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Witness(es): Various

PACIFIC GAS AND ELECTRIC COMPANY

2023 GENERAL RATE CASE

PREPARED TESTIMONY

EXHIBIT (PG&E-4)

ELECTRIC DISTRIBUTION

CHAPTERS 1-6

VOLUME 1 OF 3

(PUBLIC VERSION)



PACIFIC GAS AND ELECTRIC COMPANY
2023 GENERAL RATE CASE
EXHIBIT (PG&E-4)
ELECTRIC DISTRIBUTION

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
ELECTRIC DISTRIBUTION POLICY AND INTRODUCTION

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
ELECTRIC DISTRIBUTION POLICY AND INTRODUCTION

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 1**
3 **ELECTRIC DISTRIBUTION POLICY AND INTRODUCTION**

4 **A. Introduction**

5 This chapter introduces Pacific Gas and Electric Company's (PG&E) Electric
6 Distribution Operations (Electric Operations or EO) line of business exhibit in
7 PG&E's 2023 General Rate Case (GRC). Electric Operations is responsible for
8 safely and reliably delivering electricity to PG&E's customers over a large and
9 diverse service area through efficient and cost-effective planning, engineering,
10 constructing, maintaining, and restoring of electric distribution assets.

11 EO is focused on achieving its core mission to deliver affordable and clean
12 energy safely and reliably to our customers every single day, while building the
13 energy network of tomorrow, and meeting the challenge of climate change by
14 integrating renewable and clean energy technologies. In addition, we are
15 committed to improving the customer experience by delivering on our
16 commitments. EO's expense and capital forecasts represent a risk-informed
17 portfolio that puts safety first while delivering on customer commitments and
18 supporting California's clean energy goals.

19 **B. Key Developments Since the 2020 GRC**

20 Since the 2020 GRC, PG&E has focused on addressing wildfire risk,
21 advanced its risk assessment and risk management, continued to pursue
22 operational excellence, adapted its operations during a global pandemic, and
23 emerged from bankruptcy.

24 **1. Focus on Reducing Wildfire Risk**

25 In 2019 and 2020, California continued to experience devastating
26 wildfires due to climate change. Five of the six largest wildfires in
27 California's history occurred in 2020, all in PG&E's service territory,
28 including the first fire to ever impact more than one million acres. The
29 unprecedented weather patterns (including late-summer dry lightning
30 storms) that drove the 2020 wildfire season continued to present significant
31 wildfire risk and necessitated Public Safety Power Shutoff (PSPS) events
32 into January 2021.

1 PG&E is committed to further reducing wildfire risk to keep customers
2 and communities safe. In 2020, PG&E completed several important
3 wildfire-related safety enhancements and investments to continue progress
4 on this vital objective, consistent with state policy. This included work that:

- 5 • Reduced Wildfire Potential – Pruned or removed trees with a higher
6 potential for wildfire risk along distribution lines in High Fire Threat
7 District (HFTD) areas¹ (Enhanced Vegetation Management (EVM));
8 installed stronger, more resilient poles and covered conductors on some
9 overhead lines and undergrounded other lines in HFTD areas (System
10 Hardening); and completed inspections of the entire electrical
11 infrastructure in Tier 3 HFTD areas, and accelerated inspections in other
12 HFTD areas;
- 13 • Improved Situational Awareness – Installed additional weather stations
14 to more precisely forecast weather that could lead to PSPS events and
15 installed additional high-definition cameras to help monitor real-time
16 conditions; and
- 17 • Improved PSPS – Reduced the scope and impact of PSPS events
18 compared to events in 2019 under similar weather conditions, and
19 restored power faster after severe weather passed.

