that might grow or fall into utility equipment.	PG&E is moving towards a 100% work verification model in our routine VM program in HFTDs. In 2021, PG&E tripled our work verification workforce by adding 200 additional inspectors to perform this work. PG&E deployed, where feasible, the use of vehicle-based LiDAR technology as a further check on the quality of its VM patrols in HFTDs. Vehicle-based LiDAR scans following a routine inspection and its associated tree are meant to help objectively confirm that the required clearance around the conductors has been achieved.	Ongoing	Response to Request for a Final Report, Case No. 14-CR-00175-WHA, Document 1519, dated November 17, 2021 (discussing Vegetation Management Improvements) ^(a)
10	2021	Feedback from Energy Safety or other authoritative bodies	Areas of Continuous Improvement – Training	Experiential field training should be incorporated into the curriculum and further use testing both during and at the end of asset inspection trainings to ensure comprehension and retention of information.	PG&E updated our training content based on feedback and learnings from 2021 and is developing additional knowledge assessments and testing that we plan to incorporate in our training programs in 2022.	Completed in 2022	Response to Request for Critiques, Case 14-CR-00175-WHA, Document 1538, dated December 16, 2021 (discussing Electric Infrastructure Inspections and Remediation Work) ^(b)

**TABLE 10-1:
LESSONS LEARNED
(CONTINUED)**

ID #	Year of Lesson Learned	Subject	Type or Source of Lesson Learned	Description of Lesson Learned	Proposed WMP Improvement	Timeline for Implementation	Reference
11	2022	Feedback from Energy Safety or other authoritative bodies	Areas of Continuous Improvement – Inspections	During a 12-week period in 2022, PG&E conducted over 3,000 distribution field QC reviews. While PG&E had set an internal target of 65 percent of reviews achieving a perfect field review, the 3,000-plus field reviews averaged 43.5 percent achieving a perfect review. A separate quality verification of the distribution system inspections found that over a period from Week 14 to Week 23, 77.35 percent of the inspections received a pass rate, which was below the internal target pass rate of 90 percent. The most commonly occurring identification failures (many of which can lead to potential ignitions and wildfires) noted in the quality verification process relate to improper conductor splices, pole damage, missing/loose/damaged guy wires, exposed/broken/damaged grounds, service connections, missing inspection photos, incorrect tap clamp installations, damaged insulators and king pins, and damaged anchor rods.	Starting in 2023, we will transition to 1-3 year inspection cycles for plat maps in HFTD, with frequency assignments based on the Wildfire consequence scores from WDRM v3.	Planned for 2023	PG&E Independent Safety Monitor Status Report, dated October 4, 2022. ⁽ⁱ⁾
12	2022	Collaborations with other electrical corporations	Sharing of best practices	Based on assessments of equivalent EPSS programs among the IOUs and sharing of information inclusive of site visits at PG&E's ATS lab, PG&E learned that SDG&E's findings indicated that including EPSS specific buffer zones in the enablement criteria increased overall safety.	PG&E updated EPSS Enablement Criteria to include EPSS specific buffer zones based on SDG&E's criteria for Fast Trip activation on Red Flag Warning days only.	Implemented in 2022	PG&E's 2022 Wildfire Mitigation Plan Response to Revision Notice (RN-PG&E-22-12), dated July 11, 2022, including "Utility Benchmarking of Fast Trip Schemes and Relay Technologies for Fire Mitigation" and "Fast Trip Setting California IOU Comparison" dated June 2022.⁽ⁱⁱ⁾

**TABLE 10-1:
LESSONS LEARNED
(CONTINUED)**

ID #	Year of Lesson Learned	Subject	Type or Source of Lesson Learned	Description of Lesson Learned	Proposed WMP Improvement	Timeline for Implementation	Reference
13	2022	Collaborations with other electrical corporations	Sharing of best practices	In response to Revision Notice 22-09, PG&E collaborated with Southern California Edison Company and SDG&E to develop regional AOCs for focused tree removal based on SDG&E's AOC program.	Analyze 47 counties in PG&E service territory to improve understanding and document regional vegetation and ignition/outage risk. Develop a pilot program for focused tree inspections and mitigation in high risk AOCs.	AOCs were identified in 2022. The focused tree inspection pilot program will begin in 2023.	PG&E's 2022 Revised WMP response to Revision Notice 22-09, pp. 743-752. ^(k)
(a)	PG&E's AFN Plan for PSPS Support Quarterly Progress Reports in R.18-12-005. Specifically, Quarterly Report for Jan. 1, 2022 to Mar. 31, 2022 (Apr. 29, 2022); Quarterly Report for Apr. 1, 2021 to Jun. 30, 2021 (Jul. 30, 2021), and Quarterly Report (Jul. 1, 2022 to Sept. 30, 2022) (Oct. 31, 2022).						
(b)	See relevant portions of PG&E's Wildfire Risk Governance Committee Presentations (3/2/2022 and 6/6/2022) in Attachments 2023-03-27_PGE_2023_WMP_R0_Section 10_Atch01 and 2023-03-27_PGE_2023_WMP_R0_Section 10_Atch02.						
(c)	PG&E Public Safety Power Shutoff Policies and Procedures, Emergency Managers (July 2022). See Appendix E .						
(d)	PG&E PSPS Report to the CPUC, October 22 24, 2022 Weather Event (Nov. 7, 2022). See Appendix E .						
(e)	<i>United States v. Pacific Gas and Electric Company</i> , Case No. 14-CR-00175-WHA, Response to Request for a Final Report (Nov. 17, 2021), pp. 9-11. Available at https://docs.publicnow.com/viewDoc?hash_primary=B618903F0CA43A4F6033CFBFAA73D28CA2088D92 .						
(f)	Id. at pp. 11-16.						
(g)	Id. at pp. 18-26.						
(h)	<i>United States v. Pacific Gas and Electric Company</i> , Case No. 14-CR-00175-WHA, Response to Request for Critique (Dec. 16, 2021), pp. 10-13. Available at https://s1.q4cdn.com/880135780/files/doc_downloads/wildfire_updates/2021/12/PG-E-Response-to-Federal-Monitor-Final-Report-December-16-2021.pdf .						
(i)	Filsinger Energy Partners, PG&E Independent Safety Monitor Status Update Report (October 4, 2022), p. 18. See Appendix E .						
(j)	PG&E's 2022 Wildfire Mitigation Plan Response to Revision Notice (RN-PG&E-22-12) (July 11, 2022), pp. 62-85; <i>Utility Benchmarking of Fast Trip Schemes and Relay Technologies for Fire Mitigation; Fast Trip Setting California IOU Comparison</i> (June 2022).						
(k)	PG&E's 2022 Wildfire Mitigation Plan Update – Revised, OEIS Docket #2022-WMP (July 26, 2022), pp. 743-752.						

Catastrophic Fires From the Past 20 Years

In compliance with D.14-02-015, PG&E began tracking wildfires potentially associated with our electric facilities in 2014. [Table 5-4](#) in [Section 5.3.2](#) provides additional details about these incidents. As discussed, the information provided in [Table 5-4](#) is based on information available to PG&E at the time of the 2023 WMP filing. PG&E requested data from CAL FIRE in December 2022 for fires occurring between 2002 and 2014 in an attempt to provide additional information responsive to the Guidelines. The information provided by CAL FIRE in mid-January did not provide sufficient information to meaningfully respond further to Energy Safety's request in the Guidelines.

PG&E has a separate ACI related to lessons learned from catastrophic wildfires ([ACI PG&E-22-08](#)). In response to that ACI, we provide the lessons learned from the electrical corporation ignited catastrophic fires from 2014 to the present contemplated in this section. To avoid redundancy, please refer to that ACI response for the information and documentation requested in this section.

In addition to specific lessons learned from individual fires, we ultimately monitor our wildfire mitigation efforts through Wildfire Risk Weekly Operating Reviews which cover the following topics: ignitions; implementation of EPSS and other operational mitigations; and progress on the WMP. The weekly discussion is facilitated by the Community Wildfire Safety Program Project Management Office and attendees include PG&E's Chief Executive Officer and Executive Officer Team. We use these weekly meetings to learn about our mitigation efforts and make necessary adjustments in real time.

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
SECTION 11
CORRECTIVE ACTION PROGRAM

11. Corrective Action Program

In this section, the electrical corporation must describe its corrective action program. The electrical corporation must present a summary description of the relevant portions of its existing procedures.

The electrical corporation must report on how it maintains a corrective action program (CAP) to track formal actions and activities undertaken to:

- *Prevent recurrence of risk events;*
- *Address findings from wildfire investigations (both internal and external);*
- *Address findings from Energy Safety's Compliance Assurance Division (i.e., audits and notices of defect and violation); and*
- *Address areas for continued improvement (ACI) identified by Energy Safety as part of the Wildfire Mitigation Plan (WMP) evaluation.*

The electrical corporation must report on how it reviews each improvement area in accordance with its corrective action program. At a minimum, the electrical corporation must:

- *Identify Insufficient Occurrence And Response: Identify targeted corrective actions for areas where the event occurrence, response, or feature was insufficient;*
- *Identify Actions To Reduce Recurrence: Identify improvement actions (as applicable) to reduce the likelihood of recurrence, improve response/mitigation actions, or improve operational procedures or practices;*
- *Track Implementation: Track the improvement action plan and schedule in the electrical corporation's action tracking system;*
- *Improve External Communication: For areas where weaknesses were identified in the response of external agencies, develop a communication plan to share the information and conclusion with the responsible agency. The completion of this action and the agency's response must be documented;*
- *Integrate Lessons Learned From Across The Industry: Identify applicable generic lessons learned to improve the overall effectiveness of the electrical corporation WMPs; and*
- *Share Lessons Learned With Others: Identify and communicate any significant generic lessons learned that should be disseminated broadly (i.e., to other electrical corporations and responsible regulatory authorities, such as Energy Safety or California Department of Forestry and Fire Protection (CAL FIRE)).*

The WMP should not include detailed corrective action plans for each risk event, finding, and/or improvement area. However, this documentation must be made available to Energy Safety upon request.

Introduction

In the sections below, PG&E first reports on how we maintain a corrective action program (CAP) to track formal actions and activities. Next, we discuss how we review each improvement area in accordance with our CAP.

Maintaining a CAP to Track Formal Actions and Activities

Through our CAP, Pacific Gas and Electric Company (PG&E) identifies, evaluates, resolves, and tracks actual or potential issues, problems, failures, nonconformities, concerns, and opportunities for improvement (collectively, called CAP issues) based on probability of occurrence.²⁷⁰ CAP is a risk-informed, risk-driven process by which the organization learns from equipment, programmatic, organizational, and human performance issues.

CAP is a commitment database and tracking tool we rely on to ensure we have knowledge of, and visibility into, CAP issues and the means to track progress as we resolve them. CAP is an enterprise-wide tool used to track and manage a wide variety of issues and is not limited to risk events, wildfire investigations, or findings from regulatory agencies.

The CAP program is not specifically designed to improve external communications, integrate lessons learned from across the industry, or share lessons learned with others. There may be CAP issues whose resolution includes improving external communications, integrating lessons learned from industry or sharing lessons learned with others, but these items are not generally addressed as part of the CAP process.

For example, when Energy Safety issues PG&E a Notice of Violation (NOV) or Notice of Defect (NOD), PG&E manages it to completion through the CAP process. PG&E's responses are typically publicly available through the Energy Safety website.

PG&E maintains a CAP to track formal actions and activities undertaken to:

- Prevent recurrence of risk events;
- Address findings from wildfire investigations (both internal and external);
- Address findings from Energy Safety's Compliance Assurance Division (i.e., audits and notices of defect and violation); and
- Address ACIs identified by Energy Safety as part of the WMP evaluation.

²⁷⁰ As described in the PG&E Enterprise CAP Procedure (GOV-6101P-08) Revision 2 in [Appendix E](#).

Prevent Recurrence of Risk Events

The goal of PG&E's CAP is to minimize the recurrence of risk events. The process the Corrective Action Review team (the review team) follows includes assigning a CAP risk level for issues that are entered into the CAP database. The review team recommends an evaluation type based on the level of potential safety, reliability, financial, compliance, environmental, and/or reputational risk.

CAP evaluations include Root Cause Evaluations (RCE), Apparent Cause Evaluations (ACE), Common Cause Evaluations (CCE), and Work Group Evaluations (WGE).²⁷¹

- The RCE process is a formal and rigorous investigation that uses industry-accepted analysis methods to identify the root cause of the problem and identifies corrective actions that prevent or reduce the likelihood of a recurrence for the same or similar root cause;
- An ACE is a formal investigation based on readily available data and information which uses industry-accepted analysis methods to provide reasonable assurance that the cause of the problem was identified while also determining corrective actions to reduce the likelihood or repeat of a similar occurrence;
- CCE are analyses used to identify common underlying elements between different, unique, but similar events or issues. These elements may be anything from a common failure mode to a common cause that may or may not require further investigation; and
- WGE are the lowest level of evaluation and can be used to analyze issues, ideas, and potential opportunities for improvement.

A corrective action is developed for each issue and assigned to action owners who monitor actions to ensure they are completed by the agreed upon due date and verifies each action is completed.

To prevent recurrence of CAP issues, teams define corrective actions such as developing new training programs or revising standards or procedures focused on preventing recurrence of the specific issue. The CAP team and SMEs work together to develop and implement the agreed upon solutions and track progress through the CAP database from evaluation through implementation. The CAP team reviews and tracks open issues daily until the corrective actions are implanted and the CAP can be marked complete and closed-out.

Address Findings from Wildfire Investigations (Both Internal and External)

Our CAP addresses findings from internal and external wildfire investigations by tracking and reporting on investigations conducted by the Electrical Incident Investigation (EII) group. The EII group is responsible for investigating California Public Utilities Commission (CPUC) reportable events, Electric Incident Reports (EIR), and

²⁷¹ As described in Procedure GOV-6102P-06 – Link to full document in [Appendix E](#).

non-CPUC reportable events. A wildfire CAP is submitted when the EIR criteria are met.²⁷²

The EIR group identifies insufficient occurrence and response by investigating the following:

- How assets in the field performed in each incident;
- An apparent cause of each incident;
- A probable cause of each incident;
- A contributing cause to each incident;
- An engineering or design issue which, if changed, may reduce the probability of the incident recurring;
- A change to work procedure or process which, if changed, may reduce the probability of the incident recurring;
- Corrective actions that PG&E can take in managing our assets or our work processes to improve the safety of employees and the public, and to improve asset performance; and
- A failure to meet PG&E or CPUC asset work-process standards that could lead to a CPUC self-report.

We create a CPUC 20-day report to provide a status of the investigation within 20 business days of reporting the incident. A CAP is created when it is likely that the incident occurred because PG&E equipment, processes, procedures, and/or standards did not meet PG&E or CPUC standards.

When the investigation report is complete, any causal evaluations, EIRs, or documentation about the completed investigation are uploaded to the CAP database and an email is sent to key internal stakeholders. EIRs are made available to the public on PG&E's investor relations [webpage](#). Causal Evaluations and EIRs are provided to governing agencies upon request. If any new corrective issues are identified during the investigation, then a new CAP is created.

CAPs are tracked to completion by issue owners and evaluated for quality closure²⁷³ by the CAP group. The CAP is managed in SAP and allows tracking of overall issues and action items taken to resolve the issue. A target due date is set when an issue is accepted and changes to due dates are tracked and approved as per our operating

²⁷² As described in the Electric Incident Reporting On-Call Representative Procedure (RISK-6305P-01), Rev. 09 (Mar. 17, 2022). See [Appendix E](#).

²⁷³ Per the guidance in the PG&E Enterprise CAP Procedure (GOV-6101P-08), Rev. 2 (Jan. 14, 2022), pp. 27-28. See [Appendix E](#).

procedure. We use dashboards to prioritize work by risk level and to track overdue and coming due CAPs.

We continue to improve how we communicate our findings from wildfire investigations to external agencies. For example:

- [ACI PG&E-22-08](#) analyzes how lessons learned from past catastrophic fires are tied to the causes of past PG&E-equipment related catastrophic fires beyond what was provided in the 2022 WMP in RN-PG&E-22-01; and
- The Envista Root Cause Analyses (RCA) Report²⁷⁴ provides RCAs of the 2017-18 wildfires found to have been caused by PG&E. The report also includes a corrective action report.

Since 2020, PG&E's Electric Investigation teams have been meeting quarterly with the other Investor-Owned Utilities (IOU) to share lessons learned from incidents in which a self-report was created. Additional meetings with IOUs helped decide how to interpret requirements set forth in Energy Safety's emergency rulemaking for 29300 A(1), A(2) and B.²⁷⁵ The meetings have allowed us to understand what each utility currently investigates.

Additionally, PG&E's Ignition Investigation team reviews and categorizes all ignition events that meet the criteria identified in Fire Incident Data Plan and Reporting Procedure (RISK-6306P-01). This procedure describes the process for complying with CPUC Decision 14-02-015²⁷⁶ which requires us to report annually all fire ignitions associated with our electric facilities that meet the criteria specified in the decision. The purpose of the procedure is to identify and understand PG&E facility ignition characteristics, to assess ignition trends, and to formulate ignition prevention strategies. We use this data to analyze risk based on historic ignition frequency and to inform asset strategy.

Address Findings from Energy Safety's Compliance Assurance Division (i.e., Audits and Notices of Defect and Violation)

Energy Safety conducts inspections, audits, and investigations to oversee utility compliance with approved WMPs. We are required to correct violations and defects identified by Energy Safety per Energy Safety's Compliance Process. PG&E's CAP thoroughly reviews and addresses findings related to Energy Safety Compliance Assessments, notably NOVs and NODs.

An NOV letter lists the non-compliance with the WMP or any law, regulation, or guideline within Energy Safety's authority. An NOD letter identifies instances of deficiencies, errors, or field conditions that increase the risk of ignition posed by electrical lines and equipment and that require corrective action. Each NOV or NOD

²⁷⁴ Envista Forensics, Root Cause Analyses 2017-2018 Wildfires, (July 6, 2022). See [Appendix E](#).

²⁷⁵ 14 CFR § 29300. See [Appendix E](#).

²⁷⁶ D.14-02-015. See [Appendix E](#).

includes a deadline for us to provide a formal response about how we plan to remedy the violation or defect and prevent recurrence. Each violation or defect is assigned a risk category (severe, moderate, minor) and a required correction timeline.

When a NOV or NOD is received, we develop a response based on the following process:

- Create a CAP to track the NOV/NOD and associated corrective actions;
- Notify key internal stakeholders;
- Hold a stakeholder engagement call to review the NOV and NOD in detail and discuss corrective actions;
- Draft the NOV/NOD response and obtain senior leadership approval;
- Submit the NOV/NOD response to Energy Safety;
- Notify internal stakeholders about our final NOV/NOD response;
- Update the CAP to track any corrective actions; and
- Close the CAP once all corrective actions are completed.

Address ACIs Identified by Energy Safety as Part of the WMP Evaluation

Since the filing of original WMP in 2019, the Wildfire Safety Division, now known as Energy Safety, has reviewed wildfire mitigation plans to evaluate areas where the utilities could improve their wildfire initiatives. We have received remedies and ACIs to be addressed as part of a revision notice or a requirement for future WMPs. We have responded to each of those remedies and ACIs through corrective actions and will continue to do so.²⁷⁷

As part of the approval of the 2022 WMP, Energy Safety identified 35 ACIs for PG&E. The CWSP PMO monitors each ACI topic and provides corrective actions to Energy Safety. The ACIs stemming from the 2022 Revised WMP and our responses to them are included in [Appendix D](#).

In the 2023 WMP, we have evaluated whether any remedies or ACIs that are ongoing are appropriate topics for objectives and targets for quarterly and annual reporting purposes. Prior corrective actions also help us plan and execute subsequent WMPs. The issues raised by Energy Safety and other stakeholders have improved our WMPs over time.

We note that some of the ACIs from the 2022 WMP are directed to multiple utilities. In those instances, we are working closely with other utilities to address the areas for

²⁷⁷ For example, see PG&E's Revised 2022 Wildfire Mitigation Plan, OEIS #2022-WMP (July 26, 2022).

improvement. Lessons learned from these shared ACIs will then take place across the industry.

Reviewing Improvement Areas in Accordance with the Corrective Action Program

Identify Insufficient Occurrence and Response

Through our CAP, we identify corrective actions such as developing new training programs or revising standards or procedures focused on preventing recurrence of issues, problems, failures, nonconformities, or other concerns. As described in this Section above, these corrective actions may be identified through various evaluations and analyses. More specifically, RCE and ACE are formal investigations that help us identify insufficient occurrences or responses. In addition, our EII Group investigates apparent, probable, and contributing causes to CPUC reportable events. The group submits a wildfire CAP when EIR criteria are met.

After a CAP is submitted, SMEs work together to develop and implement the agreed upon solutions and track progress through the CAP database from evaluation through implementation. Each CAP issue is assigned to an action owner who monitors actions to ensure they are completed by the agreed upon due date and verifies each action is completed.

Identify Actions to Reduce Recurrence

The goal of PG&E's CAP is to minimize the recurrence of risk events. To reduce the recurrence of risk events, the Corrective Action Review team recommends an evaluation type based on the level of potential safety, reliability, financial, compliance, environmental, and/or reputational risk. A corrective action (e.g., developing new training programs or revising standards or procedures) is developed for each issue and assigned to action owners who monitor actions to ensure they are completed.

For additional details, please see the portion of this Section titled Prevent Recurrence of Risk Events above. It includes a discussion on the four types of evaluations and analysis performed by PG&E as part of the CAP process to not only understand root cause but to prevent recurrence in the future.

Track Implementation

CAPs are tracked to completion by issues owners and evaluated for closure by the CAP group. The CAP is managed in SAP and allows tracking of overall issues and action items taken to resolve the issue. A target due date is set when an issue is accepted and changes to due dates are tracked and approved as per our operating procedure. We use dashboards to prioritize work by risk level and to track overdue and coming due CAPs.

For additional information, please see the CAP Procedure cited earlier in this Section (GOV-6101P-08). The Standard includes information regarding the quality closure criteria for CAP issues, including actions taken to address CAP issues, in Appendix C. Appendix D to the Standard also contains Closure Documentation Guidance for Corrective Actions, including recommended documentation for completed actions.

Improve External Communication

As described above, our CAP addresses findings from internal and external wildfire investigations by tracking and reporting on investigations conducted by our EII group. The EII group is responsible for investigating CPUC reportable events, EIR, and non-CPUC reportable events. As indicated above, a wildfire CAP is submitted when the EIR criteria are met.

We create a CPUC 20-day report to provide a status of the investigation within 20 business days of reporting the incident. A CAP is created when it is likely that the incident occurred because PG&E equipment, processes, procedures, and/or standards did not meet PG&E or CPUC standards.

When the investigation report is complete, any causal evaluations, EIRs, or documentation about the completed investigation are uploaded to the CAP database and an email is sent to key internal stakeholders. EIRs are made available to the public on PG&E's investor relations [webpage](#). Causal Evaluations and EIRs are provided to governing agencies upon request. If any new corrective issues are identified during the investigation, then a new CAP is created.

PG&E's CAP also thoroughly reviews and addresses findings related to Energy Safety Compliance Assessments, notably NOV and NODs. An NOV letter lists the noncompliance with the WMP or any law, regulation, or guideline within Energy Safety's authority. An NOD letter identifies instances of deficiencies, errors, or field conditions that increase the risk of ignition posed by electrical lines and equipment and that require corrective action. Each NOV or NOD includes a deadline for us to provide a formal response about how we plan to remedy the violation or defect and prevent recurrence. When our response to the NOV or NOD is complete, we submit it to Energy Safety. In addition to the CAP process, we meet with Energy Safety every two weeks to discuss any potential NOV or NODs found during field inspection activities.

We also are continuing to improve how we communicate our findings from wildfire investigations to external agencies as demonstrated in response to [ACI-PG&E-22-08](#).

Integrate Lessons Learned From Across The Industry

PG&E discusses lessons learned based on feedback from Energy Safety, industry experts, and stakeholders and through collaboration with other electric corporations in detail in [Section 10](#) of this WMP. [Table 10-1](#) includes an overview of these lessons learned by subject. Lessons learned relate to the following topics: customer resources due to wildfire or wildfire safety programs; EPSS implementation; source side wire down and ignition events; PSPS thresholds; customer communications related to PSPS events; vegetation management inspections and removal; field training; and more.

Some of the ACIs from the 2022 WMP were directed to multiple utilities. In those instances, we are working closely with other utilities to address the areas for improvement. Lessons learned from these shared ACIs will then take place across the industry and the utilities continue to meet and discuss their findings.

PG&E is also grateful for the guidance and feedback from Energy Safety throughout the WMP process and is continually working to incorporate that feedback into each successive WMP.

Share Lessons Learned With Others

As stated above, PG&E meets regularly with other electric corporations and responsible regulatory authorities to share lessons learned and other relevant information. Some of these meetings include Energy Safety led workshops while others are self-directed. Throughout this WMP, we have identified instances of this type of collaboration as referenced, in part, below.

- In [Section 5.4.5](#), we describe how we collaborated with responsible regulatory authorities to address environmental compliance and permitting challenges;
- In Sections [8.4.3](#) and [8.4.4](#), we discuss our external collaboration and coordination relating to emergency planning and communication;
- In [Section 10](#), [Table 10-1](#), we describe lessons learned from various sources including ongoing internal monitoring, and evaluations initiatives, feedback from Energy Safety, industry experts, and stakeholders, and collaboration with other electrical corporations;
- In [Appendix D](#), [ACI-PG&E-22-02](#) we describe several activities that we are participating in with other electric corporations and industry groups to address climate change risk;
- In [Appendix D](#), [ACI-PG&E-22-11](#), we discuss our work with other utilities to evaluate lessons learned relating to the effectiveness of covered conductor;
- In [Appendix F](#), [Table 8-61](#) we list the hundreds of meetings and presentations we have participated in with counties, cities, tribal agencies, fire protection districts, and other organizations to discuss topics related to what we have learned about wildfire safety and wildfire preparations.

PG&E looks forward to continuing to share lessons learned in future WMPs or in other venues as we work together to eradicate catastrophic wildfires.

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
SECTION 12
NOTICES OF VIOLATION AND DEFECT

12. Notices of Violation and Defect

Within an NOV or NOD, Energy Safety directs an electrical corporation to correct a violation or defect within a specific timeline, depending on the risk category of the violation or defect. The electrical corporation has 30 days to respond to the NOV or NOD and provide a plan for corrective action. Following completion of the corrective action, the electrical corporation must provide Energy Safety with documentation validating the resolution or correction of the identified violation or defect. Energy Safety includes the electrical corporation's response and the resolution status of any violations or defects in the summaries it provides to the CPUC.

In Table 12-1 of the WMP, the electrical corporation must provide a list of all open violations and defects as of January 1, 2023.

Table 12-1 below lists PG&E's one open Notice of Defect as of January 1, 2023. We did not have any open Notices of Violation as of January 1, 2023.

**TABLE 12-1:
LIST OF OPEN COMPLIANCE VIOLATIONS AND DEFECTS**

ID	Type	Severity	Date of Notice	Date of Response	Summary Description of Violation/Defect	Estimated Completion Date	Summary Description of Correction
NOD_MJ4_PGE_20211207-01	Defect	Minor	3/11/2022	4/25/2022	Energy Safety found that a structure had "excessive splicing in a single span." Energy Safety notes that multiple splices on a single phase of a span indicate that the conductor has required repair multiple times and therefore, a span with an excessive number of splices is an indicator of increased risk of conductor failure and ignition.	Pending with Energy Safety	We did not agree with Energy Safety that this was a defect that warranted a prioritized replacement of the span under the minor risk categorization timeline. ^(a) We communicated these details to Energy Safety on April 25, 2022. We look forward to resolving this issue with Energy Safety.
(a) We inspected the span on April 20, 2022 and found no immediate safety concerns. More specifically, the visual and infrared inspections, and the IR imaging did not identify any immediate safety concerns. The crossarms and supporting structures were in serviceable condition. Finally, the location at issue is in the bottom 50 percent of PG&E's wildfire risk per the WDRM. We also provided details around internal guidance for managing splices and mitigating any risk associated with using them.							

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
APPENDIX A
DEFINITIONS

Appendix A – Definitions

Appendix A.1 – Energy Safety Definition of Terms

Unless otherwise expressly stated, the following words and terms, for the purposes of these Guidelines, have the meanings shown in this chapter.

Terms Defined in Other Codes

Where terms are not defined in these Guidelines and are defined in the Government Code, Public Utilities Code (Pub. Util. Code), or California Public Resources Code (PRC), such terms have the meanings ascribed to them in those codes.

Terms Not Defined

Where terms are not defined through the methods authorized by this section, such terms have ordinarily accepted meanings such as the context implies.

Definition of Terms

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM**

Term	Definition
Access and Functional Needs population (AFN)	Individuals, including, but not limited to, those who have developmental or intellectual disabilities, physical disabilities, chronic conditions, or injuries; who have limited English proficiency or are non-English speaking; who are older adults, children, or people living in institutionalized settings; or who are low income, homeless, or transportation disadvantaged, including, but not limited to, those who are dependent on public transit or are pregnant. (California Government Code 8593.3(f)(1)).
Asset (utility)	Electric lines, equipment, or supporting hardware.
At-risk species	See “high-risk species.”
Benchmarking	A comparison between one electrical corporation’s protocols, technologies used, or mitigations implemented, and other
Calibration	Adjustment of a set of code input parameters to maximize the resulting agreement of the code calculations with observations in a specific scenario.
Catastrophic wildfire	A fire that caused at least one death, damaged over 500 structures, or burned over 5,000 acres.
Circuit miles	The total length in miles of separate transmission and/or distribution circuits, regardless of the number of conductors used per circuit (i.e., different phases).
Consequence	The adverse effects from an event, considering the hazard intensity, community exposure, and local vulnerability.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Contact by object ignition likelihood	The likelihood that a non-vegetative object (such as a balloon or vehicle) will contact utility-owned equipment and result in an ignition.
Contact by vegetation ignition likelihood	The likelihood that vegetation will contact utility-owned equipment and result in an ignition.
Contractor	Any individual in the temporary and/or indirect employ of the electrical corporation whose limited hours and/or time-bound term of employment are not considered “full-time” for tax and/or any other purposes.
Critical facilities and infrastructure	Facilities and infrastructure that are essential to public safety and that require additional assistance and advance planning to ensure resiliency during Public Safety Power Shutoff (PSPS) events. These include the following: • Emergency services sector: – Police stations; – Fire stations; – Emergency operations centers; – Public safety answering points (e.g., 9-1-1 emergency services); • Government facilities sector: – Schools; – Jails and prisons; • Health care and public health sector: – Public health departments; – Medical facilities, including hospitals, skilled nursing facilities, nursing homes, blood banks, health care facilities, dialysis centers, and hospice facilities (excluding doctors’ offices and other non-essential medical facilities); • Energy sector: – Public and private utility facilities vital to maintaining or restoring normal service, including, but not limited to, interconnected publicly owned electrical corporations and electric cooperatives; • Water and wastewater systems sector: – Facilities associated with provision of drinking water or processing of wastewater, including facilities that pump, divert, transport, store, treat, and deliver water or wastewater; • Communications sector:

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
	– Communication carrier infrastructure, including selective routers, central offices, head ends, cellular switches, remote terminals, and cellular sites; • Chemical sector: – Facilities associated with manufacturing, maintaining, or distributing hazardous materials and chemicals (including Category N-Customers as defined in Decision (D.) 01-06-085); and • Transportation sector: – Facilities associated with transportation for civilian and military purposes: automotive, rail, aviation, maritime, or major public transportation (D.19-05-042 and D.20-05-051).
Customer hours	Total number of customers, multiplied by average number of hours (e.g., of power outage).
Danger tree	Any tree located on or adjacent to a utility right-of-way or facility that could damage utility facilities should it fall where: (1) the tree leans toward the right-of-way, or (2) the tree is defective because of any cause, such as: heart or root rot, shallow roots, excavation, bad crotch, dead or with dead top, deformity, cracks or splits, or any other reason that could result in the tree or main lateral of the tree falling. (California Code of Regulation Title 14 § 895.1)
Data cleaning	Calibration of raw data to remove errors (including typographical and numerical mistakes).
Dead fuel moisture content	Moisture content of dead vegetation, which responds solely to current environmental conditions and is critical in determining fire potential.
Detailed inspection	In accordance with General Order (GO) 165, an inspection where individual pieces of equipment and structures are carefully examined, visually and through routine diagnostic testing, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each is rated and recorded.
Disaster	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts. The effect of the disaster can be immediate and localized but is often widespread and could last a long time. The effect may test or exceed the capacity of a community or society to cope using its own resources. Therefore, it may require assistance from external sources, which could include neighboring jurisdictions or those at the national or international levels. (United Nations Office for Disaster Risk Reduction [UNDRR].)
Discussion-based exercise	Exercise used to familiarize participants with current plans, policies, agreements, and procedures or to develop new plans, policies,

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
	agreements, and procedures. Often includes seminars, workshops, tabletop exercises, and games.
Electrical corporation	Every corporation or person owning, controlling, operating, or managing any electric plant for compensation within California, except where the producer generates electricity on or distributes it through private property solely for its own use or the use of its tenants and not for sale or transmission to others.
Emergency	Any incident, whether natural, technological, or human caused, that requires responsive action to protect life or property but does not result in serious disruption of the functioning of a community or society. (Federal Emergency Management Agency (FEMA)/UNDRR.)
Enhanced inspection	Inspection whose frequency and thoroughness exceed the requirements of a detailed inspection, particularly if driven by risk calculations.
Equipment ignition likelihood	The likelihood that utility-owned equipment will cause an ignition through either normal operation (such as arcing) or failure.
Exercise	An instrument to train for, assess, practice, and improve performance in prevention, protection, response, and recovery capabilities in a risk-free environment. (FEMA.)
Exposure	The presence of people, infrastructure, livelihoods, environmental services and resources, and other high-value assets in places that could be adversely affected by a hazard.
Fire ecology	A scientific discipline concerned with natural processes involving fire in an ecosystem and its ecological effects, the interactions between fire and the abiotic and biotic components of an ecosystem, and the role of fire as an ecosystem process.
Fire Potential Index (FPI)	Landscape scale index used as a proxy for assessing real-time risk of a wildfire under current and forecasted weather conditions.
Fire season	The time of year when wildfires are most likely for a given geographic region due to historical weather conditions, vegetative characteristics, and impacts of climate change. Each electrical corporation defines the fire season(s) across its service territory based on a recognized fire agency definition for the specific region(s) in California.
Frequency	The anticipated number of occurrences of an event or hazard over time.
Frequent PSPS events	Three or more PSPS events per calendar year per line circuit.
Fuel density	Mass of fuel (vegetation) per area that could combust in a wildfire.
Fuel management	Removal or thinning of vegetation to reduce the potential rate of propagation or intensity of wildfires.
Fuel moisture content	Amount of moisture in a given mass of fuel (vegetation), measured as a percentage of its dry weight.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Full-time employee (FTE)	Any individual in the ongoing and/or direct employ of the electrical corporation whose hours and/or term of employment are considered “full-time” for tax and/or any other purposes.
Game	A simulation of operations that often involves two or more teams, usually in a competitive environment, using rules, data, and procedures designed to depict an actual or assumed real- life situation.
Goals	The electrical corporation’s general intentions and ambitions.
GO 95 nonconformance	Condition of a utility asset that does not meet standards established by GO 95.
Grid hardening	Actions (such as equipment upgrades, maintenance, and planning for more resilient infrastructure) taken in response to the risk of undesirable events (such as outages) or undesirable conditions of the electrical system to reduce or mitigate those events and conditions, informed by an assessment of the relevant risk drivers or factors.
Grid topology	General design of an electric grid, whether looped or radial, with consequences for reliability and ability to support PSPS (e.g., ability to deliver electricity from an additional source).
Hazard	A condition, situation, or behavior that presents the potential for harm or damage to people, property, the environment, or other valued resources.
Hazard tree	See danger tree
High Fire Threat District (HFTD)	Areas of the state designated by the California Public Utilities Commission (CPUC or Commission) as having elevated wildfire risk, where each utility must take additional action (per GO 95, GO 165, and GO 166) to mitigate wildfire risk. (D.17-01-009.)
High Fire Risk Area (HFRA)	Areas that the electrical corporation has deemed at high risk from wildfire, independent of HFTD designation.
Highly rural region	In accordance with 38 CFR 17.701, area with a population of less than seven persons per square mile, as determined by the United States Bureau of the Census. For purposes of the Wildfire Mitigation Plan (WMP), “area” must be defined as a census tract.
High-risk species	Species of vegetation that: (1) have a higher risk of either coming into contact with powerlines or causing an outage or ignition, or (2) are easily ignitable and within close proximity to potential arcing, sparks, and/or other utility equipment thermal failures. The status of species as “high-risk” must be a function of species-specific characteristics, including growth rate; failure rates of limbs, trunk, and/or roots (as compared to other species); height at maturity; flammability; and vulnerability to disease or insects.
High Wind Warning (HWW)	Level of wind risk from weather conditions, as declared by the National Weather Service (NWS). For historical NWS data, refer to the Iowa State University archive of NWS watches/warnings.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
HWW overhead (OH) circuit mile day	Sum of OH circuit miles of utility grid subject to a HWW each day within a given time period, calculated as the number of OH circuit miles under a HWW multiplied by the number of days those miles are under said HWW. For example, if 100 OH circuit miles are under a HWW for one day, and 10 of those miles are under the HWW for an additional day, then the total HWW OH circuit mile days would be 110.
Ignition consequence	The total anticipated adverse effects from an ignition at each location in the electrical corporation service territory. This considers the likelihood that an ignition will transition into a wildfire (wildfire spread likelihood) and the consequences that the wildfire will have on each community it reaches (wildfire consequence).
Ignition likelihood	The total anticipated annualized number of ignitions resulting from utility-owned assets at each location in the electrical corporation service territory. This considers probabilistic weather conditions, type and age of equipment, and potential contact of vegetation and other objects with utility assets.
Ignition probability	The relative possibility that an ignition will occur, quantified as a number between 0 percent (impossibility) and 100 percent (certainty). The higher the probability of an event, the more certainty there is that the event will occur. (Often informally referred to as likelihood or chance.)
Ignition risk	The total anticipated annualized impacts from ignitions at a specific location. This considers the likelihood that an ignition will occur, the likelihood the ignition will transition into a wildfire, and the potential consequences—considering hazard intensity, exposure potential, and vulnerability—the wildfire will have on each community it reaches.
Impact/consequence of ignition	The effect or outcome of a wildfire ignition upon objectives that may be expressed by terms including, although not limited to, maintaining health and safety, ensuring reliability, and minimizing economic and/or environmental damage.
Incident command system (ICS)	A standardized on-scene emergency management construct. It is specifically designed to provide an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. The ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in the management of resources during incidents.
Initiative	Measure or activity, either proposed or in process, designed to reduce the consequences and/or probability of wildfire or PSPS.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Integrated public alert warning system (IPAWS)	System allowing the President to send a message to the American people quickly and simultaneously through multiple communications pathways in a national emergency. IPAWS also is available to United States federal, state, local, territorial, and tribal government officials to alert the public via the Emergency Alert System, Wireless Emergency Alerts, National Oceanic and Atmospheric Administration Weather Radio, and other NWS dissemination channels; the internet; existing unique warning systems; and emerging distribution technologies.
Invasive species	A species: (1) that is non-native (or alien) to the ecosystem under consideration and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
Level 1 finding	In accordance with GO 95, an immediate safety and/or reliability risk with high probability for significant impact.
Level 2 finding	In accordance with GO 95, a variable safety and/or reliability risk (non-immediate and with high to low probability for significant impact).
Level 3 finding	In accordance with GO 95, an acceptable safety and/or reliability risk.
Limited English proficiency (LEP) population	Population with limited English working proficiency based on the International Language Roundtable scale.
Line miles	The number of miles of transmission and/or distribution conductors, including the length of each phase and parallel conductor segment.
Live fuel moisture content	Moisture content within living vegetation, which can retain water longer than dead fuel.
Locally relevant	In disaster risk management, generally understood as the scale at which disaster risk strategies and initiatives are considered the most effective at achieving desired outcomes. This tends to be the level closest to impacting residents and communities, reducing existing risks, and building capacity, knowledge, and normative support. Locally relevant scales, conditions, and perspectives depend on the context of application.
Match-drop simulation	Wildfire simulation method forecasting propagation and consequence/impact based on an arbitrary ignition.
Memorandum of Agreement (MOA)	A document of agreement between two or more agencies establishing reciprocal assistance to be provided upon request (and if available from the supplying agency) and laying out the guidelines under which this assistance will operate. It can also be a cooperative document in which parties agree to work together on an agreed-upon project or meet an agreed objective.
Mitigation	Activities to reduce the loss of life and property from natural and/or human-caused disasters by avoiding or lessening the impact of a disaster and providing value to the public by creating safer communities.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Model uncertainty	The amount by which a calculated value might differ from the true value when the input parameters are known (i.e., limitation of the model itself based on assumptions).
Multi-attribute value function (MAVF)	Risk calculation methodology introduced during CPUC's Safety Model Assessment Proceedings and Risk Assessment and Mitigation Phase proceedings. This methodology is established in D.18-12-014 but may be subject to change pursuant to R.20-07-013.
Mutual aid	Voluntary aid and assistance by the provision of services and facilities, including but not limited to electrical corporations, communication, and transportation. Mutual aid is intended to provide adequate resources, facilities, and other support to electrical corporations whenever their own resources prove inadequate to cope with a given situation.
National Incident Management System (NIMS)	A systematic, proactive approach to guide all levels of government, nongovernment organizations, and the private sector to work together to prevent, protect against, mitigate, respond to, and recover from the effects of incidents. NIMS provides stakeholders across the whole community with the shared vocabulary, systems, and processes to successfully deliver the capabilities described in the National Preparedness System. NIMS provides a consistent foundation for dealing with all incidents, ranging from daily occurrences to incidents requiring a coordinated federal response.
Near miss	Term previously used for an event with probability of ignition (now "Risk event").
Objectives	Specific, measurable, achievable, realistic, and timely outcomes for the overall WMP strategy, or mitigation initiatives and activities that a utility can implement to satisfy the primary goals and subgoals of the WMP program.
Operations-based exercise	Type of exercise that validates plans, policies, agreements, and procedures; clarifies roles and responsibilities; and identifies resource gaps in an operational environment. Often includes drills, functional exercises, and full-scale exercises.
Overall utility risk	The comprehensive risk due to both wildfire and PSPS incidents across a utility's territory; the aggregate potential of adverse impacts to people, property, critical infrastructure, or other valued assets in society.
Overall utility risk, ignition risk	See Ignition risk.
Overall utility risk, PSPS risk	See PSPS risk.
Parameter uncertainty	The amount by which a calculated value might differ from the true value based on unknown input parameters. (Adapted from Society of Fire Protection Engineers [SFPE] guidance.)
Patrol inspection	In accordance with GO 165, a simple visual inspection of applicable utility equipment and structures designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Performance metric	A quantifiable measurement that is used by an electrical corporation to indicate the extent to which its WMP is driving performance outcomes.
Population density	Population density is calculated using the American Community Survey (ACS) 1-year estimate for the corresponding year or, for years with no such ACS estimate available, the estimate for the immediately preceding year.
Preparedness	A continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response. Within the NIMS, preparedness focuses on planning, procedures and protocols, training and exercises, personnel qualification and certification, and equipment certification.
Priority essential services	Critical first responders, public safety partners, critical facilities and infrastructure, operators of telecommunications infrastructure, and water electrical corporations/agencies.
Property	Private and public property, buildings and structures, infrastructure, and other items of value that may be destroyed by wildfire, including both third-party property and utility assets.
Protective equipment and device settings	The electrical corporation's procedures for adjusting the sensitivity of grid elements to reduce wildfire risk, other than automatic reclosers (such as circuit breakers, switches, etc.). For example, PG&E's "Enhanced Powerline Safety Settings."
PSPS consequence	The total anticipated adverse effects of a PSPS for a community. This considers the PSPS exposure potential and inherent PSPS vulnerabilities of communities at risk.
PSPS event	The period from notification of the first public safety partner of a planned public safety PSPS to re-energization of the final customer.
PSPS exposure potential	The potential physical, social, or economic impact of a PSPS event on people, property, critical infrastructure, livelihoods, health, local economies, and other high-value assets.
PSPS likelihood	The likelihood of a PSPS being required by a utility given a probabilistic set of environmental conditions.
PSPS risk	The total anticipated annualized impacts from a PSPS event at a specific location. This considers the likelihood a PSPS event will be required due to environmental conditions exceeding design conditions and the potential consequences—considering exposure potential and vulnerability—of the PSPS event for each affected community.
Public safety partners	First/emergency responders at the local, state, and federal levels; water, wastewater, and communication service providers; Community Choice Aggregators; affected publicly owned electrical corporations/electrical cooperatives; tribal governments; Energy Safety; the Commission; the California Office of Emergency Services; and California Department of Forestry and Fire Protection.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Red Flag Warning (RFW)	Level of wildfire risk from weather conditions, as declared by the NWS. For historical NWS data, refer to the Iowa State University archive of NWS watches/warnings.
RFW OH circuit mile day	Sum of OH circuit miles of utility grid subject to RFW each day within a given time period, calculated as the number of OH circuit miles under RFW multiplied by the number of days those miles are under said RFW. For example, if 100 OH circuit miles are under RFW for one day, and 10 of those miles are under RFW for an additional day, then the total RFW OH circuit mile days would be 110.
Risk	A measure of the anticipated adverse effects from a hazard considering the consequences and frequency of the hazard occurring.
Risk component	A part of an electric corporation's risk analysis framework used to determine overall utility risk.
Risk evaluation	The process of comparing the results of a risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable. (International Organization for Standardization (ISO) 31000:2009.)
Risk event	An event with probability of ignition, such as wire down, contact with objects, line slap, event with evidence of heat generation, or other event that causes sparking or has the potential to cause ignition. The following all qualify as risk events: • Ignitions; • Outages not caused by vegetation; • Outages caused by vegetation; • Wire-down events; • Faults; and • Other events with potential to cause ignition.
Risk management	Systematic application of management policies, procedures, and practices to the tasks of communication, consultation, establishment of context, and identification, analysis, evaluation, treatment, monitoring, and review of risk. (ISO 31000.)
Rule	Section of Pub. Util. Code requiring a particular activity or establishing a particular threshold.
Rural region	In accordance with GO 165, area with a population of less than 1,000 persons per square mile, as determined by the United States (U.S.) Bureau of the Census. For purposes of the WMP, "area" must be defined as a census tract.
Seminar	An informal discussion, designed to orient participants to new or updated plans, policies, or procedures (e.g., to review a new external communications standard operating procedure).

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Sensitivity analysis	Process used to determine the relationships between the uncertainty in the independent variables (“input”) used in an analysis and the uncertainty in the resultant dependent variables (“output”). (SFPE guidance.)
Slash	Branches or limbs less than four inches in diameter, and bark and split products debris left on the ground as a result of utility vegetation management. (This definition is consistent with California PRC Section 4525.7.)
Span	The space between adjacent supporting poles or structures on a circuit consisting of electric lines and equipment. “Span level” refers to asset-scale granularity.
Tabletop exercise (TTX)	A discussion-based exercise intended to stimulate discussion of various issues regarding a hypothetical situation. Tabletop exercises can be used to assess plans, policies, and procedures or to assess types of systems needed to guide the prevention of, response to, or recovery from a defined incident.
Target	A forward-looking, quantifiable measurement of work to which an electrical corporation commits to in its WMP. Electrical corporations will show progress toward completing targets in subsequent reports, including Quarterly Data Reports and WMP Updates.
Trees with strike potential	Trees that could either “fall in” to a power line or have branches detach and “fly in” to contact a power line in high-wind conditions.
Uncertainty	The amount by which an observed or calculated value might differ from the true value. For an observed value, the difference is “experimental uncertainty”; for a calculated value, it is “model” or “parameter uncertainty.” (Adapted from SFPE guidance.)
Urban region	In accordance with GO 165, area with a population of more than 1,000 persons per square mile, as determined by the U.S. Bureau of the Census. For purposes of the WMP, “area” must be defined as a census tract.
Utility-related ignition	See reportable ignition.
Validation	Process of determining the degree to which a calculation method accurately represents the real world from the perspective of the intended uses of the calculation method without modifying input parameters based on observations in a specific scenario. (Adapted from ASTM E 1355.)
Vegetation management (VM)	Trimming and removal of trees and other vegetation at risk of contact with electric equipment.
Verification	Process to ensure that a model is working as designed, that is, that the equations are being properly solved. Verification is essentially a check of the mathematics. (SFPE guidance.)
Vulnerability	The propensity or predisposition of a community to be adversely affected by a hazard, including the characteristics of a person, group, or service and their situation that influences their capacity to anticipate, cope with, resist, and recover from the adverse effects of a hazard.