20 **2. Advancing Risk Assessment and Risk Management**

21 Since PG&E filed its 2020 GRC, EO has advanced its risk modeling and
22 risk management capabilities. EO evaluated its top safety risks in the 2020
23 Risk Assessment and Mitigation Phase (RAMP) Report using updated
24 enterprise risk models.² Since PG&E filed the RAMP Report, EO has
25 continued to improve the enterprise risk models based on feedback from
26 Safety Policy Division and other parties, and additional information learned
27 internally at PG&E. The models and improvements are described in the
28 Electric Distribution Risk Management Chapter (Exhibit (PG&E-4),
29 Chapter 3).

¹ HFTD areas were defined and identified by the California Public Utilities Commission (CPUC or the Commission) in 2018. The CPUC adopted the final CPUC Fire-Threat Map via disposition of Advice Letters 5211-E/3172-E, filed January 5, 2018, and approved January 19, 2018.

² PG&E's RAMP Report, A.20-06-012 (June 30, 2020).

1 In addition to updating enterprise risk models, EO developed a planning
2 model for its top safety risk – wildfire. The Wildfire Distribution Risk Model
3 (2021 WDRM) was implemented for 2021 planning and provides a
4 bottom-up view of asset and risk conditions. The 2021 WDRM identifies
5 specific circuit segments with the greatest risk of wildfire due to vegetation
6 contact or conductor equipment failure. The 2021 WDRM then
7 comprehensively assesses and prioritizes wildfire risk mitigation work,
8 including system hardening and enhanced vegetation management
9 activities. Building upon previous modeling, the 2021 WDRM uses
10 advanced software and machine learning to predict fire ignitions and
11 improve fire spread simulations to determine potential wildfire impacts. The
12 2021 WDRM allows EO to prioritize operations within the highest fire-threat
13 areas. In the spirit of continuous improvement, EO will continue to refine the
14 2021 WDRM with updated inputs and adoption of more advanced modelling
15 techniques.

16 **3. Pursuing Operational Excellence**

17 PG&E’s asset management vision is to attain the optimum balance of
18 asset risk, performance, and cost. Accordingly, EO has continued to pursue
19 Publicly Available Specification (PAS) 55 and ISO 55001 asset management
20 certifications.³ By achieving these certifications, EO will establish a
21 foundation for continuous improvement and support our commitment to the
22 safe and effective management of our electric assets on behalf of
23 customers.

24 Since 2018, EO has taken several steps towards achieving its PAS 55
25 and ISO 55001 certifications, including:

- 26 • Establishing and maintaining an EO Asset Management Policy, which
27 describes EO’s asset management framework;
- 28 • Establishing and maintaining a Strategic Asset Management Plan, which
29 specifies: (1) how organizational objectives translate to asset

³ PAS 55 and ISO 55001 are internationally recognized asset management standards that cover end to end lifecycle aspects of a business’ asset management system, and provide a common framework for the Utility to take a comprehensive view of how it manages assets in an effective and sustainable manner and to implement continuous improvement.

1 management objectives; (2) how to develop asset management plans;
2 and (3) how the asset management system supports achievement of the
3 asset management objectives;

- 4 • Establishing and maintaining Asset Management Plans, which provide
5 an overview of risks, performance, costs, and efforts underway to
6 reduce risk and maintain reliability for each of EO's asset families; and
- 7 • Instituting training sessions for EO employees to introduce and reinforce
8 a comprehensive asset management framework.

9 In 2020, EO completed the Stage One assessment in support of our
10 goal of achieving ISO 55001 and PAS 55 asset management certifications.
11 EO is working towards completing its Stage Two assessment, which
12 requires that auditors visit worksites.

13 **4. Coronavirus Pandemic**

14 On March 12, 2020, the World Health Organization declared the
15 coronavirus (COVID-19) outbreak a pandemic. Shortly thereafter, the
16 Commission directed electric utility companies in California to follow
17 customer protection measures including a moratorium on service
18 disconnections. In addition, the state, counties, and cities instituted various
19 shelter-in-place measures. As the pandemic continued, these entities
20 periodically relaxed and increased shelter-in-place measures, depending on
21 the severity of COVID-19 within each area.