**TABLE PG&E-A-1:
DEFINITION OF TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Wildfire consequence	The total anticipated adverse effects from a wildfire on a community that is reached. This considers the wildfire hazard intensity, the wildfire exposure potential, and the inherent wildfire vulnerabilities of communities at risk.
Wildfire exposure potential	The potential physical, social, or economic impact of wildfire on people, property, critical infrastructure, livelihoods, health, environmental services, local economies, cultural/historical resources, and other high-value assets. This may include direct or indirect impacts, as well as short- and long-term impacts.
Wildfire intensity	The potential intensity of a wildfire at a specific location within the service territory given a probabilistic set of weather profiles, vegetation, and topography.
Wildfire mitigation strategy	Overview of the key mitigation initiatives at enterprise level and component level across the electrical corporation's service territory, including interim strategies where long-term mitigation initiatives have long implementation timelines. This includes a description of the enterprise-level monitoring and evaluation strategy for assessing overall effectiveness of the WMP.
Wildfire risk	See Ignition risk.
Wildfire spread likelihood	The likelihood that a fire with a nearby but unknown ignition point will transition into a wildfire and will spread to a location in the service territory based on a probabilistic set of weather profiles, vegetation, and topography.
Wildland-urban interface (WUI)	The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels (National Wildfire Coordinating Group). Enforcement agencies also designate the WUI as the area at significant risk from wildfires, established pursuant to Title 24, Part 2, Chapter 7A.
Wire down	Instance where an electric transmission or distribution conductor is broken and falls from its intended position to rest on the ground or a foreign object.
Work order	A prescription for asset or vegetation management activities resulting from asset or vegetation management inspection findings.
Workshop	Discussion that resembles a seminar but is employed to build specific products, such as a draft plan or policy (e.g., a multi-year training and exercise plan).

Appendix A.2 – Definitions of Initiatives – by Category

**TABLE PG&E-A-2:
DEFINITIONS OF INITIATIVES – BY CATEGORY**

Category	Section #	Initiative	Definition
Overview of the Service Territory	5.4.5	Environmental compliance and permitting	Development and implementation of process and procedures to ensure compliance with applicable environmental laws, regulations, and permitting related to the implementation of the WMP.
Risk Methodology and Assessment	6	Risk Methodology and Assessment	Development and use of tools and processes to assess the risk of wildfire and PSPS across an electrical corporation's service territory.
Wildfire Mitigation Strategy Development	7	Wildfire Mitigation Strategy Development	Development and use of processes for deciding on a portfolio of mitigation initiatives to achieve maximum feasible risk reduction and that meet the goals of the WMP.
Grid Design, Operations, and Maintenance	8.1.2.1	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 (12 kilovolts (kV)/in. dry) and impact strength (20 foot-pounds) 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.

**TABLE PG&E-A-2:
DEFINITIONS OF INITIATIVES – BY CATEGORY
(CONTINTUED)**

Category	Section #	Initiative	Definition
Grid Design, Operations, and Maintenance	8.1.2.2	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).
Grid Design, Operations, and Maintenance	8.1.2.3	Distribution pole replacements and reinforcements	Remediation, adjustments, or installations of new equipment to improve or replace existing distribution poles (i.e., those supporting lines under 65 kV), 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.
Grid Design, Operations, and Maintenance	8.1.2.4	Transmission pole/tower replacements and reinforcements	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 65 kV).
Grid Design, Operations, and Maintenance	8.1.2.5	Traditional overhead hardening	Maintenance, repair, and replacement of capacitors, circuit breakers, cross-arms, transformers, fuses, and connectors (e.g., hot line clamps) with the intention of minimizing the risk of ignition.
Grid Design, Operations, and Maintenance	8.1.2.6	Emerging grid hardening technology installations and pilots	Development, deployment, and piloting of novel grid hardening technology.
Grid Design, Operations, and Maintenance	8.1.2.7	Microgrids	Development and deployment of microgrids that may reduce the risk of ignition, risk from PSPS, and wildfire consequence. “Microgrid” is defined by Pub. Util. Section 8370(d).
Grid Design, Operations, and Maintenance	8.1.2.8	Installation of system automation equipment	Installation of electric equipment that increases the ability of the electrical corporation to automate system operation and monitoring, including equipment that can be adjusted remotely such as automatic reclosers (switching devices designed to detect and interrupt momentary faults that can reclose automatically and detect if a fault remains, remaining open if so).
Grid Design, Operations, and Maintenance	8.1.2.9	Line removals (in HFTD)	Removal of overhead lines to minimize the risk of ignition due to the design, location, or configuration of electric equipment in HFTDs.

**TABLE PG&E-A-2:
DEFINITIONS OF INITIATIVES – BY CATEGORY
(CONTINTUED)**

Category	Section #	Initiative	Definition
Grid Design, Operations, and Maintenance	8.1.2.10	Other grid topology improvements to minimize risk of ignitions	Actions taken to minimize the risk of ignition due to the design, location, or configuration of electric equipment in HFTDs not covered by another initiative.
Grid Design, Operations, and Maintenance	8.1.2.11	Other grid topology improvements to mitigate or reduce PSPS events	Actions taken to mitigate or reduce PSPS events in terms of geographic scope and number of customers affected not covered by another initiative.
Grid Design, Operations, and Maintenance	8.1.2.12	Other technologies and systems not listed above	Other grid design and system hardening actions which the electrical corporation takes to reduce its ignition and PSPS risk not otherwise covered by other initiatives in this section.
Grid Design, Operations, and Maintenance	8.1.3.1	Asset inspections	Inspections of overhead electric transmission lines, equipment, and right-of-way.
Grid Design, Operations, and Maintenance	8.1.4	Equipment maintenance and repair	Remediation, adjustments, or installations of new equipment to improve or replace existing connector equipment, such as hotline clamps.
Grid Design, Operations, and Maintenance	8.1.5	Asset management and inspection enterprise system(s)	Operation of and support for centralized asset management and inspection enterprise system(s) updated based upon inspection results and activities such as hardening, maintenance, and remedial work.
Grid Design, Operations, and Maintenance	8.1.6	Quality assurance/ quality control	Establishment and function of audit process to manage and confirm work completed by employees or contractors, including packaging Quality Assurance/Quality Control (QA/QC) information for input to decision-making and related integrated workforce management processes.
Grid Design, Operations, and Maintenance	8.1.7	Open work orders	Actions taken to manage the electrical corporation's open work orders resulting from inspections that prescribe asset management activities.
Grid Design, Operations, and Maintenance	8.1.8.1	Equipment Settings to Reduce Wildfire Risk	The electrical corporation's procedures for adjusting the sensitivity of grid elements to reduce wildfire risk.
Grid Design, Operations, and Maintenance	8.1.8.2	Grid Response Procedures and Notifications	The electrical corporation's procedures it uses to respond to faults, ignitions, or other issues detected on its grid that may result in a wildfire.

**TABLE PG&E-A-2:
DEFINITIONS OF INITIATIVES – BY CATEGORY
(CONTINTUED)**

Category	Section #	Initiative	Definition
Grid Design, Operations, and Maintenance	8.1.8.3	Personnel Work Procedures and Training in Conditions of Elevated Fire Risk	Work activity guidelines that designate what type of work can be performed during operating conditions of different levels of wildfire risk. Training for personnel on these guidelines and the procedures they prescribe, from normal operating procedures to increased mitigation measures to constraints on work performed.
Grid Design, Operations, and Maintenance	8.1.9	Workforce Planning	Programs to ensure that the electrical corporation has qualified asset personnel and to ensure that both employees and contractors tasked with asset management responsibilities are adequately trained to perform relevant work.
Vegetation Management and Inspection	8.2.2.1	Vegetation inspections	Inspections of vegetation around and adjacent to electrical facilities and equipment that may be hazardous by growing, blowing, or falling into electrical facilities or equipment.
Vegetation Management and Inspection	8.2.3.1	Pole clearing	Plan and execution of vegetation removal around poles per PRC Section 4292 and outside the requirements of PRC Section 4292 (e.g., pole clearing performed outside of the State Responsibility Area).
Vegetation Management and Inspection	8.2.3.2	Wood and slash management	Actions taken to manage all downed wood and “slash” generated from vegetation management activities.
Vegetation Management and Inspection	8.2.3.3	Clearance	Actions taken after inspection to ensure that vegetation does not encroach upon electrical equipment and facilities, such as tree trimming.
Vegetation Management and Inspection	8.2.3.4	Fall-in mitigation	Actions taken to identify and remove or otherwise remediate trees that pose a high risk of failure
Vegetation Management and Inspection	8.2.3.5	Substation defensible space	Actions taken to reduce ignition probability and wildfire consequence (WFC) due to contact with substation equipment.
Vegetation Management and Inspection	8.2.3.6	High-risk species	Actions taken to reduce the ignition probability and wildfire consequence attributable to high-risk species of vegetation.

**TABLE PG&E-A-2:
DEFINITIONS OF INITIATIVES – BY CATEGORY
(CONTINTUED)**

Category	Section #	Initiative	Definition
Vegetation Management and Inspection	8.2.3.7	Fire-resilient rights-of-way	Actions taken to promote vegetation communities that are sustainable, fire-resilient, and compatible with the use of the land as an electrical corporation right-of-way.
Vegetation Management and Inspection	8.2.3.8	Emergency response vegetation management	Planning and execution of vegetation activities in response to emergency situations including weather conditions that indicate an elevated fire threat and post-wildfire service restoration.
Vegetation Management and Inspection	8.2.4	Vegetation management enterprise system	Operation of and support for centralized vegetation management and inspection enterprise system(s) updated based upon inspection results and activities such as hardening, maintenance, and remedial work.
Vegetation Management and Inspection	8.2.5	Quality assurance/ quality control	Establishment and function of audit process to manage and confirm work completed by employees or contractors, including packaging QA/QC information for input to decision-making and related integrated workforce management processes.
Vegetation Management and Inspection	8.2.6	Open work orders	Actions taken to manage the electrical corporation's open work orders resulting from inspections that prescribe vegetation management activities.
Vegetation Management and Inspection	8.2.7	Workforce planning	Programs to ensure that the electrical corporation has qualified vegetation management personnel and to ensure that both employees and contractors tasked with vegetation management responsibilities are adequately trained to perform relevant work.
Situational Awareness and Forecasting	8.3.2	Environmental monitoring systems	Development and deployment of systems which measure environmental characteristics, such as fuel moisture, air temperature, and velocity.
Situational Awareness and Forecasting	8.3.3	Grid monitoring systems	Development and deployment of systems that checks the operational conditions of electrical facilities and equipment and detects such things as faults, failures, and recloser operations.
Situational Awareness and Forecasting	8.3.4	Ignition detection systems	Development and deployment of systems which discover or identify the presence or existence of an ignition, such as cameras.

**TABLE PG&E-A-2:
DEFINITIONS OF INITIATIVES – BY CATEGORY
(CONTINTUED)**

Category	Section #	Initiative	Definition
Situational Awareness and Forecasting	8.3.5	Weather forecasting	Development methodology for forecast of weather conditions relevant to electrical corporation 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.
Situational Awareness and Forecasting	8.3.6	Fire potential index	Calculation and application of a landscape scale index used as a proxy for assessing real-time risk of a wildfire under current and forecasted weather conditions.
Emergency Preparedness	8.4.2	Emergency preparedness plan	Development and integration of wildfire- and PSPS-specific emergency strategies, practices, policies, and procedures into the electrical corporation's overall emergency plan based on the minimum standards described in GO 166.
Emergency Preparedness	8.4.3	External collaboration and coordination	Actions taken to coordinate wildfire and PSPS emergency preparedness with relevant public safety partners including the state, cities, counties, and tribes.
Emergency Preparedness	8.4.4	Public emergency communication strategy	Development and integration of a comprehensive communication strategy to inform essential customers and other stakeholder groups of wildfires, outages due to wildfires, and PSPS and service restoration, as required by Pub. Util. Code Section 768.6.
Emergency Preparedness	8.4.5	Preparedness and planning for service restoration	Development and integration of the electrical corporation's plan to restore service after an outage due to a wildfire or PSPS event.
Emergency Preparedness	8.4.6	Customer support in wildfire and PSPS emergencies	Development and deployment of programs, systems, and protocols to support residential and non-residential customers in wildfire emergencies and PSPS events.
Community Outreach and Engagement	8.5.2	Public outreach and education awareness program	Development and deployment of public outreach and education awareness program(s) for wildfires; outages due to wildfires, PSPS events, and protective equipment and device settings; service restoration before, during, and after the incidents and vegetation management.

**TABLE PG&E-A-2:
DEFINITIONS OF INITIATIVES – BY CATEGORY
(CONTINTUED)**

Category	Section #	Initiative	Definition
Community Outreach and Engagement	<u>8.5.3</u>	Engagement with access and functional needs populations	Actions taken understand, evaluate, design, and implement wildfire and PSPS risk mitigation strategies, policies, and procedures specific to access and functional needs customers.
Community Outreach and Engagement	<u>8.5.4</u>	Collaboration on local wildfire mitigation planning	Development and integration of plans, programs, and/or policies for collaborating with communities on local wildfire mitigation planning, such as wildfire safety elements in general plans, community wildfire protection plans, and local multi- hazard mitigation plans.
Community Outreach and Engagement	<u>8.5.5</u>	Best practice sharing with other utilities	Development and integration of an electrical corporation's policy for sharing best practices and collaborating with other electrical corporations on technical and programmatic aspects of its WMP program.

Appendix A.3 – PG&E Glossary of Additional Defined Terms

**TABLE PG&E-A-3:
PG&E GLOSSARY OF ADDITIONAL DEFINED TERMS – ALPHABETICAL BY TERM**

Term	Definition
2020 General Rate Case (GRC) Decision	Decision Addressing the Test Year 2020 GRC of PG&E: Decision (D.) 20-12-005.
2020 Risk Assessment and Mitigation Phase (RAMP) Report	PG&E's 2020 Risk Assessment and Mitigation Phase Report, filed June 30, 2020. Application (A). 20-06-012.
2022 Enterprise Risk Model	Bow Tie-based Wildfire risk model for distribution and transmission system.
2023 GRC	PG&E's Test Year 2023 GRC: A.21-06.021
Bow-Tie	Methodology to evaluate risk events, consistent with the Safety Model and Assessment Proceeding framework.
Catastrophic Fire Behavior (CFB)	The CFB is determined using Technosylva's fire spread modeling. Technosylva inputs PG&E weather data and then runs over 100 million fire spread simulations creating a dataset of potential consequence of new ignitions. The use of CFB helps PG&E identify areas where the potential consequence from an ignition is high, but where the Ignition Probably Weather (IPW) score may be low due to high circuit resiliency.
Catastrophic Fire Probability (CFP)	The CFP Model is the primary method used to determine if PSPS is necessary. This model combines the probability of fire ignitions due to weather impacting the electric system with the probability that a fire will be catastrophic if it starts.
Consequence of Risk Event (CoRE)	Consequence refers to the impact from an event in terms of damage and/or hazard posed to the natural and built environment. The CoRE models use a range of data to assess the consequence of the predicted event from the likelihood (LoRE) side of the model.
Constraints	Constraints can include, but are not limited to, environmental delays, customer interference, permitting delays/restrictions or operational holds, weather conditions, active wildfire, and accessibility into the area.
Corrective Action Program	Process for identifying, evaluating, resolving, and tracking actual or potential issues, problems, failures, nonconformities, concerns, and opportunities for improvement (collectively, called CAP issues) based on probability of occurrence.
Customer Average Interruption Duration Index (CAIDI)	CAIDI measures the average duration of a single sustained outage (i.e., an outage that lasted for longer than 5 minutes) that a customer experienced and is calculated as a weighted average by the Total Customer Minutes divided by the Total Customers impacted.

**TABLE PG&E-A-3:
PG&E GLOSSARY OF ADDITIONAL DEFINED TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Customer Minutes Interrupted (CMI)	The number of minutes a customer is without service during a Public Safety Power Shutoff (PSPS) event.
Destructive Fire	A fire that destroys 100 or more structures but does not result in a serious injury or fatality.
Distribution	Electric facilities that have a voltage below 60 kilovolt (kV).
External Factors	External Factors represent reasonable circumstances which may impact execution against targets, objectives, other work, or performance metrics including, but not limited to, physical conditions, landholder refusals, environmental delays, customer refusals or non-contacts, permitting delays/restrictions, weather conditions, removed or destroyed assets, active wildfire, exceptions or exemptions to regulatory/statutory requirements, and other safety considerations.
Failure Mode and Effects Analysis (FMEA)	A step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service.
Fire Behavior Index (FBI)	A scale of 1 to 5 that captures fire severity as a function of flame length (intensity of burn) and rate of spread. FBI of 3 or greater is expected to require aggressive suppression.
Fire Index Area	A geographical area over which fire danger determinations are produced.
Fire Index Rating	A rating to determine the risk of fire and its likely behavior. Its calculation and scale from R1 to R5-Plus considers fuel moisture, humidity, wind speed, air temperature, and historical fire occurrence. These ratings are as follows: • R1: Very little or no fire danger. • R2: Moderate fire danger. • R3: Fire danger is so high that care must be taken using fire-starting equipment. Local conditions may limit the use of machinery and equipment to certain hours of the day. • R4: Fire danger is critical. Using equipment and open flames is limited to specific areas and times. • R5: Fire danger is so critical that the use of some equipment and open flames is not permitted. • R5-Plus: The greatest level of fire danger where rapidly moving, catastrophic wildfires are possible. This is typically when fire danger is Extreme, “plus” there are high-risk weather triggers (e.g., strong winds). PSPS triggering event is an example.
Fire Potential Index R Score	See Fire Index Ratings R1 thru R5-Plus.
Fire Return Interval (FRI)	Synonymous with fire interval, fire free interval, and inter-fire interval, which refers to the elapsed time between consecutive fires that burn a given point on the landscape (e.g., 10 years/fire).

**TABLE PG&E-A-3:
PG&E GLOSSARY OF ADDITIONAL DEFINED TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Fire Season	May to November of each calendar year. This generally aligns with CalFire definition and the historical trend of wildfire activities.
Fire Weather	The danger ratings produced by the Fire Potential Index (FPI). The FPI Model combines fire weather parameters (wind speed, temperature, and vapor pressure deficit), dead and live fuel moisture data, topography, and fuel model data to predict the probability of large and/or catastrophic fires.
Flame Length	Flame length is the distance between the flame tip and the midpoint of the flame depth at the base of the flame. Flame length is an observable, measurable indicator of fire line intensity.
Fragility Curve	Represents the probability of failure (Pf) for any value of a demand parameter.
Hazard	Hazards represent a forcing function that cause asset failure depending on the condition of the asset.
High Fire Risk Area (HFRA) map	The HFRA Map considers catastrophic fire risk factors and utility infrastructure and was developed by considering incremental changes to the HFTD map boundaries to add areas where risk factors for the potential of catastrophic fire from utility infrastructure ignition during offshore wind events is higher.
IPW	The IPW Model is a machine learning model that uses ten or more years of weather data, outage, and historical ignition data to determine the likelihood of an outage for specific circuits during past weather events. The model also uses historical data to identify the outage causes.
Large Fire	A fire that burns 300 or more acres but does not meet the definition of a Destructive or Catastrophic fire.
Likelihood of Risk Event (LoRE)	LoRE is quantified per unit of risk exposure for each tranche, and then multiplied by risk exposure to produce the annual frequency of the risk event for that sub-driver/driver.
Maximum Entropy	The name given to a family of models that seek to differentiate between the characteristics of locations that have hosted grid events and those that have not.
Mitigation (Mitigation Initiative)	A measure or activity proposed or in process that is designed to reduce the impact/consequences and/or the likelihood/probability of a risk event.
Pixel	A 100 meter (m.) x 100 m. location along the grid.
PSPS Consequence	Calculated based on the backcast of PSPS impact based on current PSPS protocols.
PSPS Consequence Model	Projects the impacts and benefits of performing PSPS activities at the circuit or circuit segment level (formerly known as Circuit Protection Zones).
PSPS Likelihood	Estimated by applying the current PSPS protocols against historical climatological dataset informed by two meteorology models (FPI and IPW).

**TABLE PG&E-A-3:
PG&E GLOSSARY OF ADDITIONAL DEFINED TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
PSPS Potentially Impacted Customer (PIC)	A risk scenario to account for customers in HFTD and HFRA who could be impacted by PSPS despite not being in the historical backcast.
PSPS Risk-Benefit Tool	PG&E's PSPS Risk-Benefit Tool addresses the CPUC's requirements that California IOUs quantify the risk and benefits associated with initiating or not initiating a PSPS event for our customers.
Public Safety Specialist (PSS)	PG&E PSS team members with extensive, local wildfire operations experience. Many had a previous career with CAL FIRE or other fire agencies.
Random Forest	Random forests or random decision forests is an ensemble learning method for classification, regression and other tasks that operates by constructing a multitude of decision trees at training time.
Rate of Spread	The speed with which the fire is moving away from the site of origin measured in Chains (66 feet) per hour.
Risk Driver	Direct causes that lead to a risk event and determine the likelihood or frequency of a risk event. Risk drivers include external events (such as vegetation contact driver) and characteristics inherent to the assets or systems (such as equipment/facility failure) which contribute to the risk event.
S-MAP Settlement Agreement	The Safety Model Assessment Proceeding (S-MAP) Settlement Agreement approved by the CPUC in D.18-12-014.
Safety and Infrastructure Protection Team (SIPT)	SIPT crews consist of two to three International Brotherhood of Electrical Workers represented employees who are trained and certified as SIPT personnel. The SIPT crews provide standby resources for PG&E crews performing work in high fire hazard areas, pre-treatment of PG&E assets during any ongoing fire, fire protection to PG&E assets, and emergency medical services.
Sub-driver	A more detailed breakdown of a risk driver.
Technosylva fire spread simulation	Computerized simulations of wildfire behavior given an ignition at a location on a particular date. PG&E works with Technosylva, a vendor of fire simulation software whose outcomes are based on available fuels, topography, and weather, and structure and population data.
Threat	Represent degradation to the initial condition or strength of assets. Threats impact the condition of the asset such as corrosion, wood decay, and wear.
Transmission	Electric facilities that have a voltage that is 60 kV or above.
Transmission Operability Assessment Model	Used to assess physical condition of Transmission facilities for operational and planning decisions.
WFC Model	Wildland fire simulation model to estimate propagation and consequences of ignitions.
Wildfire Distribution Risk Model	Wildfire risk-based model for overhead Distribution system.

**TABLE PG&E-A-3:
PG&E GLOSSARY OF ADDITIONAL DEFINED TERMS – ALPHABETICAL BY TERM
(CONTINUED)**

Term	Definition
Wildfire Transmission Risk Model	Wildfire risk-based model for overhead Transmission system. This model is also known as the Transmission Composite Model.

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
APPENDIX B
SUPPORTING DOCUMENTATION FOR RISK METHODOLOGY AND
ASSESSMENT DEFINITIONS

Appendix B – Supporting Documentation for Risk Methodology and Assessment Definitions

Appendix B.1 – Summary Documentation

The electrical corporation must provide high-level information on the calculation of each risk and risk component used in its risk analysis. The summary documentation must include each of the following:

- *High-level bow tie schematic showing the inputs, outputs, and interaction between risk components in the format shown in Figure PG&E-B-1. An example is provided below.*
- *High-level calculation procedure schematic in the format shown in Figure PG&E-B-2. This schematic must show the logical flow from input data to outputs, including separate items for any intermediate calculations in models or sub-models and any input from subject matter experts.*
- *High-level narrative describing the calculation procedure in a concise executive summary. This narrative must include the following:*
 - *Purpose of the calculation/model;*
 - *Assumptions and limitations;*
 - *Description of the calculation procedure shown in the bow tie and high-level schematics;*
 - *Description of how outputs will be characterized and presented (e.g., visualization) to decision makers; and*
 - *Concise description and timeline of planned changes to the calculation procedure over the triennial Wildfire Mitigation Plan (WMP) cycle, including any key improvements from the Energy Safety Wildfire Risk Modeling Working Group and plans to align with the consensus Risk Modeling Requirements by January 1, 2024.*

Below, PG&E provides the requested, high-level model and calculation schematics. We also provide the high-level narrative describing the model calculation procedures pursuant to Energy Safety's instructions. Additional modeling information is found in [Section 6](#) of the 2023 WMP.

FIGURE PG&E-B-1:
IGNITION PROBABILITY MODEL BOW-TIE

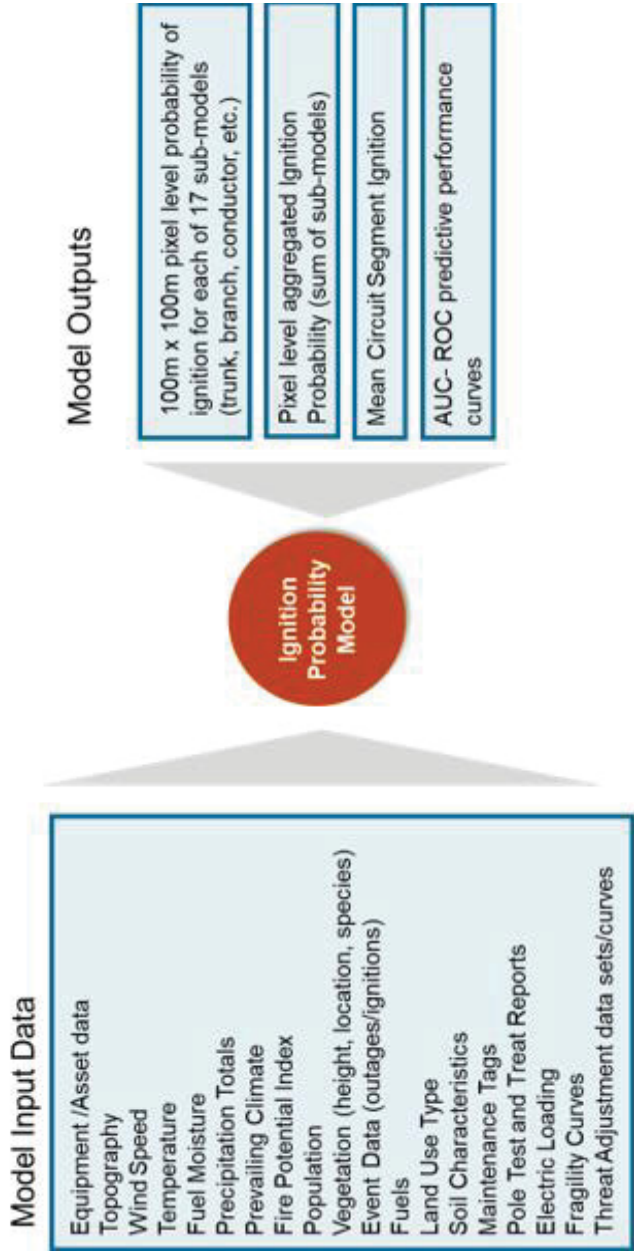


FIGURE PG&E-B-2:
WILDFIRE CONSEQUENCE MODEL BOW-TIE

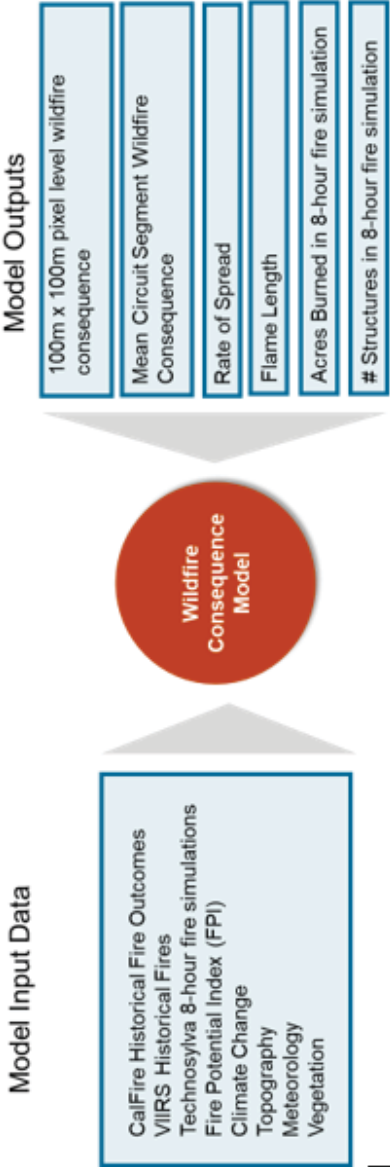


FIGURE PG&E-B-3:
PSPS CONSEQUENCE MODEL BOW-TIE

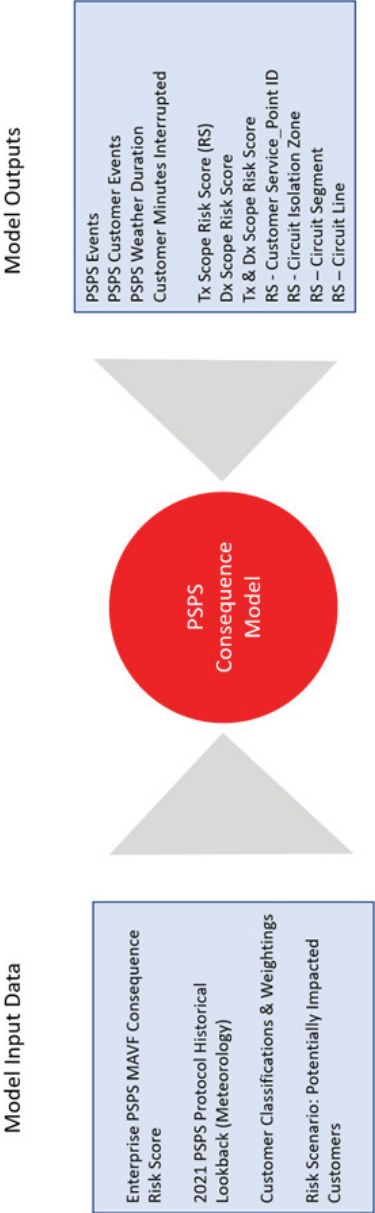
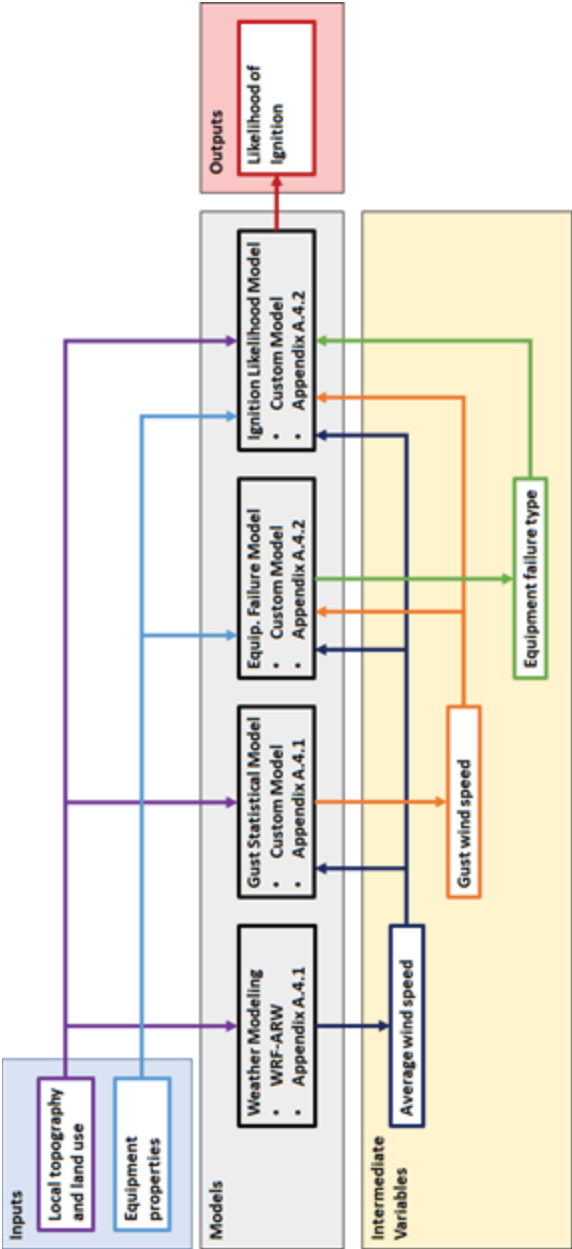


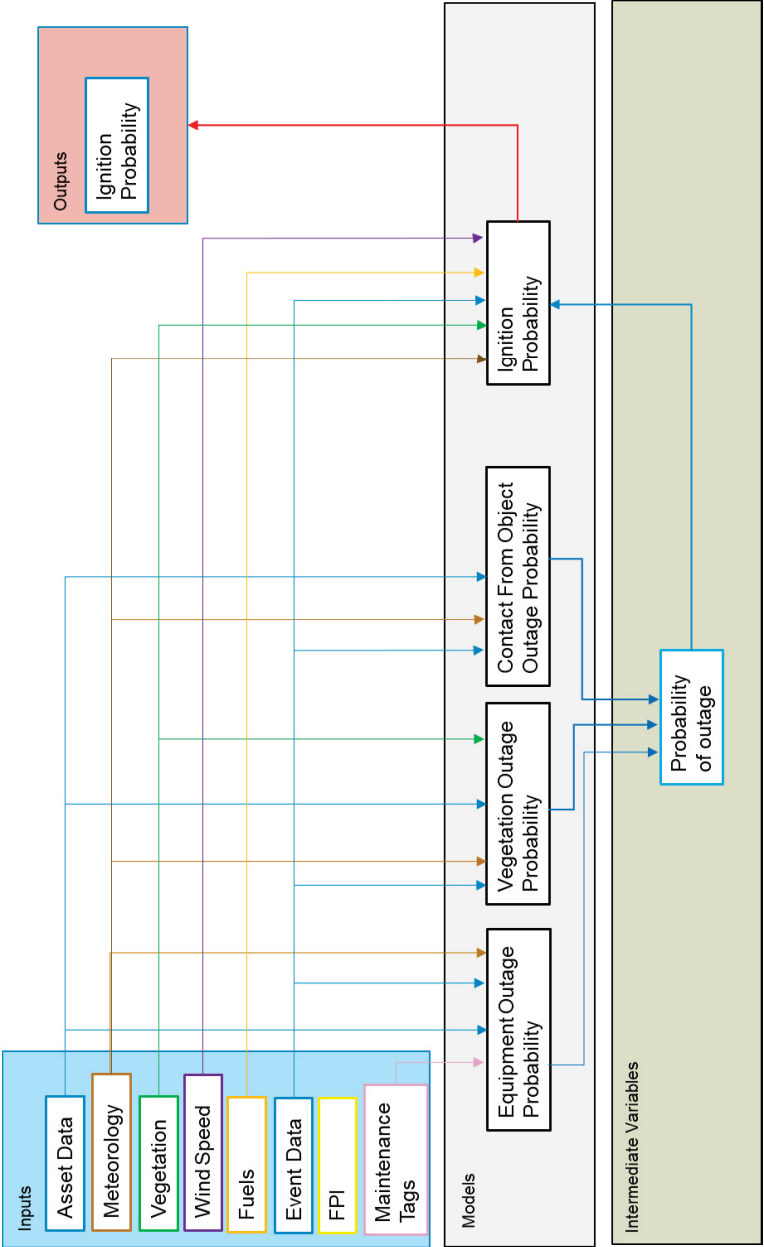
FIGURE PG&E-B-4:
EXAMPLE CALCULATION SCHEMATIC



Appendix B.3.1 – Ignition Probability Calculation Procedure Schematic

A more detailed set of diagrams and supportive narrative is provided in [Section 6.2.2.1](#).

**FIGURE PG&E-B-5:
IGNITION PROBABILITY CALCULATION PROCEDURE SCHEMATIC**



Appendix B.3.2 – Wildfire Consequence Calculation Procedure Schematics

A more detailed set of diagrams and supportive narrative is provided in [Section 6.2.2.2](#).

FIGURE PG&E-B-6:
WILDFIRE CONSEQUENCE CALCULATION PROCEDURE SCHEMATIC

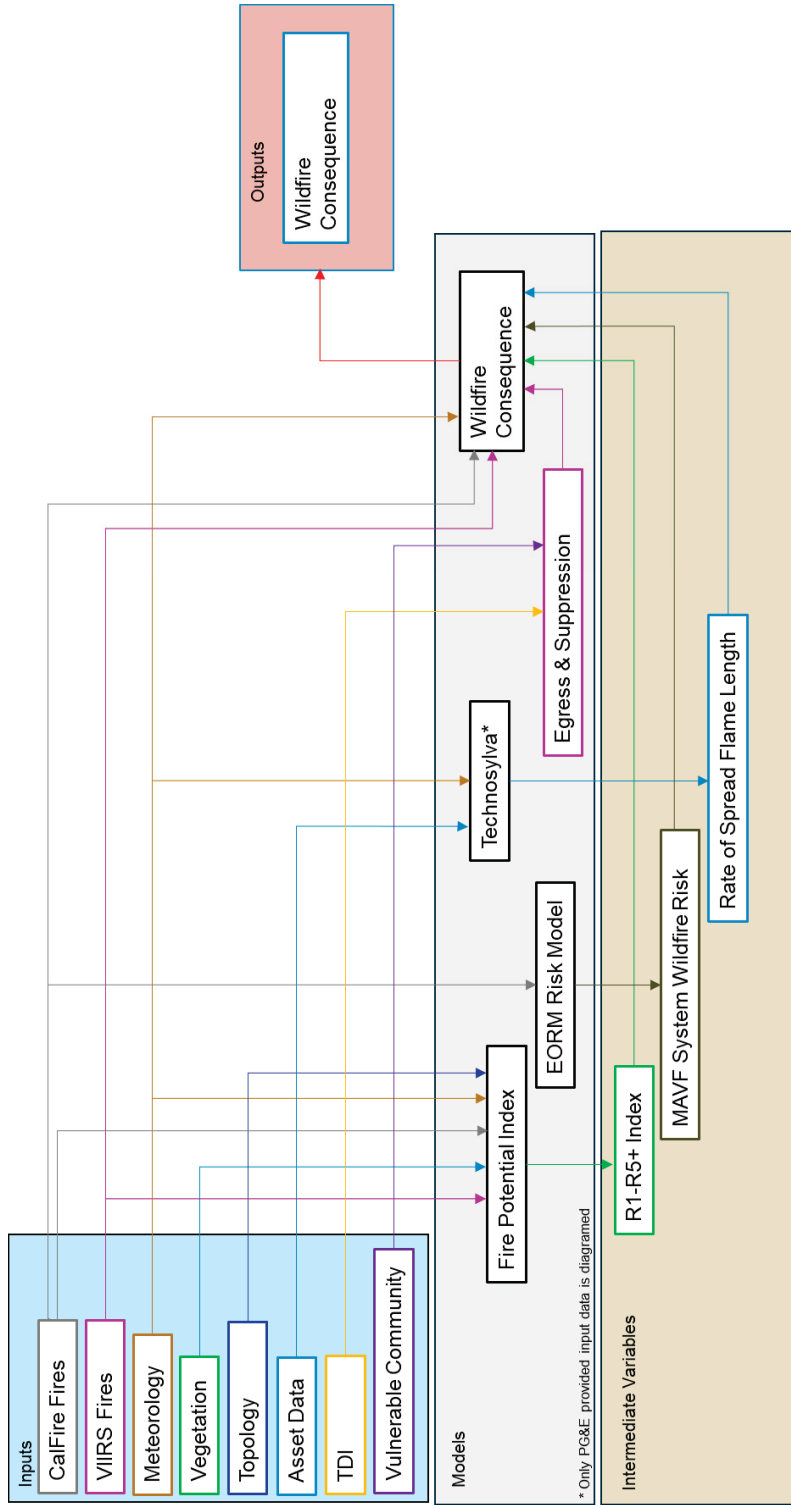
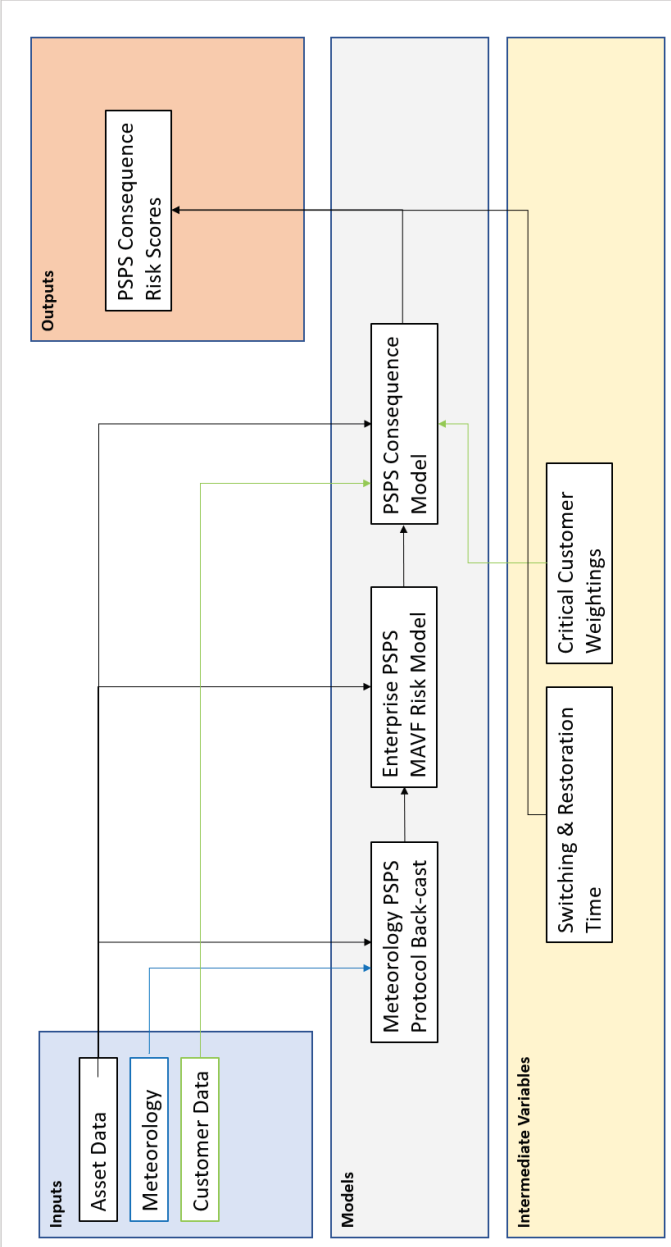


FIGURE PG&E-B-7:
PSPS CALCULATION SCHEMATIC



Appendix B.4 – High-Level Narrative Describing the Calculation Procedure

Wildfire Distribution Risk Model and Wildfire Transmission Risk Model

Model Purpose:

The Wildfire Distribution Risk Model (WTRM) and Wildfire Transmission Risk Model (WDRM) quantify the risk of wildfire ignited by the overhead transmission or distribution grid to support wildfire mitigation planning and prioritization. They assess expected wildfire risk over annual and multi-year timescales, given the conditions and assets associated with past grid events, including outages, PSPS, damage, hazards, and ignitions, from 2015-2021. To support the development of work plans around specific categories of mitigations and allow model structures to reflect what is known about specific failure modes, sub-models are trained on well-defined non-overlapping categories of grid events—subsets of all events defined by shared cause, sub-cause, and assets involved. Sub-models are tuned to the asset and environmental attributes expected and empirically confirmed to best predict grid events within each subset. Subset-level estimates of outage and ignition probability are multiplied by wildfire consequence (WFC) values derived from simulated location/fuels/conditions-specific wildfire outcomes calibrated to the satellite record of historical wildfires in California to produce asset- and location-specific risk estimates. The resulting risk values can be aggregated across subsets to produce “composite risk” estimates that span specific groups of (or all) subsets, capturing total risk while providing planners the ability to drill into contributing causes and the assets involved. These results are available to planners via interactive maps that overlay grid asset data or via roll-up to circuit segments, the planning units of system hardening, defined as the segments of grid infrastructure protected by the same protective device.

Assumptions and Limitations:

The predictive models used in the causal chain representing wildfire risk outlined in the Risk Model Framework contain inherent limitations due to modeling assumptions and data fidelity.

Predictive models, whether statistical or deterministic, such as the WDRM and WTRM, are limited in their ability to predict future conditions. Catastrophic wildfire, as a climate driven risk, is by its nature, dynamic and non-linear. While predictive models are not always right about future conditions, they are useful in directing where mitigation work should be applied. A prioritized list of grid locations generated from a risk model represent a current set of future potential destructive fire origins. As the models are refreshed each year, with the ignition and failure data from the most recent year, the dynamic nature of this climate driven risk will likely bring forward some previously lower ranked locations and drop back some previously higher ranked locations. What is certain is that by tracking these changes through the risk models, wildfire risk can be reduced and statistically run to the point where our company stand that catastrophic wildfire will cease will be realized.

For both the WTRM and WDRM the modeling approaches are based on mathematical and statistical modeling of physical systems limited to collection and processing of descriptions of the relative physical health of overhead transmission line assets. Whether it be asset data, event data, or environmental data, the data sets are

representations that may not fully capture the ground truth that will be experienced in the future. For this reason, the model development schedule outlined below, includes efforts to continuously improve data sources such as electric grid asset data.

A specific assumption in the current causal chain modeled with the Wildfire Risk Framework is that all faults resulting from a failure contain the same energy. While the input data to the ignition probability given an outage model might correlate locations that might tend to have the potential for higher energy faults, this is not explicitly modeled. Ignitions can be predicted using raw outage probabilities but improved by passing outage probabilities through a probability of ignition given an outage model. This is because the probability of ignition given an outage model can account for subset-specific character of outages (i.e., more or less likely to cause a wire down or to occur during fire weather) and locations that experience more ignition conducive to wind, vegetation types, and fuel moisture. As with all aspects of PG&E's Wildfire Risk Modeling this is an area for future improvement and industry collaboration.

Calculation Procedure:

The WDRM and WTRM define risk as the product of the Likelihood of Risk Event (LoRE) and Consequence of Risk Event (CoRE). More precisely, the LoRE is the expected count of ignitions derived from the probability of an ignition of a given cause and sub-cause involving specific asset types and the CoRE is the expected consequence of an ignition, quantified by calibrated simulations. Risk can be calculated for specific subsets of grid event or aggregated across all subsets.

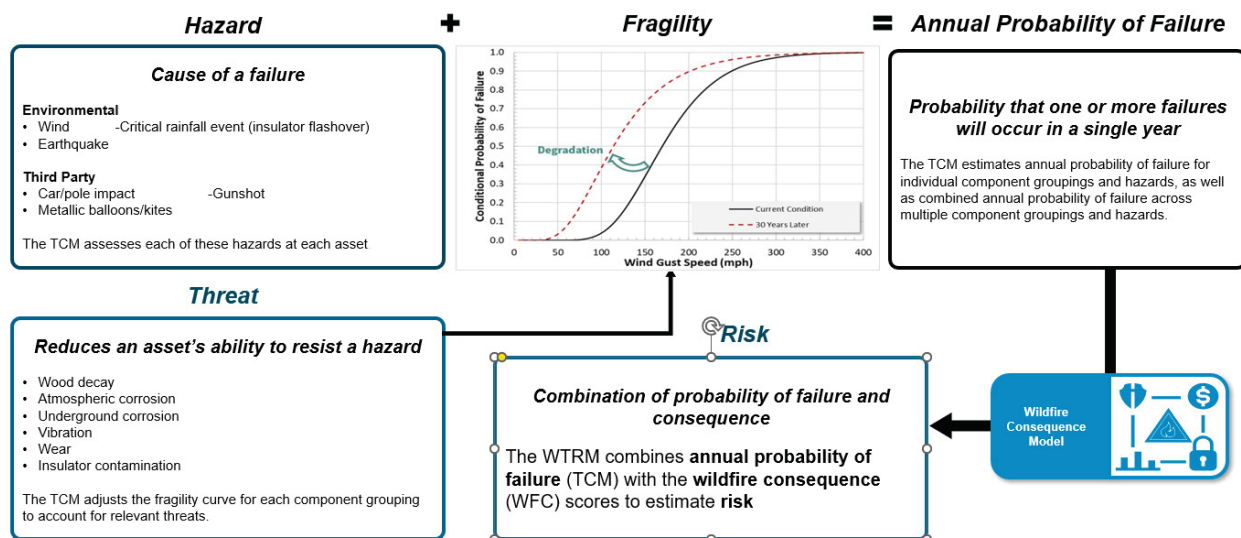
As described in [Section 6.2](#) the WTRM and WDRM employ different approaches to calculating the LoRE portion outlined in the Risk Framework. The WDRM provides a set of predictive sub-models for categories of grid events, including third party, animal, support structures, transformers, vegetation caused, and equipment failure for several types of equipment and unifies these models into a single framework and set of results—via the sub-models and compositing described in [Section 6.2.2.1](#).

To maximize the information produced by the WDRM and the training data available to sub-models, the WDRM first trains on and predicts failures capable of producing ignitions (e.g., outages) and then estimates the probability of an ignition arising from the same cause as the failures in question. This later step is based on the ignitions subset categories of cause, sub-cause and asset type(s) and local environmental conditions, including vegetation types, fuel dryness, and wind.

As failure events are less frequent on the transmission system, a machine learning approach is not preferred. As such, the WTRM approaches modeling from an engineering basis modeling the asset health (in the form of a fragility function) and the likelihood of experiencing an extreme external load (in the form of a hazard curve). The likelihood of a failure for a given asset can be evaluated by integration of the fragility and hazard curves. As assets degrade over time and conditions fragility curves can be adjusted to account for this degradation. The underlying causes of the degradation mechanisms are referred to as threats. Threats could include fungal decay for wood poles, or atmospheric corrosion for steel components. The degradation mechanisms associated with these threats are modeled to predict future fragility functions and associated failure rates.

With this approach the probability of failure is calculated for each of the component groupings itemized in [Section 6.2.2.1](#) as shown in [Figure PG&E-B-8](#) below.

**FIGURE PG&E-B-8:
OVERALL FRAMEWORK OF PG&E'S WILDFIRE TRANSMISSION RISK MODEL**



The probabilistic outcomes for the Transmission and Distribution (T&D) systems are next combined with the spatial results of the WFC model to produce the Wildfire Risk values referred to as the WTRM and WDRM, respectively. The Wildfire Consequence calculations calibrate wildfire simulation outputs against historical outcome data on California wildfires from satellite observations and fire agency records. As described in more detail in [Section 6.2.2.2](#), input data is prepared from both historical and simulated results to represent a set of outcomes for every day/location along electric T&D assets. This day/location set of data is then evaluated to determine whether the represented fire consequences are consistent with the average Multi-Attribute Value Function (MAVF) CoRE value assigned to historical destructive fires. The historical data is used to identify thresholds for the Fire Potential Index (FPI) and Technosylva models across each time and location. These thresholds establish the classifier conditions that indicate (predicts) that there may be a potentially destructive fire. Conversely, non-destructive potential is predicted when the classifier conditions are not met. Each of the predicted destructive/non-destructive outcomes has an associated mean MAVF CoRE consequence from the observed, historic outcomes. Predicted destructive potential/non-destructive potential are computed in combination with dry wind conditions for locations both inside and outside the HFRA to complete this partition of the day/location data.

As shown in [Figure PG&E-B-6](#), Version 4 of Wildfire Consequence also includes consideration of Egress and Suppression in calculating the final Consequence value. Suppression is modeled as the dependence of fraction of structures lost in historical fires on the local topography and geospatial characteristics. These are encapsulated in the Terrain Difficulty index produced by Technosylva. Egress is modeled as

dependence of fatalities as a fraction of structures affected on PG&E Access and Functional Needs (AFN).

The next step is to use the classifier described above and the starting locations of historical fires, to determine the mean MAVF for a matrix of HFRA designation and the destructive potential prediction for each historical fire location.

Assigning Grid Pixel CoRE Values From the “Destructive Potential” Classification

To project CoRE values, the covariates are computed for as many pixels as possible. For each day in the fire season, the FPI Rscore and Technosylva simulation results are classified for each pixelated location. From the pixel destructive potential classification, the appropriate CoRE value is assigned from the WFC. The final CoRE value for each pixel is the aggregate of the daily CoRE values. The final CoRE value for each pixel is the aggregate of the daily CoRE values.

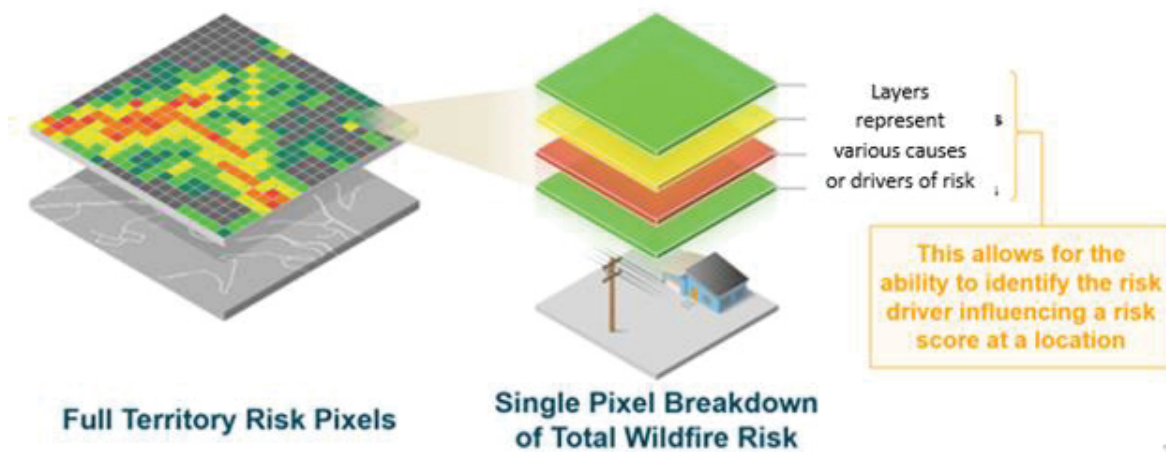
Presentation and Characterization of Model Results for Use in Developing Mitigation Workplans:

The primary purpose for the wildfire risk models is to inform various PG&E wildfire risk mitigation plans, also known as Work Plans. Work plans are produced, then executed, by various programs, including:

- System Hardening: Replaces existing assets with more resilient versions (e.g., stronger poles and wires) or moves assets to lower-risk locations (e.g., underground, different routes, etc.);
- Pole Replacement: Replaces old and worn wood distribution poles; and
- Other Inspection and Repair Programs: Typically focused on finding and quickly fixing various overhead distribution asset issues.

The output of the WTRM and WDRM is made available in tabular form as well as a spatial map with several layers—each characterizing risk from different causes or assets. These layers of risk can be examined and compared individually, or they can be composited together to understand the full risk from overhead distribution lines at a particular location or asset.

**FIGURE PG&E-B-9:
COMPOSITING OF RISK OVERVIEW**



Note that the risk varies across the geographic area depending on the characteristics of the environment, the weather, the vegetation, and the assets themselves.

Model Development Schedule:

PG&E will produce annual updates to the WDRM and WTRM. As part of our continuous improvement plan, the next WDRM, WDRM version 4, is planned for finalization during Q1 of 2023. For this update planned improvements include consequence values that account for difficulty of suppression, and factors that influence the effectiveness of evacuation in advance of fires. The model will continue to account for PSPS hazards and damages as proxies for grid events that would have occurred with the power on and will add the ability to account for the effects on EPSS (protective device settings that make them more likely to trigger protective outages under fire conditions).

Another area of focus is allowing for algorithmic specification of the circumstances under which specified mitigations are applicable, leading to a more precise application of mitigation effectiveness factors only to the degree to which they can be achieved—for example, the use of less combustible transformer fluids will be applicable only to transformers that lack them. Finally, the WDRM v4 will be based on 2022 updates to event, asset, weather, and vegetation/fuels data and will benefit from ongoing efforts to test out and incorporate new or improved model structures and covariates to improve model predictive performance.

**FIGURE PG&E-B-10:
RISK MODEL DEVELOPMENT SCHEDULE**

MODEL	2023	2024	2025
WILDFIRE DISTRIBUTION RISK MODEL (WDRM)	P _(out) & PIO for Dx Grid	Animal / Bird	Unknown
	Automated Code Base	3 rd Party	Lightening
	Mitigations	Switches Shunt Caps	Seismic
	Model Entire Dx Grid	Vegetation Mortality	Risk Mitigation Automation
		Model Causality with workplans	Reporting Risk Reduction
		All data in dB defined & explained	Evaluation Model Performance with Actuals
		Location Specific Mitigations	Asset Data Improvements
	Asset Data Improvements	Asset Data Improvements	
CONSEQUENCE MODELS	WFC all Burnable	Egress	
		Suppression	Vulnerable Communities
		Public Safety	Long Term Health Effects
		Reliability	Population Growth in WUI
		Statistical WFC Output	
WILDFIRE TRANSMISSIONRISK MODEL (WTRM)	Wind	Asset Data Improvements	Asset Data Improvements
	11 Fragility Threats	Vegetation	Unknown
	3 rd Party	Insulator Mechanical Wear	Lightning
		Conductor Mechanical Loading	Risk Mitigation Automation
	Seismic	Animal / Bird	Reporting Risk Reduction
		All data in dB defined & explained	Evaluate Model Performance with Actuals
		Location Specific Mitigations	

PSPS Consequence Model

Purpose of the Calculation/Model:

The purpose of the calculation/model is to encompass the additional risk created by Public Safety Power Shutoffs into the overall total overall utility risk. This allows an understanding of relationship between the wildfire risk and PSPS at each location or granularity.

The assumption and limitations are largely impacted by any changes in the PSPS protocols and the need to re-assess the level of impact against historical events. Because the system configuration is constantly changing, the accuracy of historical backcasts is not perfect.

Outputs of this model are generally represented in a tabular format with a ranking of highest to lowest locations (various levels of granularity based on need) to drive risk prioritization, especially around PSPS mitigation work-planning.

Over the triennial WMP cycle, the PSPS model will evolve to account for any changes in PSPS protocols, and the changes due to community vulnerability assessment inclusion.

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
APPENDIX C
ADDITIONAL MAPS

Appendix C – Additional Maps

In this appendix, the electrical corporation must provide the additional maps required by the Guidelines. As stated in the General Directions, if any additional maps needed for clarity (e.g., the scale is insufficiently large to show useful detail), the electrical corporation must either provide those additional maps in this appendix or host applicable geospatial layers on a publicly accessible web viewer. If the electrical corporation chooses the latter option, it must refer to the specific web address in appropriate places throughout its Wildfire Mitigation Plan (WMP). Additionally, the electrical corporation must host these layers until the submission of its 2026-2028 WMP or until otherwise directed by Office of Energy Infrastructure Safety (OEIS or Energy Safety). The electrical corporation may not modify these publicly available layers without cause or without notifying Energy Safety.

We have included a collection of geospatial datasets that have been stored in an ESRI file geodatabase (FGDB). They provide visual representation of and attributes for the data that are discussed in the Wildfire Mitigation Plan. File geodatabases are advantageous as they also allow for large volumes of data to be shared/consumed, enable advanced spatial analytic capabilities, and are an industry standard.

Table PG&E-C-1 below includes a list of applicable layers that are represented in our FGDB file (Attachment 2023-03-27_PGE_2023_WMP_R1_Appendix C _Atch01). Access to the FGDB file requires software designed to read and interact with these file types. These software platforms allow users to open and view the datasets.

Examples of free and publicly available software options that enable access to the file geodatabases are provided below:

- Software Option 1: <https://www.arcgis.com/index.html>;
- Software Option 2: <https://qgis.org/en/site/>;
- Software Option 3: <https://saga-gis.sourceforge.io/en/index.html>; and
- Software Option 4: <https://www.blumarblegeo.com/global-mapper/>.

**TABLE PG&E-C-1:
LIST OF GEOSPATIAL DATASETS**

Attachment Subfolder	File Name	Reference
Group 5	5.1 Service Territory	Figure PG&E-5.1-1 : Population Density Map of Highly Rural, Rural, and Urban Customers.
Group 5	5.3.2 Catastrophic Wildfire History	Figure 5.3.2-1 : Utility-Related Catastrophic Wildfires within PG&E's Service Territory Map.
Group 5	5.3.3 High Fire Threat Districts	Figure PG&E-5.3.3-1 : HFTD Tier 2 and Tier 3, and PG&E's HFRA, November 2022.
Group 5	5.3.5 Topography	Figure PG&E-5.3.5-1 : Topographic Map of PG&E Service Territory and Adjacent Portions of California with Geomorphic Province Boundaries.
Group 5	5.4.1 Urban, Rural and Highly Rural Customers	See Section 5.1 .
Group 5	5.4.2 Wildland-Urban Interfaces (WUI)	Figure PG&E-5.4.2-1 : Population Density Map of WUI.
Group 5	5.4.3.1 Individuals at Risk of Wildfire	Figure PG&E-5.4.3-1 : 2020 Census Population.
Group 5	5.4.3.2 Social Vulnerability and Exposure to Electrical Corporation Wildfire Risk	Figure PG&E-5.4.3-2 : Exposure and Social Vulnerability Map.
Group 5	5.4.3.3 Sub-Divisions with Limited Egress or No Secondary Egress	See Section 5.4.3.3 ; Unable to include a figure for this Section.
Group 5	5.4.4 Critical Facilities and Infrastructure	Figure PG&E-5.4.4-1 : Critical Facilities Count by County.
Group 6	6.4.1.1 Geospatial Maps of Top-Risk Areas within HFRA	Figure PG&E-6.4.1-1 : WDRM Outputs Map. Figure PG&E-6.4.1-2 : WTRM Outputs Map. Figure PG&E-6.4.1-3 : PSPS Risk Map.
Group 6	6.4.1.2 Proposed Updates to the HFTD	Attachment 2023-03-27_PGE_2023_WMP_R1_Appendix C_Atch01.
Group 9	9.1.2 Identification of Frequently De-energized Circuits	Figure PG&E-9.1.2-1 : De-Energized Circuits by Frequency with HFTD Contour Overlays.

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
APPENDIX D
AREAS FOR CONTINUED IMPROVEMENT

Appendix D – Areas for Continued Improvement

PG&E provided responses to ACIs from the 2023 WMP Decision in Section B.5 of the 2025 WMP Update. Please refer to the 2025 WMP Update for more information.

ACI PG&E-22-01 – Prioritized List of Wildfire Risks and Drivers

Description:

Currently, Pacific Gas and Electric Company's (PG&E or the Company) 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 Wildfire Mitigation Plan (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 High Fire Threat District (HFTD)).

PG&E Response:

Office of Energy Infrastructure Safety (OEIS or Energy Safety) has updated the definition of catastrophic wildfire in the 2023-2025 WMP Technical Guidelines to a fire that caused at least one death, damaged over 500 structures, or burned over 5,000 acres. As such, PG&E is in the process of updating our enterprise risk framework to match the new definition as visualized by a risk bowtie.

[Figure PG&E-22-01-1](#) below is a risk bowtie, in this case overall wildfire risk, which shows how PG&E maps each risk driver to its associated consequence outcome. We describe this process in [Section 7.1.4.2](#).

Historically, PG&E has partitioned the consequence outcome categories by the combination of Red Flag Warning (RFW) and Small/Large/Destructive/Catastrophic Fires. In this case, catastrophic represents a Destructive Fire that results in a serious injury or fatality involved, which is from the definition that has been further clarified by the Energy Safety. We will be updating our consequence outcomes to align with the revised definition in future modeling iterations.

**FIGURE PG&E-22-01-1:
WILDFIRE RISK BOWTIE MAPPING RISK DRIVERS TO CONSEQUENCE OUTCOMES**



In an initial assessment, using the existing pre-mitigation wildfire baseline bow-tie analysis results and an analysis of the historical fires data, PG&E estimated the likelihood of a catastrophic wildfire by risk driver, based on the new Energy Safety definition of catastrophic risk, as shown in [Table PG&E-22-01-1](#).

**TABLE PG&E-22-01-1:
WILDFIRE RISK DRIVERS**

	Pre-Mitigation Frequency of Catastrophic Wildfire			% Pre-Mitigation Frequency of Catastrophic Wildfire		
	HFTD	Non-HFTD	All	HFTD	Non-HFTD	All
1. Vegetation Contact	1.3	0.1	1.3	56%	21%	52%
2. Equipment/facility failure	0.7	0.1	0.8	33%	43%	34%
3. Contact from object	0.1	0.1	0.2	6%	31%	9%
4. Wire-to-wire contact	0.05	0.00	0.05	2%	0%	2%
5. Unknown	0.03	0.01	0.04	1%	3%	2%
6. Other	0.02	0.00	0.02	1%	1%	1%
7. Utility work/Operation	0.004	0.0001	0.004	0%	0%	0%
8. Vandalism/Theft	0.002	0.002	0.004	0%	1%	0%
9. Contamination	0.002	0.001	0.004	0%	1%	0%
Total	2.2	0.3	2.5	100%	100%	100%
Note: Based on Energy Safety's updated definition, the analysis assumed that: 100 percent chance that Destructive Fires would be Catastrophic Wildfires in the HFTD; 50 percent chance that Destructive Fires would be Catastrophic Wildfires in Non HFTD; 28 percent chance that Large Fires would be Catastrophic Wildfires in the HFTD; and 16 percent chance that Large Fires would be Catastrophic Wildfires in Non HFTD. The "Catastrophic Wildfires" designation is based on Energy Safety's 2023 WMP guidance while the "Destructive/Large Fires" designation is PG&E's definition from our bow tie.						

ACI 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.

PG&E Response:

PG&E looks forward to participating in an Energy Safety-led scoping meeting regarding climate change and wildfire risk research and collaboration.

PG&E is currently participating in the ongoing Energy Safety-led Risk Model Working Group (RMWG) sessions. In September 2022, we participated in a technical work group with other California utilities where participants discussed the approaches each utility is taking to determine and model on-going and worsening climate change impacts to our service territory.

We are also participating in several other activities related to addressing climate change risk including:

- We facilitated ongoing joint utility collaboration as part of the 2018-2020 California Public Utilities Commission (CPUC or Commission) Rulemaking to Consider Strategies and Guidance for Climate Change Adaptation;
- We are participating in monthly calls with Southern California Edison Company (SCE) related to our climate vulnerability assessment and integrating climate change risk in enterprise risk assessment and planning;
- Along with SCE, we are a leading member of the Electric Power Research Institute's Climate READi (Resilience and Adaptation initiative), a multi-year initiative that will produce "one of the most comprehensive, integrated approaches to physical climate risk assessment;"

- We participate in the Institute of Electrical and Electronics Engineers Distribution Resilience Working Group that is focused on creating metrics and mitigations for climate risk to electric distribution facilities; and
- We are an active participant in multiple CPUC proceedings dealing with climate risk, the value of resilience, and integrating long-term and near-term risks including wildfire risk.

ACI 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.

PG&E Response:

PG&E participated in an Energy Safety-led scoping meeting on December 8, 2022 focusing on Community Vulnerability and in the first Risk Model Work Group meeting held on December 14, 2022. We will participate in follow-up activities as well. We expect to work with stakeholders to learn more about community vulnerability, and we are working to integrate community vulnerability into both our Wildfire and our Public Safety Power Shutoff (PSPS) consequence modeling. This includes critical facilities and infrastructure, as well as customers enrolled in the medical baseline allowance program or who have durable medical equipment or access needs.

The recent Commission Phase II Decision Adopting Modification to the Risk-Based Decision-Making Framework and Directing Environmental and Social Justice (ESJ) Pilots²⁷⁸ (Phase II Risk Assessment and Mitigation Phase (RAMP) and ESJ Pilots Decision) means that PG&E will be the first California Investor-Owned Utility (IOU) to file the results of the ESJ Pilot Study in our 2024 RAMP Application.

²⁷⁸ D.22-12-027.

ACI 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.

PG&E Response:

Meetings continue to take place between PG&E, SCE, and San Diego Gas & Electric Company (SDG&E) to evaluate how to best account for, quantify, and model suppression effects on wildfire spread. As part of this collaborative effort, the three utilities have been leveraging fire simulation data from Technosylva, specifically their Terrain Difficulty Index. As a result of this collaborative work, we developed an approach to model suppression as part of our 2022 WMP Commitment A.05. We continue to collaborate with the other utilities in preparation for a future Energy Safety-led working group meeting on the topic of fire suppression considerations.

ACI PG&E-22-05 – 8-Hour Fire Spread Simulations

Description:

PG&E's 8-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; and*
- 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.*

PG&E Response:

PG&E, along with other IOUs, use Technosylva's Wildfire Risk Reduction Model (WRRM) for infrastructure and mitigation planning activities. The WRRM application uses a standard 8-hour duration for all fire spread simulations conducted using historical data (climatology). This duration represents a typical first burning period of a fire, consistent with response and suppression efforts. Previous research and historical data analysis have determined that approximately 90 percent of large destructive fires can be identified by their behavior in the first burning period alone and do not require longer simulations to identify these scenarios. However, from collaborative benchmarking among PG&E, SCE, and SDG&E, and subsequent consultation with Technosylva, we asked Technosylva to conduct a sensitivity study on 24-hour wildfire consequence simulations.

Technosylva has conducted an initial sensitivity study and presented results to the utilities individually. The preliminary results comparing the 8-hour and 24-hour simulations for a portion of PG&E's service territory demonstrated that the longer simulations present a wider range of potential outcomes along with an extended extent of impact. Specifically, locations with fast moving grassy fuels could slow when reaching residential or less burnable territory and some locations with less combustible fuels can reach locations with higher combustible fuels resulting in higher consequences. In general, 24-hour simulations result in higher impacts as simulated fires are more likely to reach highly populated areas despite decreasing reliability on the weather forecasts as time progresses, and unknown suppression effectiveness over time. Sensitivity analysis is continuing, and PG&E will be able to provide results in 2023 that quantify the effectiveness of shorter versus longer simulation durations.

PG&E will continue to collaboratively work with Technosylva and the other utilities to appropriately incorporate these longer simulations into future wildfire risk models.

ACI 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; and*
- Describe and quantify effectiveness for how PG&E anticipates Covered Conductor (CC) and undergrounding initiatives will impact expected ignitions due to conductor damage or failure.*

PG&E Response:

PG&E has not observed an increase in risk events and ignition likelihood in our territory in 2022 following our full HFTD deployment of Enhanced Powerline Safety Settings (EPSS). Specifically, PG&E has observed a tangible reduction of risk events and ignition likelihood across the two most-frequent cause drivers (vegetation contact and equipment failures). These two suspected initiating events are the riskiest in term of numerical count and are where we have the most amount of control to prevent the ignition. [Table PG&E-22-06-1](#) below shows the CPUC-reportable fire ignitions in 2022 compared to the prior 3-year average.

**TABLE PG&E-22-06-1:
CPUC-REPORTABLE FIRE IGNITIONS – COMPARING 2022 TO 3-YEAR AVERAGE (2019-2021)**

2022 vs. 3-Year Average of Reportable Ignitions by Suspected Initiating Event		
Suspected Initiating Events	3-Year Average	2022
Contact from Object – Vegetation	63	38
Equipment Failure – PG&E	33	14
Contact from Object – Animal/Bird	12	7
Wire-to-Wire Contact	3	0
Unknown/Other (inc. Weather)	4	1
Contamination	3	2
Contact from Object – Third Party	16	19
Utility Work/Operation	1	6
Total	134	87

[Table PG&E-22-06-1](#) shows a reduction in the number of CPUC-reportable ignitions overall and for every driver except for third-party contacts and utility work/operation. The 2022 results for third-party contacts are higher than the mean, but within the normal variation year-over-year (e.g., PG&E observed 21 ignitions caused by third-party contact in 2021).

PG&E attributes the increase in Utility Work/Operation ignitions to improvements in our processes for identifying the cause of ignitions, through our Enhanced Ignition Analysis (EIA) Program, rather than an increases in occurrence. By better identifying the causes of ignitions we develop lessons learned and identify areas for improvement.

We expect both CC and undergrounding to be effective in reducing ignitions due to conductor contact damage or failure. With undergrounding, ignitions due to conductor contact damage or failure is 99 percent,²⁷⁹ or virtually, eliminated, as typical underground ignitions are not caused by the conductor itself, but due to limited incidents from third-party contact around the subsurface or padmount facilities for an undergrounded circuit.

For CC, we expect fewer ignitions in areas where we replace bare conductor with CC. While CC is effective in reducing ignition risk from small vegetation, contact from object, and equipment failure, there are still circumstances, such as contact from large tree falls and vehicle strikes, that can damage lines where CC has been installed, and ignitions can occur. We discuss this issue in [ACI PG&E-22-11](#).

²⁷⁹ In response to Critical Issue RN-PG&E-23-05, PG&E discusses the effectiveness of undergrounding primary lines considering secondary lines and services. See PG&E's response to Critical Issue RN-23-PG&E-05 in Section 8.1.2.2.

ACI 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; and*
- *An update on progress made to address the issues, including references to where changes have been applied.*

PG&E Response:

E3 – Energy, Environment and Economics, an independent third party, conducted a review of PG&E's WDRM, version 3 (E3 Review of Model v3).²⁸⁰ The objective of the review was to:

- Review the suitability and applications of consequence data in the modelling framework;
- Review the specific use of the Risk Model Information in each of its operations areas; and,
- Describe potential future uses of WDRM v3 and longer-term multi-year wildfire planning models.

The E3 Review of Model v3 concluded:

- PG&E has made substantial progress in transforming its model from one that was primarily used to validate mitigation measures chosen by its Subject Matter Experts (SME) within high fire zone areas to a model that can be used to supplement and prioritize the targeting of mitigation measures across its entire service territory.²⁸¹
- The construct of [WDRM] v3 appears to be consistent with their [PG&E's] commitment in their [PG&E's] WMP to refocus mitigation work to achieve a target

²⁸⁰ E3 Review of PG&E's Wildfire Risk Model Version 3, dated May 2022. Please see Attachment 2023-03-27_PGE_2023_WMP_R0_Section 6.6.1_Atch01.

²⁸¹ *Id.* at p. 4.

where 80 percent of their work is focused on mitigating the risk of the highest 20 percent of identified line segments.²⁸²

- PG&E has made a substantial effort to incorporate feedback from the CPUC, stakeholders, E3 and its internal users to update the WDRM between versions 2 and 3. The updates made represent real improvements in several critical areas. From E3's review, the modeling team includes a group of highly skilled professionals from inside and outside of PG&E. The model is leveraging the best available data and methods to prioritize risk levels by geographic area and ignition type allowing for evidence-based decision-making. This model represents an improvement from v2. Most of modeling limitations are driven by limitations in data and resources which are difficult for the modeling team to directly solve.²⁸³

E3 identified areas for improvement in the WDRM v3.²⁸⁴ We list these recommendations, as well as the 2022 progress-to-date and ongoing improvement plans in [Table PG&E-22-07-1](#) below.

²⁸² *Id.* at p. 4.

²⁸³ *Id.* at p. 11.

²⁸⁴ *Id.* at p. 4.

**TABLE PG&E-22-07-1:
E3 IDENTIFIED AREAS FOR IMPROVEMENT**

Line No.	Recommendation	Progress	Next Steps
1	Standardizing and documenting the relationship between the model and SMEs	Developed and implemented standardized client process in development of WDRM v4 model.	Conduct ongoing updates to the process in alignment with WDRM v4 development enhancements.
2	Improving the transparency and validity of the consequence portion of the model	Collaboration with other utilities to improve wildfire consequence model resulting in expanding length of Technosylva simulations to 24-hours.	Aim to incorporate into WDRM v4 or v5.
3	Establishing a data quality control process	Developed asset data quality dashboards to prioritize asset data improvement projects.	Identify and execute asset data improvement projects.
4	Establishing an expanded roadmap for model direction	Developed for WDRM and Wildfire Transmission Risk Model (WTRM).	Continue to incorporate items from Energy Safety RMWG and SME feedback throughout model development cycles.
5	Exploring potential further use cases of the model	Expanded individual sub-models to improve alignment with workplans in WDRM v4.	Include expanded sub-models in WDRM v4.
6	Coordinating PG&E's process with broader State-wide wildfire planning	Communicated recommendations to Energy Safety as part of the proposed work on coordinating utility and state wildfire plans.	Risk Model Workgroup session in 2023.

E3 also evaluated PG&E's progress against recommendations made to improve the WRDM v2 model. E3 noted that PG&E has addressed many of these recommendations in the current WDRM v3 modeling but there are some remaining suggestions that PG&E plans to address or incorporate in version 4 of the wildfire risk model.²⁸⁵ The three items E3 recommends PG&E continue to improve are listed on lines 1, 2, and 4 in [Table PG&E-22-07-1](#) above.

²⁸⁵ *Id.* at p. 12.

ACI 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; and*
- 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.*

PG&E Response:

As part of our 2022 Revised WMP, we provided a description of each catastrophic wildfire that: (1) occurred since 2017; (2) was greater than 500 acres; and (3) was determined by the California Department of Forestry and Fire Protection (CAL FIRE), a local fire suppression agency, the Safety and Enforcement Division (SED), or the United States Forest Service (USFS) to have been caused by PG&E or its assets. For each fire, we described the lessons learned, measures to mitigate the cause, and how the lessons learned have been integrated into our wildfire strategy in addition to the cause and date of ignition. The information was based on information available to PG&E at that time and evaluations and/or reports or information provided by external parties. We noted that we are continuing to evolve and strengthen our mitigations based on ongoing learnings especially with our EIA Program.

As part of the approval of PG&E's 2022 Revised WMP, Energy Safety asked for more analysis on how lessons learned are tied to the causes of past PG&E-equipment related catastrophic fires beyond what we have provided to date. This includes: (1) specific cause analysis for each identified fire analyzing the issues that led to the ignition and spread; (2) an evaluation of programmatic and systemic issues related to the cause; and (3) consideration of resources to make changes to wildfire mitigation activities.

Below we provide more information responsive to Energy Safety's requests. For clarity, we are following the format provided in response to Critical Issue 22-01 in last year's Revised 2022 WMP. In addition, we are adding the Butte Fire to the response given the broader request for information regarding catastrophic fires made by Energy Safety in

[Section 5.3.2](#) and [Section 10](#) of this WMP. We are also including the Mosquito Fire as a fire that may be attributable to electrical facilities, but is still under investigation, in response to the request made in [Section 5.3.2](#). To avoid redundancy, this response will serve as the answer to the [Section 10](#) request for lessons learned from any and each catastrophic wildfire ignited by its facilities or equipment identified in response to [Section 5.3.2](#).

We have added additional details in [Table PG&E-22-08-1](#), where possible, to respond to Energy Safety's requests. We also note that for more recent fires under investigation, and fires that are still in litigation, our analysis is still ongoing and subject to change.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES**

Fire Name: Butte Fire	
Date of Ignition	September 9, 2015
Cause Based on Available Information	According to CAL FIRE, a gray pine contacted a PG&E powerline which ignited part of the tree. Embers from the contact with the conductor dropped into the fuels below the conductor, which ignited the wildland fire. Two gray pines on the outer edge of the pine stand had been previously removed, which left the interior gray pine that contacted the conductor more exposed to the sun and the powerlines.
Lessons Learned	At the time of the Butte Fire, PG&E did not have a process in place for evaluating specific lessons learned from individual fires. Since the time of the Butte Fire, PG&E has improved employee and contractor training regarding Vegetation Management (VM) to mitigate wildfire and ensure safe work practices.
Measures to mitigate cause	Improved employee and contractor VM training.
Integration of Lessons Learned into Wildfire Strategy	We do not have specific mitigations in our 2023 WMP related to the Butte Fire because we have already improved our VM practices since that time. We have invested significant resources into our Pre-Inspector basics Training Path (formerly called the Structured Learning Path) to provide specific, well-defined training related to the work being performed. We have partnered with the International Brotherhood of Electrical Workers (IBEW) and educational institutions, such as the California Community College system, to establish a training program designed to provide the skills and knowledge necessary to perform tree crew work safely and competently. PG&E has also implemented training programs for VM employees and contractors who are responsible for VM projects. (See e.g., 2023-2025 WMP, Section 8.2.7 for Workforce Planning and training information.) We also adopted Acceptable Quality Levels for our Quality Assurance Vegetation Management and Quality Verification Vegetation Management programs. (PG&E's 2022 Revised WMP, p. 774.)

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

Fire Name: Railroad Fire	
Date of Ignition	August 29, 2017
Cause Based on Available Information According to the USFS,	According to the United States Department of Agriculture Forest Service, a contractor was hired to remove a dead cedar tree adjacent to PG&E's powerlines in Madera County. After several cuts to the tree had been made, the tree fell at an angle and hit PG&E's powerlines. After the tree hit the powerlines, the vegetation beneath the powerlines ignited. Given the presence of the downed lines, the crew could not safely attempt to put out the fire. Without immediate suppression efforts, the fire spread into the surrounding forest.
Lessons Learned	At the time of the Railroad Fire, PG&E did not have a process in place for evaluating specific lessons learned from individual fires. Upon review, the Railroad Fire did not result from an issue relating to PG&E's electric system. PG&E sent a crew to the area to mitigate a hazard tree to prevent a potential wildfire from occurring. The fire resulted from VM work that could have been performed more safely. Since the time of the Railroad Fire, PG&E has improved VM training and employee and contractor training regarding work outdoors in any forest, brush, or grass-covered land.^(a) In 2021, we implemented Safe Work Practices that outline safe work processes that contractors must adhere to when performing tree work.^(b) If tree work cannot be performed pursuant to the safe work practices outlined because of abnormal conditions, contractors should stop work to reevaluate how to perform the work safely.
Measures to mitigate cause	Improved employee and contract VM training for responding to hazard trees in proximity to PG&E powerlines.
Integration of Lessons Learned into Wildfire Strategy	We do not have specific mitigations in our 2023 WMP related to the Railroad Fire because we have already improved our VM practices since that time. We have invested significant resources into our Pre-Inspector basics Training Path (formerly called the Structured Learning Path) to provide specific, well-defined training related to the work being performed. We have partnered with the IBEW and educational institutions, such as the California Community College system, to establish a training program designed to provide the skills and knowledge necessary to perform tree crew work safely and competently. PG&E has also implemented training programs for VM employees and contractors who are responsible for VM projects. (See e.g., 2023-2025 WMP, Section 8.2.7 for Workforce Planning and training information.)
Fire Name: October 2017 Wildfires	
Date of Ignition	Various (see details below for each fire)
Cause Based on Available Information According to the USFS,	Vegetation contact and equipment failures in high winds caused these fires. Below we provide a high-level cause analysis for each of these fires based on available information: Cherokee – On October 8, 2017, PG&E observed that branches from a green, healthy California White Oak/Valley Oak tree had broken in Oroville. Per the troubleman who responded, one branch was found on the ground lying on top of a downed conductor. Another broken branch was suspended

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	in the air, hanging on another branch, and touching a conductor that remained intact. <u>Adobe</u> – According to CAL FIRE, the Adobe Fire was one of six incidents constituting the “Nuns Fire,” which ignited on October 8, 2017. The Adobe Fire occurred in Kenwood. When PG&E was granted access to the incident location, PG&E observed a green Eucalyptus tree that had fallen and was laying on three of three conductors of a 12 kilovolts (kV) primary tap line on the ground. The Eucalyptus tree was rooted approximately 60 feet from the distribution conductors. <u>Nuns</u> – According to CAL FIRE, the “Nuns fire” consists of six different fires: Nuns, Adobe, Norrbom, Pressley, Partrick and Oakmont, and it started on October 8, 2017 in Glen Ellen. When PG&E was granted access to the incident site, PG&E observed that the top section of a green, healthy Alder tree had broken and was laying on the ground near one of three conductors of a downed open wire secondary service in Glen Ellen. Over a week later, two healthy Douglas Fir trees also came down on primary distribution conductors, and steel messenger cables supporting the telephone and Community Antenna Television conductors approximately 0.4 miles downstream from the initial ignition location. <u>Sulphur</u> – According to CAL FIRE, the Sulphur incident started on October 8, 2017 in Clearlake Oaks. PG&E identified two poles that had broken. The top section of one pole had broken and fallen to the ground, and the pole one span to the west had burned at the base and fallen to the ground. This resulted in a wire down event. <u>La Porte</u> – According to CAL FIRE, this fire started on October 9, 2017 in Bangor, Butte County. PG&E understands that CAL FIRE collected a section of conductor and a tree branch prior to releasing the incident location. After CAL FIRE released the incident location on October 13, 2017, PG&E accessed the site and was able to identify a number of broken oak tree branches and a downed conductor at the incident location. <u>Pressley</u> – According to CAL FIRE, the Pressley fire started on October 9, 2017. The CAL FIRE website lists the location of the Pressley Fire as “east of Rohnert Park” in Sonoma County. Per CAL this is one of the six fires that were included in the vegetation-caused “Nuns Fire.” <u>Norrbom</u> – According to CAL FIRE, the Norrbom Fire was one of six incidents that make up the “Nuns Fire,” which ignited on October 8, 2017. On June 8, 2018, CAL FIRE issued a press release stating that the Norrbom fire was caused by a tree falling and contacting PG&E power lines. It is possible CAL FIRE was referring to a location on Gehricke Road, Sonoma, at which a black oak tree was found lying on downed conductors. <u>Redwood Valley</u> – According to CAL FIRE, the Redwood Valley incident location was first observed on October 9, 2017. According to the CAL FIRE Investigation Report for the Redwood Incident, a CAL FIRE employee reported a small vegetation fire on the east side of Hawn Creek Road. A PG&E troubleman recalled seeing one of three phases down near the incident location later in the day. <u>Cascade</u> – CAL FIRE determined the Cascade Fire, which occurred in Yuba County on October 8, 2017, was started by sagging power lines coming into contact during heavy winds. PG&E observed that the primary conductors were in place and appeared to be in working order at the time
--	---

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	that CAL FIRE requested possession of the equipment. The secondary service line appeared to be damaged at mid-span, but there was no apparent damage to other PG&E facilities. <u>Partrick</u> – According to CAL FIRE, this fire occurred in Napa on October 8, 2017. When PG&E was granted access to the incident location, PG&E observed that a 20-inch diameter Coast Live Oak tree, approximately 50 feet tall and rooted approximately 40 feet uphill from distribution conductors had broken above its base. One of the two phases on a 12 kV tap line was on the ground. According to CAL FIRE, the Partrick Fire was one of six ignitions that were part of the “Nuns Fire.” <u>Atlas</u> – According to CAL FIRE, the Atlas Fire started in two locations in Napa on October 8, 2017. When PG&E was granted access to the first incident location, PG&E observed a broken tree limb and broken field-phase primary insulator on a 12 kV circuit. A green, healthy tree limb fell from a California White Oak/Valley Oak that was rooted approximately 15 feet from the distribution conductors. When PG&E was granted access to the second incident location, PG&E observed a California Black Oak tree that had broken at the base and was lying on the ground. The base of the California Black Oak tree was burnt and rooted approximately 20 feet from the distribution conductors. <u>Lobo</u> – According to CAL FIRE, the Lobo Fire ignited on October 9, 2017, near Nevada City. CAL FIRE removed both a Ponderosa Pine tree and distribution conductors at the incident location before releasing the incident location. Prior to CAL FIRE removing the tree, PG&E employees who assisted with the evidence collection reported briefly observing the pine tree resting on the conductors. PG&E does not know how the tree came to rest on the conductors because CAL FIRE removed the tree prior to PG&E having a chance to inspect the tree. <u>Oakmont</u> – According to CAL FIRE’s website, the Oakmont Fire started late on October 14, 2017. However, according to PG&E records, a PG&E troubleman was at the Oakmont incident location to assist CAL FIRE on the evening of October 13, 2017, and he reported that there was already a quarter-acre grass fire with CAL FIRE on site working to contain the fire. When PG&E was granted access to the incident location on October 18, PG&E observed that a green, healthy Douglas Fir tree had uprooted and fallen onto other trees. Two of two phases of the 12 kV circuit were down on another tree, but the tree was still standing and not on fire. <u>Pocket</u> – According to CAL FIRE’s website, the Pocket incident started on October 9, 2017, in Geyserville. When PG&E accessed the incident location on October 17, 2017, PG&E observed that a top section of a California White Oak/Valley Oak tree had broken. At least one conductor of a 12 kV circuit was on the ground. The California White Oak/Valley Oak was rooted approximately 15 feet from the distribution conductors.
Lessons Learned	At the time of the October 2017 Wildfires, PG&E did not have a process in place for evaluating specific lessons learned from individual fires. For purposes of this response, we address the October 2017 wildfires collectively because they occurred over a relatively short period of time during significant high wind events. The identified ignitions primarily resulted from: (1) vegetation contact with electrical facilities; and/or (2) equipment failure. Therefore, our lessons learned addressed VM, equipment failure, and high wind weather events.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	We continue to learn from past fires. The CPUC required PG&E to hire an independent firm to undertake a Root Cause Analysis (RCA) of each of the October 2017 wildfires to identify gaps that can be closed to reduce the risk of future catastrophic wildfires. Envista Forensics completed the RCA and published its report in July 2022.^(c) PG&E responded to the Envista findings in August.^(d) PG&E agreed with the majority of the recommendations contained in that report, and referenced the work done by the Company since 2017 in the areas of risk assessment and mapping, situational awareness and forecasting, grid design and system hardening, asset management and inspections, VM and inspections, grid operations and protocols, data governance, emergency protocols, and PSPS. We address some of these items below.
Measures to mitigate cause	<u>Vegetation Contact:</u> In 2019, we Initiated the Enhanced Vegetation Management (EVM) Program in HFTD areas to go above and beyond regulatory requirements and address the highest risk Circuit Protection Zones (CPZ). We concluded this program at the end of 2022. Increased vegetation inspection capabilities for EVM by employing enhanced technologies such as Light Detection and Ranging (LiDAR). By 2019, we had captured LiDAR and imagery data on almost all Tier 2 and Tier 3 HFTD distribution lines. This helped to identify trees within striking distance of distribution lines to aid in the EVM inspection process. Disabled automatic reclosers in Tier 2 and Tier 3 HFTD areas to prevent potential ignitions from vegetation contact in high wind and weather events during fire season.^(e) Implemented a System Hardening Program to mitigate risks associated with vegetation contact. Our system hardening work includes, but is not limited to, undergrounding overhead lines, covering conductor, and creating remote grids in HFTDs/High Fire Risk Areas (HFRA). <u>Equipment Failures:</u> Developed modeling and analytics to evaluate conductor to conductor contact. Evaluated the types of materials used for distribution poles for strength and resiliency to mitigate pole failures. <u>High Winds and Weather Leading to Potential Ignitions:</u> Developed and began implementing a PSPS Program in 2018 for distribution lines that traverse Tier 3 areas to mitigate potential ignitions from vegetation contact or equipment failure that could occur during high wind and other weather events. In 2019, PSPS was expanded to all distribution and transmission lines that traverse Tier 2 and Tier 3 HFTD areas. Since that time, we have worked to reduce the size, scope, and length of PSPS events. Installed weather stations to be more aware of local weather and wind conditions.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

Integration of Lessons Learned into Wildfire Strategy	<u>Vegetation Contact:</u> EVM was integrated into our VM Program and in 2022 we performed work on approximately 1,900 of the highest risk ranked circuit miles. We have incorporated LiDAR vegetation inspections for transmission facilities and have plans to continue to capture and update our LiDAR datasets. (2023-2025 WMP, Sections 8.2.1 and 8.2.2.1) We have continued to enhance and are developing our One Vegetation Management platform which will allow for digital work packages, tracking, and records for VM. (2023-2025 WMP, Section 8.2.4) We have Supervisory Control and Data Acquisition (SCADA)-enabled many reclosers and for reclosers that are automatic, we are continuing to disable them in HFTDs during fire season. (2023-2025 WMP, Section 8.1.8.1) We have significantly expanded our System Hardening Program, including undergrounding, which is intended to reduce the potential for vegetation caused ignitions. (2023-2025 WMP, Sections 8.1.2.1, 8.1.2.2) <u>Equipment Failure:</u> We are focusing our pole loading and replacement program on Tier 2 and Tier 3 HFTD areas to address potential pole failures that may lead to an ignition. In 2022, PG&E completed pole loading analysis of more than 314,000 poles, all of which are considered the highest risk poles, either due to the pole characteristics or location, being in an HFTD area. (2023-2025 WMP, Section 8.1.3.2). In addition, as a part of our System Hardening Program, we are evaluating and, where needed, replacing poles with stronger composite poles that reduce the risk of failure during wildfires. (2023-2025 WMP, Section 8.1.2.3.) Our PSPS Program addresses weather conditions including high wind events. Since conductor to conductor contact typically occurs during high wind events, the PSPS Program can mitigate the wire-to-wire contact that occurred in the Cascade Fire. (2023-2025 WMP, Section 9.2) <u>High Winds and Weather:</u> We have continued to evaluate and refine our PSPS Program, which is intended to prevent ignitions during high wind and other weather conditions, such as RFWs. (2023-2025 WMP, Section 9.) We are continuing to use weather stations and high-definition cameras for situational awareness of high winds and weather events. (2023-2025 WMP, Section 8.3.5.)
Fire Name: Airline Fire	
Date of Ignition	June 4, 2018
Cause Based on Available Information	The Eastern and Airline Fires started at two different points and had two different apparent causes, but they are related. The Eastern Fire resulted when a healthy tree branch leaned into a distribution pole in high winds breaking one of three conductors. (CAL FIRE determined that tree-trim activities were sufficient.) The Airline Fire was a result of the Eastern Fire vegetation contact which caused a fault current resulting in a conductor failure on a long span and a wire down.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	The length of the conductor on the long span that failed following the Eastern Fire was over 600'. The long span and the natural topography around the incident pole could have contributed to wind-generated oscillation of these lines, and over time, weakened the conductor. In addition, the lengthy span was not equipped with a vibration damper.
Lessons Learned	The tree which caused the initial ignition (Eastern Fire) was healthy and CAL FIRE determined that tree-trim activities were sufficient. For this reason, there is no lesson learned associated with the Eastern Fire. The long span and the natural topography around the incident pole for the Airline Fire could have contributed to wind-generated oscillation of these lines, and over time, weakened the conductor which led to the wires down event. A vibration damper may have prevented oscillation and this ignition.
Measures to mitigate cause	As stated above, PG&E has determined from previous failure analysis, asset evaluations, and industry knowledge that wind and outside forces induced vibration can weaken conductor overtime. Further, PG&E considers vibration dampers a mitigation to the threat of conductor vibration and an asset-life extension strategy. PG&E has current standards that require the installation of vibration dampers for distribution span configurations that are exposed to high risk of vibration. ^(f) Additionally in 2023, PG&E published a standard with an effective date of 3/5/2023 to include spiral vibration dampers on new installations of 1/0 Aluminum Conductor Steel Reinforced (ACSR) and #2 Copper CC that are greater than 300 feet in length.
Integration of Lessons Learned into Wildfire Strategy	Upon review, our current maintenance tags do not include a field for missing vibration dampers. In 2023, PG&E will perform an extent of condition and risk evaluation of conductor vibration for the existing HFTD distribution system to identify HFTD distribution spans where dampers may be needed and risk prioritize installation of dampers with other maintenance and inspection activities across the distribution system.
Fire Name: Camp Fire	
Date of Ignition	November 8, 2018
Cause Based on Available Information	CAL FIRE investigators determined the cause of the Camp Fire was electrical arcing between an energized jumper conductor (power line) and the steel tower structure. Investigators determined a "C hook" that linked an insulator string connected to the jumper conductor to the transposition arm of a PG&E tower failed, allowing the energized jumper conductor to make contact with the steel tower structure. The ensuing electrical arcing between the jumper conductor and steel tower structure caused the aluminum strands of the conductor to melt as well as a portion of the steel tower structure. The molten aluminum and steel fell to the brush covered ground at the base of the steel tower structure. This molten metal ignited the dry brush, which resulted in the fire. The broken "C hook" that led to the arcing showed substantial wear with age. The ignition occurred on a RFW day.
Lessons Learned	The lessons learned from the Camp Fire include: (1) the need for rigorous equipment inspections and maintenance; and (2) using risk modeling to prioritize inspection and maintenance work so that maintenance is performed in the highest risk area for wildfires. In the enhanced inspection process, wear on C-Hooks and other equipment was specifically addressed.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

Measures to mitigate cause	<u>Enhanced Asset Inspections:</u> Initiated Wildfire Safety Inspection Program (WSIP) in 2019 to perform enhanced inspections of all PG&E overhead transmission and distribution equipment and facilities in HFTD areas. This program, which became the foundation of our current enhanced inspection program, was informed by a Failure Modes and Effects Analysis (FMEA) that PG&E conducted after the Camp Fire. The FMEA identified multiple potential points of failure on transmission assets that could cause ignitions, including wear on C-hooks and other insulator attachment hardware, and the failure points capable of visual observation were incorporated into WSIP inspection forms. A similar approach was utilized for WSIP inspections of distribution facilities. PG&E's enhanced WSIP inspections differed from our prior routine inspections in various ways, including: for transmission towers in elevated and extreme high fire threat- areas, the use of climbing and drones equipped with high-resolution- cameras; inspection forms that specifically required inspectors to check for certain potential failure modes (including worn cold end- hardware) and document the condition of various components (including cold end- hardware), regardless of whether they required repair; review of drone photographs by members of the Drone Inspection Review Team; and review and prioritization of inspection findings by Centralized Inspection Review Team, composed of qualified personnel with collective experience in engineering, inspections and maintenance. <u>Risk Modeling and Prioritized Inspections and Maintenance:</u> Develop risk models that specifically evaluate the potential for asset or equipment failure, including failure associated with asset age, environmental factors such as wind speed and direction, corrosion, and other relevant risk drivers where such a failure may result in a wildfire ignition. Use risk models to inform prioritization of highest risk maintenance tag work <u>Expanded PSPS Program:</u> In 2019, PSPS was expanded to all distribution and transmission lines that traverse Tier 2 and Tier 3 HFTD areas.
Integration of Lessons Learned into Wildfire Strategy	<u>Enhanced Asset Inspections:</u> We have implemented detailed asset inspections which are now a part of wildfire strategy for both distribution and transmission facilities in HFTD and HFRAs.^(g) (2023-2025 WMP, Section 8.1.3.) <u>Risk Modeling and Prioritized Inspections and Maintenance:</u> We are developing sub-models for our risk modeling that specifically evaluate the potential for equipment failure. (2023-2025 WMP, Sections 6.2.1 and 8.1.3). We have also used risk modeling to prioritize inspections for transmission facilities. (See 2023-2025 WMP, Section 8.1.3.) PG&E is using risk modeling to proactively reduce risk from the current backlog of maintenance tags by prioritizing the highest risk tags. (2023-2025 WMP, Section 8.1.7.)