22 The COVID-19 pandemic impacted EO in different ways, including
23 workforce safety and the ability to perform some scheduled work. During
24 the pandemic, PG&E has sought to prioritize the health and safety of the
25 public and employees, while ensuring the ability to continue to provide safe
26 and reliable electric service to customers.

27 To protect the health and safety of employees, contractors, and the
28 public, EO issued COVID-19 work plan guidelines describing work activities

1 that should continue⁴ and work types that should be paused.⁵ Work that
 2 paused later resumed as shelter-in-place orders allowed. EO will continue
 3 to work throughout this GRC cycle on the backlog of work paused due to the
 4 pandemic.

5 EO also took actions to ensure safe and reliable electricity service would
 6 continue during the pandemic. EO established and activated the COVID-19
 7 Emergency Operations Center for over 100 operational periods to monitor
 8 and respond to the impacts of the pandemic, confirming business
 9 capabilities as government policies evolved. Additionally, EO set up full
 10 distribution and transmission control rooms at the San Ramon Valley
 11 Conference Center, where operators were sequestered as an additional
 12 precaution.

13 **5. Emergence from Bankruptcy**

14 In 2020, PG&E emerged from Chapter 11 bankruptcy after successfully
 15 completing its restructuring process and implementing its Plan of
 16 Reorganization (POR). As part of its POR, PG&E made a series of
 17 commitments regarding governance, operations, and financial structure, all
 18 designed to further prioritize safety. PG&E made these commitments
 19 working with the Governor's Office and incorporating guidance from CPUC
 20 President Batjer, which was included in the full Commission's approval of
 21 the POR.⁶

22 Some of the commitments impacting EO include:

- 23 • Introducing a 6-step Enhanced Oversight and Enforcement Process⁷ to
 24 ensure that PG&E meets safety and operational commitments, and
 25 promptly corrects any issues that may arise;
- 26 • Achieving PAS 55 and ISO 55001 certifications; and

4 Work that should continue was defined as work identified as critical during shelter-in-place, including emergency response, critical societal needs, PSPS and wildfire mitigation work, critical/essential new business needs, essential regulatory compliance work, and critical operating equipment work.

5 Non-critical work that was paused included: new business and work requested by others; non-essential compliance and critical operating equipment work; and, capacity, reliability, and asset replacement work.

6 Decision (D.) 20-05-053.

7 D.20-05-053, p. 111, Ordering Paragraph 4 and Appendix A.

- Setting financial targets for EO forecasts that will help position PG&E to deliver cost-effective service to customers while actively managing costs within budgets to improve long-term costs and financing plans.

C. Areas of Focus in the 2023 GRC

EO's expense and capital forecasts represent a risk-informed work portfolio that addresses top safety risks, delivers on customer commitments, and supports California's clean energy goals. The Electric Distribution Forecast and Investment Planning chapter (Chapter 2 of this exhibit) provides additional detail on the methods used to develop the forecast as well as information about the alignment with POR targets.

1. Continued Focus on Wildfire Risk Mitigation Work

Over half of PG&E's service territory lies in Tier 2 and Tier 3 HFTD areas. The wildfire threat in these areas has increased significantly over the past decade due to climate change and other factors.⁸ Approximately 25,500 line-miles, or nearly one-third, of PG&E's electric distribution assets lie within HFTD areas. Many of these assets include long lines that serve low-density, non-urban customers and communities located within the "wildland-urban interface," who face an increased fire risk. Approximately 10 percent of PG&E's electric customers reside within HFTD areas, and the number of customers living in wildland-urban interfaces or HFTD areas may increase in the future. PG&E is continuing to evaluate its wildfire risk and may expand wildfire risk mitigations to include additional areas.