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

Fire Name: Lonoak Fire	
Date of Ignition	June 25, 2019
Cause Based on Available Information	The fire ignited from a wire down event near King City. A PG&E electric crew foreman and distribution supervisor conducted a patrol downstream of the incident location to look for a possible source of the fault that coincided with the fire ignition. About 1.4 miles downstream of the incident location, a bird nest was located on a distribution pole. A few spans further downstream from the bird nest, bird feathers were observed attached to one of the conductors along with black marks on two of the conductors. Bird feathers were also found on the ground under the conductors where the black marks on the conductors were observed. Based on these observations, it was concluded that this fire resulted from avian contact across two phases at the bird contact location, resulting in a fault current that caused the #2 gauge Aluminum Conductor Steel Reinforced (ACSR) wire to fail at the incident location. In addition, the Alcoa Stockbridge vibration dampers used on this older conductor may have contributed to the failure of the conductor wire. PG&E had ceased installing this type of vibration damper previously.
Lessons Learned	Periodic inspection and maintenance of the equipment was not adequate for the conductor or the vibration damper. In addition, a higher-level inspection should have taken place given the presence of the Stockbridge vibration damper on a 2ACSR wire.
Measures to mitigate cause	A Corrective Action Program (CAP) event was assigned to determine the ongoing risk from vibration dampers in the field and deployed on #2 ACSR and #4 ACSR conductor wires. The team evaluated extent of risk between #2 ACSR and Alcoa Stockbridge dampers. The evaluation did not identify any specific risk. However, as circuits with #2 ACSR are identified through maintenance or planned projects, the dampers will be replaced.^(h) PG&E's Overhead Inspection Job Aid was updated with photographs to demonstrate what to look for in inspections with regard to broken wire stands at the vibration damper.⁽ⁱ⁾
Integration of Lessons Learned into Wildfire Strategy	As indicated above, we have updated our job aid regarding inspections for broken wire near vibration dampers. More generally, we have implemented detail inspections and are working to improve inspection quality. Our detailed inspection processes are described generally in Section 8.1.3 of the 2023-2025 WMP. We also described the improvements made to our asset inspections in the response to Critical Issue RN-PG&E-22-08 as part of the 2022 Revised WMP.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

Fire Name: Kincade Fire	
Date of Ignition	October 23, 2019
Cause Based on Available Information	The Kincade Fire ignited in the Geysers geothermal area in Sonoma County on October 23, 2019. According to CAL FIRE, a jumper cable on the Geysers #9 Lakeville 230 kV transmission line broke and arced upon failure toward the associated steel tower. CAL FIRE concluded this arcing ignited the vegetation below and ignited the fire. The portion of the transmission line connected to the broken jumper remained energized at the time of the incident though it had not served load to the neighboring Calpine-owned geothermal facility for several years. During the fire investigation, it was also determined that, following Calpine's request to remove the connection between the line and the Calpine-owned facility, the jumper cable had been configured as "open"—i.e., electrically connected at only one end, rather than both ends. According to CAL FIRE, due to this configuration, the jumper cables may have had a greater range of movement, potentially increasing the wear on the jumper cable at issue to the point that it failed during the wind event on October 23, 2019.
Lessons Learned	There were two primary lessons learned from the Kincade Fire. First, the need to provide additional guidance on how to routinely evaluate whether facilities in the field are idle and need to be de-energized and/or removed. Second, the need to provide additional guidance on the proper construction of open jumpers in order to prevent any undesired outcomes that may result from jumper conductor length or movement.
Measures to mitigate cause	<u>Removal of Idle Facilities and Open Jumpers:</u> Immediately after the Kincade Fire, PG&E reviewed all transmission lines to determine if other energized spans not serving customer load remained in the field. Based on the review, one line segment in an HFTD area was identified and de-energized. PG&E issued revised guidance for employees and contractors regarding idle facilities and issued guidance on open jumpers to be cut as short as practical, typically 2-3 feet in length.⁽ⁱ⁾ PG&E surveyed our transmission system to identify and remediate open jumpers not in compliance with new guidance. PG&E revised inspection forms so that inspectors are required to report facilities that are not serving customer load. PG&E removed remaining idle facilities in the area where the Kincade Fire was initiated. PG&E implemented plan to remove conductor and structures (where applicable) associated with approximately 70 permanently abandoned transmission lines or portions of transmission lines.^(k) <u>Risk Modeling:</u> PG&E developed risk modeling intended to focus on the probability of asset failure to prioritize asset management work. As detailed in Section 6.2, the WTRM provides a forecast of the probability of failure for individual transmission equipment components based on the threats that impact the

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	condition of the asset, such as corrosion, decay, wear, and the hazards the equipment must withstand, such as wind. <u>Enhanced Asset Inspections and Maintenance:</u> PG&E implemented enhanced inspections and risk prioritized maintenance programs to address items identified during inspection (See Section 8.1.3 of the 2023-2025 WMP for a general discussion of our transmission asset inspection work.).
Integration of Lessons Learned into Wildfire Strategy	<u>Idle Facilities:</u> In 2022, PG&E removed 63 miles (HFTD and non-HFTD) of permanently abandoned transmission facilities in our system. In 2023, PG&E will continue to remove permanently abandoned conductor and structures associated with the 70 permanently abandoned transmission lines or portions of transmission lines we have identified <u>Risk Modeling:</u> We have developed the WTRM to assess risk based on the probability of equipment or an asset failure (See generally, 2023-2025 WMP, Section 6.2). The risk model allows for the future prioritization of inspections and wildfire mitigation work plans based on probability of failure and the potential consequence of a wildfire. <u>Enhanced Asset Inspections and Maintenance:</u> We have been implementing enhanced inspections in HFTD and HFRA areas and prioritizing maintenance in these areas. These programs are described in more detail above in the discussion of the Camp Fire. <u>Low Cycle Fatigue:</u> A CAP has been opened to evaluate the extent of condition for low cycle fatigue threats to the transmission overhead system. The CAP is currently open, and we expect to perform testing in 2023.
Fire Name: Grizzly Fire	
Date of Ignition	October 27, 2019
Cause Based on Available Information	Grass fire occurred in a wildlife area used for bird and elk hunting. PG&E did not evaluate or collect physical evidence at the time because none of the authorities or media reports suggested that PG&E's facilities were implicated. The fire could have resulted from overhead electrical equipment, but we are unable to determine the precipitating event(s) which may have caused an equipment failure. There was an RFW the day of ignition.
Lessons Learned	Although PG&E was unable to determine the apparent and/or contributing causes of this fire, three mitigation measures were implemented.
Measures to mitigate cause	<u>Special Patrol of Circuit:</u> Following investigation of the incident, and out of an abundance of caution, an additional patrol was initiated downstream from a line recloser source-side of the fire's suspected area of origin to: Verify raptor construction. Identify any spans where the conductor may be too close together, where spreader brackets could be installed, if needed.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	Identification of any poles that were leaning and causing too much slack on the conductors. Identification of splice counts on each span (pole to pole). <u>Use of Wooden Pole Elk Guards:</u> Elk guards used to add additional protection to wooden poles near the suspected area of origin. <u>Evaluation of Line Spreader Devices:</u> Assessment to determine if the use of line spreader devices or other protective devices could be effective in reducing the likelihood of a potential line-to-line fault at the Incident Location (Tier 1 Non-HFTD).
Integration of Lessons Learned into Wildfire Strategy	Because the cause of the fire was not definitively determined, we have not been able to include specific lessons learned into our wildfire strategy, but we performed mitigations related to the specific incident location. However, our enhanced inspection program, described above in the discussion of the Camp Fire, identifies asset conditions that may result in ignitions and prioritizes high risk maintenance work to mitigate the potential for ignitions.
Fire Name: Drum/Lompoc Fire	
Date of Ignition	June 14, 2020
Cause Based on Available Information	On June 14, 2020, a line recloser on a 12 kV distribution circuit opened due to a line-to-line fault that was detected. PG&E dispatched troublemen to investigate the outage. Upon arrival at the incident location, the troublemen observed smoke and an electrical conductor between two poles that failed midspan. According to the Santa Barbara County Fire Department, the conductor had ignited vegetation when it contacted the ground. Though the SED cited PG&E for failure to maintain minimum clearances, PG&E determined that the spacing of conductors on the pole at both ends of the incident span exceeded the minimum clearances required by General Order 95, Rule 38, and we are unaware of any condition that would have increased the risk of the lines contacting one another in the middle of the span. Ultimately, the specific cause of the failure could not be determined.
Lessons Learned	We were not able to determine the specific cause of the conductor failure. There was no vegetation in the area and although there is bird activity, no bird carcass was found afterwards. We are improving our ignition investigation capability to be able to do more extensive analyses of these types of ignitions in the future. In addition, to the extent the fire was the result of equipment failure, our enhanced inspection program is intended to review all of our equipment and identify equipment that may fail and cause a wildfire ignition.
Measures to mitigate cause	See Camp Wildfire (describing enhanced inspection measures).
Integration of Lessons Learned into Wildfire Strategy	See Camp Wildfire (describing enhanced inspection measures). In early 2021, PG&E established the EIA Program, uniting experts in different departments, including equipment failure experts in Applied Technology Services and Asset Failure Analysis (newly-established to support this process), to better understand the causes of PG&E facility ignitions and recommend targeted corrective actions to reduce the risk of

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	wildfires. In regard to ignitions where equipment failure is the suspected cause, the EIA team will coordinate the collection of failed assets for testing and analysis then analyze remaining risk (Extent of Condition) to inform wildfire mitigation strategies. (See Sections 10 and 11 of the 2023-2025 WMP for additional details regarding PG&E's wildfire investigation work and communications of lessons learned.)
Fire Name: Zogg Fire	
Date of Ignition	September 27, 2020
Cause Based on Available Information	According to CAL FIRE, on September 27, 2020, a gray pine near Zogg Mine Road in unincorporated Shasta County failed and struck PG&E powerlines. This contact resulted in an ignition of the vegetation beneath the powerlines. The ignition occurred on a RFW Day and quickly spread beyond the area of origin. The trees in the area where the ignition occurred had been inspected in 2018, 2019, and 2020. Photographs of the subject tree from PG&E's July 2019 LiDAR indicate the subject tree had a green canopy and appeared healthy, according to CAL FIRE's arborist expert.
Lessons Learned	Our analysis of the Zogg Fire led us to further evaluate the propensity for tree related- outages and overstrike tree potential, specifically during certain weather conditions such as RFW days, and to pilot programs to perform more detailed inspections of potential strike trees on routine VM patrols.
Measures to mitigate cause	<u>Vegetation Contact:</u> See October 2017 Fires for discussion of mitigations implemented regarding vegetation contact. <u>Public Safety Power Shutoff:</u> We modified our PSPS Protocols to include locations with tree over-strike potential in the 70th percentile or above. This was described in more detail in our 2021 WMP. (2021 WMP, p. 980)
Integration of Lessons Learned into Wildfire Strategy	<u>Vegetation Contact:</u>⁽¹⁾ EVM was integrated into our VM Program and in 2022 we performed work on approximately 1,900 of the highest risk ranked circuit miles. Given the effectiveness of the EPSS Program and resources required for EVM, we will no longer be performing EVM work in 2023. However, we will be continuing some EVM procedures in high-risk areas. (See 2023-2025 WMP, Section 8.2.3.4.) We have incorporated LiDAR vegetation inspections for transmission facilities and have plans to continue to capture and update our LiDAR datasets. (2023-2025 WMP, Sections 8.2.1 and 8.2.2.1) We have SCADA-enabled many reclosers and for reclosers that are automatic, we are continuing to disable them in HFTD Tier 2 and 3 areas during fire season. (2023-2025 WMP, Section 8.1.8.1.2) We have significantly expanded our System Hardening Program, including undergrounding, which is intended to mitigate the potential for vegetation caused ignitions. (2023-2025 WMP, Section 8.1.2.)

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	<u>PSPS:</u> We have continued to evaluate and evolve our PSPS protocols. We have incorporated tree-overstrike potential as a key attribute in our PSPS models that are based on artificial intelligence and machine learning. (See 2023-2025 WMP, Section 9.2 for additional information.) We have incorporated high-risk vegetation and asset tags into our PSPS protocols so that we can inform the scope of PSPS events, appropriately, to address this potential risk.^(m) (2023-2025 WMP, Section 9.2.)
Fire Name: Dixie Fire	
Date of Ignition	July 13, 2021
Cause Based on Available Information	According to CAL FIRE, the Dixie Fire ignited in the Feather River Canyon when a tree failed and fell onto an overhead distribution line. As a result of the tree contact, fuses on two of the conductors operated, but the third fuse did not operate, and that line remained energized. The contact between the tree and the energized line eventually led to an ignition. CAL FIRE notes that at the time of the failure, the tree that contacted PG&E's powerlines was alive, vital, and growing vertically. Post-fire inspection suggested the tree had previous damage and decay that contributed to its failure.
Lessons Learned	Even on non-RFW days and/or days with no weather or wind events, an ignition can occur when vegetation or other objects contact an energized powerline. Outages in HFTD areas whose cause cannot be quickly ascertained may call for a more expedited response time even if there is not a known safety hazard, especially during summer months during times of drought. PG&E's investigation is ongoing and may lead to the implementation of additional measures.
Measures to mitigate cause	<u>Enhanced Powerline Safety Settings:</u> The EPSS Program was implemented following the Dixie Fire to reduce the potential for vegetation contact resulting in an ignition. It is not weather dependent like PSPS. EPSS has been enabled on all HFRA and EPSS buffer area distribution circuits in our service territory based on Fire Potential Index conditions and criteria approved by our Wildfire Risk Governance Steering Committee. While EPSS has been shown to reduce ignitions, it can lead to more frequent outages, as it inverts the typical system protection plan. <u>Outage Response Times:</u> After the Dixie fire, PG&E targeted responding safely to any outages in Tier 2 and Tier 3 HFTD areas like we would for a 9-1-1 emergency—with a goal of 60 minutes. In early 2022, that was refined and aligned with EPSS circuit enablement—which are turned on when there are conditions of heightened wildfire risk in HFRA and the EPSS buffer areas. Our goal is to respond to outages on EPSS-enabled circuits within 60 minutes or less.⁽ⁿ⁾ <u>Undergrounding:</u> After the Dixie Fire, PG&E announced a plan to underground 10,000 of distribution powerlines in high fire risk areas. Undergrounding powerlines will help reduce vegetation contact ignitions. (2023-2025 WMP,

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

	Section 8.1.2.2.) From 2023-2026, PG&E intends to underground 2,100 circuit miles of distribution lines in high fire risk areas. We note that the circuit associated with the Dixie Fire was in the scoping process for undergrounding in 2021 before the fire occurred.
Integration of Lessons Learned into Wildfire Strategy	<u>EPSS:</u> The EPSS Program was implemented following the Dixie Fire to reduce the potential for vegetation contact resulting in an ignition. It is not weather dependent like PSPS. EPSS has been enabled on all HFRA and EPSS buffer area distribution circuits in our service territory based on Fire Potential Index conditions and criteria approved by our Wildfire Risk Governance Steering Committee. While EPSS has been shown to reduce ignitions, it can lead to more frequent outages, as it inverts the typical system protection plan. <u>Outage Response Times:</u> After the Dixie fire, PG&E targeted responding safely to any outages in Tier 2 and Tier 3 HFTD areas like we would for a 9-1-1 emergency—with a goal of 60 minutes. In early 2022, that was refined and aligned with EPSS circuit enablement—which are turned on when there are conditions of heightened wildfire risk in HFRA and the EPSS buffer areas. Our goal is to respond to outages on EPSS-enabled circuits within 60 minutes or less. <u>Undergrounding:</u> After the Dixie Fire, PG&E announced a plan to underground 10,000 of distribution powerlines in high fire risk areas. Undergrounding powerlines will help reduce vegetation contact ignitions. (2023-2025 WMP, Section 8.1.2.2.) From 2023-2026, PG&E intends to underground 2,100 circuit miles of distribution lines in high fire risk areas. We note that the circuit associated with the Dixie Fire was in the scoping process for undergrounding in 2021 before the fire occurred.
Fire Name: Mosquito Fire	
Date of Ignition	September 6, 2022
Cause Based on Available Information	According to CAL FIRE, the Mosquito Fire began on September 6, 2022 near OxBow Reservoir in Placer County near PG&E transmission (60 kV) facilities. PG&E has not observed down conductor in the area or any vegetation related issues. The cause of the fire is under investigation.
Lessons Learned	There are currently no lessons learned from this ignition because its cause is still under investigation.
Measures to mitigate cause	N/A see Lessons Learned.

**TABLE PG&E-22-08-1:
LESSONS LEARNED FROM UTILITY-CAUSED CATASTROPHIC FIRES
(CONTINUED)**

Integration of Lessons Learned into Wildfire Strategy	N/A see Lessons Learned.
(a) Preventing and Mitigating Fires While Performing PG&E Work Standard (TD-1464S). See Appendix E. (b) Chainsaw Operation for Vegetation Management (TD-7101M-11), Rev 0 (2/1/2022). See Appendix E. (c) Envista Forensics, <i>Root Cause Analyses of the 2017-18 Wildfires</i>, (July 6, 2022). See Appendix E. (d) Comments of Pacific Gas and Electric Company on Envista Forensic's Final Root Cause Analysis Report, (August 4, 2022). See Appendix E. (e) Enhanced Powerline Safety Settings (EPSS) and Patrol Process (TD-2700P-26), (11/24/2022) (EPSS settings now disable reclosing). See Appendix E. (f) Vibration Damper Requirements for Various Types of Overhead Conductors, 015073, Rev. #5 (12/17/2020). See Appendix E. (g) Job Aid: Overhead Assessment (TD-2305M-JA02), Rev. 11 (April 3, 2023); Transmission Patrols and Enhanced Inspection Frequency Guidelines (TD-8123P-100), Rev. 0 (03/12/2022); Electric Transmission Line Guidance for Setting Priority Codes (TD-8123P-103), Rev. 0 (01/03/2023). See Appendix E. (h) Vibration Damper Requirements for Various Types of Overhead Conductors, 015073, Rev. #5 (12/17/2020). See Appendix E. (i) Job Aid: Overhead Inspection (TD-2305M-JA02) (3/23/2022). See Appendix E. (j) Overhead Transmission Line Design Criteria, Doc No. 068177, Rev. 14, (12/17/2020). See Appendix E. (k) PG&E Removal Plan for Permanently Abandoned Transmission Facilities. See Appendix E. (l) In 2022, we conducted a pilot program to perform a visual inspection of all sides of a potential strike tree on routine VM patrols in HFTD areas. We are still evaluating the results of the pilot and have not yet made changes to our processes or procedures. (m) Public Safety Power Shutoff for Transmission and Distribution Procedure (PSPS-1000P-01), 9/1/2022. See Appendix E. (n) Enhanced Powerline Safety Settings (EPSS)-Electric Operations Restoration Dispatch Requirements (TD-2202P-01) (11/01/2022). See Appendix E.	

ACI 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; and*
- 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.*

PG&E Response:

Mitigating wildfire risk posed by utility assets is a rapidly evolving area of practice where improvements are achieved through the adoption of data and methods. As such, PG&E's WDRM has evolved—and improved—over time. As highlighted by the Independent Safety Monitor Quarterly Report, dated October 2022, “PG&E's wildfire risk models have seen considerable refinement, incorporating such things as advanced machine learning, the introduction of increasing sources of historical ignitions, greater geographic granularity and environmental inputs, distance weighting, and the use of more advanced wildfire spread and consequence formulation over time.”²⁸⁶ [Figure PG&E-22-09-1](#) highlights the evolution and improvements from WDRM v1 to WDRM v3.

²⁸⁶ PG&E Independent Safety Monitor Status Update Report, Filsinger Energy Partners, (October 4, 2022) (Filsinger, October 2022), p. 19. See [Appendix E](#).

**FIGURE PG&E-22-09-1:
EVOLUTION AND IMPROVEMENTS – WDRM V1 THROUGH WDRM V3**

Evolution and Improvements of PG&E's Wildfire Distribution Risk Model			
	2019 WDRM v1	2021 WDRM v2	2022 WDRM v3
Probability	Exposure	HTFD T2/3	HTFD T2/3
	GIS Vintage	2018	2018v/2020c
	Risk Event	2015-2018 Ignitions	2015-2019 Ignitions
	Vegetation	Yes	Yes
	► LiDAR Data	No	No
	Conductor	Primary	Primary
	Support Structures	No	No
	Transformers	No	No
	Compositing	No	No
	Mitigation Effectiveness	No	No
Consequence	Exposure	HTFD T2/3	HTFD + Burnable Tier 1
	GIS Vintage	July 2016	April 2019
	Fuels	2012 LANDFIRE	2020 Fuels Snapshot
	Simulation Duration	6 Hours	8 Hours
	Consequence Formulation	Reax Index comp. Volume and Structures	FBI >= 2 and Acres >= 300 and Buildings >= 50, OR FBI >= 3
			FPI >= R4, OR FL >= 5 and ROS >= 12

A natural byproduct of these improvements is that risk prioritization rankings can and will change. PG&E continues to emphasize that risk models are a statistical analytical approach to approximating and estimating the risk of wildfire which is a dynamic risk. As such, outputs from successive risk models will shift with the update of each additional year of events (outages and ignitions) as well as modeling improvements. Between WDRM v2 and v3 several factors resulted in shifts to circuit segment prioritization. What follows is a description of the modeling improvements, data improvements, resulting shifts in prioritization, and locations of projects that were deprioritized.

Modeling Improvements

Version 1 (v1) – 2019

In 2019 PG&E started to prioritize circuits and circuit segments for wildfire risk mitigation using our v1 model. Ignition probability was derived from outage and ignition data using a logistical regression model. Wildfire consequence predictions came from fire modeling software vendor REAX Engineering.

The WDRM v1 supported mitigation work conducted from 2019-2021.

Version 2 (v2) – 2020-2021

The second generation of the WDRM took a meaningful step forward by using more advanced modeling, examining more sub-drivers with regards to ignitions, and using PG&E's MAVF to predict wildfire consequences. The v2 model used more advanced algorithms and machine learning.

PG&E also improved the modeling so that it was more granular spatially and by risk driver. The spatial resolution of the model was improved from circuits in v1 to 100 x 100-meter (m) areas (pixels) in the HFTD in v2. In addition, we modeled vegetation-caused ignitions separately from other ignitions along conductor lines to understand these two risk drivers. This resulted in two related but separate models (i.e., vegetation-caused and conductor-involved), each of which was used by a different wildfire risk mitigation program (EVM and System Hardening, respectively).

V2 was also upgraded to use physics-based fire simulation outputs provided by vendor Technosylva, mapped into MAVF fire size/severity tranches based on their simulated characteristics, to quantify wildfire consequence.

Version 3 (v3) – Modeling in 2021 for Use Starting in 2022

For the WDRM v3 model, PG&E implemented numerous improvements based on internal review and feedback from public safety specialists, other partners, interveners, and a third-party review. This version uses more-advanced machine-learning modeling techniques, incorporates improved and updated data, adds predictions of wildfire risk reduction when mitigating various sources of risk, expands to understand additional ignition sources and sub-drivers, and more.

This version also models several “causal pathways” to ignitions separately, allowing for the nature of these causes to inform the type of model structure and relevant covariates. This also allows for a more specific mapping between cause categories and the mitigations that address them.

Data Improvements

WDRM v3 model data improvements have focused on three areas: (1) event data (outage, PSPS damages, and ignitions); (2) model inputs (covariate), for the probabilistic (Likelihood of a Risk Event) models; and (3) wildfire simulation data and historical fire records in the development of the wildfire consequence (Consequence of Risk Event) models.

Updated and Expanded Outage and Ignition Training Event Data

PG&E has a rich set of ignition data starting in 2015. The WDRM v3 model estimates both the probability of outage and probability of ignition from outages using outage and ignition data through 2020 (where outage data includes imputed data from damages incurred when the power was off for PSPS events) to enable more detailed dissection of data by cause and equipment involved without the loss of predictive power.

More Accurate, Covariate Data Inputs

The WDRM v3 includes more accurate inputs such as tree data from a combination of LiDAR and satellite data, updated weather data from PG&E’s meteorology team, tree species data, and predictions from PG&E’s pole loading simulation program.

An Improved Wildfire Consequence Model

We significantly upgraded the wildfire consequence model using improved wildfire simulation data and calibration with historical fire records to provide improved predictions. In line with an E3²⁸⁷ report recommendation, the planning and operational versions of wildfire consequence were developed from a common core data set and framework. This has improved the coordination between the two models.

The fuels layer used in the Technosylva fire simulation was updated to replace current fire scars with a 2030-fuels forecast. As described in PG&E's 2022 WMP,²⁸⁸ 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."²⁸⁹

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 use high resolution imagery sources to conduct burn severity mapping to provide fuels updates for burn areas.

Shifts in Risk Prioritization

Due to changes in the categories of events modeled, the geographic territory covered, and circuit segment name and circuit geometry changes, there is no direct comparison between v2 and v3.

The closest comparison is a comparison of the vegetation models. In v2 of the WDRM, the vegetation model had an overall Receiver Operator Characteristic – Area Under the Curve (AUC) score of 0.73, while v3 (which models trunks, branches, and other

²⁸⁷ E3 is Energy, Environment and Economics, an independent third-party who evaluated PG&E's wildfire risk models.

²⁸⁸ See PG&E's 2022 WMP (July 26, 2022), Section 4.5.1(d) Wildfire Consequence Model and an August 2022 Data Response to OEIS (OEIS_016-Q02).

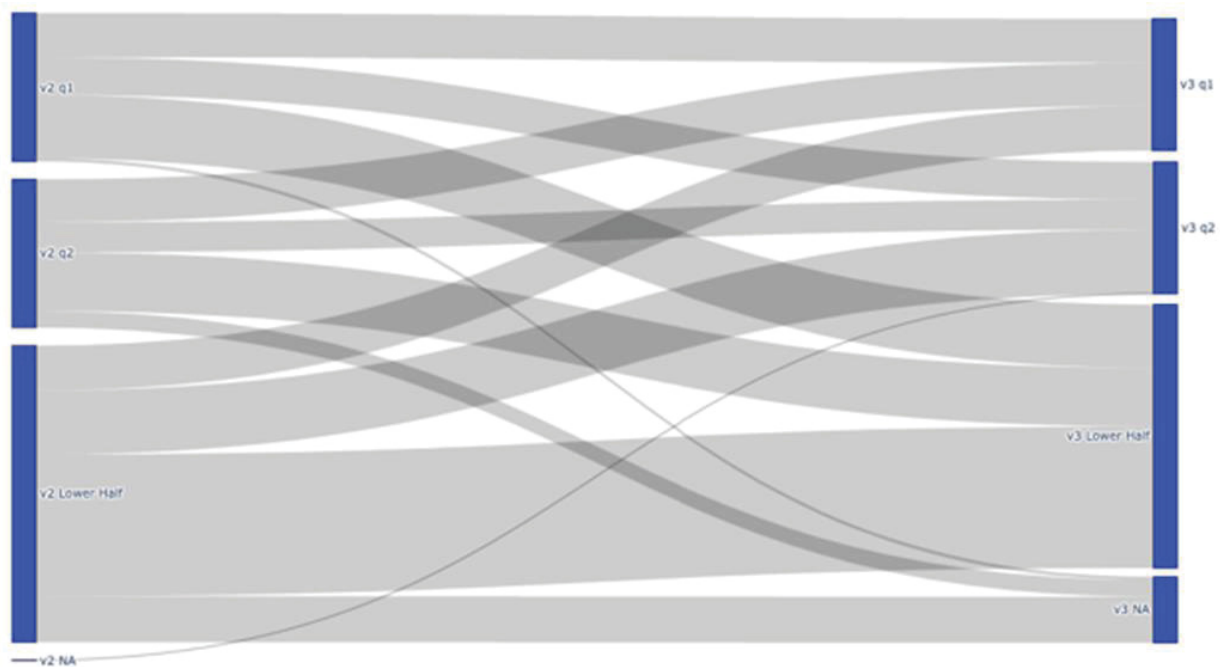
²⁸⁹ PG&E's 2022 WMP (July 26, 2022), p. 183.

attributes separately) shows an improvement over v2 with an AUC score for the vegetation composite of 0.78.

Nevertheless, if the resulting HFTD circuit segment prioritization for the System Hardening composite from the v2 and v3 model are compared, the movement of circuit segments can be observed. The Sankey chart below ([Figure PG&E-22-09-2](#)) displays movement between the top two quartiles and the lower 50 percent from the v2 model on the left to the v3 model on the right. The following observations correspond to flows on the Sankey chart:

- 25 percent of v3 1st and 2nd quartile circuit segments are new and were not present in the v2 model;
- The majority of new v3 circuit segments are ranked in the lower half in the v3 model; and
- Approximately one-third of v2 1st and 2nd quartile circuit segments move to the lower 50 percent in v3.

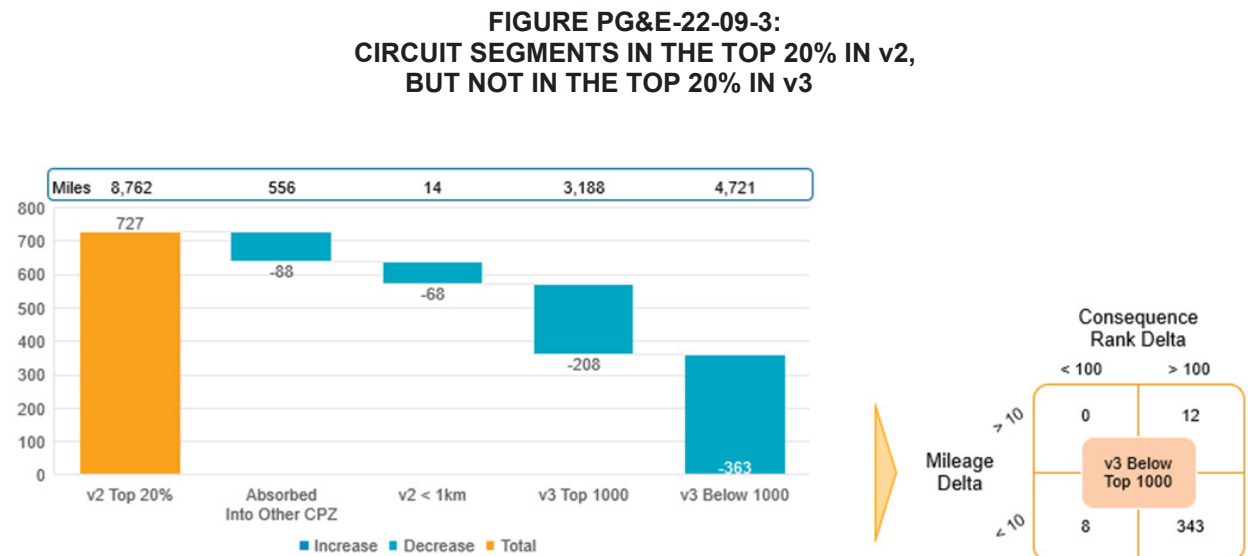
**FIGURE PG&E-22-09-2:
SANKEY VIEW SYSTEM HARDENING CIRCUIT SEGMENT RISK, v2 VS. v3**



In most cases, the central cause of changing risk was updated consequence values. The following causes were also found to play a role:

- Geometry changes including addition, subtraction, and the splitting of the CPZ into two or more distinct circuit segments in v3;
- Name changes including the absorption of CPZs into others resulting in the original CPZ no longer existing;
- The handling of CPZs that were partially included in HFTDs. In v2, the total risk was found by only summing those risk pixels belonging to the CPZ whose centroid was within the HFTD while in v3, all pixel risks belonging to the CPZ were summed whether or not it was included in the HFTD.

We studied risk changes for those circuit segments which were in the top 20 percent of risk in v2 but had dropped out of the top 20 percent in v3 as shown in [Figure PG&E-22-09-3](#) below.



Of the 727 circuit segments in the top 20 percent of v2 risk:

- 88 were absorbed into another circuit segment name; and
- Another 68 circuit segments were less than 1km long.

Of the remaining 571 circuit segments:

- 208 remained in the v3 top 20 percent (or top 1,000).

Of the top 727 circuit segments in the v2 top 20 percent:

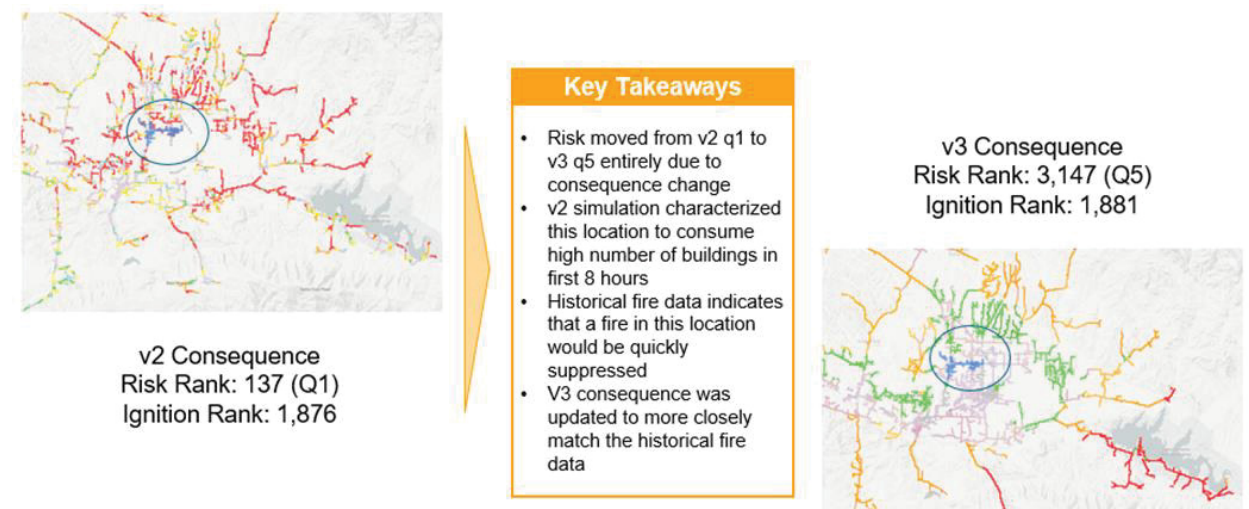
- 363 dropped to the lower 80 percent.

Of these 363 circuit segments:

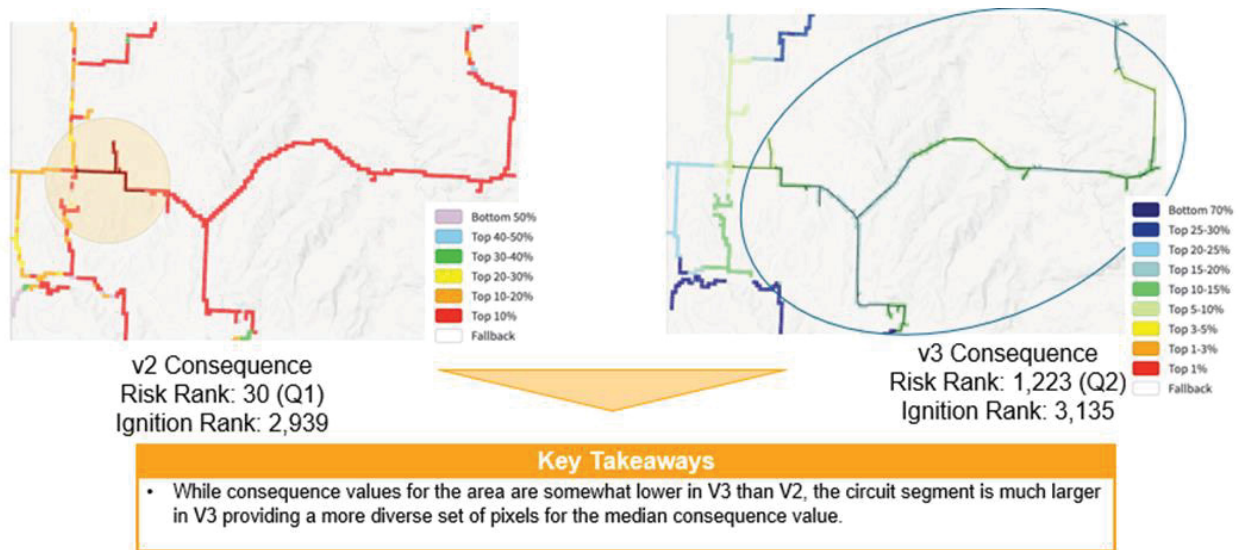
- Most of moves (343) were dominated by a large shift in the wildfire consequence value and rank;
- A small portion of these moves (12) were influenced by both a large shift in the circuit segment mileage and wildfire consequence; and
- 8 circuit segments moved due to a shift in the ignition probability and were minimally influenced by wildfire consequence or a change in length.

The two figures below ([Figure PG&E-22-09-4](#) and [Figure PG&E-22-09-5](#)) illustrate these movements between the two versions of the risk model:

**FIGURE PG&E-22-09-4:
SANTA YNEZ 1104CB – LARGE CONSEQUENCE CHANGE, SMALL MILEAGE CHANGE**



**FIGURE PG&E-22-09-5:
POSO MOUNTAIN 2103CB – SMALL CONSEQUENCE CHANGE, LARGE MILEAGE CHANGE**



Project Impacts

Because of the relationship between when WDRM v3 was approved and the development of workplans, there were no projects that were de-prioritized from the changes implemented between V2 and V3 of the model.

As summarized and highlighted by in the ISM Quarterly report:

“Since the wildfire mitigation work plans for EVM and system hardening for 2021 and 2022 have been focused on working on CPZs at the top of the V2 risk ranking, some of this completed and still in-progress work has/is continuing to be done on CPZs that the latest model has now identified as lower risk. For the WMP EVM programs, work in 2021 was primarily focused on CPZs risk ranked 1 to 100 using a tree-weighted adjustment (as detailed in the WMP) to the V2 model. For 2022, the EVM work is focusing primarily on CPZs ranked using same model from 101-253. Given annual work plan horizons, and the approval of V3 of the model in April 2022, the first EVM, system hardening and distribution inspection work plans that are anticipated to be risk informed by V3, are not scheduled to begin until 2023.

As previously noted, system hardening projects can take years between when they are initially scoped, and when construction may begin. During such an extended period, changes to the risk models have been occurring, with accompanying shifts in CPZ risk rankings. As a result of these changes, previously approved system hardening projects have not yet initiated construction on CPZs that are now ranked as much lower risk.

With the release of V2 in late 2020, PG&E directed the reprioritization of the System Hardening Program, halting many projects and placing them on-hold pending reevaluation. Throughout 2020 and 2021, these projects were reevaluated, and many were brought back into the workplan for reasons such as EPSS Recommendations, CalTrans Design Standard Decision Document pilot, and PSPS

lookback changes. PG&E elected to hold and wait until the release of V3 to complete the final opportunity assessment and then decide whether to cancel several projects scheduled to occur on CPZs now deemed lower risk.

The shifting of the distribution circuit/CPZ risk rankings between model versions over the past five years also has the unintended consequence of making it appear as if much of the previous EVM and system hardening work was focused on areas now forecast to have lower risk.”²⁹⁰

²⁹⁰ Filsinger October 2022, pp. 21-22. See [Appendix E](#).

ACI 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 weather 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.

PG&E Response:

During the 2018 launch of the weather station program, PG&E consulted with meteorologists, analysts, and external parties—as well as benchmarked with other California IOUs—to help us determine the weather station density we should install in the HFTD areas across our territory. We determined that a weather station situated approximately every 20 overhead lines miles would be appropriate in these areas, which equated to around 1,300 weather stations.²⁹¹ Our network complements existing state and federally owned and maintained weather stations (e.g., National Weather Service and Remote Automated Weather Stations), which we also use for situational intelligence.

In 2019 the California Energy Commission (CEC) awarded a \$5 million dollar grant to advance California's wildfire science capabilities. Part of the grant, which was awarded to an external party, was to determine the optimal density and configuration of weather stations for electrical utilities. We met with this party's project teams to obtain preliminary access to reports, and we also serve as a member on the Technical Advisory Board that provides feedback into this and related projects.

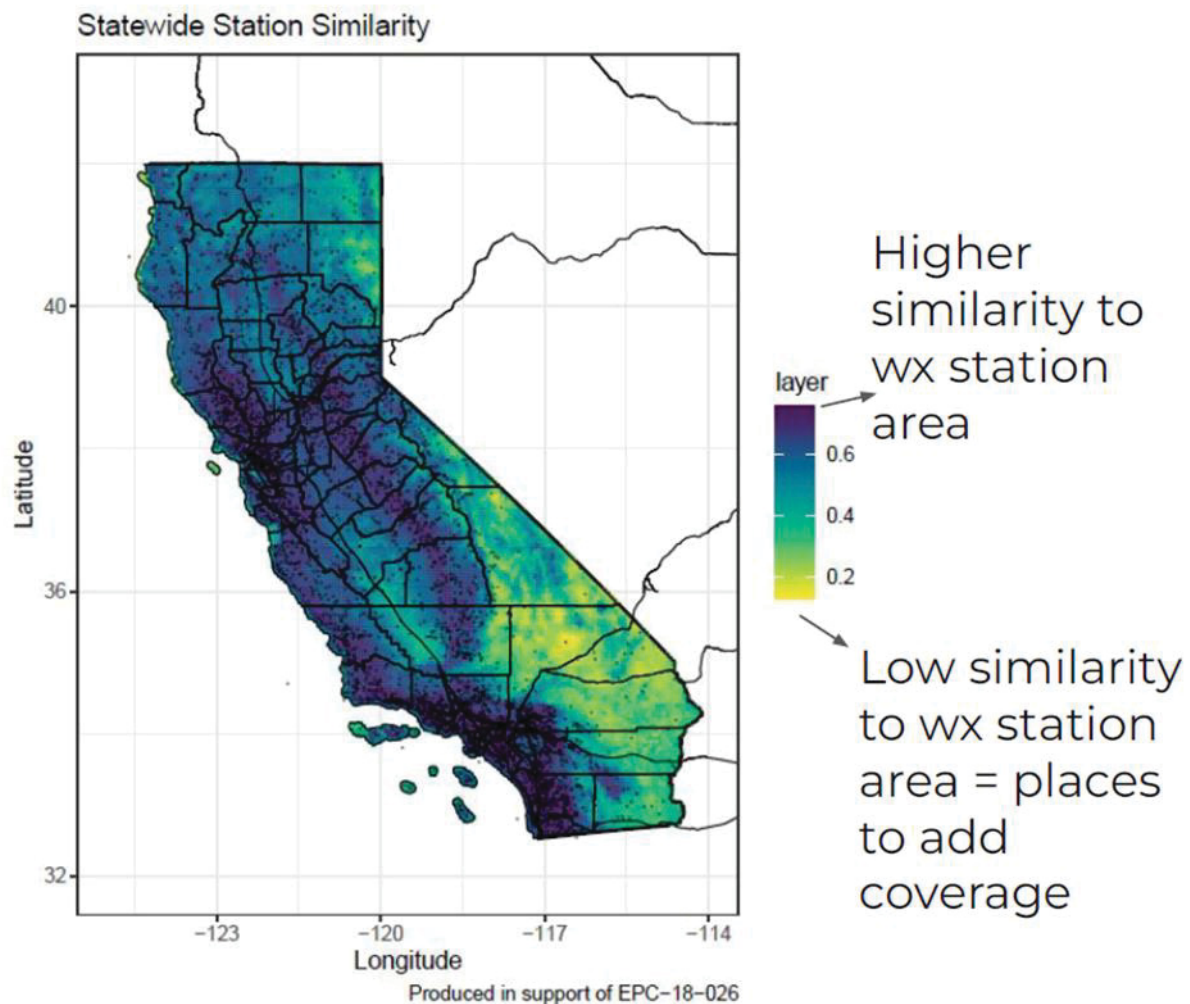
This external study funded by CEC grant EPC-18-026 used a Maximum Entropy algorithm to classify and identify areas with similar climate to locations that already have weather stations, and areas with climate conditions that are not well measured by current stations. The result was a continuous grid of similarity scores, which indicate how similar/dissimilar a new weather station would be relative to the existing network(s). Low similarity scores help identify areas where additional weather stations may need to be installed.²⁹²

²⁹¹ See PG&E's 2019 WMP (Feb. 6, 2019), Section 4.5.3, pp. 90-91.

²⁹² Based on an advanced copy of the external study.

The statewide similarity scores from this external study are shown in [Figure PG&E-22-10-1](#) below. The areas with the lowest similarity scores are in the Tier 1 Central Valley in the PG&E service territory—as well in the highest terrain in the Sierra Nevada—where PG&E assets are few and installations in USFS land take years to complete due to permitting lead times.

**FIGURE PG&E-22-10-1:
STATEWIDE STATION SIMILARITY SCORES**



This study supports the current density of weather stations in the PG&E territory, confirming that it is largely sufficient given the small area of low similarity scores. The final report notes that, “. . . for fire weather purposes, it may be necessary to position additional weather stations in canyons and other regions where short-term winds can rapidly spread wildfires.”

PG&E strongly believes that the external study supports our 2019 conclusion that 1,300 weather stations would “...provide PG&E with sufficiently granular knowledge of local conditions to appropriately guide its wildfire risk reduction measures.”²⁹³

While our weather station network is nearing full maturity, we plan to install more stations in the Tier 1 areas to improve situational awareness and work through permitting challenges to install additional sites in the coming years in federal lands. We also welcome and encourage additional weather station installations from state and federal agencies and continue to leverage those networks to enhance our capabilities.

²⁹³ PG&E’s 2019 WMP (Feb. 6, 2019), p. 91.

ACI 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 CC 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 CC effectiveness joint study;*
- *Provide a table indicating which WMP sections include changes (compared to its 2021 and 2022 Updates) as a result of the CC effectiveness joint study. This should include, but not be limited to:*
 - *Changes made to CC effectiveness calculations;*
 - *Changes made to initiative selection based on effectiveness and benchmarking across alternatives;*
 - *Inclusion of Rapid Earth Fault Current Limiter, Open Phase Detection, Early Fault Detection, and Distribution Fault Anticipation as alternatives, including for PSPS considerations;*
 - *Changes made to cost impacts and drivers; and*
 - *An update on data sharing across utilities on measured effectiveness of CC in-filed and pilot results, including collective evaluation.*

PG&E Response:

In 2022, the joint California IOUs continued to work on the Joint CC Effectiveness Study (Joint IOU Covered Conductor Working Group Report)²⁹⁴ to better understand the advantages, operative failure modes, and current state of knowledge regarding CCs.

A summary of the learnings for each of the following sub-workstreams is provided below: Testing; Estimated Effectiveness; Additional Recorded Effectiveness; Alternative Technologies; and Cost and Impact Drivers.

Goals and Timeline for Implementation

[Table PG&E-22-11-1](#) below lists PG&E's goals related to lessons learned from the CC effectiveness study and the timeline for implementing them. The table also includes a reference to the section of the WMP where we discuss changes associated with the lesson learned.

²⁹⁴ Attachment 2023-03-27_PGE_2023_WMP_R0_Appendix D ACI PG&E-22-11_Atch01.

**TABLE PG&E-22-11-1:
COVERED CONDUCTOR EFFECTIVENESS STUDY
LESSONS LEARNED – GOALS AND TIMELINES**

Goal	Timeline for Implementation	WMP Section Changes
Incorporate Phase 1 and Phase 2 Testing Findings	A new inspection checklist question for detecting CC damages has been added to 2023's inspection checklist for execution. Findings will be further reviewed to assess if additional updates to Inspection and Maintenance standards are required in 2023 for 2024 implementation.	ACI PG&E-22-11
Updates to CC Effectiveness	Estimated Effectiveness was updated in January 2023 Recorded Effectiveness Preliminary Results as developed in January 2023; Re-assessment of Recorded Effectiveness using 2023 data for January 2024.	ACI PG&E-22-11
Changes to initiative selection based on effectiveness and benchmark	Preliminary Results were consistent with existing effectiveness figures, so there are currently no changes to the recommended initiative selection based on 2023 data in January 2024.	ACI PG&E-22-11
Incorporation with Alternative Technologies	In January 2023, PG&E evaluated, in cooperation with Joint IOUs, incorporation of alternative technologies with CCs; no further action at this time.	Joint IOU Covered Conductor Working Group Report ^(a)
Changes in Cost & Drivers	In January 2023, PG&E updated our cost drivers year-over-year, acknowledging the impact of location, and labor. Breakdown of units performed per year, was also performed in January 2023 and included in the Joint IOU study.	ACI PG&E-22-11
Update on Data Sharing on Measured Effectiveness	In January 2023, PG&E shared via Joint IOU CC measured effectiveness.	Joint IOU Study
(a) Attachment 2023-03-27_PGE_2023_WMP_R0_Appendix D ACI PG&E-22-11_Atch01.		

CC Testing

CC testing was performed in 2 phases. The Phase 1 objectives were to:

- Develop IOU-agreed CC FMEA;
- Summarize current testing/knowledge of CC performance; and
- Identify gaps in current testing/knowledge and practices/implementation.

The Phase 1 Final Report was published by Exponent in February 2022.²⁹⁵

²⁹⁵ Available at: <https://efiling.energy.ca.gov/eFiling/Getfile.aspx?fileid=52749&shareable=true>.

For the remainder of 2022, PG&E and the other IOUs executed Phase 2 of the CC effectiveness study. The Phase 2 objectives were to:

- Develop test plans based on Phase 1 report identified gaps and recommendations.
- Complete physical testing of CC; and
- Document results from physical testing of CC.

In Phase 2, SCE, SDG&E, and PG&E executed different elements of the testing as part of the joint IOU effort. The results of the testing will be included in the final report that was completed in February 2023 and is attached to this plan.²⁹⁶ PG&E's testing included:

- Dimensional analysis;
- Filler content analysis;
- Water absorption;
- Fourier-transform infrared spectroscopy;
- Heat shrinkage;
- Differential scanning calorimetry;
- Flammability;
- Tensile;
- Accelerated corrosion;
- Water ingress;
- Water immersion;
- Ultraviolet weathering;
- Leakage current and dielectric strength;
- Tracking resistance;
- Tracking resistance with salt fog; and
- Lightning.

²⁹⁶ Attachment 2023-03-27_PGE_2023_WMP_R0_Appendix D ACI PG&E-22-11_Atch02.

Most of the tests were conducted per American National Standards Institute (ANSI), Insulated Cable Engineers Association (ICEA), or European Norm (EN) standards. The testing occurred June to December 2022 and the final testing report was published in December 2022.²⁹⁷

In 2023, based on the results of the study and SME discussion, PG&E updated our inspection checklist to include a specific question for identifying failure modes that are unique to CC. PG&E will continue to review the findings from the study and evaluate any additional changes that are necessary in the following areas:

- Maintenance and inspection practices specific to CC;
- CC estimated effectiveness;
- CC recorded effectiveness; and
- Cost impacts and drivers.

Covered Conductor Estimated Effectiveness

Based on the work conducted through the joint IOU study, PG&E is comparing our existing SME estimated effectiveness designations with the findings from the study. While this is expected to be an ongoing process, we have refreshed our estimated effectiveness values based on updated designations and the data as follows:

- Tree fall-in associated with wire on object, and wire on ground, changed from “None” (not effective) to “Medium” (some effectiveness). While other IOUs considered a higher effectiveness than PG&E, there are large enough trees in our service territories that can damage CC and therefore CC does not have as substantial an increase in effectiveness in this case.
- Contact from Object Vehicle changed from “None” (not effective) to “Medium” (some effectiveness). We agree with other IOUs that this has some limited benefit. Given that we are installing larger poles to support CCs, the larger poles have the potential to sustain more impact from vehicle than existing infrastructure.
- Animal caused outages associated with conductor contact changed from “None” (not effective) to “All” (very high effectiveness). Testing on the covering material of the CCs showed a high resiliency to damage. PG&E found the insulating properties of the covering did not diminish significantly when damaged. Therefore, we have increased CC effectiveness for mitigating damage caused by animals like squirrels and birds.

Additionally, we have refreshed our data for estimated effectiveness to include outage data through 2022. We also expanded the study to include all outages throughout the entire year instead of only on high wind days. Previously, the last update was from PG&E’s 2023 GRC filing, which had data through 2020. Based on the latest update

²⁹⁷ Instructions for viewing the Joint-IOU Covered Conductor Testing Cumulative Report (December 22, 2022) located in [Appendix E](#).

using data through 2022, the estimated effectiveness is 64 percent. This is consistent with the previous results that were completed using data through 2020.

Covered Conductor Recorded Effectiveness

PG&E will continue to use estimated effectiveness to represent system hardening overhead effectiveness until more data points are available to support recorded effectiveness values. At the end of 2022, there were approximately 960 miles of overhead CCs installed on our system. The number of ignitions observed on the CC lines to date does not provide enough data to reach a conclusion about recorded effectiveness that is statistically significant.

Though we have limited ignition data on CCs, we calculated a preliminary range for recorded effectiveness of overhead hardening by applying the following proxy. Most distribution outages (momentary and sustained) typically involve a fault condition. Thus, for purposes of estimating overhead hardening recorded effectiveness, we assume that all distribution outages can potentially result in an ignition, regardless of other prevailing conditions, to capture more data points for measurement.

PG&E is measuring the recorded effectiveness of CC by comparing the outages on the circuit segments with CCs to outages on circuit segments with bare conductors. The comparison was conducted on an outages-per-year, per-mile basis to normalize outage rates pre- and post-CC. [Table PG&E-22-11-2](#) below presents the results of this preliminary recorded effectiveness analysis.

**TABLE PG&E-22-11-2:
PRELIMINARY RECORDED EFFECTIVENESS ANALYSIS**

	Miles Overhead Hardened as of End -of-Year (EOY) 2019 ^(a)		Miles Overhead Hardened as of EOY 2020 ^(b)		Miles Overhead Hardened as of EOY 2021 ^(c)	
	Outages per Year per Mile	% Improvement Compared to Zero CC	Outages per Year per Mile	% Improvement Compared to Zero CC	Outages per Year per Mile	% Improvement Compared to Zero CC
Zero CC	0.38	N/A	0.38	N/A	0.24	N/A
Partially CC (>0% and <80%)	0.22	41%	0.25	36%	0.17	28%
Mostly CC (>=80%)	0.11	69%	0.11	72%	0.07	70%
(a) Only considers outages from 2020 to 2022. (b) Only considers outages from 2021 to 2022. (c) Only considers outages in 2022.						

The calculated outage reduction percentage (used as a measure for the recorded effectiveness) shows that CC sections experience approximately 28 to 70 percent fewer faults compared to bare conductor circuit segments.

The results in [Table PG&E-22-11-2](#) above are preliminary due to the following:

- The analysis in [Table PG&E-22-11-2](#) compares outages for locations that have CCs compared to locations with bare conductors. This analysis may over or under-represent effectiveness benefits because it does not capture the impact of localized environmental/weather conditions within HFRA.
- It is assumed that all distribution outages could potentially result in an ignition. It does not factor in if one type of outage is more or less likely to result in an ignition than other types of outages. However, there are several failure modes, such as tie-wire failure, which have a much lower likelihood of ignition compared to an outage due to a broken conductor.
- The outages in Partially CC and Mostly CC could have occurred on the sections of the line that are not covered, which cannot be validated due to lack of exact geospatial information for the outages.
- Approximately 30 percent of the hardened miles could not be directly linked to the appropriate upstream circuit segment due to the changes and dynamic nature of our system. Hence, they were not considered as part of the analysis.

Additionally, in 2023, as part of our ignition investigation process, we are incorporating additional reviews related to ignitions that occur on a CC line.

Below are some examples related to the effectiveness of CCs that we have observed:

Example 1 ([Figure PG&E-22-11-1](#))

On May 10, 2021, a 125-foot ponderosa pine that was 55 feet away from a pole, failed approximately 40 feet above ground, severing the CC, causing a wiredown, and a subsequent CPUC-reportable ignition.

**FIGURE PG&E-22-11-1:
COVERED CONDUCTOR EFFECTIVENESS – EXAMPLE 1**



Affected Asset



Fallen Tree



Burn Scar



Severed Conductor

Example 2 (Figure PG&E-22-11-2)

On May 2, 2022, a 120-foot ponderosa pine that was being abated for previously reported structural concerns, fell on a CC line, severing it, starting a CPUC-reportable ignition.

**FIGURE PG&E-22-11-2:
COVERED CONDUCTOR EFFECTIVENESS – EXAMPLE 2**



These two incidents highlight some limitations concerning CC. In both incidents, there were VM inspections and CC deployed, but even with the combined mitigations, it still resulted in an ignition.

Example 3 (Figure PG&E-22-11-3)

On December 27, 2021, two CCs were supporting an entire tree. While there was no ignition an electrical outage did occur on the line.

**FIGURE PG&E-22-11-3:
COVERED CONDUCTOR EFFECTIVENESS – EXAMPLE 3**



Incorporation With Technology Alternatives

Please refer to the Joint IOU Study that describes technology alternatives and PG&E's collaborative efforts with other IOUs. PG&E will continue to participate in evaluating technology alternatives, sharing data, and effectiveness of alternative technologies as part of the joint IOU effort.

Changes in Cost and Impact Drivers

PG&E's unit costs for our Overhead System Hardening Program, which includes CC, have decreased between 2021 and 2022 as shown in [Table PG&E-22-11-3](#).

**TABLE PG&E-22-11-3:
2022 COVERED CONDUCTOR SUMMARY**

Cost Components	2021 Cost per Circuit Mile	2022 Cost per Circuit Mile
Labor (Internal)	\$209,000	\$129,931
Materials	\$161,000	\$150,783
Contractor	\$470,000	\$394,140
Overhead	\$226,000	\$140,298
Other	\$6,000	\$2,813
Financing Costs	\$11,000	\$7,733
Total	\$1,083,000	\$825,698

The costs in [Table PG&E-22-11-3](#) include the components for CC that are comparable with the other IOUs as part of the Joint IOU efforts. They do not include all cost components that make up our comprehensive Overhead System Hardening Program.

PG&E continues to rely on a combination of line removals, remote grid, and undergrounding as the primary system hardening effort due to its ability to reduce the most wildfire risk. We will continue to install CC in the appropriate locations.

ACI PG&E-22-12 – Covered Conductor Inspection and Maintenance

Description:

Pacific Gas and Electric Company (PG&E) lacks specific directives for inspection procedures and practice regarding Covered Conductor (CC) inspection and maintenance.

Required:

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 CC effectiveness joint study established by Office of Energy Infrastructure Safety's (OEIS or Energy Safety) 2021 Wildfire Mitigation Plan (WMP) Action Statements. This 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 CC effectiveness joint study will be expected in the 2023 WMPs.

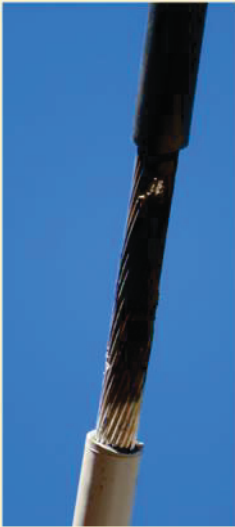
PG&E Response:

In 2023, PG&E updated our inspection checklist to include a specific question for identifying failure modes that are unique to CC based on the results from the CC testing and Subject Matter Expert discussions. The new inspection question is:

“Primary CC has energized sections (such as rotated Kaddas covers, splices, connectors, flying bells) that are not covered or where the jacket has visible damage or signs of tracking.”

In addition, the Overhead Assessment Job Aid (TD-2305M-JA02) for inspectors has been updated to include reference images of the type of damage inspectors should look to identify. [Figure PG&E-22-12-1](#) below is an example of guidance given to the inspectors from the job aid.

**FIGURE PG&E-22-12-1:
EXAMPLE OF DAMAGE FROM JOB AID TD-2305M JA02**

Exposed Primary Covered Conductor Tree Wire, Burnt Conductor	
	At this Location: Tree Wire conductor exposed and burnt
	Perform Minor Work: No
	Write 3rd Party Notification: No
	Write EC Notification: Yes
	FDA= Tree Wire / Exposed / Repair
	FDA= Conductor / Burnt / Repair
	Priority: E Tag, 3-12 months depending on exposure

We will continue to use the findings from the Joint IOU CC effectiveness study to identify degradation mechanisms, threats, and hazards that need to be evaluated during the asset life cycle. Findings from this analysis will inform the inspection criteria and maintenance tag prioritization for CCs and will be incorporated into the 2024 distribution overhead (OH) inspection plan and inspection checklist as part of objective GH-03, which can be found in [Section 8.1.1.1](#).

For additional information on the progress of the Joint IOU CC effectiveness study, please see PG&E's response to Areas for Continued Improvement (ACI) PG&E-22-11 and the Joint IOU CC effectiveness study included as an attachment in [Appendix G](#).

ACI 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:

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 Rapid Earth Fault Current Limiter and Distribution Fault Anticipation/Early Fault Detection, 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 CC 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 CC effectiveness joint study will be expected in the 2023 WMPs.

PG&E Response:

Please refer to the section of the Joint IOU CC effectiveness study ([Appendix G](#)) on New Technologies Evaluation and Implementation for the response to this ACI.

ACI 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:

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.

PG&E Response:

Wildfire mitigation selection (as described in [Section 7.1.4](#)) incorporates an approach across distribution, transmission and substation that aligns with overall utility risk. This influences prioritization and areas of focus for the organization.

PG&E is working to harden transmission assets and reduce wildfire risks through the multiple mitigation programs listed below. The decrease of the transmission hardening targets from 2021 to 2022 was specific to the Targeted Line Rebuild and Line Removal programs. We explain the decreased target in the Targeted Line Rebuild section below. Other programs either have steady progress or are newly initiated programs with targets.

In the Targeted Line Rebuild program, we identified major projects based on High Fire Threat District (HFTD) location, compliance obligations, and other factors before the Wildfire Transmission Risk Model (WTRM) was available. HFTD location was used to baseline the scope of this program. In 2022, PG&E conducted a risk, scope, and execution-stage assessment for each of the projects in progress to determine which should proceed and which could be put on hold. This effort allowed a quick transition to using the WTRM to select future projects.

The projects included in this program are identified based on WTRM and other asset health and performance risk considerations.

Other transmission hardening programs—Transmission Poles/Towers Replacements and Reinforcements and Transmission Tags—are prioritized using the WTRM and other asset health and performance risk considerations. The targets for these programs are not tracked separately but are an integral part of transmission tags as described in [Section 8.1.7.1](#).

Targeted Line Rebuild (see [Section 8.1.2.5](#))

Targeted lines traversing HFTD are selected for reconductoring. From there, these lines are fully assessed for all component asset health and compliance against current standards as well as electrical capacity needs. The project scope typically includes replacements of conductors, insulators, and structures. Asset replacements restore assets to new, up-to-standard, and typically incorporate a more robust design. These are large scale investments and work execution takes multiple years involving permitting, construction and clearance planning. While certain projects started years ago, the units are only counted when a project is released to operations. For these reasons, the number of miles completed may vary significantly from year to year. This work is part of target GH-05 in [Section 8.1.1.2](#).

Dispersed Conductor Component (Splice) Hardening (see [Section 8.1.2.5](#))

A conductor splice is considered a higher risk point of failure within a conductor span, due to factors such as corrosion, moisture intrusion, vibration, and workmanship variability. Certain type of splices, such as a twist splice, have shown to have higher risk of failure. We initiated a new program to install a shunt splice on top of an existing splice. This installation eliminates the splice as a single point of failure because failure of the original splice would not result in down conductor. Lines prioritized for this program are based on higher risk splice and wildfire consequences. Shunt splice installation is part of target GH-06 in [Section 8.1.1.2](#).

Transmission Pole/Tower Replacements and Reinforcements (see [Section 8.1.2.4](#))

There are multiple programs that improve the conditions of our structures, thus reducing failure and wildfire risks. One of these programs is the replacement of wood poles with steel poles. PG&E has replaced approximately 2,000 to 3,000 structures per year since 2019. This work is not tracked separately but is an integral part of the transmission tags described in [Section 8.1.7.1](#).

Line Removal (see [Section 8.1.2.9](#))

When we identify transmission lines that we confirm are no longer needed for operations they are prioritized for de-energization, grounding, and removal.

Transmission Tags (see [Section 8.1.7.1](#))

Since the inception of the enhanced inspection program in 2019, a significant increase in the volume of repair tags has been created. PG&E has increased our efforts in addressing the maintenance backlog by performing approximately 250 percent the number of tags per year compared to work completed prior to 2019. A critical milestone will be reached in 2023 when we plan to complete the transmission tag backlog. Completing the maintenance repairs and replacements directly reduces failure and wildfire risks.

ACI 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:

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.*

PG&E Response:

Transmission is not targeting additional sectionalizing devices in the 2023-2025 timeframe. To support this decision, we reviewed the current 10-year PSPS lookback. Of the 111 transmission lines in the 2022 10-year lookback, the lines either have already been sectionalized or do not presently need to be sectionalized. An example of a line that would not need to be sectionalized is a line that goes from one substation to another, with no junctions or tapped stations in between.

Automated distribution sectionalizing devices have been installed at strategic locations over the past 4 years, producing the greatest sectionalizing benefit given the 10-year lookback for PSPS event simulations. We have reached a point of diminishing returns based upon this analysis, where further investment would result in minimal customer benefits. In 2023, we are adjusting our distribution sectionalizing device program so that we will maximize reliability through our EPSS Program. Going forward, we will identify locations for sectionalizing with protective devices in smaller protective zones to improve the most reliability challenged circuit segments.

For both transmission and distribution, the 10-year lookback is updated annually and may result in adjustments to the program. Additionally, if we identify switch assets that need to be replaced during an inspection, we can upgrade them at that time.

ACI 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:

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; 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 Response:

In [Section 8.1.2.2](#), Overview of the Activity, PG&E describes our approach for prioritizing undergrounding miles in HFTDs, including risk, feasibility, and current progress. In 2022, we completed 180 miles of undergrounding compared to a target of 175 miles and completed those miles below the targeted unit cost.

Please see PG&E's 2023-2026 Undergrounding Workplan,²⁹⁸ which lists the planned undergrounding locations and mileage by year from 2023-2026.²⁹⁹ To demonstrate the risk and feasibility of each project, the workplan includes the associated risk model used to identify projects in scope (either WDRM V2 or WDRM V3), as well as the Risk Rank,³⁰⁰ Mean Risk,³⁰¹ Feasibility Score by Circuit Protection Zone (CPZ),³⁰² and HFTD Tier. The undergrounding projects included in the workplan are in any stage of

²⁹⁸ See Attachment 2024-07-05_PGE_2023_WMP_R6_Appendix D ACI PG&E-22-16_Atch01_CONF.

²⁹⁹ Note, any miles included for 2022 reflect those projects that span multiple years from 2022 into 2023 and beyond. Not all 2022 completed miles are included in this workplan if those projects are not relevant to the 2023-2026 timeframe.

³⁰⁰ Risk rank is a metric based on the results of the relevant risk model where circuit segments are ranked on a 1 to N basis, where 1 is the highest risk circuit segment, and N is the lowest risk.

³⁰¹ Mean risk is the summation of the total risk of all pixels (100 x 100-meter cell) linked to a circuit segment, divided by the total number of pixels. The total risk values are from System Hardening Wildfire Distribution Risk Model (WDRM) v3.

³⁰² The feasibility score is the cost multiplier indicating the difficulty of undergrounding the circuit segment based on presence of hard rock, water crossing, and gradient. The scale ranges from 1 to 3, with 3 being most challenging. The feasibility score is only available at the circuit segment level, and individual project feasibility may vary.

the review, planning and execution process. The information in this workplan is current as of June 26, 2024.

The total undergrounding miles included in the workplan exceed our annual targets as provided in [Section 8.1.2.2](#), as well as the total 4-year target of 1,370 miles. We intentionally build-in additional miles, as compared to the annual targets, to account for unforeseen delays related to factors such as access, weather, permitting, land rights acquisition, materials or other constraints that may be experienced during the project lifecycle. Thus, some of the projects included in this workplan may not be completed in the 2023-2026 timeframe. Generally, PG&E will continue working on these projects until they can be completed in a future year.

The timing and mileage associated with an individual project can change as well due to project dependencies. Additionally, the mix of projects can change if new fire rebuild projects arise and they take precedence over certain planned projects. Finally, additional projects may be identified and added to the workplan going forward for potential completion in the 2023-2026 timeframe.

Project status and timelines will change as projects are further developed. All workplans are highly date-dependent and may not match a workplan provided previously or those that we provide in the future.

For more information regarding undergrounding and risk prioritization, see PG&E's response to Critical Issue [RN-PG&E-23-05](#) in [Section 8.1.2.2](#).

ACI 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 HFTDs/High Fire Risk Areas.

PG&E Response:

Please refer to the 2023 targets GM-02 and GM-03, which are presented in [Section 8.1.1.2](#), as well as the associated narrative in [Section 8.1.7](#) for a full description of how we are addressing this ACI.

For more information regarding reduce the backlog of repairs, see PG&E's response to Critical Issue [RN-PG&E-23-04](#) in [Section 8.1.7.1](#).

ACI 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; and*
- 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.*

PG&E Response:

PG&E has had a Distribution “Compliance Inspector” classification since 2003. We also have a dedicated Inspector workforce that consists of 151 authorized workers as of December 2022. Historically, we have been able to fill these positions and retain the Compliance Inspectors who are on staff.

PG&E relied on a high volume of contractor resources to complete overhead inspections over the last 3 years because of the increased volume of overhead inspections and increased inspection frequencies in HFTD areas. Until now, we have not had the opportunity to evaluate and “right size” our PG&E Inspector resources based on the volume of both overhead and underground work.

To resolve this, we plan to hire 100 additional employees between 2023 and 2025. We will benchmark with other utilities and work to create a new classification that can support the work that is needed. This increase in our headcount will enable us to develop experienced PG&E resources who know the geographic areas that they work in, who live and work in the communities that they support, and who can build trust and relationships in our hometowns.

Additionally, in 2023, we will be shifting field safety reassessments from System Inspections (SI) to Construction/Restoration, allowing our PG&E inspector resources to perform more inspections on time and further reduce our dependency on external resources. Additional headcount also will result in more leadership roles (Manager, Supervisor, Inspector Review Specialist) to support the new resources, which we anticipate will also drive an increase in performance.

However, we will still need to use some contractor inspector resources to ensure work is completed. To improve this process, in 2022, we entered into a 3-year vendor contract which helps us manage and monitor contractor performance and quality. It also helps us identify and retain the higher performing contract inspectors year over year, improving overall performance.

ACI 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 Quality Assurance/Quality Control (QA/QC) results of other utilities' asset inspections; and*
- 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.*

PG&E Response:

As described in response to Maturity Survey Section 3.4.1, we hold regular benchmarking sessions with the other utilities as well as a continuing informal dialog and sharing of best practices. This includes actively seeking information from other utilities, actively sharing information with other utilities, and participating in benchmarking exercises to identify areas of improvement. We also plan to develop a standard process for testing applicability of best practices regarding the training and QA of asset personnel and to create procedures for sharing and receiving best practices and lessons learned in this area.

Additionally, PG&E reviewed the results from our benchmarking efforts with SCE and SDG&E related to classifications and qualifications of employees who perform inspections and patrols to determine potential areas for improvement. PG&E currently uses a journeyman lineman classification to perform all inspection and patrol activities, as does SDG&E. SCE, however, uses journeyman linemen for some activities but also uses a lower classification to perform other activities. In 2023, PG&E will continue our benchmarking with other utilities and—similar to SCE—is considering developing and using lower-level classifications to perform specific types of work. Classifications being considered include “Patrolman,” who would perform patrol work, and an “Inspector” classification that would be qualified to perform both distribution and transmission inspections. Similarly, in the future, PG&E is looking to mirror our partners in California with a “360” inspection, where both drone and ground inspections can be completed simultaneously.

Thus, while we see the benefit of having a journeyman lineman perform all patrol and inspection activities at PG&E, we recognize that the skillset and experience of a journeyman may not be necessary for certain types of activities such as patrols. However, the creation of a new classification would also require a substantial overhaul of our training program, as all training and guidance is currently conducted with the understanding that the employees have journeyman lineman experience, which requires

a different level of professional knowledge and experience than that of a lower classification, such as a patrolman. Regardless, we will continue to improve the quality of our inspection work, continue to benchmark with our peers, and continue to explore all options that may help us improve the quality of our work.

ACI 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; and*
- *Report on its 2022 expanded use of drones and other aerial technology for asset inspections based on findings from the pilot program.*

PG&E Response:

Introduction

Aerial inspections can provide visibility of overhead assets that may otherwise be challenging to obtain. This specific look at our assets may be especially helpful in detecting abnormal conditions on conductors, equipment, and the tops of poles. Drones and helicopters can also reach assets in remote areas more easily than inspectors on foot, capturing images that can later be inspected in a desktop review.

PG&E conducted very small aerial inspection pilots in 2020 and 2021 on distribution equipment. Based on promising results from these pilots, PG&E conducted an expanded pilot in 2022, inspecting roughly 6,500 structures and including three different methods of aerial inspection for distribution overhead structures: drone only; helicopter only; and drone plus inspector.

The 2022 pilot addressed the following questions:

- How effective are aerial inspections at detecting abnormal conditions on distribution overhead equipment?
- What types of conditions are better detected by ground versus aerial inspections?
- What is the rate at which aerial inspections can be performed and what execution considerations should PG&E consider when developing a distribution aerial inspection program?
- How do different aerial technologies and methods for inspection compare in terms of their outcomes on each of the questions above?

Methodology

Study Design

The 2022 pilot program planned scope consisted of 9,000 structures on 35 circuits across HFTD and non-HFTD areas. The scope was divided into three segments of equal size: 3,000 each of drone only, helicopter, and drone plus inspector.

PG&E-targeted problematic circuits already included in the 2022 ground inspection plan where aerial inspections would likely deliver the most benefit. Incorporating input from field supervisors, PG&E selected circuits with a history of high numbers of Category A tags, A tags on tie wires, locations with difficult terrain and near past wildfires, repeat ignitions related to overhead conductors, and circuits with notifications associated with insulators. The final structures selected were located in the North Valley, Yosemite, Sacramento, and Central Coast-divisions.

Across inspection methods, we assigned 9,528 structures to be inspected to meet the goal of 9,000 structures, since we expected scope changes due to wildfires, drone, plus ground inspector scheduling issues, and out of scope structures like secondary and guy poles. These 9,528 structures were comprised of 2,106 structures in Non-HFTD, 5,820 structures in HFTD Tier 2, and 1,602 structures in HFTD Tier 3 areas.

Aerial inspections were conducted four to six weeks after detailed ground inspections were conducted on the same structures. The schedule for drone-only and helicopter-only inspections was developed based on the previously scheduled ground inspection. For the drone plus ground inspections, PG&E supplemented the planned GO 165 ground inspection by sending a drone operator out with the inspectors.

Inspection Methods

PG&E tested the following three aerial inspections methods:

- Drone Only: The drone only method entails a drone pilot alone in the field flying a drone and capturing eight to ten photos of all angles of a pole. The shot sheet focused on the top 2/3 of the pole. Within two to four weeks after the image capture, a remote desktop inspection is completed to identify abnormal conditions. The drone used in this method was a DJI Mavic 3. Drone only flights were conducted by pilots from approximately 7:00 a.m. to 5:00 p.m. Pacific Time.
- Helicopter Only: This method is the same as used for the drone only above, except the pictures were taken via helicopter and not drone. The helicopters took photos as they approached the structure offset from the centerline of the circuit by approximately 100 feet to provide a downward side view of the pole. Once the circuit run was completed, the helicopter flew back over the structures in the same manner from the other side. This flight path provided a good view of all quadrants of the pole from top to bottom. The helicopter used was a Eurocopter AS 350.

- Drone Plus Inspector: The drone plus inspector inspection augments a ground inspection with three to five pictures taken from the top of the pole downward. While in the field, inspectors viewed these images and recorded whether abnormal conditions reported were discovered because of the use of the photos. The same three to five photos were also inspected through a desktop inspection.

For each of these inspection types, customers were notified in advance of inspections through PG&E's standard process, including Interactive Voice Response and mailers.

Image Quality Assurance (IQA) and Emergency Conditions

The pilot included the development of an aerial QC process which was used to evaluate the preliminary image quality before a desktop inspection. The PG&E IQA team reviewed imagery for inspectability and any emergency tags (A tags). If an emergency tag was identified, the tag was escalated to an Inspection Review Specialist (IRS) for review. If the IRS concurred that it was a valid A tag, they created a document including the location as well as the description and pictures of the issue. The document was emailed to Dispatch, who addressed the A tag in accordance with PG&E's current A tag repair processes.

Desktop Inspections and Tag Creation

For drone-only and helicopter-only methods, inspections were conducted up to 48 days after image capture using iHawk, a vendor-provided platform. Desktop inspectors in the 2022 pilot were GO 165 Qualified Electrical Work inspectors.

The pilot used current business processes to create notifications. Inspectors created a new notification for conditions found if a structure had no open notifications. If a structure had an open notification, we added any new issues discovered to the same notification. Any duplicate tags (i.e., those already found by ground inspections) were cancelled. Finally, when inspectors or pilots noted inaccuracies in asset registry data during image capture or desktop inspections, they provided updates to the Geographic Information System team.

The pilot project relied on manual tag creation processes because automating the SAP notification process turned out to be a much more complex task than planned. Correctly cancelling duplicate finds and adding new finds to existing notifications required more complex programming than was initially anticipated.

Find Rate Calculation

Find rates are calculated by dividing the number of new notifications by the number of inspections performed. Note that more than one condition can be documented on a single notification and more than one notification can be assigned to a structure (based on different priority levels). To calculate find rates for ground vs. aerial comparisons, PG&E included only structures in the pilot that did not have open notifications in 2022 from prior years and where inspection results were reviewed by an IRS. Excluding structures with open notifications is necessary because the data structure limits us from easily seeing whether a finding is from 2022 or a previous year.

To compare findings between ground and aerial inspections, PG&E compared Facility Damage Actions (FDA) and tag priorities for the same structure. For a finding to be considered as found by both inspection methods, it had to be located on the same structure, have the same FDA and the same tag priority.

Results and Discussion

Inspection Methods

PG&E inspected a total of 6,514 structures as part of the aerial pilot out of the initial 9,528 structures that were planned. These 6,514 structures were comprised of 2,483 structures in Non-HFTD, 2,732 structures in HFTD Tier 2, and 1,299 structures in HFTD Tier 3.

PG&E inspected a total of 3,059 structures by the drone-only method, which delivered 100 percent of photos requested. Drones captured photos from all angles of the structure and desktop inspectors completed about 40 to 50 desktop inspections per day. The photo quality was excellent and permitted a thorough structure inspection. Customers provided incidental positive feedback in the field, appreciating the investment in new technology and methods.

PG&E inspected a total of 576 structures by helicopter-only method, which delivered 80 percent of photos requested. While PG&E originally intended to inspect closer to 3,000 structures by helicopter, we cancelled most helicopter inspections midway through the pilot. In prior small pilot projects, we were able to use helicopter photos. However, the vendor used in the 2022 pilot provided pictures that fell short of our quality expectations; the photo quality from helicopter inspections was poor and did not permit a thorough desktop inspection. PG&E assigned drones to capture photos of the structures missed by helicopters.

Furthermore, the helicopter inspections took photos from limited angles and missed approximately 20 percent of structures, largely due to tree obstruction. Helicopters were sometimes too large to maneuver to photograph dead-end poles and poles on steep slopes from all angles. Customers also shared incidental noise complaints in the field associated with the helicopters. The desktop inspectors each completed 40 to 50 desktop inspections per day of helicopter photos.

PG&E inspected a total of 2,879 structures by drone plus inspector method, which delivered 100 percent of photos requested. Adding drones to the detailed GO 165 inspection slowed the inspection to roughly 20 to 25 poles per day, which is slower than both the stand-alone ground inspection as well as the image capture rate for both drone-only and helicopter-only. The pilot project also faced challenges associated with trying to coordinate drone pilot schedules with ground inspection schedules. In the field, multiple inspectors noted that viewing conditions were not always ideal and camera glare was a challenge. This inspection method also demonstrated that drone pilot training needed improvement and that our picture requirements needed to be clarified.

Based on the results across the three inspection methods, PG&E concluded that the drone only method is the most promising for aerial inspections in the near-term. The value proposition for aerial inspections lies in detecting conditions that are challenging to see, especially those that are so severe as to create an immediate ignition or public

safety risk. PG&E aims to get visibility on these conditions that we have previously been unable to detect as quickly as possible, and the drone-only methodology provides the best opportunity to do so. It was the methodology with the lowest unit cost and the ability to scale the most quickly since both image capture and desktop inspection can be done rapidly.

Helicopter-only inspections produced lower quality pictures at a higher unit cost. Due to the challenges associated with helicopter-only inspections, PG&E believes that helicopter-only is better used to supplement other aerial methods as needed or considered as a longer-term opportunity.

Drone plus inspector is a promising methodology but is also the most complex and challenging to scale quickly. Merging ground with aerial inspections into a single inspection would require investment in tools, training, and process development. Because far fewer structures could be completed each day under this inspection method, drone plus inspector would not permit PG&E to quickly find A and B-tag conditions. Driving the unit cost of a drone plus inspector inspection to reasonable levels would likely require training a considerable number of inspectors to become drone pilots. Furthermore, tag find rates and findings from this method also suggest that this approach still requires a remote desktop inspection for finding all conditions. These cost and execution hurdles need to be overcome before drone plus inspector could become a long-term solution.

Finally, through benchmarking efforts, PG&E learned that Southern California Edison Company (SCE) and San Diego Gas & Electric Company (SDG&E) also began their distribution aerial inspections using the drone-only method. SCE and SDG&E moved to drone plus inspector only after they completed several years of inspections in their systems with a drone-only method. This move was mainly due to a desire to have fewer field touches. SCE's current integrated method allows them to inspect roughly 6-8 structures a day.

[Figure PG&E-22-20-1](#) below summarizes the outcomes from each of the methods used in the pilot program:

**FIGURE PG&E-22-20-1:
RESULTS OF AERIAL PILOT PROJECT**

	Drone-Only (Recommended for 2023)	Heli Only	Drone + Inspector
<i>Photo Capture and Inspection Quality</i>	All angles, high quality photos, very high find rates	Limited angles, missed ~20% structures, Average quality photos, medium find rates	All angles, high quality photos, high find rates, sub optimum field viewing, subject to glare
<i>Speed</i>	- 40 to 50 asset capture per day - 40 to 45 desktop inspections per day	- 40 to 45 desktop inspections per day	- 20 to 25 drone + field inspections per day per team - 40 to 45 desktop inspections per day
<i>Unit Cost (pilot scale)</i>	\$186 per structure	\$221 per structure	\$311 per structure
<i>Customer Impact / safety</i>	Minimal negative customer impact	Minimal negative customer impact, some noise complaints	Minimal negative customer impact
<i>Other</i>			Scheduling challenges with drone pilots with ground inspectors

Tag Find Rates

For both ground and aerial inspections, tag find rates were generally high for the structures inspected in the pilot. Ground find rates for structures in the aerial pilot were generally higher than ground find rates across the service territory. The selection of problematic circuits and high tag density for inclusion in the pilot is the likely explanation for this trend. [Table PG&E-22-20-1](#) below summarizes find rates for the pilot. Note that total find rate is based on structures (and so the percentages do not add up to the total). Below, PG&E discusses find rates for each aerial inspection method.

For drone-only inspections, find rates for A, B, and E tags were 1.2 percent, 3.0 percent, and 31.7 percent. Overall, drone-only inspections generally produced higher find rates (47 percent) than ground inspections of the same structures (31 percent). PG&E attributes the higher find rates for drone-only to the high-quality pictures taken by drone and the additional perspective from the air allows detection of conditions that are challenging to see from the ground. Furthermore, this pilot is the first aerial inspection of these structures, whereas ground inspections were completed at least once in the last five years for all the structures in the pilot and at most three years ago in HFTD, so conditions detectable by ground were likely already detected in previous inspections.

Drone produced comparable E tag find rates relative to ground inspections of the same structures, but slightly lower find rates for A and B tags. Pilot results underestimate the true ability of drone inspections to detect A tags due to the design of the study. Since aerial followed ground inspections of the same structure in all cases, A tags detected by ground inspections were addressed before aerial inspections took place, so there was no opportunity for aerial inspections to detect the A tag conditions found by ground.

A limited number of B tags were also addressed before the aerial inspection. None of the A tags found by any method of aerial inspection were identified by ground inspections.

There was a pronounced difference in ground and drone-only inspections for F tags, with drone-only inspections producing nearly four times as many F tags when inspecting the same structures. The other aerial inspection methods also yielded much higher F tag find rates relative to ground findings on the same structures. This finding is largely driven by the drone inspectors using different guidance when writing notifications for missing high voltage signs.

**TABLE PG&E-22-20-1:
FIND RATES BY PRIORITY FOR GROUND AND AERIAL**

	Ground (Structures Corresponding to Drone-Only Inspections)	Drone- Only	Ground (Structures Corresponding Helicopter-Only Inspections)	Helicopter- Only	Drone Plus Inspector (Field)	Drone Plus Inspector (Desktop Inspection)
Total Sample Size	3,059		576		2,879	
Find Rate Sample Size	2,580		549		2,650	
A	1.3%	1.2%	1.3%	0.4%	1.1%	1.3%
B	3.8%	3.0%	2.7%	1.1%	1.7%	1.6%
E	29.1%	31.7%	29.0%	24.2%	19.1%	35.2%
F	5.6%	20.7%	5.6%	18.8%	2.9%	25.1%
Overall	38.6%	47.1%	37.9%	40.1%	24.3%	51.1%

For helicopter-only inspections, find rates for A, B, and E tags were 0.4 percent, 1.1 percent, and 24.2 percent. Helicopter-only inspections had lower find rates than the ground inspections of the same structures for all three of these tag priorities. More specifically, helicopter-only inspections found less than half as many A and B tags as the ground inspections. These lower find rates from helicopter-only are likely attributable to lower image quality. As discussed above, helicopter inspections were halted due to images not being granular enough to permit detection of abnormal conditions.

PG&E separated tags created with the drone plus inspector method into tags generated in the field during the GO 165 ground inspection (including those from viewing images from the drone in the field) from tags created during the remote desktop inspection of the 3-5 photos. Both inspections produced similar find rates for A and B tags, roughly 1.2 percent and 1.6 percent. Similar with other inspection methods, the A tags found in the field (and a limited number of B tags) were already addressed by the time of the desktop inspection. In other words, all of the A tags found in desktop inspection were incremental to those found in the field, suggesting that not all A tag conditions visible by drone were necessarily identified by the inspector out in the field even though they had a drone. This may be related to sub-optimal field viewing conditions that many

inspectors reported. Overall, findings from this method suggest that providing real-time drone images to the inspector in the field may not be sufficient for finding all conditions and that a remote desktop inspection may still be beneficial.

Finally, PG&E did not directly compare find rates from the aerial pilot to those from other key distribution inspection programs. In 2022, distribution Pole Test and Treat (PT&T) inspections had a 5.3 percent pole replacement find rate. Distribution infrared inspections had a 0.01 percent find rate for B tags and a 0.02 percent find rate for E tags. PG&E does not have a climbing inspection program for our distribution OH assets. While the overall find rates for ground and aerial in the pilot are much higher than these find rates of other programs, the find rates are not comparable since these inspections are designed to capture entirely different failure modes. PT&T is primarily designed to capture failure due to internal rot or shell degradation belowground, while infrared targets potentially damaged and/or faulty components that are not detectable solely by visual inspection methods such as ground or aerial.

Tag Findings

PG&E compared the findings from the drone-only inspections with findings from ground inspections of those same structures in the pilot. There was some overlap between findings, but most findings (92 percent) were found by either drone or ground, but not both. The percent overlap by priority was 0 percent for A tags, 10 percent for B tags, 8 percent for E tags, and 9 percent for F tags. These differences in findings largely reflect the differing vantage points of the two inspection methods. However, differences in how inspectors from ground compared to drone created notifications also drove some differences, with the same conditions being assessed as different priorities in some cases or as different FDAs. In other words, the overlap in findings is higher than the data indicates.

The most common and overlapping findings across both ground and drone-only inspections were missing high signs, a condition easily visible from both ground and air. Other common and overlapping findings across both inspection methods included improper conductor connections, loose hardware/framing, and decayed or rotten poles. The remaining findings show little to no overlap and are typically weighted heavily towards one of the two inspection methods. [Table PG&E-22-20-2](#) below shows the top conditions identified in drone-only inspections and the corresponding structures inspected by ground.

Both ground and drone detected conductor and connector conditions, but drone-only generally detected more of them. Desktop review permits a close-up examination of tie wires, jumpers and jumper connections, splices, and conductors in the insulator shoes or on the very top of the insulators that are not visible from the ground. Dozens of drone tags revealed conductor damage (broken strands), broken tie wires, improper connections, tie wires in contact with the tops of arms (with tracking), melted tree wire insulation at connections, and loose clamps. Where both ground and drone detected tie wire conditions, the conditions were often rated more severe via aerial inspections, which had an improved and closer vantage point to view the condition.

**TABLE PG&E-22-20-2:
TOP FDAs FOR DRONE ONLY AND CORRESPONDING GROUND INSPECTIONS
(ALL TAG PRIORITIES)**

	FDA	Drone-Only Occurrence	Drone-Only FDAs percent of Total
1	High Sign-Missing-Install	377	22%
2	Conductor-Improper Connection-Adjust	363	21%
3	Pole-Broken/Damaged-Repair	225	13%
4	Hardware/Framing-Loose-Adjust	91	5%
5	Marking-Missing-Install	60	3%
6	Animal Mitigation-Mitigation Missing-Install	51	3%
7	Marking-Broken/Damaged-Replace	46	3%
8	Tie Wire-Loose-Replace	51	3%
9	Pole-Decayed/Rotten-Replace	52	3%
10	Conductor-Broken/Damaged-Repair	28	2%
11	Total FDA Population Reviewed	1,731	78%

	FDA	Ground Occurrence	Ground FDAs percent of Total
1	High Sign-Missing-Install	257	13%
2	Conductor-Improper Connection-Adjust	205	10%
3	Pole-Decayed/Rotten-Replace	165	8%
4	Connector-Incorrectly Installed-Replace	159	8%
5	Hardware/Framing-Loose-Adjust	79	4%
6	Pole-Broken/Damaged-Replace	77	4%
7	Guy-Loose-Adjust	67	3%
8	Crossarm-Decayed/Rotten-Replace	58	3%
9	Crossarm-Broken/Damaged-Replace	53	3%
10	Guy-Overgrown-Trim	47	2%
11	Total FDA Population Reviewed	1,999	58%

Drone inspections were able to detect many small hardware issues that are challenging or even impossible to see from the ground. Over half of the A and B tag findings from drone inspections come from the FDA hardware-framing-loose/adjust. Within the desktop inspections, the inspectors were able to clearly see small hardware such as cotter keys that are inserted into the pins that hold dead-end insulators to the crossarm at one end and to the conductor at the other end. Loose keys can quickly become missing keys, which could lead to conductors dropping to the ground.

Damaged and hollowed pole tops are another condition found by drone inspections that is challenging to observe from the ground. Some pole tops that look slightly rotted or damaged from the ground (jagged top) may be hollow down to more than 1 foot from the top. The aerial view can show if the shell of the pole at the through bolt is thin enough to be a risk of failure, a condition that could lead to the conductor dropping to the ground.

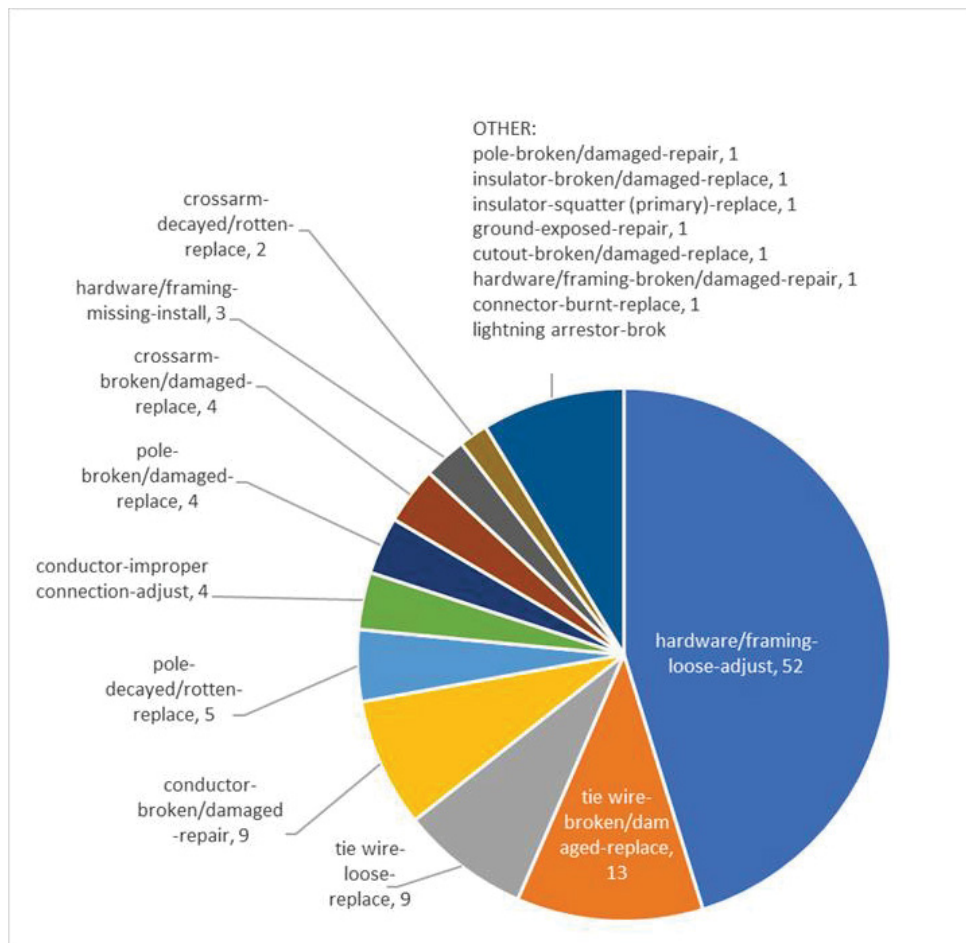
Ground inspections were better at detecting conditions at the bottom of the pole. These include vegetation issues as well as guy conditions at the ground level, including anchors, some of which must be unearthed for a thorough inspection.

Overall, the results indicate that ground and drone inspections are complementary in nature, with ground being able to better detect some conditions than drone, and vice versa. [Figure PG&E-22-20-2](#) and [Figure PG&E-22-20-3](#) below shows the overlap in conditions across different FDAs. Some of the patterns we see reflect the fact that not all FDAs were available for inspectors to select in iHawk. For example, the FDA “connector – incorrectly installed – replace” was not an option for the aerial inspectors and they used “conductor – improper connection – repair” in those cases. “Conductor – broken/damaged – replace” was also not an option. Some overlaps in condition detection are also underreported due to differences in choosing the action of “repair” vs. “replace” as part of an FDA. Some of these differences are training issues, but some are related to the visibility the aerial inspectors had of the issue. For example, woodpecker holes that were large, but shallow could be “pole-broken/damaged-repair,” but from the ground view the hole looked as though it could not be repaired, so ground inspectors may have selected “replace” instead.

**FIGURE PG&E-22-20-2:
COMPLEMENTARY CONDITION DETECTION ACROSS DRONE ONLY AND
CORRESPONDING GROUND CONDITIONS**



**FIGURE PG&E-22-20-3:
FDAs FOR DRONE ONLY A AND B TAGS**



Conclusions and Improvements for 2023

Based on the results of the pilot, PG&E concluded that there is significant value in using drone-only inspections to detect abnormal conditions on distribution assets. We reached this conclusion considering the costs and benefits of the drone-only inspection.

In this case, the benefit of the inspection is the ability to assess the risk of our OH assets from angles that are not normally accessible. The pilot results show that the drone-only inspections permit us to detect a larger variety of abnormal conditions on our OH assets, producing high tag find rates that will lead to corrective work to address the issues identified. The A tag find rate of over 1 percent was remarkable—the ability to detect and address emergency conditions on one out of every 100 structures was very compelling in deciding to further pursue distribution aerial inspections.

With respect to cost, the unit cost of drone-only inspections in the pilot (\$186) was higher than that of detailed ground inspections (\$112). PG&E expects that at scale, the cost of aerial inspections will reduce to become more comparable to the current cost of ground inspection. Based on these observations, PG&E concluded that there are benefits to continuing to explore the aerial inspection program. Benchmarking with

other utilities also supports this conclusion; both SCE and SDG&E have pursued and grown their distribution aerial programs in recent years.

Preparing for 2023

PG&E used the results of this pilot to develop our pilot aerial inspection program for 2023. The pilot demonstrated that ground and aerial inspections are complementary in nature, with some conditions being more visible by ground and others by air. Given this finding, we decided to focus our near-term aerial inspection program on the top 1/3 of the structure, which can be more challenging to assess via ground inspections. Limiting the aerial inspections to a pole top inspection enables PG&E to cover more ground with aerial more quickly, keeping the focus on eliminating A and B tag conditions that are of immediate concern and not focusing on conditions that are better detected by a ground inspection.

With its high aerial tag find rates, the pilot program demonstrated that there is value in focusing this inspection on areas of high risk. This led to PG&E developing a 2023 aerial inspections strategy that continues to drive aerial inspections in locations where they will bring the most value—in the areas of PG&E’s service territory where we are most concerned about catastrophic wildfires. [Section 8.1.3.2](#) describes PG&E’s strategy for identifying structures for aerial inspections in 2023.