Using the 2021 WDRM, EO identified the highest risk circuit segments and prioritized risk mitigation activities within those segments. This work builds on progress from previous years:

- Enhanced Vegetation Management – Conducting additional miles of EVM work focused on the highest risk circuit protection zones;
- System Hardening – Completing additional miles of system hardening targeting three risk areas: (1) the top 20 percent of highest wildfire risk

⁸ For example, the U.S. Forest Service estimates that 147 million trees died in California from drought and invasive beetles from 2010-2018, which is just one of the factors that has contributed to the significant increasing in the size of the HFTDs within PG&E's service territory.

1 miles; (2) overhead structures previously impacted directly by wildfires;
2 and, (3) those areas most impacted by PSPS;

- 3 • PSPS and PSPS Impact Reduction Initiatives – Executing PSPS events
4 to reduce wildfire risk while also working to reduce: (1) the scope of
5 PSPS events by installing sectionalizing devices to include only the
6 customers who need to be de-energized and deploying temporary
7 generation to serve customers who can safely receive power, and
8 (2) the impact of PSPS events to customers by providing back up power
9 for critical customer facilities and providing essential services to
10 impacted customers;
- 11 • Situational Awareness and Forecasting Initiatives – Continuing
12 installation of a variety of weather and fire monitoring devices, including
13 weather stations and high-definition cameras, across HFTD areas to
14 enable early warning of high-risk fire conditions and real-time
15 identification of emerging wildfires; and
- 16 • Additional System Automation and Protection – Implementing and
17 exploring various emergent system protection technologies that may
18 reduce wildfire risk. Two examples include Rapid Earth Fault Current
19 Limiter (technology that automatically and rapidly reduces the flow of
20 current and risk of ignition in single phase to ground faults) and
21 Distribution Transmission Substation – Fire Action Scheme and
22 Technology (technology that detects objects approaching an energized
23 power line and responds quickly to shut off power before objects impact
24 the line).

25 PG&E's wildfire mitigation programs and activities are discussed in
26 Chapter 4. In addition to reducing wildfire risk to keep customers and
27 communities safe, some wildfire mitigation work, such as EVM and System
28 Hardening, is expected to positively impact reliability.

29 PG&E is continuing to evaluate and assess wildfire risk. As additional
30 data and modeling capabilities expand, the most efficient suite of mitigations
31 for a particular circuit segment may change. EO's mitigation work will be
32 aligned and updated to reflect the initiatives outlined in annual Wildfire
33 Mitigation Plan reports.

2. Increasing Customer Focus by Delivering on Customer Commitments

As PG&E increases its customer focus by putting the customer at the center of operations, EO is committed to providing customers with a positive customer experience by supporting several customer commitments. Key customer commitments in this GRC forecast include Electric Distribution Capacity, Community Rebuild, Field Metering, and New Business/Work at the Request of Others (NB/WRO).

EO's Electric Distribution Capacity forecast includes expenditures to address an increase in new applications for service and added loads to serve industrial, agricultural, high-tech facilities, as well as state and local infrastructure. EO also anticipates additional capacity needed to support a substantial increase in electric vehicle (EV) fast charging and fleet charging applications. Chapter 17 in this exhibit provides additional information on these issues.

Following the devastating Camp Fire in 2018, PG&E initiated the Community Rebuild Program to rebuild PG&E's distribution electric and gas system infrastructure in the areas damaged by the fire. EO's GRC forecast includes expenditures associated with undergrounding electric distribution assets in the Town of Paradise and adjacent parts of Butte County. PG&E is committed to completing the rebuild in a safe and reliable manner. Chapter 23 in this exhibit describes the Community Rebuild Program.

Since the 2020 GRC, the Field Metering Program transitioned to the EO organization. In this GRC forecast, EO has included expenditures for replacing defective SmartMeter™ gas modules with newer, functioning endpoint devices. Replacing these modules will ensure customer usage is accurately recorded and reliably delivered to PG&E's billing systems. Chapter 8 discusses this program in greater detail.