The pilot demonstrated that we could implement aerial inspections on distribution at the scale of a few thousand. For drone-only inspections, PG&E had no safety issues and experienced minimal challenges in the areas of customer notification, vendor quality, photo capture, and the desktop inspection platform. However, the pilot demonstrated what areas of aerial inspections needed improvement before the program could be scaled:

- 1) **Clarity on Photo Requirements:** The pilot showed that PG&E needed to provide additional training for drone pilots and more clarity with respect to what pictures are required. For the 2023 effort, we have improved the drone pilot shot-sheet by including photos of the various pole framing types that show why we require additional pictures for certain framing types. Additionally, we are scheduling drone pilot training sessions to help the pilots understand our requirements and answer their questions before they begin work.
- 2) **Automated Tag Creation Process:** The pilot demonstrated that the manual process of tag creation was not scalable. We are building an automated process so that tags from desktop inspections are automatically created in SAP. For the aerial inspection program to scale, PG&E must be able to create new notifications or make changes to open notifications in real time. Additionally, we are building the processes and tools to execute a Field Safety Reassessment on open notifications.
- 3) **Consistency in Tag Guidance:** The pilot also showed that there was some inconsistency in how aerial desktop inspectors identified conditions relative to ground inspectors. To address this gap, PG&E consolidated guidance for desktop inspectors into the same OH Job Aid used by ground inspectors. The Job Aid was improved to include conditions and examples from aerial inspections, including pictures and a discussion of conditions on cotter keys, tie wires, and other equipment that may be better detected by aerial inspections. Additional FDAs will

also be added to iHawk to enable desktop inspectors to select the same conditions as ground inspectors.

As described in [Section 8.1.3](#), PG&E will be using 2023 to expand the pilot aerial inspection program by focusing on drone-only inspections. We will use our learnings from 2023 to potentially set a specific WMP target in future years.

ACI PG&E-22-21 – Asset Inspections QA/QC

Description:

PG&E is falling behind on its asset inspection 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), 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; and*
- 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.*

PG&E Response:

[Table PG&E-22-21-1](#) below sets out the requested QC quantitative targets while [Table PG&E-22-21-2](#) provides the results of the remaining 2022 asset inspection QA/QC.

**TABLE PG&E-22-21-1:
ASSET INSPECTION – 2022 QC AUDIT RESULTS AND 2023-2025 YTD PASS RATES**

Inspection Type	Type of Audit	Audit Results 2022 (Critical Pass Rate)	2023 YTD Pass Rate Results (Data as of 9/14/2023)
Transmission	Desktop	92.3% ^(a)	99.00%
Transmission	Field	81.0% ^(a)	99.10%
Distribution	Desktop	85.5%	94%
Distribution	Field	79.3%	86.33%
^(a) Percentages were slightly modified in response to Critical Issue RN-PG&E-23-02.			

**TABLE PG&E-22-21-2:
QUALITY MANAGEMENT – 2022 QUALITY VERIFICATION TRANSMISSION AND DISTRIBUTION
SI AUDIT RESULTS**

	A	B	C	D
	Locations Audited	Locations w/ Critical Attribute Failure	Total Critical Attribute Failures	Pass Rate
Distribution	3,041	670	847	77.97%
Transmission	2,696	100	109	96.29%

- *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*

We evaluate and make improvements to our Quality Control (QC) Program on a yearly basis. We focus on program efficiency, program effectiveness, stakeholder engagement, QC volume and sample size, and close out procedures. New programs are piloted and evaluated and, if approved, added to the QC Program catalog.

The System Inspection Quality Control (SIQC) team is significantly increasing the number of Quality Reviews of inspections that SI completes. This will create a true quality management system, reduce risk, improve SI performance, and drive inspection improvements. For 2023, SIQC's desktop QC team will evaluate more completed inspections and Quality Verification (QV)/Quality Assurance (QA) will review a statistically valid sample of the SIQC team's work. The SIQC team will focus on the critical attributes defined by asset strategy. This will allow us to increase the number of reviews performed daily while focusing on ignition risk attributes.

QC discrepancies are documented in electronic QC Review Assessment forms. Dashboards are used to show quality trends and discrepancy data using pre-determined metrics. We use these QC dashboard results to provide training and coaching and to update training materials and procedures. The QC team provides content for the New Inspector Training Program that shows an overview of the top trends and findings from the previous program year. In addition, the QC team participates in the Inspect App updates, standards and job aid update working sessions, and provides feedback on gaps and continuous improvements opportunities.

The top three findings in Distribution in 2022, which demonstrate weak points or areas that can be improved, were:

- 1) Conductor has splices within 24 inches on insulator;
- 2) Loose Guy Wires; and
- 3) Pole Broke, damages, cracked, rotted, or decayed.

The top three findings in Transmission in 2022, demonstrating weak points or areas that can be improved, were

- 1) Loose Guy Wires;
- 2) Pole top has damage or split top; and
- 3) Structure has bird, animal, or insect damage.

To address problems, we developed different criteria for addressing QC findings including:

- Revising policies, standards, procedures, checklists, and tools and providing training related to the revisions;
- The QC leadership team holds meetings to discuss the assessment results and trends;
- Sharing dashboards, charts and other visual management aids showing trends, metrics, and highlights from the QC process; and
- Using the QC data to drive improvements.

On a quarterly basis as part of the close-out procedures QC will submit a Corrective Action Plan containing:

- A summary of findings summary, trending metrics, and overall program results; and
- Tasks, strategies and corrective actions required to address the findings.

Systems inspection quality verification will focus on validation of the inspections performed by SIQC, to ensure effectiveness of QC and build additional levels of defense against failures.

- *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.*

There are three layers of defense for the 2023 programs: QC, QV, and QA.

SIQV is now integrated into the QC department and will follow the same guidelines and processes as QC. Building the program in the same department allows for standardization and consistency for quality reviews of inspections. QC and QV have clearly defined objectives, scopes of work, and an execution plan. This allows for consistency and a frequent exchange of information ensuring that all findings are addressed.

QA/QV will review a statistically valid sample of the SIQC team's work.

QA focuses on ensuring compliance discrepancies resulting from completed QC and QV assessments are integrated into improvement plans. QA also updates standards, procedures, and training. QA assess trends and the root causes of compliance issues and performs process audits.

Establishing a quality vertical that includes layers of defense is an improvement compared to having than multiple, duplicative layers that do provide additional control or assurance of quality.

For additional information about our quality assurance and quality control programs, see our response to Critical Issue RN-PG&E-23-02 in [Section 8.1.6.1](#).

ACI PG&E-22-22 – Progress on Meeting Asset Inspection Regulatory Requirements

Description:

PG&E is not meeting 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; and*
- 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.*

PG&E Response:

PG&E interprets the ACI header “Progress on Meeting Asset Inspection Regulatory Requirements” to refer instead to maintenance requirements, given the ACI description. Please refer to the 2023 targets GM-02 and GM-03, which are presented in [Section 8.1.1.2](#), and to the associated narrative in [Section 8.1.7](#) for a complete description of how we are addressing this ACI.

ACI 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; and*
- *Provide a plan for achieving progress that extends through the 2023-2025 WMP cycle.*

PG&E Response:

PG&E developed a UDS Program in 2021 that addresses reduction or adjustment of live fuels. UDS expands vegetation clearance around certain poles to extend the firebreak. UDS is not used as extensively as pole clearing but is based on a risk informed prioritization and has a more limited scope.

Starting in 2023 the program will begin to incorporate maintenance of work completed in newly developed Areas of Concern where the work overlaps with the pole clearing program. The UDS Program will also continue to target new populations with annually updated tranches that prioritize the work targeted for execution. This work and maintenance will target both transmission and distribution assets to supplement the work completed by the pole clearing program at higher risk assets and locations.

ACI PG&E-22-24 – Progression of Vegetation Management Maturity

Description:

In response to RN-PG&E-22-09, Pacific Gas and Electric Company (PG&E) identified several initial steps to mature in certain capabilities in its vegetation management (VM) program.

Required Progress:

In its 2023 Wildfire Mitigation Plan (WMP), PG&E must report on its progress in implementing its initial steps to increase the maturity of its VM program including any resulting plans and timelines.

PG&E Response:

To improve VM program maturity PG&E has taken actions to meet RN-PG&E-22-09 commitments and is taking additional actions that will enhance or improve specific elements starting in 2023.

Actions Specific to RN-PG&E-22-09

PG&E developed Areas of Concerns in 2022. This was a multiple phase effort involving cross functional teams to evaluate 47 counties within our service territory. Evaluations used numerous available datasets, including but not limited to, seasonal outages, Enhanced Powerline Safety Settings (EPSS) outages, ignitions, Public Safety Power Shutoff (PSPS) history, PSPS damage, and local knowledge to create polygons that encompass overhead (OH) circuits that we will target for focused VM efforts beginning in 2023.

Focused Tree Inspections: PG&E is developing AOCs to better focus VM efforts to address high risk areas that have experienced higher volumes of vegetation damage during PSPS events, outages, and/or ignitions. We have conducted a county-by-county review with regional SMEs and used this information to develop polygons where focused vegetation inspections can be evaluated to determine appropriate counties to prioritize pilot(s). Focused Tree Inspection plans will be piloted in at least one area. The pilot will develop and implement guidelines that inform inspections

Pilot activities are scheduled to begin in Quarter 2, 2023 and are referred to as the Focused Tree Inspection program.

We describe the Focused Tree Inspection program in [Section 8.2.3.4](#).

For additional information about our FTI Program, see our response to Critical Issue RN-PG&E-23-07 in [Section 8.2.2](#).

ACI 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 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.³⁰³

PG&E Response:

PG&E VM can be constrained by environmental delays, individual customer issues, permitting delays/restrictions or operational holds, weather conditions, active wildfire, and accessibility into an area where inspections are required. To address constraints, we work through our VM processes to resolve the roadblock and execute the work.

In 2023, VM plans to start the process of centralizing constraints resolution. As part of the build out of the centralized constraints team, three major categories will be addressed: customer constraints, environmental constraints (including internal PG&E procedures required to perform work) and permitting constraints (including both Land and Environmental permits). PG&E will consider creating a “right tree-right place” program, as part of the centralize Constraints Resolution process.

For each major constraint category, the constraints team will partner with Operations to build a process for addressing each constraint type, implement the new process, and create metrics to track each constraint type. Reporting will track total constraints by type and the time it takes to resolve a constraint after it has been identified.

³⁰³ Final Decision on PG&E’s WMP 2022 Update (Nov. 10, 2022), p. 181.

ACI PG&E-22-26 – Auditing of Internal Pre-Inspectors

Description:

PG&E has hired 108 internal pre-inspectors. PG&E's Quality Assurance/Quality Control (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.

PG&E Response:

The field quality control group performs individual observations/assessments of the pre-inspection population.

For the 2023 Vegetation Management programs that use pre-inspectors, the QA/QC sample will be taken from work performed by contractor and internal pre-inspectors. The procedures that the QA/QV team follows will be revised in 2023. PG&E anticipates that the updated procedures will be complete by the end of the second quarter of 2023.

ACI PG&E-22-27 – Vegetation Management Wildfire Inspection Guide – Stakeholder Engagement

Description:

PG&E is developing a VM Wildfire Inspection Guide to assess hazard trees in post-fire situations.

Required Progress:

PG&E must engage with Energy Safety, California Department of Forestry and Fire Protection (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.

PG&E Response:

PG&E's VM Wildfire Inspection Guide served as an interim guidance document through 2022. This interim document is being replaced by a PG&E Standard that will be published in early 2023 and a supporting procedure to be developed in Quarter 1 2023.

PG&E will engage with Energy Safety, CAL FIRE, the Wildfire Safety Advisory Board, and other stakeholders to receive feedback on the Standard in Quarter 1 2023. Feedback will inform the procedure document which will follow similar vetting and evaluation from external stakeholders prior to preparing for fire season in 2023.

ACI PG&E-22-28 – Progression of Effectiveness of Enhanced Clearances Joint Study

Description:

The 2021 Action Statements required the large Investor-Owned Utilities (IOU) 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 Southern California Edison Company (SCE) and San Diego Gas & Electric Company (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.

PG&E Response:

The utilities have prepared a joint response to this Area for Continued Improvement.

SDG&E, PG&E, and SCE (jointly, IOUs) have continued to collaborate on the vegetation clearance study. Bi-weekly meetings occurred throughout 2022 with attendees from the IOUs and Energy Safety attending.

The IOUs are focused on addressing the required progress of this study, which include:

- Standardize the data collection process for the cross-utility database of tree-caused risk events;
- Determine where and in what form the database will exist; and
- Examine, to the best of our ability, whether 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.

To most effectively achieve the objectives of the study, the IOUs chose to hire a third-party to establish the data collection standards, create the cross-utility database, and study the relationship between enhanced vegetation clearances and tree-caused risk events. A third-party vendor will provide both experience in data analysis and an independent review of the data and conclusions.

To select a qualified vendor for this multi-year engagement the IOUs nominated potential bidders for the work, and SDG&E led a Request for Information (RFI)

effort that was sent to eight different vendors. The RFI was distributed in February, with responses due back in early March. After reviewing and scoring the information received from the vendors, three were then invited to participate in a Request for Proposal (RFP). The documentation for the RFP was prepared and distributed to the vendors in early June and responses were received in July. The RFP materials were scored, and negotiations began with the selected vendor in August. The contract was completed in October and the vendor began attending the joint IOU meetings and beginning data collection for the study. Progress on each of the required areas is provided below:

1. Standardize the Data Collection Process for the Cross-Utility Database of Tree-Caused Risk Events:

The Electric Power Research Institute (EPRI) research team is implementing the first phase of the study: Database Evaluation. The first step has been for EPRI to request a sample set of data from each of the participating IOUs. This data includes information from relevant vegetation, outage, Geographic Information System (GIS), weather, and related data sets. The data samples are currently under review and a meeting with the research team and the IOUs is planned for Q1 of 2023 to discuss the data fields. After this discussion, a larger sample of data will be requested from each of the IOUs, including relevant metadata, and historical data. These will be combined into a database and jointly evaluated. The EPRI team will consider how best to combine the three separate groups of data into a single database. This will begin the second phase of the study: Database Development (that will exist on the EPRI Server). The three phases are described in more detail below.

2. Determine Where and In What Form the Database Will Exist

The database will exist on the EPRI Server, and outage data will be pushed to EPRI at a cadence determined over the course of the project, likely weekly. Vegetation, weather, GIS, and other datasets will also be pushed to the database at selected, regular intervals. The outage data will include outages that are not vegetation related. EPRI will query the freeform notes to extract possible tree related outages that were mis-coded. EPRI will examine and put the utility data into a common format and create a new database from the combined utility data. This data will be accessible for queries by the participants. If all the participants agree, the data can also be available for downloading, and can be made anonymous by the providing utility prior to transfer.

3. Examine, to the best of our ability, whether 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.

This will be done by first examining a selection of each IOU's databases including weather, vegetation management, GIS, OMS, and other related databases. The review will first include a review of the datasets, the frequency of collection, the quality of the data, the confidence in the data, historical data available from each IOU, the metadata, variables, definitions. Each utility will also identify a data

steward. Using this information from the sample selection, and a second request for larger dataset, we will create a data dictionary. After reviewing the samples of each company, and during the discussions described below, we will develop the joint database. The fields and coding systems in the joint database will be designed with the utilities and will leverage the vendor's prior experience on similar projects. The EPRI Data Science Platform will be able to integrate data of various formats and types, facilitating the data analysis described below.

Future plans for the study include creating the joint database across the three utilities to establish uniform data collection standards, focus on tree-caused risk events, incorporate both biotic and abiotic factors, and assess the effectiveness of enhanced clearances. Once the database is created, there is a great opportunity for researchers and practitioners to gain deep insights into the causes of ignition events and the potential vegetation management options to mitigate them. The study has the potential to address short and long-term research needs in California, where wildfire risk is expected to increase.

The following steps will be implemented between January 2023 and June 2024.

1. Database Evaluation:

- a. First, a sample of each IOU's database will be evaluated, recognizing that each IOU's database has some common fields and other fields that are not aligned. Then a larger section of the data will be evaluated. This will be to review existing data and guidelines for data collection and determine if the current structures allow the key research questions for this project to be addressed. To that end, and to ensure that the data can help us answer our key questions, we plan to have immersive discussions with each IOU's respective vegetation management and outage management teams to better understand what data is currently captured and to evaluate the level of quality and certainty of data contained in the database fields. This purpose of the immersive discussions is to understand the current database structures used by each utility, the method of recording data, the type of historical records available, the definitions of specific tree-pruning activities, the differences in the outage management systems (OMS), and other information that may vary by utility.
- b. The research team and utility Subject-Matter Experts from each of the three IOUs will attend a group workshop. This is tentatively scheduled for February 6-7. During this meeting we will discuss the key question raised at the individual meetings and discuss the possibility of modifying outage cause codes to best capture the information needed to perform a meaningful study, including sharing ideas regarding additional data fields. As a team (research team and utility SMEs) we will decide on the design of a consolidated database structure to be used moving forward.
- c. Third, once outage cause codes are determined, a survey/coding workshop will be held describing scenarios that should be coded. This survey will be given to all employees that input cause codes in the OMS. While the survey will capture the initial inputs, the survey will also present the user with the desired coding based upon the decisions made in the group workshop.

2. Database Development:

EPRI will base the database development on previous experience with cross utility databases such as the industry wide databases for Transmission and Distribution asset performance, inspections, and maintenance. Before defining the final database structure, we will adopt a phased approach. Initially we will investigate each utility's data individually. We then look at the lessons learned to assess the broader applicability. At that stage, we begin developing a cross utility database and design the criteria around how the common database is set up and populated, as well as the data management lifecycle criteria.

3 Data Analysis:

- a. In addition to a single, unified database structure, and having the data that allows IOUs to understand every vegetation contact with the lines, there is a need to drill down to understand vegetation treatments and their effectiveness. Assuming adequate history on circuits that have data before and after enhanced clearance work was performed, we would conduct statistically valid analyses on that group of circuits. The general objective of the data analysis would be to understand the effect of enhanced vegetation clearances on outage performance. The results would likely lead to other analyses and comparison with other treatment approaches depending on weather conditions. Depending on the type of data received, its granularity, the temporal scale, length of time that enhanced vegetation management has been implemented in the circuits, and how many variations the utility has used, there are many different options for analysis. For example, if the circuit characteristics and approaches are substantially different from one another (circuit to circuit or utility to utility) a self-benchmarking or baseline extrapolation might be possible if sufficient historical data is also provided. Other analyses will be determined based on the available data.
- b. EPRI will share the results of Data Analysis in a technical memo which will include data, graphs, charts, and narrative text. This information can be used to share results with joint IOU stakeholders, including agencies, and the general public, regarding results of the analysis and any insights regarding the potential links between enhanced vegetation clearing, outages, and ignition risk.

Separate from the joint IOU database study on enhanced clearances, each of the large IOUs have completed work to understand the effectiveness of enhanced clearances within their respective service territories. Details on these efforts are described below.

SDG&E

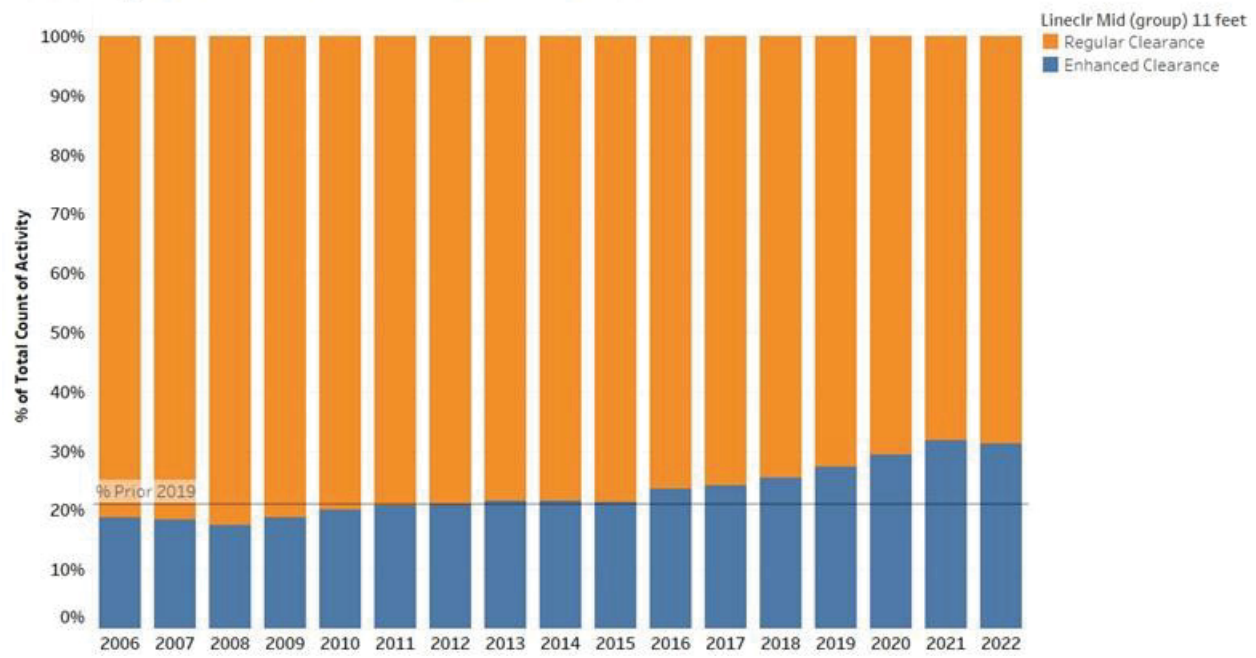
SDG&E has implemented several initiatives within its Vegetation Management program to reduce power outages and mitigate the risk of wildfire. These initiatives include covered conductor, undergrounding, enhanced inspection processes, and enhanced line clearance. To assess the impact of the Enhanced Clearance Vegetation Management program, which was launched in 2019, we conducted an analysis. Our goal was to understand the effectiveness of this program in reducing outages and potential wildfire.

According to the California Public Utilities Commission General Order (GO) 95, Rule 35, distribution voltage lines in California must have a minimum clearance of 18 inches. In the High Fire Threat District (HFTD) region of the state, the minimum clearance is 4 feet for distribution lines. For the purposes of this analysis, “enhanced clearance” refers to trees that were trimmed to a height above 11 feet. In 2019, SDG&E increased the percentage of trees managed at enhanced clearance distances (11 feet or higher) to 25 percent of its inventory and saw a reduction in power outages. The graph ([Figure PG&E-22-28-1](#) and [Figure PG&E-22-28-2](#)) below illustrates the percentage of inventory trees that were managed at enhanced clearance distances versus not enhanced from 2006 to 2022.

Distribution of Tree Inventory Line Clearance Distance

**FIGURE PG&E-22-28-1:
SDG&E – PERCENT OF TREES ENHANCED VS. NON-ENHANCED 2006-2022**

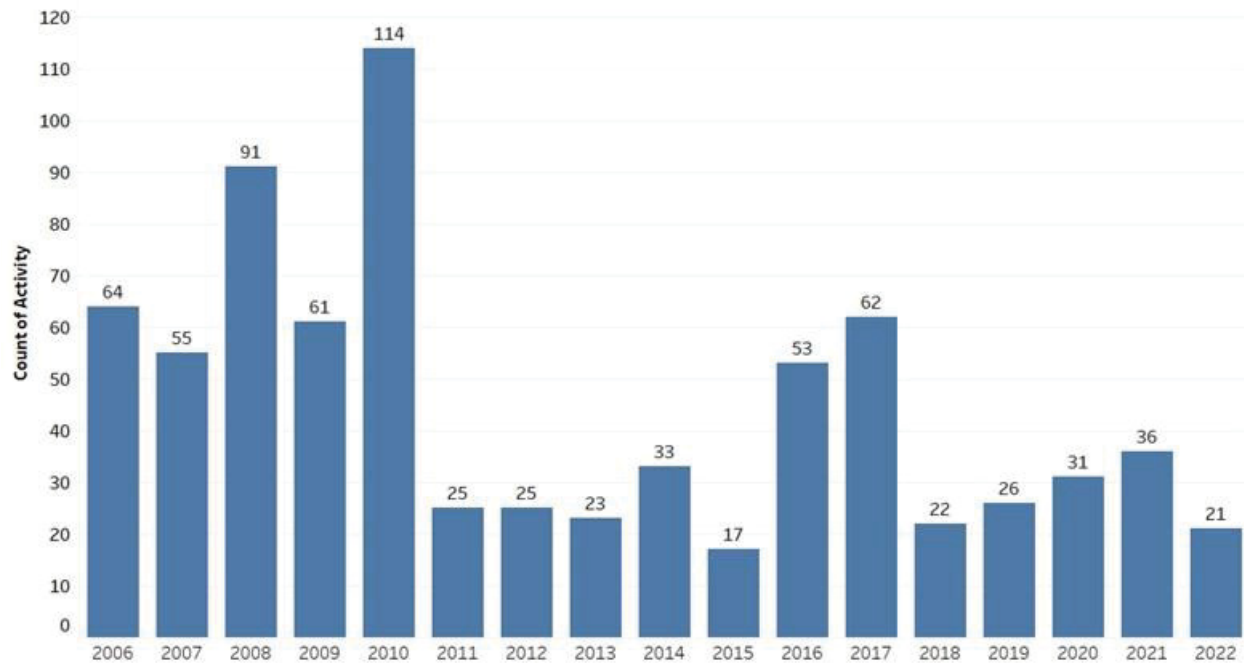
Percentage of Trees Enhanced vs. Non Enhanced 2006-2022



Historical Vegetation Related Outage Count

**FIGURE PG&E-22-28-2:
SDG&E – VEGETATION-RELATED OUTAGES 2006-2022**

Vegetation related Outages 2006-2022



To understand its outage reduction over recent years, SDG&E analyzed historical data. When comparing the years 2019-2022 to 2014-2018, SDG&E observed approximately a 20 percent improvement in outages ([Figure PG&E-22-28-3](#)).

**FIGURE PG&E-22-28-3:
SDG&E – OUTAGE COMPARISON**

Year	Group	Count of FACILITYIDs	Outage Count	Outage Rate (Outage Count/Count of FACILITYIDs)	% of FACILITYIDs less or equal to 11 feet	% of FACILITYIDs greater than 11 feet	Avg % of FACILITYIDs greater than 11 feet	% Change	Average Outage Count	Outage Improvement (count)	Outage Improvement (% change)	Average Outage Rate	Outage Rate Improvement	Outage Rate Improvement (% change)
2014	Prior EVM (14-18)	393,217	33	0.008%	78.4%	21.6%								
2015	Prior EVM (14-18)	388,903	17	0.004%	78.6%	21.4%								
2016	Prior EVM (14-18)	383,351	53	0.014%	76.3%	23.7%								
2017	Prior EVM (14-18)	379,431	62	0.016%	75.8%	24.2%								
2018	Prior EVM (14-18)	381,170	22	0.006%	74.6%	25.4%	23.2%		37.4			0.010%		
2019	EVM (19-YTD 22)	377,554	26	0.007%	72.7%	27.3%								
2020	EVM (19-YTD 22)	377,919	31	0.008%	70.7%	29.3%								
2021	EVM (19-YTD 22)	384,613	36	0.009%	68.2%	31.9%								
2022	EVM (19-YTD 22)	372,472	24	0.006%	68.8%	31.2%	29.9%	6.67%	29.3	8	21.8%	0.008%	0.0020%	20.7%

To determine the contribution of the enhanced clearance initiative to the observed improvement in outages, we employed a machine learning model (logistic regression) to analyze the relationship between line clearance distance and the probability of tree-caused power outages. The logistic regression model considered various variables

that may impact outage probability, and we conducted a sensitivity analysis to examine the effect of line clearance distance on outages while holding other factors constant.

SDG&E analyzed all activities from 2014 to 2022 to understand the relationship between line clearance distance and the probability of tree-caused power outages. We linked each outage event to its corresponding inspection or trim activity to determine the most recent line clearance distance before the outage occurred. The variable “outage” served as the flag variable that was predicted in the model.

The following features were included in the model:

- Species;
- Line Clearance Distance;
- Enhanced Clearance (yes or no);
- Tree Height; and
- Diameter at Breast Height.

To evaluate the performance of the model, the entire dataset was split into training and test data sets. The training set was used to build the model, and the test set was used to evaluate the model’s performance on unseen data. Once we understood the model’s performance, we altered the line clearance distance in the sensitivity analysis to understand its effect on the predicted probability of outages for each activity.

The sensitivity analysis reduced the line clearance distance of all activities with a line clearance distance above 11 feet (enhanced clearance level) to 11 feet. We then reran these activities through the model using the same threshold value to make predictions. We assumed that the new distribution of activities would have the same performance distribution as the actual data, allowing us to determine the number of outages that were potentially prevented for these trees.

By altering the line clearance distance value, but holding other factors constant, we were able to evaluate the impact of line clearance on tree-related outages. Our results revealed that reducing line clearance from enhanced levels (>11 ft) to regular levels (11 ft) led to an increase in the number of predicted tree-caused outages. Specifically, the model predicted a reduction in tree-related outages by approximately 12 percent attributed to enhanced clearances.

PG&E

PG&E launched the EVM program in response to changing environmental conditions and based on our best view of risk mitigation at the time. Since launching EVM in 2019, PG&E’s wildfire capabilities have continued to evolve and mature; we now have solutions that provide more effective and efficient wildfire risk reduction such as PSPS, EPSS, System Hardening and other Operational Mitigations. We are also evaluating additional Operational Mitigations, including partial voltage detection, downed conductor detection, and breakaway connectors, each of which will further reduce the risk of

catastrophic wildfires. The data below shows a slight decline in the 2022 non-Major Event Days (MED) Outages performance compared to the 3-Year Average.

The good measure is to compare the outages reduction because ignitions are impacted due to other wildfire reduction mitigation.

Data in the table below is not Normalized for Non-MED Outages (i.e., there are more non-MED in 2022 compared to 2021).

**FIGURE PG&E-22-28-4:
PG&E – 2022 VEGETATION OUTAGES COMPARED WITH 2021 AND 3-YEAR AVERAGE**

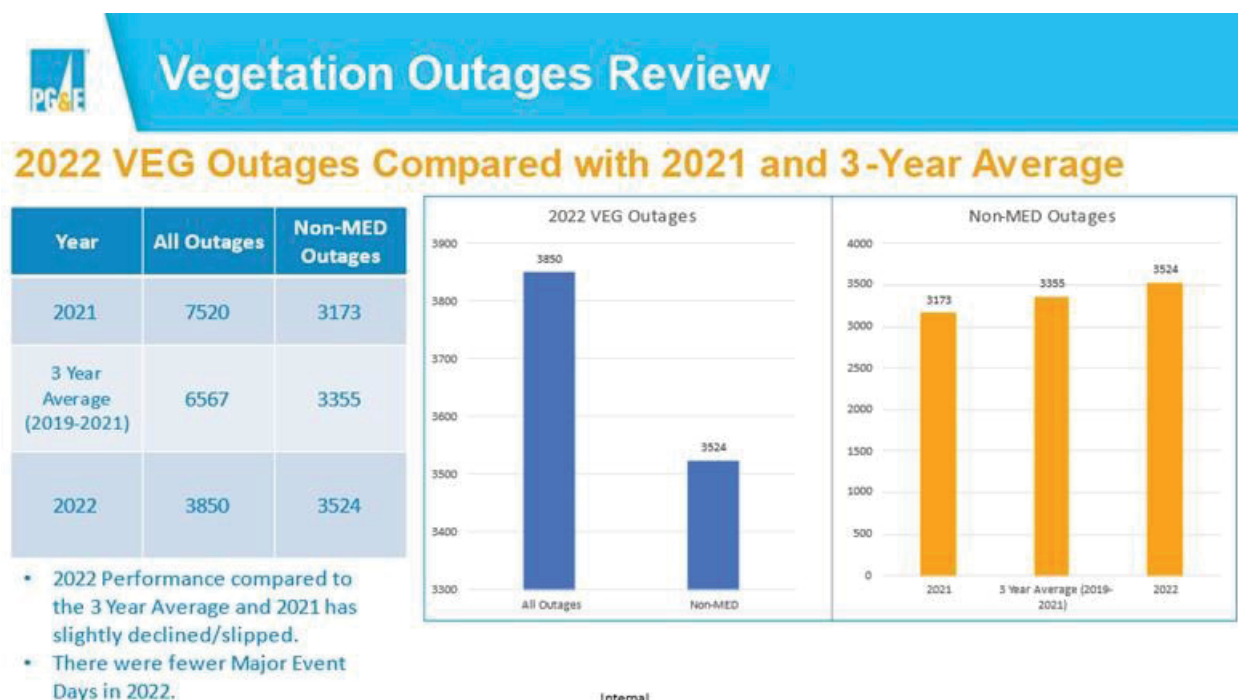


FIGURE-22-28-5:
PG&E – VEGETATION MANAGEMENT NON-MED OUTAGE RUNNING TOTAL DASHBOARD

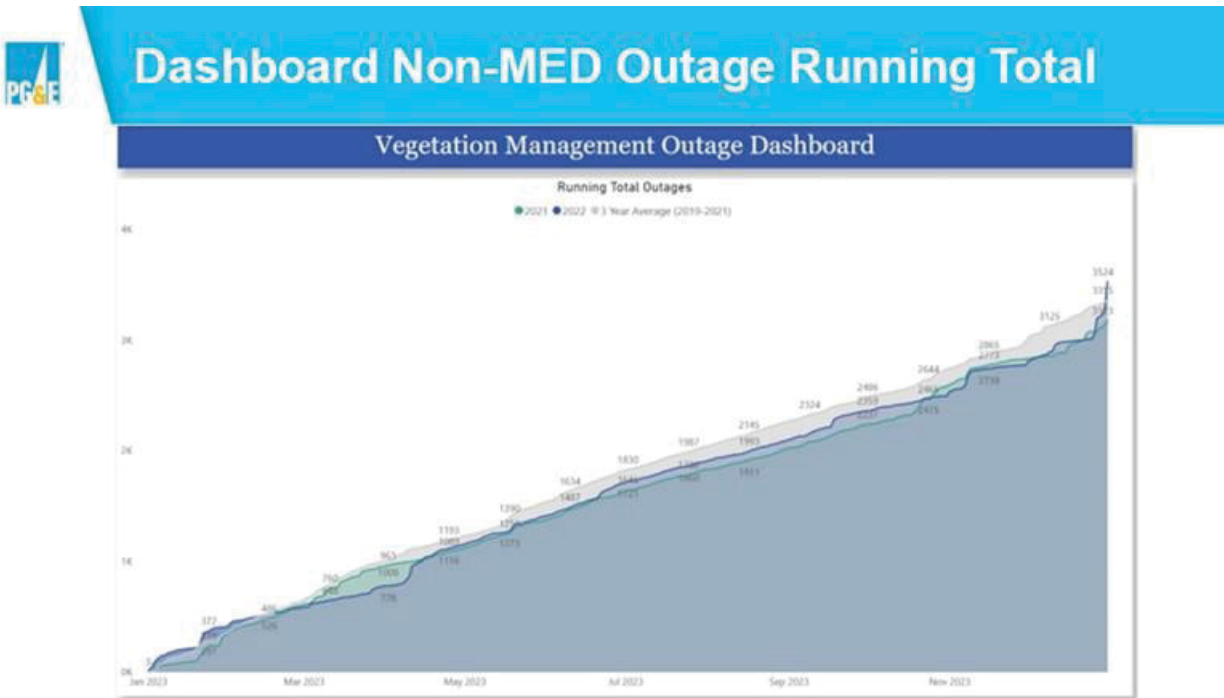
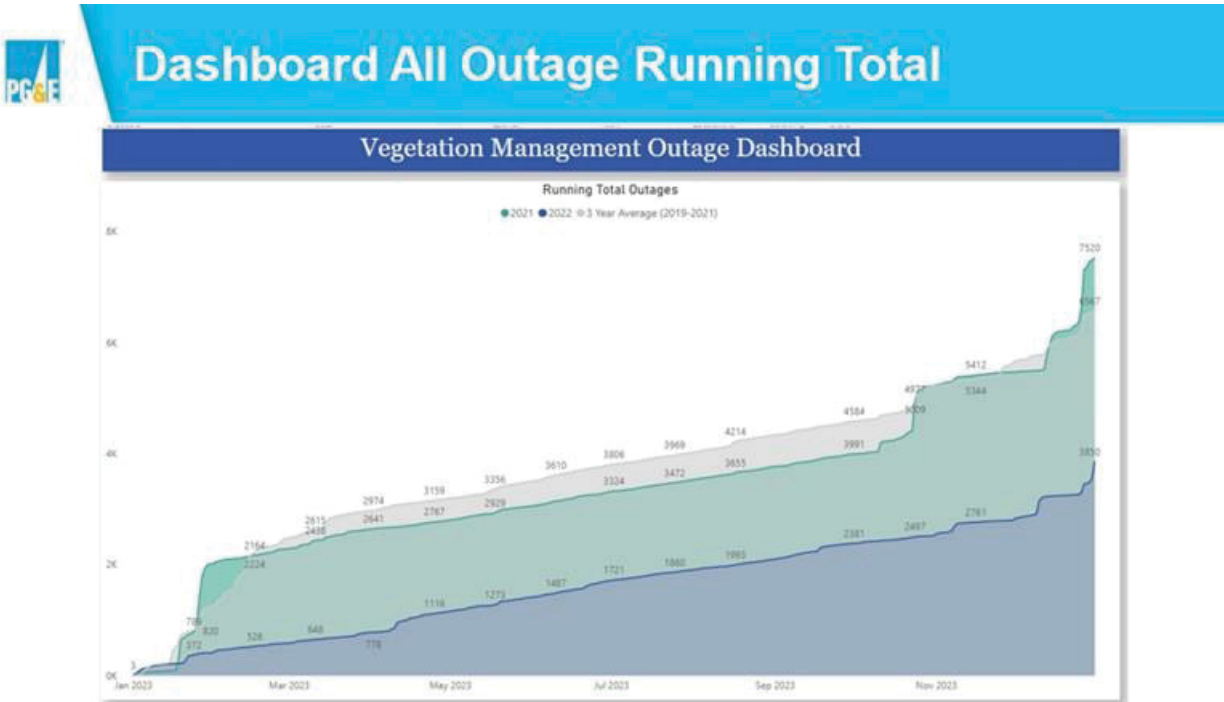
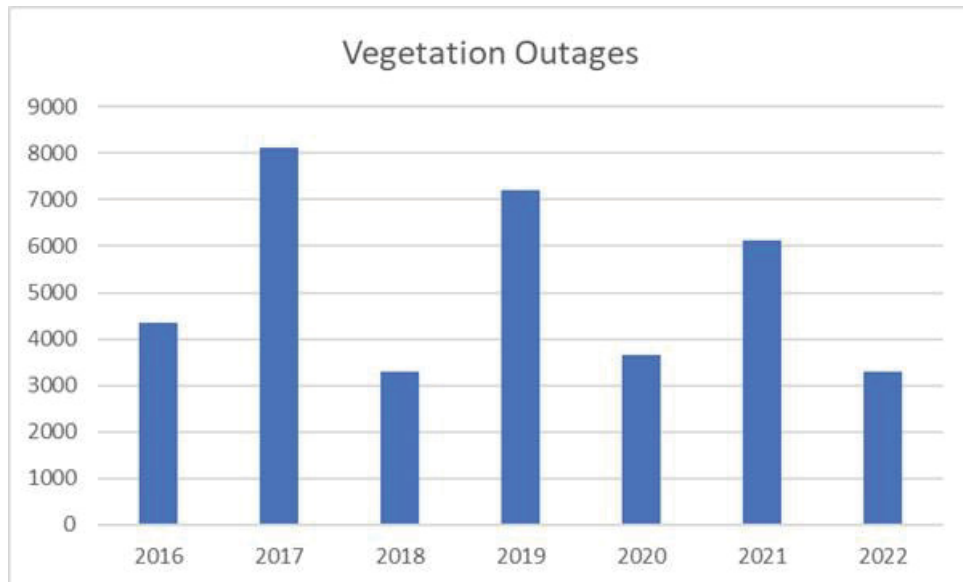


FIGURE PG&E-22-28-6:
PG&E – VEGETATION MANAGEMENT ALL OUTAGE RUNNING TOTAL DASHBOARD



Total Vegetation Outages 2016-2022

FIGURE PG&E-22-28-7:
PG&E – VEGETATION OUTAGES 2016-2022



SCE

Beginning in late 2018, SCE began implementing enhanced clearance programs to achieve greater trimming distances consistent with Decision 17-12-024, which amended GO 95 to increase recommended clearance distances at time of trimming in HFTDs. SCE believes that tree-caused circuit interruptions (TCCI) continue to serve as an appropriate data point to use in assessing the impact of SCE's enhanced clearance programs on wildfire risk mitigation.

Outage data in [Table PG&E-22-28-1](#) represents TCCI's on SCE's distribution system as confirmed through SCE field verification. The data shows a significant decline of 60 percent in the average annual number of TCCI's between the pre-enhanced clearance period of 2015 through 2019 and the post-enhanced clearance period of 2020 through 2022. In the pre-enhanced clearance period for HFTDs, SCE experienced an annual average of approximately 148 TCCI's, while in the post-enhanced clearance period, the annual average of the number of TCCI's is currently 60, a reduction of approximately 60 percent.

As of Q4 2022, there were no reported events on SCE's transmission circuits.

**TABLE PG&E-22-28-1:
SCE – AVERAGE EVENTS PRE- AND POST-ENHANCED CLEARANCES**

Average Events Pre and Post Enhanced Clearances	Pre-Enhanced Clearances	Post-Enhanced Clearances ^(a)	Difference
	Avg of Annual TCCIs (2015-2019)	Avg of Annual TCCIs (2020-2022)	
HFTD	148.4	60	-60%
Non-HFTD	289.2	168	-42%
All	437.6	228 ^(b)	-48%
Note: SCE's TCCI data categorization in this table is grow-in, blow-in and fall-in events with six total fault type categories: Grow-In, Blow-In, Fall-In, Human Caused, No Cause/Not tree related, and Uncategorized. This data excludes Human Caused, No Cause/Not tree related, and Uncategorized recorded events. SCE has maintained data for annual outages since 2015 and for enhanced clearance since 2020. (a) While SCE began implementing enhanced clearance in 2019, "post-enhanced" is focused on 2020 to the present, in consideration of the time required to execute and advance expanded clearance work across SCE's HFTD in its service territory. (b) December 2022 data is subject to change pending final verification.			

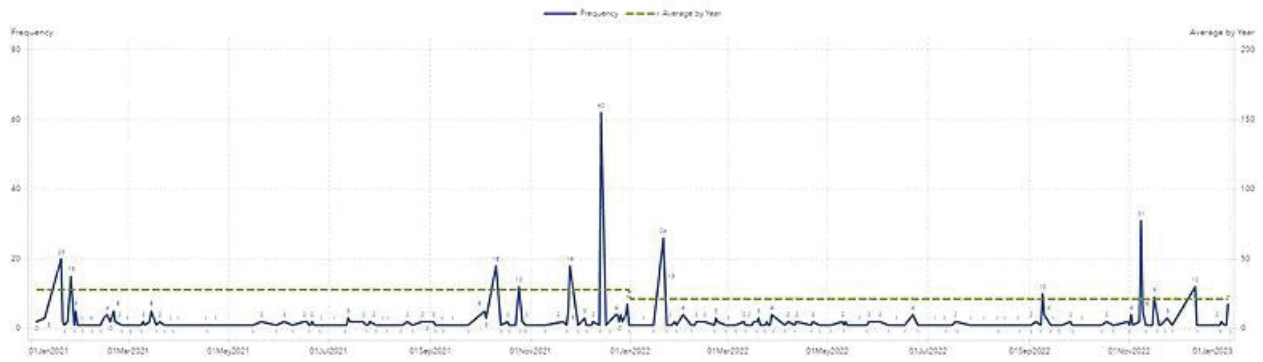
Though SCE has tracked TCCIs since 2015, advancements in its work management system have allowed SCE to associate specific outage events with the specific tree(s) in its inventory since 2021. Starting in 2021, SCE's legacy outage data was updated to newer data collection standards and into Fulcrum, one of SCE's data collection tools. This additional functionality helps further SCE's insight into outage events and potentially informs future mitigation strategy.

Additionally, SCE has enhanced the functionality of its outage dashboard to facilitate a more holistic view of TCCIs across the system. These views provide insight into TCCI trending, as well as factors that may affect outage frequencies, such as at-risk species, time of year, and related weather events. Figures 1 through 3 ([PG&E-22-28-8](#), [PG&E-22-28-9](#), and [PG&E-22-28-10](#)) show some examples of visualization available on the dashboard. The dashboard (as reflected in Figures 1 and 2 ([PG&E-22-28-8](#) and [PG&E-22-28-9](#))) shows a year-over-year decline in TCCIs in SCE's service area since the implementation of enhanced clearances and other wildfire mitigation initiatives. Finally, the data also indicates that SCE is experiencing flatter fluctuation of events over the year compared to prior years, with similar seasonal and storm-related spikes.

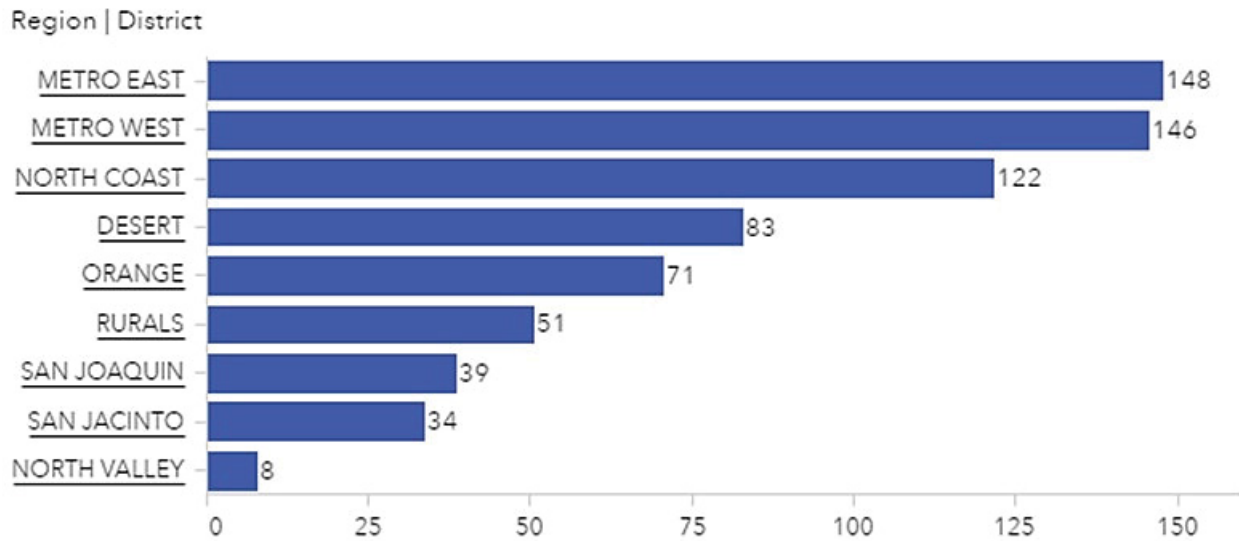
**FIGURE PG&E-22-28-8:
SCE – TIME SERIES PF TCCI EVENTS (2019 AND PRIOR – PRE-ENHANCED)**



**FIGURE PG&E-22-28-9:
SCE – TIME SERIES PF TCCI EVENTS (2020 AND PRIOR – PRE-ENHANCED)**



**FIGURE PG&E-22-28-10:
SCE – COUNT OF GROW IN, BLOW IN, AND FALL IN TCCIS BY REGION FOR POST ENHANCED
CLEARANCE (2020-2022)**



During this joint effort, SCE has diligently participated in furthering the goals of this effort by helping to delineate the steps required and contributing to the selection of the 3rd party consultant for the study. Over the next few years, SCE anticipates finding more substantial evidence of the impact of enhanced clearances on the reduction of tree-related events.

ACI PG&E-22-29 – Participation in Vegetation Management Best Management Practices Scoping Meeting

Description:

VM 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 VM best management practices for wildfire risk reduction. This VM 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.

PG&E Response:

The scoping meeting is scheduled for February 10, 2023, to be led by Energy Safety.

ACI 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.

PG&E Response:

PG&E uses an Operational Mitigation, EPSS (see [Section 8.1.8.1](#) for a description of our EPSS work), to respond to faults, ignitions, and other issues detected on the grid that may result in a wildfire.

[Section 8.1.8.2](#) describes how we locate, prioritize, and respond to faults/outages in HFRA locations.

We do not use our wildfire consequence modeling to locate, prioritize and respond to the locations of faults/outages in HFTD areas as they happen. Rather, PG&E's Emergency Operations Restoration Dispatch Supervisor, and dispatch personnel, monitor the Outage Information System/Outage Management Tool to ensure personnel are dispatched quickly to respond to EPSS outages. When an outage occurs on an EPSS enabled circuit, the outage will display a "Y" value in the EPSS column that indicates the outage is tied to EPSS protection.

ACI 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 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; and*
- Provide a description and associated justification of any modifications to PSPS wind speed thresholds since the 2022 Update.*

PG&E Response:

How PG&E Coordinates with Other Utilities to Understand the Impacts of Installing Covered Conductors and the Associated Changes That Could Be Made to PSPS Thresholds as a Result

Covered conductors can potentially reduce the risk of consequences arising from the objects contacting distribution lines. In collaboration with the joint IOU team, PG&E has performed effectiveness studies to evaluate how covered conductors can reduce ignition risk compared to bare conductors. The results have been reviewed and further improvements are in progress to achieve more accurate and granular metrics regarding the effectiveness of this program.

Covered conductors reduce the probability of outage and ignitions but do not eliminate the risk entirely. The effectiveness of covered conductors is not homogenous as effectiveness is a function of surrounding vegetation risk and wind speeds.

More specifically, based on the collaboration with the joint IOU team, one of the biggest hazards during PSPS events is the potential for tree fall into line. Despite the improvements in covered conductor in reducing the probability of outage and ignition, this failure mode is something covered conductor does not largely mitigate. Therefore, PG&E is not proactively adjusting PSPS thresholds as a result of the study.

We also note that due to our PSPS modeling approach, we would not manually adjust our final PSPS risk thresholds to account for covered conductor or any other program that reduces the probability of catastrophic outcomes. Our Catastrophic Fire Probability model (discussed in [Section 9](#)) is a risk-based assessment of the probability of ignition

given an outage multiplied by the probability of catastrophic fires (Fire Potential Index). Thus, we would not adjust the threshold at which PSPS is executed (each area is scoped for PSPS at the same risk threshold), but *any* program or external factor that results in a beneficial outcome would reduce the probability of ignitions and therefore *decrease* the chance of achieving the PSPS threshold.

To account for year-over-year changes, we incorporate new outage data each year into our Outage Producing Winds (OPW) and Ignition Probability Weather (IPW) machine learning models. These updates account for any updated wind to outage to ignition responses in local areas of the grid. Additionally, this is discussed in this document under the IPW model.³⁰⁴ We are also exploring if adding covered conductor as a feature of the IPW model in future iterations provides benefits (see Objective SA-04).

Provide a Summary of Key findings, Including Any Changes Implemented to PG&E's PSPS Procedures or Practices

No changes to PG&E's PSPS protocols have currently been made based on studies and benchmarking of covered conductors; however, as discussed above, PG&E has continued to update PSPS models to include the improved performance of covered conductor installations.

Provide Any Studies Completed by Third Parties on Wind Speed Thresholds for Covered Conductor, or, if Not Yet Completed, a Timeline for Completion

PG&E has not yet commissioned any third-party studies on wind speed thresholds for covered conductors. However, PG&E is in the progress of performing dynamic finite element analysis (FEA) simulations of system hardened circuits, including covered conductors with maximum GO 95 wind loading to determine component specific safety factors. This analysis will be used to ensure compliance with GO 95 minimum construction safety factors for all components installed as part of system hardened designs.

The five span FEA simulations will be performed for all system hardening design configurations with various approved poles, crossarms, 3-phase configurations, covered conductor types, insulators, and span angles. The dynamic wind loading will be simulated for roughly 110 components for each simulation performed and safety factors will be calculated comparing component rated strengths vs. actual loading stresses.

Below are example images of the components and configurations used within the simulations, and stress maps on the individual system hardened components based on maximum wind loading.

³⁰⁴ See, for example, [Table 6-1](#), PG&E's Risk Models.

**FIGURE PG&E-22-31-1:
COMPONENTS AND CONFIGURATIONS USED WITHIN THE SIMULATIONS**

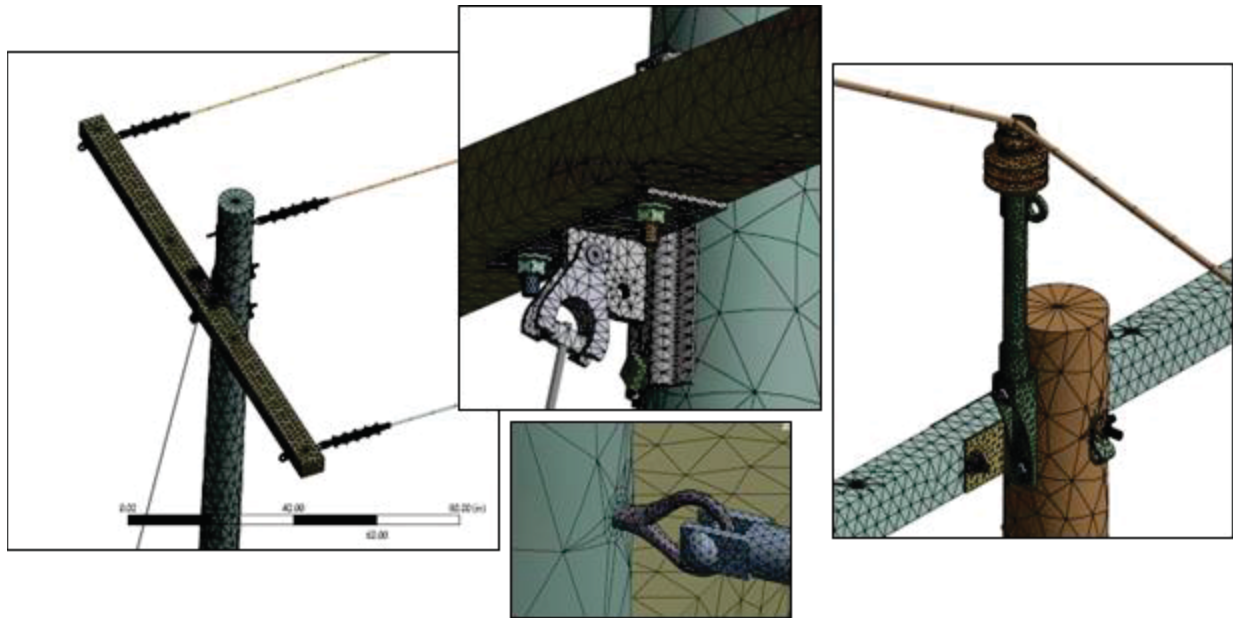


FIGURE PG&E-22-31-2:
STRESS MAPS ON THE INDIVIDUAL SYSTEM HARDENED COMPONENTS
BASED ON MAXIMUM WIND LOADING

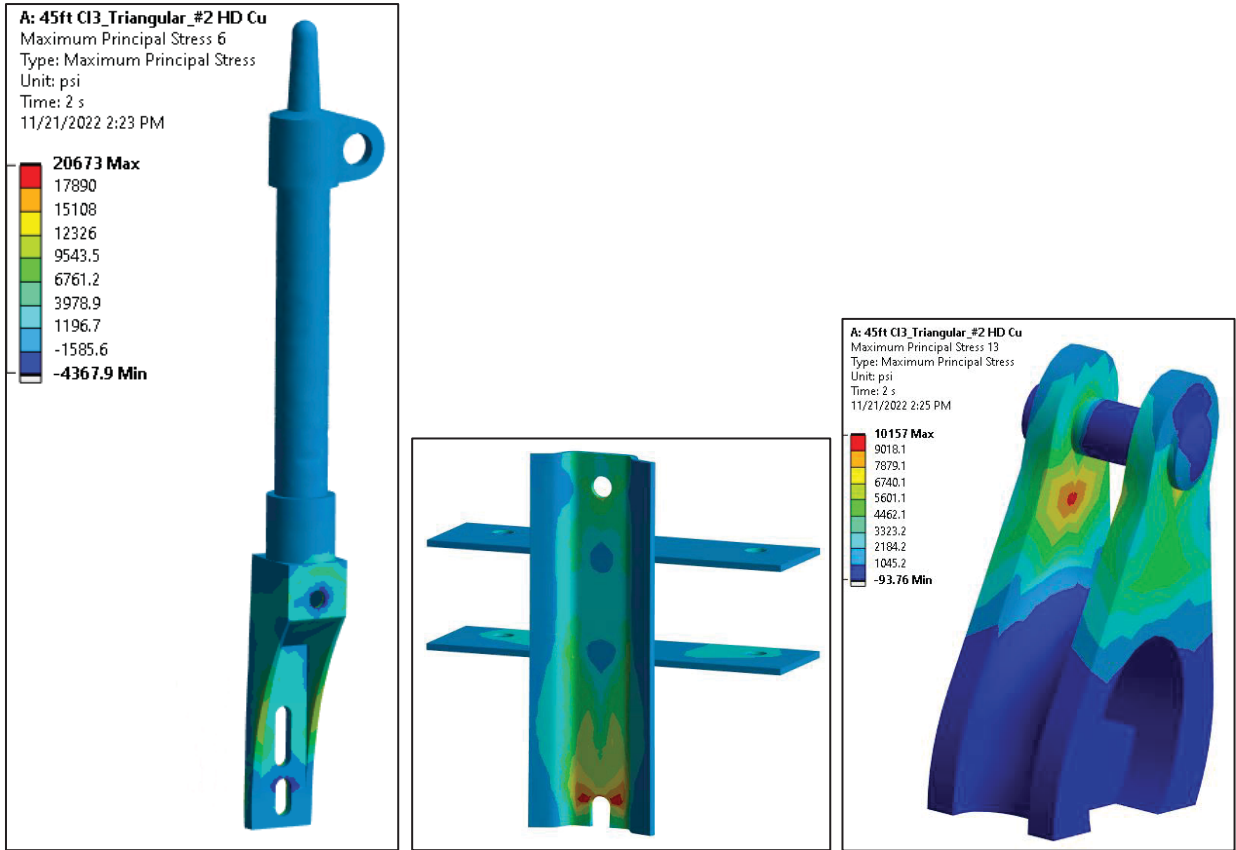
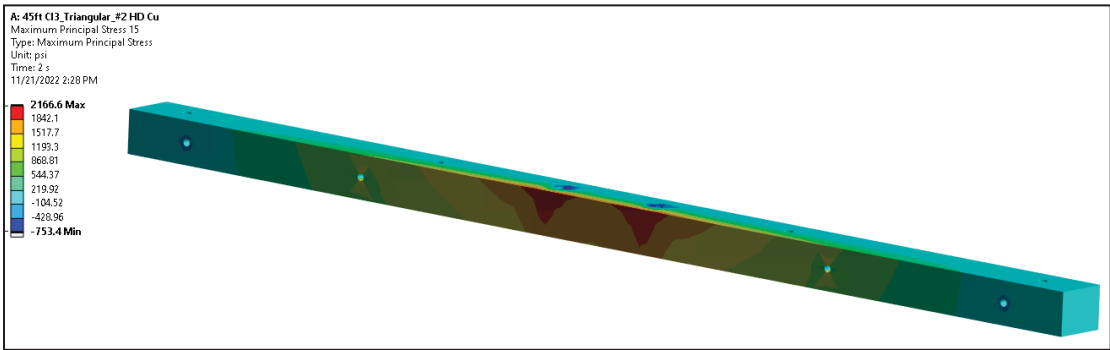


FIGURE PG&E-22-31-3:
STRESS MAP ON THE INDIVIDUAL SYSTEM HARDENED COMPONENTS
BASED ON MAXIMUM WIND LOADING



There are 32 different five-span configurations that will be evaluated. PG&E intends to finish the simulations by the end of Q2 of 2023. Results will then be shared with design engineering to determine if revisions to system hardened designs are needed. The dates by which we will make changes to overhead hardening designs will be determined based on complexity of change and predicated on completion of thorough management of change process.

Provide a Description and Associated Justification of Any Modifications to PSPS Wind Speed Thresholds Since the 2022 Update

As discussed above, PG&E does not use wind speed thresholds, and instead uses a risk-based approach for PSPS. Please see [Section 8.3.5](#) for additional details.

ACI 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 Access and Functional Needs, 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.);*
- *Vegetation data; and*
- *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.

PG&E Response:

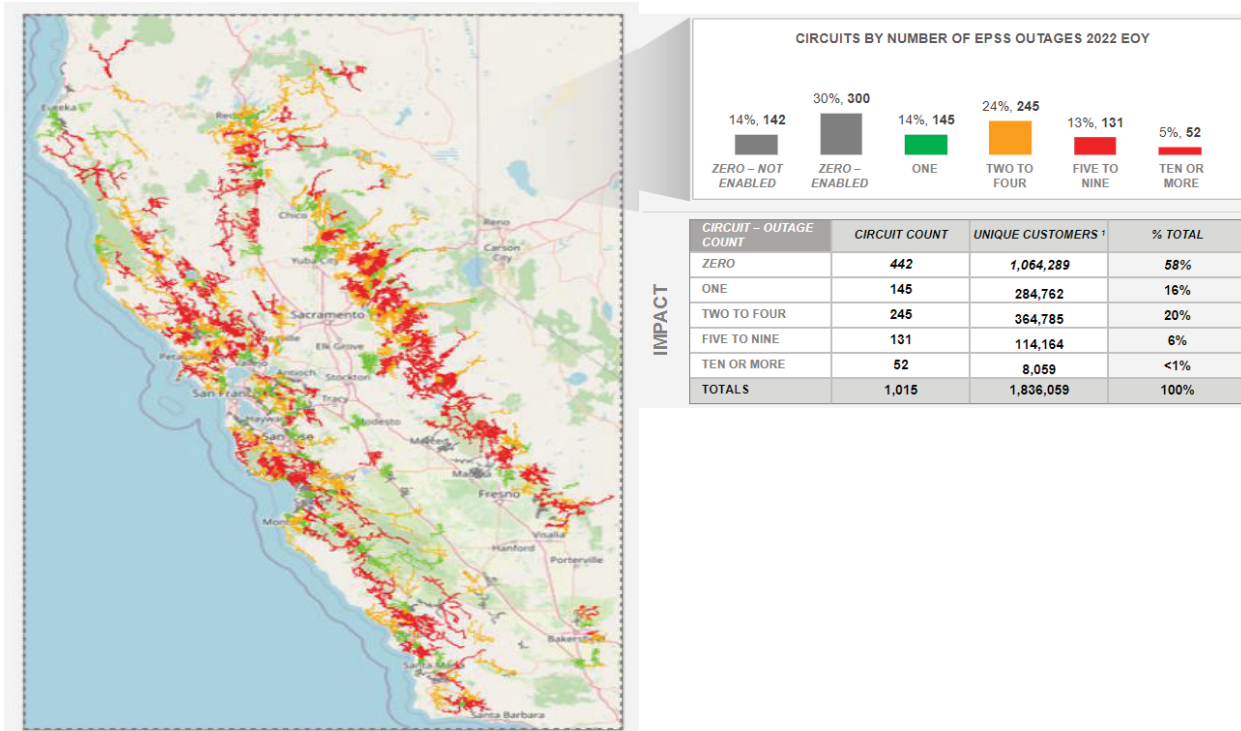
The attached 2022 Reliability Study³⁰⁵ addresses eight of the first nine requirements of this ACI ([ACI PG&E-22-32](#)). Regarding resource constraints, we do not anticipate resource constraints and we carefully plan for resources and staffing according in preparing for EPSS outages to meet our goal of responding within 60 minutes.

The data provided is aggregated to the CPZ that experienced outages while EPSS was enabled in 2022. What the report does not highlight is that a significant percentage of customers that were protected by EPSS in 2022 did not experience an outage. Fifty eight percent—more than 1 million customers—were not affected by EPSS in 2022. However, more than 122,000 customers experienced more than five outages while EPSS protection was enabled, 8,059 of whom experienced more than 10 outages while

³⁰⁵ See Attachment 2023-03-27_PGE_2023_WMP_R0_Appendix D ACI PG&E-22-32_Atch01.

EPSS was enabled. Reducing the frequency of outages for those customers will be the focus of our reliability mitigation work in 2023.

**FIGURE PG&E-22-32-1:
CIRCUITS BY NUMBER OF EPSS OUTAGES 2022**



Based on the results of the attached 2022 EPSS Reliability Study, PG&E will be undertaking the following activities to continue to improve reliability for customers experiencing outages on circuits protected by EPSS in 2023.

- 1) **Vegetation Management:** In 2023 we will transition our Enhanced VM program to a proactive, targeted VM that is geared at improving operational performance. The program will focus on the circuit protection zones within the EPSS program with a history of vegetation caused outages. Additionally, we will continue execute our Vegetation Extent of Conditions operation from 2022 that rapidly responds to EPSS outages with vegetation as the cause and: (1) determines if there are additional vegetation risks upstream and downstream of the fault location; and (2) attempts to remove any identified vegetation.
- 2) **Circuit Sectionalization:** We have identified approximately 100 additional protective devices to install on the most reliability challenged circuit protection zones to help reduce customer count exposure should a fault occur.
- 3) **Enablement/Disablement:** In 2023 the EPSS Operations team will look to further optimize the ability to enable EPSS at a more granular level so that only those CPZs reaching the required elevated wildfire risk criteria will be enabled on a given day. This ability to enable or disable at a CPZ level will allow PG&E to reduce enablement on sections of a circuit that geographically may exist in challenging

terrain or be exposed to different weather conditions than other sections of the same circuit (e.g., a circuit segment that traverses the coastal range from west to east).

- 4) Multiple Outage Reviews: Optimize the existing multiple outage review process for more targeted solutions on an individual outage basis. This would include immediate Multi Outage Reviews (MOR) assignment on all CPZs that were Customers Experiencing Multiple Interruptions (CEMI) 5+ in 2023. In addition, the EPSS Operations team will work to enhance the secondary causal review outage investigation processes to endeavor to resolve more unknown cause outage activity and identify appropriate mitigations.
- 5) CEMI 10+ Customer Impact: The EPSS program will examine the 19 circuits and associated 57 protection zones where customers experienced more than 10 outages while EPSS was enabled. That effort will include an examination of MORs from 2023 to determine where mitigation actions reduced or eliminated outage frequency. Local engineering personnel will further examine each CPZ to identify new solutions that could be incorporated into workplans to further drive down the frequency of outages on these circuits in 2023. These solutions could include installation of additional Fault Indicators, line sensors, or additional targeted VM work, or installation of animal guards and diverters to reduce animal contact on the lines; and
- 6) Customer Experience: Improve customer communication tracking at the service point identification level for enhanced customer engagement related to ensuring awareness of the portfolio of direct customer support offerings. Additionally, we will examine whether there are opportunities to expand eligibility for customer support program offerings for highly impacted customers, including medical baseline customers, that may currently be affected by outages on EPSS circuits but that reside just outside the thresholds for eligibility.

ACI 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; and*
- *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.).*

PG&E Response:

Electric asset inventory data (Asset Registry) is a foundational element in enabling effective wildfire mitigation efforts. We have implemented and continue to work on targeted and systematic data quality improvements and data management programs to remediate our most critical data gaps associated with the physical assets that contribute most significantly to wildfire risk.

We acknowledge that there is missing or incomplete data in the Asset Registry database at the asset type inventory (asset record) level and at the data field (data element) level. Many of these data gaps resulted from inadequate historical data management practices, including lack of data collection standards and controls, human error, errors during conversion of paper records to digital records, and backlogs of records for processing.

In response to these historical challenges, we initiated our Asset Registry Data Quality (ARDQ) program in 2022 to develop the foundational tools, processes, and functional roles to systematically measure the quality of our most important asset data. Through this program we have developed the capability to:

- Identify and inventory our Critical Data Elements (CDE) within the Asset Registry;
- Document metadata associated with the CDEs;
- Develop and apply hundreds of data quality rules to the CDEs;
- Assign data stewardship responsibilities to staff to assess data quality of CDEs and identify targeted areas for data quality remediation;
- Provide visibility into data quality and measure progress in closing data quality gaps for CDEs through dashboards in our enterprise data and analytics platform (Palantir Foundry); and
- Publish high-quality asset data for use in Palantir Foundry-based analytics.

Through the ARDQ program, we have identified over 570 CDEs relating to 12 risk-prioritized asset types and we will continue to be expanded to other Asset Registry data and asset condition data going forward.

PG&E generally implements a risk-prioritized approach to data management and targeted data quality improvement projects related to our Asset Registry data with a near-term focus on a quantifying and addressing data gaps associated with data types that contribute most significantly to wildfire risk.³⁰⁶ Our risk bowtie models for asset failures that contribute to ignition events account for approximately 86 percent of wildfire risk.

PG&E broadly targets seven data quality dimensions and specifically targets the dimension of completeness through projects aimed at filling in missing data.

Through our ARDQ program, we have quantified fill rates for critical data fields for the twelve asset components, including attributes such as installation date, manufacturer, voltage rating (where applicable), and material type (where applicable), as cited in the ACI.

Along with the ARDQ program we have implemented a series of programs and projects to improve our overall data management practices with a focus on high-risk, critical data issues within the electric Asset Registry. These programs and projects fall into three categories.

1. Asset Record Backlog Reduction: Projects and programs to address backlogs of aged As-Built and Map Correction work orders to more accurately and timely reflect assets in the field.
2. Asset Data Governance: Programs to develop, implement, improve Asset Registry related governance in the form of standards, procedures, and processes.
3. Asset Data Quality Remediation: Discrete projects aimed at addressing specific gaps at a data element and/or asset record level. These projects may also include deployment of new technologies, procedures or processes needed to remediate the root cause data quality issues. In addition to addressing data gaps within our current data model, PG&E is also undertaking efforts to expand its Asset Registry to include new data fields to enable risk analysis and asset management.

One example of a major Asset Data Quality Remediation project is the Transmission Asset Information Collection project, which PG&E implemented to address gaps in Asset Age data for critical transmission asset components in

³⁰⁶ The 12 risk-prioritized asset types are: steel; non-steel; conductor; insulator; support structures (poles); primary overhead conductor; dynamic protection device; fuse; surge arrester; capacitor bank; voltage regulator; and service transformer. These risk-prioritized asset types are used in [Table PG&E-22-33-1](#) in [Appendix F](#) listing current data fill rates for a subset of the data elements through 2022.

response to conditions of PG&E's probation.³⁰⁷ Under this project, PG&E conducted a records search and, where available, recorded the age and date of installation of certain critical transmission tower components in HFTDs, the failure of which may result in ignition. Where asset age records were not reasonably available, PG&E is making conservative assumptions of such ages and dates of installation. Lastly, PG&E is implementing a program to determine the expected useful life of critical components factoring in field conditions and incorporating that information into its risk-based asset management programs. We have completed data collection for assets (structures) in HFTD districts in 2022 and will address the non-HFTD structures in those circuits in 2023

In [Appendix F](#) we provide tables that: list the programs underway to improve the quality of our Asset Registry data; provide an update on our progress filling in missing data; and list the projects completed in 2022.

³⁰⁷ *U.S. v. PG&E*, CR 14-00175 WHA (Aug. 7, 2020) (Document 1243), Order Approving and Adopting Proposed Conditions of Probation, US District Court Northern District of California, p. 4, #7 Asset Age Condition, *stating*; “For certain critical transmission tower components in High Fire-Threat Districts, the failure of which may result in an ignition, PG&E shall conduct a reasonable search and, where available, record the age and date of installation of those components. For all other such critical transmission components and where asset age records are not reasonably available, PG&E shall make conservative assumptions of such ages and dates of installation. PG&E shall also implement a program to determine the expected useful life of critical components factoring in field conditions and incorporate that information into its risk-based asset management programs. PG&E shall begin this effort (or supplement any existing or planned initiatives) immediately and provide monthly progress reports to the Monitor team.”

ACI 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; and*
- 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.*

PG&E Response:

PG&E quantitatively assesses the viability of alternative mitigations as part of our overall mitigation strategy that is meant to address the highest wildfire risk locations based on wildfire risk models and subject matter expertise.

In the 2022 WMP, PG&E discussed the decision tree used to inform mitigation selection at high wildfire risk location.³⁰⁸ This required the review of high-risk locations informed by the WDRM for line removals and remote grids first, before considering the viability of undergrounding and overhead hardening. While we still review system hardening projects for possible line removal first, we explained in our 2022 WMP how undergrounding is a more effective mitigation in terms of long-term risk reduction³⁰⁹ than overhead hardening when line removal is not possible. Therefore, we have shifted to using undergrounding as the preferred method of system hardening. This shift in strategy is contingent on the ramp-up of underground (UG) miles to drive lower unit costs, resource optimization, and longer-term contracts.

³⁰⁸ PG&E 2022 Revised WMP (Docket #2022-WMPs), (July 26, 2022), pp. 561-563.

³⁰⁹ PG&E 2022 Revised WMP (Docket #2022-WMPs), (July 26, 2022), p. 553.

Given the potential to reduce unit costs through a scaled undergrounding program, PG&E developed a process for scoping, bundling, and tranching potential UG mile locations based on wildfire risk and feasibility. To account for operational and executability factors, we needed to consider the variability in cost due to the terrain difficulty when transitioning an existing OH location to UG. For instance, on average, it takes 1.25 UG install miles to replace 1 OH mile. However, at times, this multiplier can be 2-3 times greater, especially in the highest risk locations, because of existing OH circuitry traversing steep gradient and water crossings. In these areas underground miles would need to be relocated to run along roads, winding around the terrain features.

PG&E developed a measurement described in the 2022 Revised WMP³¹⁰ as the Simplified Wildfire Risk Spend Efficiency (SWRSE) or Wildfire Feasibility Efficiency (WFE) to identify where we could most efficiently reduce risk given the terrain feasibility at a particular location due to the presence of hard rock, large water crossings and/or gradient. We calculate the SWRSE as follows:

$$SWRSE = \frac{\text{Wildfire Risk}}{\text{Cost}} = \frac{\text{Wildfire Risk}}{\text{Standard Cost} * \text{Feasibility Score}}$$

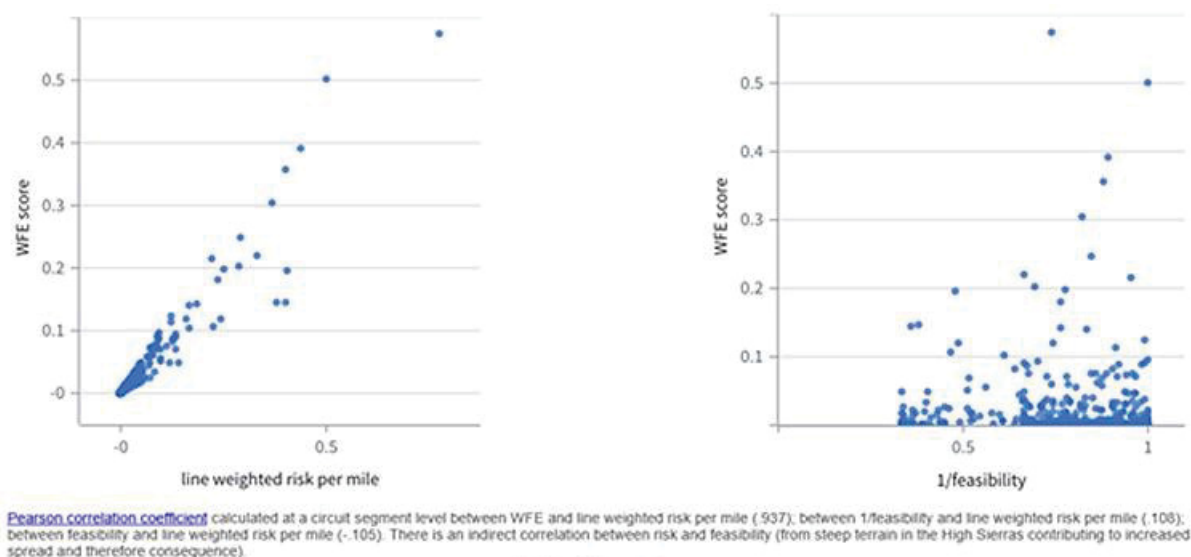
While in practice the standard cost per mile of undergrounding is expected to decline over time, we assumed it to be fixed at 1 for all circuit segments so that the selection is only driven by feasibility and risk. This defines the WFE Score:

$$WFE\ Score = \frac{\text{Line Weighted Risk per Mile}}{\text{Feasibility Cost Multiplier}}$$

Importantly, the risk values span a much larger range (several orders of magnitude) than the feasibility scores (bound between 1-3), meaning that prioritizing based on simplified wildfire risk-spend efficiency produces similar results compared with prioritizing based on risk, especially at the highest end of the risk curve. Overall, PG&E evaluated the statistical significance and influence of risk compared to feasibility as shown in [Figure PG&E-22-34-1](#) below. [Figure PG&E-22-34-1](#) indicates that, based on the Pearson correlative coefficient, WFE and risk are 93.7 percent correlative, while feasibility is only 10.8 percent. This confirms that our prioritization of WFE is focused more on risk and less on feasibility.

³¹⁰ PG&E 2022 Revised WMP (Docket #2022-WMPs), (July 26, 2022), p. 574. For additional information see Application (A.) 21-06-021, Exhibit (PG&E-17), p. 3-5, line 22 to p. 3-9, line 8.

**FIGURE PG&E-22-34-1:
CORRELATING WILDFIRE RISK AND FEASIBILITY**



For the Undergrounding Program, we selected the roughly 8,000 OH miles with the highest SWRSE to produce roughly 10,000 miles of undergrounding. To maximize operational efficiency and minimize disruption to our customers, the selected circuit segments were then bundled together at the circuit level to allow for scoping, designs, dependency, and execution. Each bundle is comprised of circuit segments of up to 100 miles on a unique circuit and prioritizes bundling circuit segments with similar WFE scores to minimize variability within the bundle.

The Undergrounding Program portfolio was then split into three tranches of executable work generally aligning to PG&E's GRC rate case periods over the next approximately 10 years. The original designation of Tranche 1 consisted of approximately 3,000 miles of circuits resulting in the most risk reduction that would be executed in the roughly 2024 to 2026 timeframe. The remaining two tranches, which amount to approximately 7,000 UG miles, will be addressed in later years.

In December 2022, we updated our 2023-2026 undergrounding mileage³¹¹ from the original target of approximately 3,000 miles to 1,750 miles between 2024-2026. Because of the reduced miles, naturally, this reduced the amount of risk reduced through 2026, from an original risk reduction of 33 percent in 2024-2026 to a risk reduction of approximately 18 percent.

PG&E remains committed to prioritizing risk for future projects not already scoped and included in the existing workplan, which were identified using the WDRM v2 model and WFE framework based on the 2022 WDRM v3 model. PG&E's circuit selection strategy continues to focus on creating a portfolio that allows us to maximize wildfire risk reduction for the resources deployed across our territory.

³¹¹ A.21-06-021, PG&E's Reply Brief, (Dec. 9, 2022), p. 329, Table 4-2.

PG&E is currently in the process of reviewing the selection methodology used to date to identify additional higher-risk circuit segments that are not currently included in 2024-2026 work plan. Given the impending release of WDRM v4 in early 2023, we expect to re-evaluate our new project selection framework leveraging the outputs of WDRM v4. The updated project selection framework (e.g., the replacement for the 2022 WFE framework) will then be used to determine the highest risk circuit segments to be incorporated into the execution workplan.

For additional information regarding wildfire risk and feasibility, see PG&E's response to Critical Issue [RN-PG&E-23-05](#) in [Section 8.1.2.2](#).

ACI 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); and*
- 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.*

PG&E Response:

While PG&E uses the longer 10-year lookback to target mitigations, we incorporated only the most recent five years of the lookback to quantify the expected impacts of our mitigations because we consider the five-year timeframe more representative of expected near term future PSPS impacts. PG&E projected our 2023-2026 portfolio of undergrounding and Motorized Switch Operator (MSO) mitigation work against the 2018-2022 lookback of PSPS events to quantify their impacts on PSPS scope, frequency, and duration.

To calculate each PSPS mitigation's benefit, PG&E computed the direct impact of each mitigation activity on PSPS scope, specifically, the reduction in number of customers and associated customer hours per PSPS event. To quantify the reduction of frequency for PSPS events, PG&E evaluated whether any previous PSPS events could have been eliminated applying the mitigations.

We concluded that none of the mitigation initiatives described in this analysis will completely eliminated any event.

PG&E updated the total annual underground miles target for 2025 to align with the final GRC decision.³¹² Since the targeted number of customers being mitigated from PSPS

³¹² See 2025 WMP Update, Section B.2.1.1.2 for more information.

events is directly tied to the number of miles of undergrounding completed and MSO devices installed, [Table PG&E-22-35-1](#) is updated to reflect the change for 2025.

For more details on lookback analysis, please see [Table PG&E-22-35-1](#) below.

**TABLE PG&E-22-35-1:
PSPS EVENTS LOOKBACK ANALYSIS**

Mitigation Type	Incremental Customers Mitigated ^(a)	Cumulative Customers Mitigated ^{(a),(b)}	Incremental Mitigated (%)	Cumulative Mitigated (%)	Incremental Customers Mitigated Per Event	Incremental Customer Hours Mitigated ^(a)	Incremental Customer Hours Mitigated Per Event
2023 MSO	1,090	1,090	0.07%	0.07%	57	545	29
2023 UG	13,973	13,973	0.87%	0.87%	735	542,894	28,573
2023 Year Total	15,063	15,063	0.94%	0.94%	793	543,439	28,602
2024 MSO	205	1,295	0.01%	0.08%	11	102	5
2024 UG ^(c)	9,775	23,748	0.68%	1.55%	946	698,059	36,740
2024 Year Total	9,980	25,043	0.69%	1.63%	956	698,161	36,745
2025 MSO	–	1,295	0.00%	0.08%	–	–	–
2025 UG ^(d)	13,175	36,923	0.84%	2.37%	693	511,531	26,923
2025 Year Total	13,175	38,218	0.84%	2.45%	693	511,531	26,923
2026 MSO	–	1,295	0.00%	0.08%	–	–	–
2026 UG ^(e)	29,942	66,866	1.93%	4.24%	1,576	1,162,544	61,187
2026 Year Total	29,942	68,161	1.93%	4.32%	1,576	1,162,544	61,187

- (a) “Incremental Customers Mitigated”, “Cumulative Customers Mitigated”, and “Incremental Customer Hours Mitigated” are calculated over the whole five-year lookback analysis. The five-year lookback analysis shows the hypothetical PSPS events created by applying 2022 PSPS guidance to the weather from 2018-2022 and is used in this WMP to calculate projected PSPS customer impacts. To find the per year average, divide the values displayed in each of these three columns by five.
- (b) PG&E’s Target PS-07 for 2023-2025 reflects the anticipated improvement of reducing PSPS impact of approximately 38,000 customer events as presented in this table.
- (c) 2024 UG numbers will be adjusted upon PG&E’s 2024 Change Order decision for Target GH-04.
- (d) 2025 numbers are updated based on Target GH-04 change to align with the final GRC decision. See Sections B.2.1.1.2 and B.2.1.1.3 in the 2025 WMP Update for more information.
- (e) 2026 incremental numbers have not been updated with the latest undergrounding forecast. Exact target commitment will be included in PG&E’s 2026-2028 WMP filing. The cumulative numbers have been updated to account for the 2025 undergrounding forecast changes.

Importantly, this lookback analysis accounts for the benefits of our planned 2023-2026 mitigations. Project development and refinement is still underway for the 2023-2026 mitigation workplan. Therefore, the locations and quantities of the various mitigations assumed in this analysis are based on estimates available to date. The lookback assumes the benefits from the two projects complete their planned mitigation for each respective year, regardless of when during the year they are completed. This analysis is also subject to the limitations associated with using historical weather lookback as previously described in this section.

[Table PG&E-22-35-2](#), below, details the target reductions from PG&E's WMP mitigations.

**TABLE PG&E-22-35-2:
TARGET REDUCTIONS AS A RESULT OF PG&E'S WMP MITIGATIONS**

	2023 Incremental	2024 Incremental	2025 Incremental	2026 Incremental	2023-2026 Cumulative
Average PSPS Scope per Event	0.94%	1.15%	1.40%	1.94%	5.32%
Per-Customer Duration per Event ^(a)	(0.07)%	(0.01)%	0.00%	0.00%	(0.08)%
Event Frequency	0.00%	0.00%	0.00%	0.00%	0.00%
(a) Negative percentage indicates an increase in Per Customer Duration per Event. This is because MSO device replacements remove customers with short outage duration from the PSPS event which increases the average outage duration of remaining customers in the event.					

Based on the mitigations discussed above, the five-year lookback analysis shows a potential 5.3 percent (4,481 customers) reduction in average PSPS event size. This percentage was used to forecast 2023-2026 values.

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
APPENDIX E
REFERENCED REGULATIONS, CODES, AND STANDARDS

Appendix E – Referenced Regulations, Codes, and Standards

In this appendix, PG&E provides in tabulated format a list of referenced codes, regulations, and standards, and other referenced documents.

In response to Office of Energy Infrastructure Safety’s Revision Notice for PG&E’s 2023-2025 WMP, PG&E is providing some new and/or updated standards and procedures. They have been integrated into Table PG&E-E-1.

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
California Legislation:	Assembly Bill 56 (Hill, 2011)	Gas corporations: rate recovery and expenditure: intrastate pipeline safety.	Bill Search (ca.gov)
California Code of Regulations (CCR):	Title 14, § 29300	State regulation requiring regulated entities to notify the Office of a fault, outage, or other anomaly occurring within the vicinity of a fire or a wildfire threat that poses a danger to infrastructure.	California Code of Regulations
	Title 14, §§ 1250-1258	Provides specific exemptions from: electric pole and tower firebreak clearance and electric conductor clearance standards and to specify when the standards apply.	
California Public Resources Code (PRC) Sections:	§ 4291	Forests, Forestry and Range and Forage Lands > Protection of Forest Range and Forage Lands > Mountainous, Forest-, Brush- And Grass-Covered Lands.	Codes: Codes Tree - Public Resources Code - PRC (ca.gov)
	§ 4292		
	§ 4293		
	§ 4295.5		
	§ 4221 – 446	Forests, Forestry and Range and Forage Lands > Protection of Forest Range and Forage Lands > Mountainous, Forest-, Brush- And Grass-Covered Lands > State Responsibility Area Fire Prevention Fees > Appeals Process	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
Applications before the California Public Utilities Commission (CPUC or Commission):	Application (A.) 20-06-012	PG&E's 2020 Risk Assessment and Mitigation Phase (RAMP) Report.	CPUC Proceeding Information (ca.gov)
	A.21-06-021	PG&E's Test Year 2023 General Rate Case (GRC) Application.	
California Public Utilities (PUC) Code Sections:	§ 768.6	Requires that the Commission establish standards for disaster and emergency preparedness plans and for California electrical corporations to develop and update an emergency and disaster preparedness plan	Codes: Codes Tree - Public Utilities Code - PUC (ca.gov)
	§ 8386 § 8386(c)(18)	Requires an electrical corporation to construct, maintain, and operate its electrical lines and equipment in a manner that will minimize the risk of catastrophic wildfire. Each electrical corporation shall submit a wildfire mitigation plan (WMP) to the Wildfire Safety Division for review and approval.	
	§ 956.5	Owners and operators of intrastate transmission and distribution lines shall meet with local fire departments to discuss and review emergency plans.	
CPUC Decisions	Decision (D.) 02-04-026	Interim Opinion Regarding Phase 1 Issues – rulemaking on electric and gas baseline allowances.	Decision Search Form (ca.gov)
	D.05-10-044	Interim Opinion Approving Various Emergency Program Changes Re: Anticipated High Natural Gas Prices In Winter 2005-2006.	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	D.06-04-055	Decision Granting the Request of the Joint Utilities to Modify Requirements for Reporting Incidents Involving Trees or Other Vegetation in the Vicinity of Power Lines.	
	D.09-08-029	Decision in Phase 1 – Measures to Reduce Fire Hazards in California Before the 2009 Fall Fire Season.	
	D.21-06-014	Decision Addressing the Late 2019 Public Safety Power Shutoffs by PG&E, SCE, and SDG&E to Mitigate the Risk of Wildfire Caused by Utility Infrastructure.	
	D.14-02-015	Decision Adopting Regulations to Reduce the Fire Hazards Associated with Overhead (OH) Electric Utility Facilities and Aerial Communications Facilities.	
	D.14-12-025	Decision Incorporating a Risk-Based Decision-Making Framework into the Rate Case Plan and Modifying Appendix A of D.07-07-004.	
	D.16-01-008	Decision Updating the Annual Electric Reliability Reporting Requirements for California Electric Utilities.	
	D.17-01-009	Decision Adopting a Work Plan for the Development of Fire Map 2.	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	D.17-12-024	Decision Adopting Regulations to Enhance Fire Safety in The High Fire-Threat District.	
	D.18-12-014	Phase Two Decision Adopting Safety Model Assessment Proceeding (S-Map) Settlement Agreement with Modifications.	
	D.19-05-042	Adopting De-Energization (Public Safety Power Shutoff (PSPS)) Guidelines (Ph. 1 Guidelines).	
	D.19-05-037	Decision on PG&E's 2019 WMP Pursuant to Senate Bill (SB) 901.	
	D.19-05-042	Decision Adopting De-Energization (PSPS) Guidelines (Phase 1 Guidelines).	
	D.19-07-015	Decision Adopting an Emergency Disaster Relief Program for Electric, Natural Gas, Water and Sewer Utility Customers.	
	D.19-09-027	Decision Establishing a Self-Generating Incentive Program to Support the San Joaquin Valley Disadvantaged Community Pilot Projects	
	D.20-01-021	Self-Generation Incentive Program Revisions Pursuant to Senate Bill 700 and Other Program Changes	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	D.20-03-004	Decision on Community Awareness and Public Outreach Before, During and After a Wildfire, and Explaining Next Steps for Other Phase 2 Issues.	
	D.20-05-051	Decision Adopting Phase 2 Guidelines For De-Energization of Electric Facilities to Mitigate Wildfire Risk.	
	D.20-06-003	Phase I Decision Adopting Rules and Policy Changes to Reduce Residential Customer Disconnections for the Larger California-Jurisdictional Energy Utilities.	
	D.20-06-017	Decision adopting short-term actions to accelerate microgrid deployment and related resiliency solutions.	
	D.20-12-030	Direction Regarding Marketing and Outreach of the Disadvantaged Communities – Single-Family Solar Homes.	
	D.21-05-019	Decision Addressing Phase II Issues Relating to Emergency and Disaster Preparedness Plans.	
	D.21-06-014	Decision Addressing the Late 2019 PSPS to Mitigate the Risk of Wildfire Caused by Utility Infrastructure.	
	D.21-06-034	Decision adopting Phase 3 revised and additional guidelines and rules for PSPS.	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	D.21-11-009	In the matter of the Application of Ting Telecom California for a Certificate of Public Convenience and Necessity to Provide Full Facilities-Based and Resold Competitive Local Exchange Services Throughout the State of California.	
	D.22-10-002	Decision Resolving Litigated Issues for Southern California Edison Company's Phase 2 GRC.	
	D.22-12-027	Phase II Decision Adopting Modifications to the Risk-Based Decision-Making Framework and Directing Environmental and Social Justice Pilots.	
	D.22-03-008	Decision Closing RAMP Proceeding.	
	D.22-10-002	Decision Addressing Phase I Tracks 3 And 4 Issues –OIR to Further Develop a Risk-Based Decision-Making Framework for Electric and Gas Utilities.	
	D.22-11-033	Decision Modifying D.02-04-026 Regarding Requirements to Remain Enrolled in Medical Baseline Program.	
	Res. E-5162	Behind-The-Meter Microgrid Tariff Pursuant to D.21-01-018.	
	Res. E-5242	Allows PG&E to offer Remote Grids as a sole standard service offering under certain conditions.	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	GO 165	Inspection cycles for electric distribution facilities	
CPUC General Orders (GO):	GO 166	Standards for Operation, Reliability, and Safety During Emergencies and Disasters.	CPUC General Orders (ca.gov)
	GO 174	Rules for Electric Utility Substations.	
	GO 95	OH Electric Line Construction.	
	Investigation (I.) 19-06-015	OII on the Commission's Motion into the Maintenance, Operations and Practices of PG&E with Respect to its Electric Facilities. Includes Envista Forensics Root Cause Analysis of 2017-2018 Wildfires.	
CPUC Investigations and Rulemakings:	R.08-11-005	OIR to Revise and Clarify Commission Regulations Relating to the Safety of Electric Utility and Communications Infrastructure Provider Facilities.	Root Cause Analysis of the wildfires of 2017 and the Camp fire of 2018 (I.19-06-015)
	R.12-11-005	Order Instituting Rulemaking Regarding Policies, Procedures and Rules for the California Solar Initiative, and Self-Generation Initiative and Other Distributed Generation Issues.	Rulings Search Form (ca.gov)
	R.15-06-009	OIR Regarding Policies, Procedures and Rules for Regulation of Physical Security for the Electric Supply Facilities and to Establish Standards for Disaster and Emergency Preparedness Plans.	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	R.18-12-005	Decision adopting phase 3 guidelines and rules for PSPS to mitigate wildfire risk caused by utility infrastructure. Includes Access and Functional Needs (AFN) quarterly progress reports.	
	R.19-09-009	OIR Regarding Microgrids Pursuant to SB 1339 and Resiliency Strategies.	
	R.20-07-013	OIR to Further Develop a Risk-Based Decision-Making Framework for Electric and Gas Utilities.	
	ESRB-4 (Agenda 13027)	Directs Investor-Owned Electric Utilities to take remedial measures to reduce the likelihood of fires started by or threatening utility facilities.	
CPUC Resolutions:	ESRB-8	Resolution extending de-energizing reasonableness, notification, mitigation, and reporting requirements.	ESRB-4
	Comprehensive Preparedness Guide (CPG) 101	Developing and Maintaining Emergency Operations Plans (September 2021, V.3).	ESRB-8
Federal Aviation Administration Rules	FAA Part 107 Rules	Airspace Authorizations rules for Drone pilots flying under the small Unmanned Aircraft Systems (UAS) Rule.	www.faa.gov
	FAA Part 91 Rules	General Operations regarding operations of private aircrafts.	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
Federal Emergency Management Agency Resources:	AL 4014G/5378 E	To revise Electric Rule 12 to allow customers to reestablish service under a prior rate schedule as part of our Emergency Consumer Protection Plan	CPG 101 Link
	AL 4145-G/5643-E	Revision to the Emergency Consumer Protection Plan under Gas and Electric Rule 1	AL are available at: Advice Letters (pge.com)
PG&E Advice Letters (AL):	AL 4249 G/5827 E2 (PG&E ID U 39 M)	Budget AL	
	AL 5918 E	Implementation Plan for Community Microgrid Enablement Program in Compliance with D.20-06-017	
	AL 6623-E	Remote Grids as Sole Standard Service Offering	
	2022 PG&E Community Resource Center Plan	2022 PG&E Community Resource Center Plan	
PG&E Communications, Comments, and Documents:	Company Emergency Response Plan (CERP) Annex Maintenance and Deadlines	CERP Annex Maintenance and Deadlines	Wildfire Mitigation Plan (pge.com)
	2020 CERP Change Record	2020 CERP Change Record	
	EMER-3001M	CERP (1/1/2023)	
	EMER-3002M	Electric Annex	
	EMER-3008M	Emergency Communication Annex to the CERP	
	EMER-3105M	Wildfire Annex	
	EMER-3106M	PSPS Annex	
	2022 Safety Outage Decision-Making Guide	2022 Safety Outage Decision-Making Guide (Power Off for Safety)	
	PSPS Event Notifications (October 2022)	PSPS Event Notifications (October 2022)	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	PG&E GO 166 2020-2021 Annual Compliance Report	Emergency Response Plan – GO 166 Compliance for the period July 1, 2020, through December 31, 2021.	
	PG&E PSPS Report to the CPUC	Report to the CPUC, October 22-24, 2022 (Weather Event Nov. 7, 2022)	PG&E GO 166 2020-2021 Annual Compliance Report
	PG&E PSPS Policies and Procedures (Emergency Managers)	PG&E PSPS Policies and Procedures (Emergency Managers)	PSPS Report to CPUC
	PG&E (U 39 E) 2022 AFN Plan for PSPS Support	(1/31/2022) R.18-12-005, Filed 12/13-2018	Public Safety Power Shutoff Policies And Procedures Emergency Managers (pge.com)
	PG&E Independent Safety Monitor (ISM) Status Update Report	Outlines a scope of work that includes Filsinger Energy Partners, Inc. monitoring certain safety and risk aspects of PG&E's electric and natural gas operations and infrastructure	PG&E'S Access and Functional Needs Plan for Public Safety Power Shutoff Support
	PG&E Removal Plan for Permanently Abandoned Transmission Facilities	Reports on PG&E's plan to resolve the remedial actions and the resulting Administrative Consent Order regarding the 2019 Kinkade Fire.	PG&E Independent Safety Monitor Report (ca.gov)
	PG&E Multi-Year Training and Exercise Plan 2023-2025 (MYTEP)	PG&E Multi-Year Training and Exercise Plan 2023-2025 (MYTEP)	Wildfire Mitigation Plan (pge.com)
	PG&E 2020 RAMP Report	RAMP (Risk Assessment and Mitigation Phase) Report.	Wildfire Mitigation Plan (pge.com)

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	PG&E 2022 WMP (Includes Revision Notice and Maturity Survey documents)	WMP (Wildfire Mitigation Plan)	2020 RAMP Report
	PG&E 2023 GRC	General Rate Case: a state-mandated process for investor-owned electric and gas companies to request funding for distribution and generation costs.	PG&E 2022 WMP
	OH: Conductors 015073	Vibration Damper Requirements for Various Types of OH Conductors	PG&E 2023 GRC
PG&E Utility Bulletins, Job Aids, Manuals, and Best Practices:	OH: Transmission 068177	OH Transmission Line Design Criteria	Wildfire Mitigation Plan (pge.com)
	TD-076253-B005	De Energized Operation of Inertia SCADA MSO	
	TD-1001M	Electric Transmission Preventive Maintenance Manual	
	TD-2305M-JA02	Job Aid: OH Assessment	
	TD-2700P-06-B001	No Load Line Segment De-Energization Process	
	TD-7102P-01-B026	Enhanced Vegetation Management (VM) Transition to Distribution Routine Patrol	
	TD-7102P-01-JA01	General Best Management Practices for All VM Activities	
	TD-7101M-11	Chainsaw Operation for VM	
	TD-7112P-01-JA01	Fire Risk Assessment: Vegetation Control Pole Clearing	
	TD-7112P-01-JA02	Pole Work Status Report Types	
	TD-8123M	Electric Distribution Preventive Maintenance Manual	
	GOV-6101P-08	Enterprise Corrective Action Program Procedure	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
PG&E Utility Procedures:	GOV-6102P-06	Cause Evaluation Procedure	Wildfire Mitigation Plan (pge.com)
	GOV-7101S	Enterprise Records and Information Management Standard	
	LAND-4001P-01	Substation Fire Hardening	
	LAND-5201P-01	Power Generation Powerhouse and Switchyard Defensible Space	
	PSPS-1000P-01	PSPS for Transmission and Distribution	
	RISK-6305P-01	Electric Incident Reporting On-Call Representative Procedure	
	RISK-6306P-01	Fire Incident Data Collection Plan and Reporting Procedure	
	TD-1001P-13	Enhanced Inspection and Maintenance Requirements for Diablo Canyon and Morro Bay Power Plants OH Transmission Facilities	
	TD-1001P-14	Infrared (IR) Inspection Procedures	
	TD-1003P-01	Management of Idle Electric Transmission Line Facilities Procedure	
	TD-1006P-02	Switch Maintenance and Inspection Program for Electric Transmission	
	TD-1470P-01	Attachment 1, Application Guide Device Profile Settings (Enhanced Powerline Safety Settings (EPSS)); Fast-Tripping Scheme mode of device)	
	TD-2022P-01	Infrared (IR) Inspections of Electric Distribution Facilities	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	TD-2202P-1	EPSS-Electric Operations (EO) Restoration Dispatch Requirements	
	TD-2302P-05	Electric Distribution Maintenance Requirements for Miscellaneous OH and Underground Equipment	
	TD-2325P-01	Intrusively Inspecting, Reinforcing, and Reusing Wood Poles	
	TD-2459P-01	Idle Facility Program	
	TD-3320P-12	Substation SAP Work Management System Process	
	TD-3328P-01	Development of the Annual Substation Supplemental Inspection Plan	
	TD-3350P-10	Substation Animal Abatement Measures	
	TD-2700P-26	EPSS and Patrol Process	
	TD-7103P-02	Transmission Orchard Patrol Procedure	
	TD-7103P-04	Transmission Integrated Vegetation Management Procedure	
	TD-7103P-09	VM Hazard Notification Procedure	
	TD-7102P-01	Distribution Routine Patrol Procedure (DRPP) Distribution Inspection Procedure (DIP)	
	TD-7102P-17	VM Priority Tag Procedure	
	TD-7102P-23	VM Second Patrol Procedure	
	TD-7103P-01	Transmission Non-Orchard Routine Patrol Procedure	
	TD-7102P-26	Wood Management	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	TD-7112P-01	Vegetation Control Procedure	
	TD-8123P-100	Transmission Patrols and Enhanced Inspection Frequency Guidelines	
	TD-8123P-101	Transmission Line Corrective Notification Maintenance Strategy	
	TD-8123P-103	Electric Transmission Line Guidance for Setting Priority Codes	
	TD-1001S	Electric Transmission Line Inspection and Preventative Maintenance Program	
PG&E Utility Standards:	TD-7103S	Transmission Vegetation Management (TVM) Standard	Wildfire Mitigation Plan (pge.com)
	ENV-10002S	Environmental Release to Construction for Environmental Evaluations	
	TD-1464S	Preventing and Mitigating Fires While Performing PG&E Work	
	TD-1470S	EPSS	
	TD-2305S	Electric Distribution Maintenance Requirements	
	TD-2321S	Guidance Document Analysis Avian Protection Plan	
	TD-2325S	Inspecting, Testing, and Maintaining Wood Poles	
	TD-3322S	Substation Equipment Maintenance Requirements	
	TD-3322S, Attachment 7	Substation Equipment Maintenance Requirements; Circuit Breaker Maintenance Template	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
	TD-3328S	Substation Supplemental Inspection Program	
	TD-7112S	Vegetation Control Program	
	TD-8124S	Detailed System Inspections Framework	
	TD-9212S	EO Asset Registry Governance	
	EMER-2001S	Company Emergency Response Plans Standard	
	EMER-7001S	Enhanced Customer and Community Support During All Hazards Standard	
	TD-7102-01	Vegetation Management Distribution Inspection Procedure	
	TD-7102P-Att01	Strategies to Manage and Reduce Palms	
	TD-7102P-Att02	EVM WMP Commitments	
	TD-7102P-Att03	Identifying Major Woody Stems	
	TD-7102P-Att04	Handling Stump Resprouts	
	TD-7102P-Att05	Bi-Annual Tree Management and Reduction Strategy	
	TD-7102P-Att06	Tree Removal Inventory Program	
	TD-7102P-Att07	Focused Tree Inspection Procedures	
	TD-7102P-Att08	Vegetation Management Operational Mitigation Procedure	
	TD-7102S	Vegetation Management Program	
	TD-7114S	Vegetation Management Post Wildfire Standard	
	ANSI A300	American National Standards Institute A300 – Generally accepted	

**REVISED TABLE PG&E-E-1:
LIST OF REFERENCED CODES, REGULATIONS, STANDARDS, AND
OTHER REFERENCED DOCUMENTS
(CONTINUED)**

Category	Name of Regulation, Code or Standard	Brief Description	Link (if available)
		industry standards for tree care practices	
Third Party/Other Cited Materials:	Effectiveness of Covered Conductors: Failure Mode Identification and Literature Review	Covered Conductors Phase 1 Exponent Report (12/22/21)	ansi.org
	Effectiveness and Implementation Considerations of Covered Conductors: Testing and Analysis	Exponent: Joint-IOU Covered Conductor Testing Cumulative Report (12/22/22)	Effectiveness of Covered Conductors: Failure Mode ID and Lit Review
	SFAC-003-4 TVM/ Federal Energy Regulatory Commission (FERC) Order# 777	Standard Federal Agency Code: TVM to manage vegetation located on transmission rights of way (FERC).	Wildfire Mitigation Plan (pge.com)
	Intl. Organization for Standardization (ISO) 55001	An asset management system standard, the main objective of which is to help organizations manage the lifecycle of assets more effectively	ferc.gov
	ISO 45001 and 14001	ISO 14001 is the international standard for implementing an Environmental Management System. ISO 45001 focuses on managing Occupational Health and Safety concerns.	
	Web Content Accessibility Guidelines (WCAG) 2.0 AA	WCAG 2.0 AA accessibility standards	ISO.org
	WCAG 2.1 AA	WCAG 2.1 AA accessibility standards	w3.org

PACIFIC GAS AND ELECTRIC COMPANY
2023-2025 WILDFIRE MITIGATION PLAN
APPENDIX F
SUPPORTING DOCUMENTATION FOR NON-RISK SECTIONS
(OVERFLOW TABLES)

Appendix F – Supporting Documentation for Non-Risk Sections (Overflow Tables)

The electrical corporation must provide all detailed documentation from Section 7 in this appendix.

<Enter the associated section before adding the support documentation, e.g., Section 8.2.3.4 Fall-in Mitigation>

This section includes information that exceeds the page limits in the WMP Guidelines or is better presented in an Appendix. The information in this appendix is organized by WMP section and table number.

Appendix F.1 – 1. Executive Summary

PG&E'S PERFORMANCE AGAINST 2020-2022 QUANTITATIVE WMP INITIATIVE TARGETS
TABLE PG&E-1.1-1:

Line No.	2022 Unique ID	2022 WMP Initiative Target Name	2020 WMP Target	2020 Actual	2021 WMP Target	2021 Actual	2022 WMP Target	2022 Actual
1	B.02	Weather Stations – Installations and Optimizations	400	378	300	308	100	111
2	B.03	High-Definition Cameras – Installation	200	216	135	153	98	100
3	B.04	Distribution Fault Anticipation – Installation	N/A	1	N/A	16	40	48
4	B.05	Early Fault Detection – Installations	N/A	–	N/A	–	2	2
5	B.06	Line Sensor – Installations	20	46	N/A	67	40	63
6	C.01	Expulsion Fuse – Removal	625	643	1,200	1,429	3,000	3,085
7	C.02	Distribution Sectionalizing Devices – Install and SCADA commission	592	604	250	269	100	124
8	C.03	Transmission Line Sectionalizing – Install and SCADA commission	23	54	29	41	15	18
9	C.04	Distribution Line Motorized Switch Operator – Replacements	N/A	2	48	50	50	57
10	C.05	SCADA Recloser Equipment – Installations	N/A	20	81	81	17	17
11	C.06	Fuse Savers (Single Phase Reclosers) – Installations	N/A	–	70	71	80	81
12	C.07	Temporary Distribution Microgrids	N/A	2	8	5	4	4
13	C.08	Rincon Transformer Fuse – Replacement	N/A	–	N/A	–	1	1
14	C.09	Emergency Back-up Generation	N/A	5	23	32	15	15
15	C.10	10K Undergrounding	N/A	–	N/A	73	175	180
16	C.11	System Hardening – Distribution	220	342	180	210	470	483
17	C.12	System Hardening – Transmission	N/A	103	92	104	33	38
18	C.13	Surge Arrestor – Removals	8,850	10,263	15,000	15,465	4,590	4,621
19	C.14	Remote Grid – Operate New Remote Grid Standalone Power System (SPS) Units	N/A	–	1	1	2	2

PG&E'S PERFORMANCE AGAINST 2020-2022 QUANTITATIVE WMP INITIATIVE TARGETS
TABLE PG&E-1.1-1:
(CONTINUED)

Line No.	2022 Unique ID	2022 WMP Initiative Target Name	2020 WMP Target	2020 Actual	2021 WMP Target	2021 Actual	2022 WMP Target	2022 Actual
20	C.15	Butte County Rebuild – Undergrounding	20.0	29.3	23.0	23.6	55.0	58.7
21	D.01	Detailed Inspections – Distribution	(a)	339,026	(a)	480,749	396,000	398,184
22	D.02	Detailed Inspection Transmission – Ground	(b)	(b)	26,810	26,826	39,000	39,005
23	D.03	Detailed Inspection Transmission – Climbing	(c)	(c)	26,810	1,385	1,800	1,835
24	D.04	Detailed Inspection Transmission – Aerial	(d)	14,376	26,810	26,826	39,000	39,004
25	D.05	Infrared Inspections – Distribution	N/A	5,450	N/A	10,093	9,000	9,560
26	D.06	Supplemental Inspections – Substation Distribution	69	69	71	71	86	86
27	D.07	Supplemental Inspections – Substation Transmission	124	124	33	33	43	43
28	D.08	Supplemental Inspections – Hydroelectric Substations and Powerhouses	38	38	38	38	52	52
29	D.10	HFTD/HFRA Open Tag Reduction – Distribution	N/A	116,116	N/A	211,561	55,000	45,951
30	D.11	HFTD/HFRA Open Tag Reduction – Transmission	N/A	52,826	N/A	74,158	18,000	21,145
31	E.01	EVM	1,800	1,878	1,800	1,983	1,800	1,924
32	E.02	Pole Clearing Program	N/A	7,253	N/A	9,869	7,000	8,356
33	E.03	LiDAR Ground Inspections – Distribution	N/A	80	N/A	–	2,000	3,359
34	E.04	LiDAR Routine Inspections – Transmission	N/A	18,220	N/A	17,758	17,683	17,867
35	E.06	Defensible Space Inspections – Distribution Substation	N/A	163	N/A	172	132	132
36	E.07	Defensible Space Inspections – Transmission Substation	N/A	45	N/A	79	55	55
37	E.08	Defensible Space Inspections – Hydroelectric Substations and Powerhouses	N/A	–	N/A	63	61	61
38	E.09	Utility Defensible Space – Distribution	N/A	–	N/A	5,551	7,000	7,168

PG&E'S PERFORMANCE AGAINST 2020-2022 QUANTITATIVE WMP INITIATIVE TARGETS
TABLE PG&E-1.1-1:
(CONTINUED)

Line No.	2022 Unique ID	2022 WMP Initiative Target Name	2020 WMP Target	2020 Actual	2021 WMP Target	2021 Actual	2022 WMP Target	2022 Actual
39	E.10	Pole Clearing Program, per Public Resources Code 4292 in the CAL FIRE State Responsibility Area (SRA) ^(e)	N/A	96,775	N/A	88,163	80,258	80,208
40	F.02	EPSS – Install Settings on Distribution Line devices	N/A	–	N/A	170	3,580	3,580
41	F.04	EPSS – Reliability Improvements	N/A	–	N/A	–	50	50
42	J.01	Community Engagement – Meetings	N/A	18	N/A	13	22	23

-
- (a) 2020 WMP Target: 100 percent of HFTD Tier 3, and 33 percent of HFTD Tier 2 assets.
- (b) 2021 WMP Target: Tier 3 and Zone 1 – annually; and Tier 2 and HFRAs within the non-HFTDs – every three years (477,309).
- (b) 2020 WMP Target: Transmission – aerial and visual for ~22,000 structures.
- (b) 2020 Actual: 100 percent of Tier 3 (11,313) and 33 percent of Tier 2 (14,970) 25,752.
- (c) 2020 WMP Target: Transmission – aerial and visual for ~22,000 structures.
- (c) 2020 Actual: 100 percent of Tier 3 (338) and 33 percent of Tier 2 (779) 1,117.
- (d) 2020 WMP Target: Transmission – aerial and visual for ~22,000 structures.
- (e) PG&E met this target in 2022. Please see the 2022 Q4 QDR for additional details.

Appendix F.2 – 5. Overview of Service Territory

Appendix F.2.1 – 5.3.1 Fire Ecology

**TABLE PG&E-5.3.1-1:
LIST OF DOCUMENTS REFERENCED IN THE FIRE ECOLOGY DISCUSSION**

Anderson, M. K. 2006. The Use of Fire by Native Americans in California. pp. 17-430 in N. G. Sugihara, J. W. van Wagtendonk, K. E. Shaffer, J. O. Fites-Kaufman, and A. E. Thode, editors. Fire in California's ecosystems. University of California Press, Berkeley, California, USA.
Beatty, R. M., and A. H. Taylor. 2009. A 14,000-year sedimentary charcoal record of fire from the northern Sierra Nevada, Lake Tahoe Basin, California, USA. The Holocene 19:347-358.
Swetnam, T. W., C. H. Baisan, A. C. Caprio, P. M. Brown, R. Touchan, R. S. Anderson, and D. J. Hallett. 2009. Multi-Millennial Fire History of the Giant Forest, Sequoia National Park, California, USA. Fire Ecology 5:120-150.
Sugihara, N. G., J. W. van Wagtendonk, K. E. Shaffer, J. O. Fites-Kaufman, and A. E. Thode, editors. Fire in California's ecosystems. University of California Press, Berkeley, California, USA.
Heinselman, M. L. 1981. Fire intensity and frequency as factors in the distribution of and structure of northern ecosystems. Pages 7-57 in H. A. Mooney, T. M. Bonnicksen, N. L. Christensen, J. E. Lotan, and W. A. Reiners, editors. Fire regimes and ecosystem properties, proceedings of the conference. General Technical Report WO-GTR-26. USDA Forest Service, Washington, D.C., USA.
Romme, W. 1980. Fire history terminology: report of the ad hoc committee. Pages 135-137 in M. A. Stokes and J. H. Dieterich editors. Proceedings of the fire history workshop. General Technical Report RM-81. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.
Franklin, J., C. E. Woodcock, and R. Warbington. 2000. Multi-Attribute Vegetation Maps of Forest Service Lands in California Supporting Resource Management Decisions. Photogrammetric Engineering and Remote Sensing 66:1209-1217.
Rollins, M. G. 2009. LANDFIRE: a nationally consistent vegetation, wildland fire, and fuel assessment. International Journal of Wildland Fire 18:235-249.
Van de Water, K. M., and H. D. Safford. 2011. A Summary of Fire Frequency Estimates for California Vegetation Before Euro-American Settlement. Fire Ecology 7:26-58.
Safford, H. D., and K. M. Van de Water. 2014. Using Fire Return Interval Departure (FRID) Analysis to Map Spatial and Temporal Changes in Fire Frequency on National Forest Lands in California. Research Paper PSW-RP-266. USDA Forest Service, Pacific Southwest Research Station, Albany, California, USA.
Krawchuk, M. A., M. A. Moritz, M. A. Parisien, J. Van Dorne, and K. Hayhoe. 2009. Global Pyrogeography: the Current and Future Distribution of Wildfire. PLoS One 4:e5102.
Pausas, J. G., and J. E. Keeley. 2009. A Burning Story: The Role of Fire in the History of Life. BioScience 59:593-601
Bowman, D. M. J. S., J. Balch, P. Artaxo, W. J. Bond, M. A. Cochrane, C. M. D'Antonio, R. DeFries, F. H. Johnston, J. E. Keeley, M. A. Krawchuk, C. A. Kull, M. Mack, M. A. Moritz, S. Pyne, C. I. Roos, A. C. Scott, N. S. Sodhi, and T. W. Swetham. 2017. The human dimensions of fire regimes on Earth. Journal of Biogeography 38:2223-2236.
Wills, R. 2006. Central Valley Bioregion. Pages 295-320 in N. G. Sugihara, J. W. van Wagtendonk, K. E. Shaffer, J. O. Fites-Kaufman, and A. E. Thode, editors. Fire in California's ecosystems. University of California Press, Berkeley, California, USA.

**TABLE PG&E-5.3.1-1:
LIST OF DOCUMENTS REFERENCED IN THE FIRE ECOLOGY DISCUSSION
(CONTINUED)**

van Wagtendonk, J. W., and D. R. Cayan. 2008. Temporal and Spatial Distribution of Lightning Strikes in California in Relation to Large-Scale Weather Patterns. <i>Fire Ecology</i> 4:34-56.
van Wagtendonk, J. W., and J. Fites-Kaufman. 2006. Sierra Nevada Bioregion. Pages 264-294 in N. G. Sugihara, J. W. van Wagtendonk, K. E. Shaffer, J. O. Fites-Kaufman, and A. E. Thode, editors. <i>Fire in California's ecosystems</i> . University of California Press, Berkeley, California, USA.
Westerling, A. L., H. G. Hidalgo, D. R. Cayan, and T. W. Swetnam. 2006. Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity. <i>Science</i> 313:940-943.
Steel, Z. L., H. D. Safford, and J. H. Viers. 2015. The fire frequency-severity relationship and the legacy of fire suppression in California forests. <i>Ecosphere</i> 6:8.
Skinner, C. N., and A. H. Taylor. 2006. Southern Cascades Bioregion. pp. 195-224 in N. G. Sugihara, J. W. van Wagtendonk, K. E. Shaffer, J. O. Fites-Kaufman, and A. E. Thode, editors. <i>Fire in California's ecosystems</i> . University of California Press, Berkeley, California, USA.
Dolanc, C. R., J. H. Thorne, and H. D. Safford. 2013. Widespread shifts in the demographic structure of subalpine forests in the Sierra Nevada, California, 1934 to 2007. <i>Global Ecology and Biogeography</i> 22:264-276.
Keeley, J. E., W. J. Bond, R. A. Bradstock, J. G. Pausas, and P. W. Rondel. 2012. <i>Fire in Mediterranean Ecosystems</i> . Cambridge University Press, Cambridge, UK.

Appendix F.3 – 8. Mitigation Initiatives

Appendix F.3.1 – 8.4 Emergency Preparedness

The electrical corporation must provide all detailed documentation from Section 8.4 in this appendix.

**TABLE PG&E-8.4.2-2:
EMERGENCY OPERATIONS CENTER POSITION REQUIRED TRAINING MATRIX – OCTOBER 1, 2022**

		TRAINING															
		IS 100	IS-200	IS-700	IS-800	G606	IS-368	G-775	G-191	G626	ICS 300	ICS 400	IS 702 PIO	ICS 402	IS-230d	G-611	
		Initial Base				Expanded							Specialized				
OIC	Officer-In-Charge														R		
Command	EOC Commander	R	R	R	R	R	R	R	R	R	R	R	R			R	R
Command	Deputy EOC Commander	R	R	R	R	R	R	R	R	R	R	R	R			R	R
Command	EOC Coordinator	R	R	R	R	R	R	R	R	R							
Liaison	Liaison Officer	R	R	R	R	R	R	R	R	R	R	R	R			R	R
Liaison	Assistant Liaison Officer	R	R	R	R	R	R	R	R	R	R	R	R			R	R
Liaison	Cal OES SOC AREP	R	R	R	R	R	R	R	R	R	R	R				R	
Liaison	Liaison Coordinator	R	R	R	R	R	R	R	R								
Liaison	Liaison Branch Director	R	R	R	R	R	R	R	R								
Liaison	Deputy Liaison Branch Director	R	R	R	R	R	R	R	R	R	R	R					
Liaison	Tribal Liaison	R	R	R	R	R	R	R	R								
Liaison	Agency Rep Group Supervisor	R	R	R	R	R	R	R	R								
Liaison	County/City Group Supervisor	R	R	R	R	R	R	R	R								
Customer Strategy	Customer Strategy Officer	R	R	R	R	R	R	R	R	R	R	R				R	R
Customer Strategy	Assistant Customer Strategy Officer	R	R	R	R	R	R	R	R	R	R	R				R	R
Customer Strategy	Critical Infrastructure Lead	R	R	R	R	R	R										
Customer Strategy	Notification Hawk	R	R	R	R	R	R										
Customer Strategy	Back Up Generation Lead	R	R	R	R	R	R										
Customer Strategy	Data Analyst	R	R	R	R	R	R										
Customer Strategy	Staff	R	R	R	R	R	R										
Customer Strategy	CSO Support (Agency/Coms)	R	R	R	R	R	R										
Customer Strategy	CRC Lead	R	R	R	R	R	R										
Customer Strategy	CRC Swat Team	R	R	R	R	R	R										

**TABLE PG&E-8.4.2.2:
EMERGENCY OPERATIONS CENTER POSITION REQUIRED TRAINING MATRIX – OCTOBER 1, 2022
(CONTINUED)**

		TRAINING														
		IS 100	IS-200	IS-700	IS-800	G606	IS-368	G-775	G-191	G626	ICS 300	ICS 400	IS 702 PIO	ICS 402	IS-230d	G-611
		Initial Base					Expanded					Specialized				
Customer Strategy	AFN Strategy Lead	R	R	R	R	R	R									
Customer Strategy	AFN Advisor	R	R	R	R	R	R									
PIO	Public Information Officer	R	R	R	R	R	R	R	R	R	R		R		R	R
PIO	Assistant Public Information Officer	R	R	R	R	R	R	R	R	R	R		R		R	R
PIO	Writers	R	R	R	R	R	R									
PIO	P&I Liaison	R	R	R	R	R	R									
PIO	Social Media	R	R	R	R	R	R									
PIO	Digital Strategy Publisher	R	R	R	R	R	R									
PIO	DCPP & Los Padres Division PIO	R	R	R	R	R	R	R	R	R	R		R		R	R
Safety	Safety Officer	R	R	R	R	R	R	R	R	R	R					
Safety	Assistant Safety Officer	R	R	R	R	R	R	R	R	R	R				R	R
Operations Section	Operations Section Chief	R	R	R	R	R	R	R	R	R	R				R	R
Operations Section	Deputy Operations Section Chief	R	R	R	R	R	R	R	R	R	R				R	R
Operations Section	Distribution Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Distribution Deputy Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Transmission Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Power Gen Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Gas Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Information Technology (IT) Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Air Ops Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Temp Gen Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Temp Gen Deputy Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	Veg Branch Director	R	R	R	R	R	R	R	R	R	R					
Operations Section	IT BT Advisor	R	R	R	R	R	R									
Planning Section	Planning Section Chief	R	R	R	R	R	R	R	R	R	R				R	R
Planning Section	Deputy Planning Section Chief	R	R	R	R	R	R	R	R	R	R				R	R

**TABLE PG&E-8.4.2.2:
EMERGENCY OPERATIONS CENTER POSITION REQUIRED TRAINING MATRIX – OCTOBER 1, 2022
(CONTINUED)**

		TRAINING														
		Initial Base				Expanded				Specialized						
		IS 100	IS-200	IS-700	IS-800	G606	IS-368	G-775	G-191	G626	ICS 300	ICS 400	IS 702 PIO	ICS 402	IS-230d	G-611
Planning Section	Public Safety Power Shutoff (PSPS) Deputy Planning Chief	R	R	R	R	R	R	R	R	R	R				R	
Planning Section	Situation Unit Leader	R	R	R	R	R	R		R							
Planning Section	Situation Unit Support	R	R	R	R	R	R									
Planning Section	Situation Unit Support Data Analyst	R	R	R	R	R	R									
Planning Section	Documentation Unit Leader	R	R	R	R	R	R		R	R						
Planning Section	Documentation Unit Support	R	R	R	R	R	R									
Planning Section	Resource Management Unit Leader	R	R	R	R	R	R	R	R		R					
Planning Section	Resource Management Unit Support	R	R	R	R	R	R									
Planning Section	Resource Unit Leader	R	R	R	R	R	R	R	R		R					
Planning Section	Contract Resource Management	R	R	R	R	R	R									
Planning Section	Resource Tracking Support	R	R	R	R	R	R									
Planning Section	Demobilization Unit Leader	R	R	R	R	R	R	R	R		R					
Planning Section	GIS Technical Specialist	R	R	R	R	R	R									
Planning Section	Meteorology Technical Specialist	R	R	R	R	R	R									
Planning Section	Geosciences Technical Specialist	R	R	R	R	R	R									
Planning Section	HAWC Unit Leader	R	R	R	R	R	R				R					
Planning Section	Distribution Asset Health Specialist	R	R	R	R	R	R									
Planning Section	Transmission Asset Health Specialist	R	R	R	R	R	R									
Planning Section	BC Tech Specialist	R	R	R	R	R	R									
Planning Section	PSPS Tech Unit Leader	R	R	R	R	R	R									
Planning Section	PSPS Tech Specialist	R	R	R	R	R	R									
Planning Section	PSPS Data Analyst	R	R	R	R	R	R									
Planning Section	PSPS Portal Unit Leader	R	R	R	R	R	R									
Planning Section	PSPS Portal Unit Support	R	R	R	R	R	R									
Planning Section	PSPS Process Unit Leader	R	R	R	R	R	R									
Planning Section	PSPS Risk Analyst	R	R	R	R	R	R									

**TABLE PG&E-8.4.2.2:
EMERGENCY OPERATIONS CENTER POSITION REQUIRED TRAINING MATRIX – OCTOBER 1, 2022
(CONTINUED)**

		TRAINING														
		Initial Base				Expanded				Specialized						
		IS 100	IS-200	IS-700	IS-800	G606	IS-368	G-775	G-191	G626	ICS 300	ICS 400	IS 702 PIO	ICS 402	IS-230d	G-611
Planning Section	PSPS Recorder	R	R	R	R	R	R									
Planning Section	PSPS Communication Coordinator	R	R	R	R	R	R									
Logistics Section	Logistics Section Chief	R	R	R	R	R	R	R	R	R						
Logistics Section	Deputy Logistics Section Chief	R	R	R	R	R	R	R	R	R	R				R	R
Logistics Section	Service Branch Director	R	R	R	R	R	R	R	R		R					R
Logistics Section	Support Branch Director	R	R	R	R	R	R	R	R		R					
Logistics Section	Environmental/Land Response Unit Leader	R	R	R	R	R	R				R					
Logistics Section	Environmental/Land Response Unit Support	R	R	R	R	R	R									
Logistics Section	Facilities Unit Leader	R	R	R	R	R	R									
Logistics Section	Ground Support Unit Leader	R	R	R	R	R	R				R					
Logistics Section	Physical Security Unit Leader	R	R	R	R	R	R				R					
Logistics Section	Lodging Unit Leader	R	R	R	R	R	R									
Logistics Section	Lodging Unit Support	R	R	R	R	R	R									
Logistics Section	Base Camp/Staging Area Support	R	R	R	R	R	R									
Logistics Section	Mutual Assistance Unit Leader	R	R	R	R	R	R									
Logistics Section	MA Coordinator	R	R	R	R	R	R									
Logistics Section	MA Support	R	R	R	R	R	R									
Logistics Section	Logistics Reporting Leader	R	R	R	R	R	R									
Logistics Section	Communications Tech Specialist	R	R	R	R	R	R									
Logistics Section	Admin/Food Unit Leader	R	R	R	R	R	R									
Logistics Section	Admin/Food Unit Support	R	R	R	R	R	R									

**TABLE PG&E-8.4.2-3:
MYTEP APRIL TO JUNE 2022 WILDFIRE AND PSPS EXERCISES**

Quarter 2 – 2022			
	Apr	May	Jun
Wildfire	Wildfire Seminar 12-Apr	Los Banos Pacheco 70kV Emergency Restoration Workshop 24-May	Wildfire FE (with PSPS FSE) 6/13/2017
PSPS	Emergency Field Ops Region Overviews 4/11-12	PSPS Seminar 5/3	PSPS FSE w/comms drill 6/13/2022
		PSPS TTX 5/17	N/A
		Field Ops:	Field Ops:
		Humboldt 5/2-3	San Jose 6/2-3
		N Valley 5/4-5	Peninsula 6/6-7
		Sonoma 5/9-10	Center Coast 6/8-9
		N Bay 5/11-12	Stockton 6/13/-14
		Sac 5/16-17	Yosemite/Kern 6/16-17
		Sierra 5/18-19	Fresno 6/21-24
		Diablo 5/23-24	East Bay 6/27-28
		Mission 5/25-26	Los Padres 6/29-30
		De Anza 5/31-6/1	

**TABLE PG&E-8.4.2-4:
COMPANY EMERGENCY RESPONSE PLAN (CERP) ANNEX MAINTENANCE AND DEADLINES**

Hazard	Annexes	Review Due	New Annex Publish Date
Cybersecurity (North American Electric Reliability Corporation (NERC) CIP-008 compliance), EMER-3102M		Q1	
Earthquake, EMER-3101M		Q4 (NLT 11/30)	
Extreme Weather Annex (EMER-3108M)		Q3	
Infectious Disease and Pandemic Response Annex, EMER-3103M			6/30/22
PSPS Annex, EMER-3106M		April 30	
Tsunami Annex, EMER-3104M		Q3	
Wildfire Annex, EMER-3105M		Q1	
Physical Threat Annex			TBD
Functional			
Aviation Services Annex, EMER-3010M		Q3	
Canal Entry Annex, EMER-3011M		Q4 (NLT 11/30)	
Nuclear Annex			6/30/22
Disaster Rebuild, EMER-3012M		Q1	
Electric, EMER-3002M		Q2	
Emergency Communications, EMER-3008M		Q2	
Gas, EMER-3003M		Q4 (NLT 11/30)	
Human Resources, EMER-3006M		Q4 (NLT 11/30)	
Information Technology, EMER-3007M		Q2	
Logistics, EMER-3005M		Q3	
Power Generation, EMER-3004M		Q4 (NLT 11/30)	
Workforce Management/Contact Center Operations, EMER-3009M		Q4 (NLT 11/30)	

TABLE PG&E-3.4.2-5:
2020 CERP CHANGE RECORD

Topic	2019	2020	Type	Change Detail
Remove Rev symbol	Throughout	Throughout	Removed	NA
Insert Rev Symbol	Throughout	Throughout	Added	NA
Formatting	Throughout	Throughout	Formatting	NA
Base Plan	1, 1.4	1, 1.4	Removed	Removed the words "base plan".
Emergency Management Plans	1, 1.5	1, 1.5	Revised	For bullet 1, removed "Emergency management plans" with "The CERP"; added an "s" after flow. For bullet 2, replaced the Company Emergency Response Plan with CERP; added some caps. For bullet 3, added "there are two (2) kinds of Annexes: Functional Annexes and Hazard Annexes; remove "and are generally referred to as the ____ Annex. Functional annexes are updated by the function or LOB; hazard-specific annexes are updated by Emergency Preparedness and Response (EP&R). For bullet 4, removed "base plan and annexes; added caps. Figure 1- remove "and supporting Documents in title; remove is general referred to as "the CERP"
Annexes	1, 1.5, 1.5.1	1, 1.5, 1.5.1	Updated	Added annex after gas. Added Canal Entry Emergency Response Plan, Disaster Rebuild Annex, PSPS Annex and Fire Prevention Plan. Changed the footnote to 2020 and add to Nuclear, PSPS, and Wildfire.
Plan Maintenance	1.6	1.6	Added	Cybersecurity will notify EP&R within 30 days of any changes to the NERC CIP 08 requirement. EP&R will notify individuals with an emergency role within 60 days of a plan changes (roles and responsibilities, response groups, or technologies). Cybersecurity will assist EP&R to update the emergency plan within 90 days of an emergency incident or exercise.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Topic	2019	2020	Type	Change Detail
Governance and Authorities	1.7	1.7	Added	State that Pacific Gas and Electric Company (PG&E) will comply with NERC CIP 008 requirements. Refer to Section 1.6 as to how we will comply.
Organizational Structure	Table 2.1	Table 2.1	Updated	Needs to be updated. Supply Chain not under Human Resources.
Fire Potential Index	2.1.1	2.1.1	Removed	Recommended removal of section as it is covered in Section 8.11.3.
Elec Transmission and Distribution Assets	2.3.1	2.3.1	Removed	Removed reference to district and divisions and separated electric distribution from transmission.
Transmission Circuit Miles and Substations	2.3.1	2.3.1	Updated	Added: information was validated by Transmission Asset Strategy and ET-GIS on 1/21/20. Deleted "Interconnected with electric power systems throughout 14 US states, 2 Canadian provinces, and parts of Mexico. Deleted "Source: LBGIS ElecMCDistricts. Deleted footnote #8 "Transmission substation information provided by Substation Asset Management 6/28/2019. Information excludes third-party generation, or RAS sites. Also confirmed by SEC 10-K report (for FY ending Dec 31, 2018), page 17."
Point of contact for CAISO	2.3.1	2.3.1	Removed	Deleted content "transmission and distribution operations with."
Control Centers	2.3.1	2.3.1	Added	Added "transmission" to the sentence explaining connecting transmission and distribution substations to individual customers.
Electric Trans Overview	2.3.1	2.3.1	Updated	Provided updated language to include in 2.3.1 and map.
Power Generation	2.3.3	2.3.3	No Change	NA
LiveSafe App	New	2.5.1, 8.2	Added	Provided reference to LiveSafe intranet site for employee safety.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

EDO EM	2.5.2	2.5.2	Removed	Removed last sentence "EDO EM also serves as a liaison with public safety agencies during emergencies."
Electric Distribution Operations EM	2.5.2	2.5.2	Removed	Removed last sentence of first paragraph about serving as the liaison with public safety agencies.
DCPP Emergency Preparedness	2.5.4	2.5.4	Added	Updated to Senior Vice President Generation and Chief Nuclear Officer.
Power Generation Emergency Preparedness	2.5.5	2.5.5	Updated	Added "The VP of Power Generation has overall responsibility to manage emergency preparedness at hydro, fossil fuel, and solar power generation facilities. The Director of Engineering reports to the VP. The Public Safety Specialists report to the Director.
General Planning Assumptions	3.1.1	3.1.1	Addition	Added "and SEMS" to bullet 2.
EOC Resources Process	3.1.3.1	9.1.3.1	Updated	Replace "AC" with "REC"
Infectious Disease	3.2	3.2	Added	Added infectious disease scenario summary among others in Section 3.
SOPP Model	3.2.1	3.2.1	Updated	SOPP Model leverages over 25 years of historical data.
Tsunami Hazard	3.2.3	3.2.2		"The best source of tsunami information is from the National Oceanic and Atmospheric Administration (NOAA) tsunami alert system . See link https://www.tsunami.gov. "
Cybersecurity	3.2.3	3.2.4	Removed	Remove 2018 date and "training" language in sentence after chevron graphic.
Annual Training	3.2.3	3.2.3	Revised	PG&E updates the Cybersecurity Annex to the CERP and conducts exercises to test the plan.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Threat Landscape	3.3	3.3	Added	Added "in real-time" and the EORM Program includes a horizon-scanning process which monitors threats over a longer time horizon and modified the Corporate Risk Register and cross-cutting factors as needed.
Annex Development	3.4	3.4	Updated	Removed "including cybersecurity attack and earthquake." Added the GDL. Removed lines of business with LOB; change Coop with ConOps
Finance	4.7	4.7	Updated	Included "and other applicable filings," "cost estimate," internal accounting and "forecast." Removed "debt rating agencies" from the section.
Training Requirement	3.5.1	3.5.1	Added	Added new content about new training requirements in force.
Exercises	3.5.2	3.5.2	Added	Listed the core capabilities.
PSPS Roles	5	5	Moved	Refer to the PSPS Annex for further information about PSPS-specific roles.
Public Information Officer	5.1.6	5.1.5	Updated	Edited the 3rd bullet by replacing the "classified as public" to "related to the event".
Law Officer	5.1.8	5.1.8	Updated	Law does not develop the document retention plan. Replaced the word "develops" with the word "reviews."
Law Officer	5.1.8	5.1.8	Updated	Changed to "Legal Officer."
Aviation Operations Branch	5.2.1	5.2.1	Updated	Make sure Aviation removes reference to Logistics and reference to the Logistics Resource Guide
Power Generation Branch	5.2.6.	5.2.6	Updated	Added "PG Operations Team, Energy Supply Group Supervisor, Nuclear Technical Specialist, Power Gen Recovery Team."
Power Generation Recovery Team	5.2.6	5.2.6	Updated	Added in the event of a generation emergency, the Power Generation Recovery Team maintains and documents "...for non-nuclear generation activities."

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Power Generation Operations Team	5.2.6.1	5.2.6.1	Added	Added who will serve on this team and general responsibilities of this team.
Energy Supply Supervisor	5.2.6.2	5.2.6.2	Added	Added responsibilities to Energy Supply Supervisor
IT Branch	5.2.8	5.2.8	Added	Added "EOC" to Section Chief and IT Branch.
Intelligence & Investigation	5.3	5.3.1	Added	Need to show the different personnel composition of the Intelligence and Investigations Section for a cybersecurity incident vs for a PSPS Event. Remedy is to show the 2 different personnel composition for I&I Section.
Planning Section	5.4	5.4	Updated	To better reflect the actual reporting, removed the Gas Resource Management box in the org structure.
Access and Functional Needs	5.4.4.1	5.4.4.1	Added	Added description of the position which includes advising the EOC Commander, Customer Strategy Officer, Planning Section Chief, and others.
Logistics Section	5.5	5.5	Updated	Updated Logistics organization chart.
Logistics Reporting Lead	5.5.1	5.5.1	Updated	Minor update to ninth & tenth bullet
Logistics Reporting	5.5.1	5.5.1	Updated	Logistics Reporting Lead" changed "points" to "lessons learned" in "Records...." Bullet. Added "as requested" at end of "Reports..." bullet.
Service/Support Branch	5.5.2	5.5.2	Reviewed	No edits required.
Physical Security	5.5.2		Updated	Added to "5.5.2.1 Physical Security Unit" this bullet:
Physical Security Unit	5.5.2.1	5.5.2.1	Updated	Added third bullet regarding them providing security at temporary emergency sites.
Food/Admin Support	5.5.2.2	5.5.2.2	Updated	Minor update to fourth bullet.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Admin Support /Food	5.5.2.2	5.5.2.2	Updated	In "5.5.2.2 Admin Support/Food Unit" appended "for meal counts" to "Partners..." bullet
Environmental Response Unit	5.5.2.3	5.5.2.3	Reviewed	No change.
Facilities Unit	5.5.2.4	5.5.2.4	Updated	In "5.5.2.4 Facilities Unit" appended "when activated" to "Sets up..." bullet.
Facilities Unit	5.5.2.4	5.5.2.4	Updated	Delete reference to Alternate Company Headquarters.
Base Camp /Staging Area Support	5.5.2.5	5.5.2.5	Updated	Minor update to fifth bullet.
Hotel/Berthing Unit	5.5.2.6	5.5.2.6	Removed	In "5.5.2.6 Hotels/Berthing Unit" removed "affected personnel" from "Arranges..." (first) bullet.
Hotel/Berthing Unit	5.5.2.6	5.5.2.6	Updated	Minor update to first bullet.
Air Operations	5.5.2.7	5.5.2.7	Removed	In "5.5.2.7 Ground Support Unit" removed two bullets "Coordinates aircraft needs..." and "Coordinates air charter services..."
Ground Support Unit	5.5.2.7	5.5.2.7	Updated	Removed references to Aviation.
Supply Unit	5.5.2.8	5.5.2.8	No Change	No edits required.
Materials Buyers and Service Buyers	5.5.2.9	5.5.2.9	No Change	No edits required.
Emergency Facilities	6	6	Updated	Updated content to be more specific about what our emergency facilities are.
Operations Emergency Centers	6.1.4	6.1.4	Updated	Updated the language for Gas OECs described.
Operations Emergency Center	6.1.4	6.1.4	Updated	Updated the language to remove the pre-set Gas OECs (18). Gas does not maintain 18 Gas OECs.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Primary and Secondary EOCs	6.1.7	6.1.7	Added	Updated section to include VERC as one of two primary EOC sites and SRVCC as the secondary site.
SIOC Operations	6.2.6	6.2.6	Added	Added "The SIOC provides security monitoring 24x7x365."
Security Intelligence Operations Center	6.2.6	6.2.6	Updated	Updated the description of the SIOC.
Wildfire Safety Operations	6.2.7	6.2.7	Updated	Added details about the center and Wildfire Safety and Infrastructure Team.
Wildfire Safety and Infrastructure Team	6.2.7.1	Removed	Removed	Removed 6.2.7.1 from the CERP and provided to PSPS Team for inclusion in PSPS Annex. Consolidated the description into detail under WSOC section. WSIPT information was provided to PSPS to ensure that it is fully presented in the PSPS Annex. SME provided updated description of the team.
Support and Coordination Centers	6.3	6.3	Updated	Updated Mgr. title from Mgr. to Sr. Mgr.
MTCC	6.3	6.3	Updated	In "6.3 Support and Coordination Centers" Table 6.1, MTCC row, Activate and Command Authority column, changed "Manager of Warehouse Distribution" to "Sr. Manager, Materials Distribution Operations"
Base Camps	6.4	6.4	Updated	In "6.4.1 Base Camps" added bullet "Have PG&E Safety Specialist on site to oversee all safety related issues"
Emergency Field Facilities	6.4	6.4	Updated	Minor wording update.
Base Camps	6.4.1	6.4.1	Replaced	Replaced base camp picture with more current base camp picture.
Staging Sites	6.4.2	6.4.2	Updated	Minor wording edit including updating demobilization section.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Micro-Sites	6.4.3	6.4.3	Updated	Added language about the use of micro sites in support of PSPS events.
Materials Laydown Area	6.4.4	6.4.4	No Change	No edits required.
Community Resource Centers	6.4.5	6.4.5	Updated	Updated items provided to customers.
Community Resource Center	6.4.5	6.4.5	Updated	Updated language about the CRCs.
California State Government	7.4	7.4	Moved text Addition	Moved, added, and removed information to overview to help clarify. Mention the CA Services Act in the overview.
United State Federal Government	7.5 United State Federal Government	7.5 United State Federal Government	Moved text Addition	Moved, added, and removed information to overview to help clarify
Emergency Plan Activation	8.1 Emergency Plan Activation	8.1 Emergency Plan Activation	Moved text Removed text Addition	Moved, added, and removed information to overview to help clarify. Removed Centers on table. Too many variables and centers info down below
Emergency Incidents Levels and Activation Criteria	8.1, B	8.1, B	Added	Removed "Information Technology PG&E Incident Levels" and replaced it with "Levels of Emergency and Activation Criteria chart."
Emergency Center Activation during Terrorist Activity	8.2	8.2	No change	Activation criteria based on terrorist scenario is reviewed by Corporate Security.
Emergency Centers Activations	8.2	8.2	Removed	Changed title and added and removed information to help clarify.
EOC On-call Staff	8.3.1.2	8.3.1.2	Added	'Added full list of on-call team members who are sent weekly reminders of their on-call status. Added new language about on-call and on-deck teams and changes to the EOC On-call Teams program.
Establish Command	8.3.3	8.3.3	Removed	Added and removed information to help clarify.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

SOPP	8.11.2	8.11.2	Updated	Recommended to get update from WMP. Tech writer drafted section.
FPI	8.11.3	8.11.3	Updated	Recommended to get update from WMP. Tech writer drafted section.
OPW	8.11.4	8.11.4	Updated	Recommended to get update from WMP. Tech writer drafted section.
DASH Reports	8.12.1	8.3.1.3.1	Updated	Requested to change DASH paragraph to "The Dynamic Automated Seismic Hazard (DASH) reports provide information necessary to prioritize inspections following an earthquake. Post-earthquake DASH reports are currently produced for gas, electric, generation and corporate real estate facilities."
Debris Flow	8.12.1.5	8.3.1.3.5	Updated	Strike out pilot tested and rain tested information.
Check-in Check-out Process	9.1.1	9.1.1 Resource Check-in Check-out Process	Added	Add new content include the range of where this is implemented and what is primarily being tracked.
Roles and Responsibilities	9.1.1.1	9.1.1.1	Removed	Changed title. Added, moved, and removed information to help clarify.
Resource Management Unit	9.1.1.2, 9.1.1.5	9.1.1.2, 9.1.1.5	Updated	Removed "demobilization unit." Added based on the size of the incident, assessed resource availability. Also updated Table 9-2 Resource Management re activation of the Resource Management Unit during OEC, REC, GEC, ETEC, or STOEC.
Vehicle and Equipment Rentals	9.1.5	9.1.5	Updated	Added reference to REC's and updated contact information box
Materials	9.1.6	9.1.6	Updated	Minor re-wording and removal of reference to OEC and GEC
Logistics Section Chief	9.3.1.7	9.3.1.7	No change	No edits required.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Demobilization Order	9.3.3	9.3.3	Added	Added "GERP" as well as the Electric Annex referenced in this subsection.
Demobilization of Base Camps	9.3.4	9.3.4	No Change	No edits required.
Demobilization of Materials	9.3.5	9.3.5	Replaced	Minor update. Replaced storm with event.
Demobilization of Equipment, Vehicles and Rentals	9.3.5.1	9.3.5.1	Updated	Minor update. Added additional equipment examples and reworded section.
DCPP Emergency Plan	10.3.3	10.3.3	Added	Added the correct reference to the DCPP emergency plan.
Coordination at the Local Level	10.3.3	10.3.3	Removed	removed DCPP material. Did not seem different that everyone's process
Contact Centers	NA	10.4.3	Added	Create a section for this information
Communicating with the Media	10.4.4	10.4.4	Updated	Replaced Marketing and Communications.
Command Call Agenda	E.2.4 #10	E.2.4 #10	Updated	Updated reference to Marketing and Communications (from Corporate Relations) with materials laydown area and CRCs. Also, updated Supply Chain to Supply Chain/Materials
Command Call Agenda	E.2.4	E. 2.4	Updated	Replace Earthquake Impact with Geohazard Impact. Remove the earthquake items listed and change to "Incident Specific Command Call topics are listed in the Technical Specialists Geosciences Document."
Agenda	E.2.7.3	E.2.7.3	Removed	Fueling and equipment listed twice. Corrected.
Media Briefing	E.3.3	E.3.3	Updated	Updated the information and mentioned media briefing that could take place at the primary EOC--VERC.

**TABLE PG&E-8.4.2-5:
2020 CERP CHANGE RECORD
(CONTINUED)**

Operational Period 1	F.2.1	F.2.1	Updated	Clock time 1630 added reference to materials laydown area and community resource center
Operational Period 2 and later	F.2.2	F.2.2	Updated	Removed reference to Supply Chain. Clock times 1100 and 1600. Note reference is appropriate in the initial call where the VP of Supply Chain/Materials is reporting out. When Logs. Chief is reporting out section is Logistics.
LOB On-call Teams	J	J	Added	Added new on-call guidance to the appendix.
Glossary	J.2	J.2	Revised	Changed Material Laydown Area to Materials Laydown Area