The NB/WRO Program supports new customers and existing customers connected to our distribution system, as well as requests from customers and governmental agencies to relocate existing PG&E facilities. In this GRC forecast, EO has included expenditures to support an increased demand for residential customer connections and EV charging infrastructure costs. Chapter 18 in this exhibit provides additional information on the NB/WRO Program.

3. Supporting California's Clean Energy Goals

PG&E is committed to supporting California's greenhouse gas emissions reductions goals. Widespread transportation electrification and increased adoption of distributed energy resources (DER) will help achieve the state's greenhouse gas emissions reductions goals. EO's GRC forecast includes programs associated with supporting DERs, EVs, and energy storage.

To support DER growth, PG&E continues to improve existing technology infrastructure to enable a more dynamic grid through PG&E's Integrated Grid Platform (IGP). Ultimately, PG&E's IGP aims to facilitate DER enablement and safe and reliable operation of the electric grid. The IGP will modernize PG&E's grid with improved situational awareness, operational efficiency, cybersecurity, and DER integration capabilities to meet today's challenges while also positioning the grid to meet the demands of a dynamic energy future. In this GRC, PG&E continues its multi-year effort to build and implement its IGP, which includes: developing advanced distribution planning tools, facilitating the development of multi-customer microgrids, continuing implementation of an Advanced Distribution Management System (ADMS), and beginning implementation of a Distributed Energy Resource Management System to complement the ADMS program. Chapter 21 provides additional information on PG&E's IGP.

Widespread transportation electrification will require a grid that can support charging needs. PG&E's GRC forecast includes expenditures to support electrification in two areas: Capacity (Chapter 17) and New Business (Chapter 18). In support of California's EV public and shared charging infrastructure goals, PG&E's Capacity program forecasts expenditures associated with system upgrades necessary to support EV fast charging and EV fleet charging stations. Additionally, PG&E's New Business Program forecast includes costs associated with upgrading electric distribution infrastructure to support new EVs in PG&E's service territory. These service upgrade costs now include both infrastructure upgrades on the utility side of the meter and upgrades to the meter itself.

Energy storage will play a crucial role in renewable resource integration, helping balance the intermittency of renewable generation and low customer

1 demand during peak generation. EO's GRC forecast includes two energy
2 storage projects. First, PG&E's Electric Distribution Capacity forecast
3 includes the Renz Energy Storage project, which is designed to address
4 capacity deficiencies. Second, PG&E's IGP forecast includes the Elkhorn
5 Battery Energy Storage System (Elkhorn BESS), which is being constructed
6 in partnership with Tesla, Inc. The Elkhorn BESS will store and dispatch
7 energy to the electrical grid during periods of high demand, enhancing
8 reliability by addressing capacity deficiencies without adding new fossil fuel
9 resources to the grid. The system will also participate in the California
10 Independent System Operator (CAISO) markets, providing energy and
11 ancillary services to the CAISO-controlled grid.

12 **4. Improving Public and Workforce Safety**

13 PG&E remains committed to delivering on our planned work safely; it is
14 our most important responsibility. While EO remains focused on reducing
15 wildfire risk, EO's GRC forecast contains planned investments that are
16 intended to further reduce system safety risk.

17 The planned investments include:

- 18 • Programs that address asset-related safety risk: (1) continuing to
19 replace manhole covers in areas of high pedestrian foot traffic with
20 hinged venting manhole covers designed to stay in place in the event of
21 a vault explosion; and, (2) continuously improving detailed inspections of
22 assets to enable proactive identification of any potential equipment
23 issues that may lead to failures;
- 24 • Public awareness programs that educate third-party workers and the
25 public about power line safety and the hazards associated with wire
26 down events; and,
- 27 • Programs that facilitate a more data-driven, risk-based asset
28 management strategy by: (1) improving EO's ability to capture outage
29 and failure information; and, (2) continuing to improve risk modeling.

30 PG&E is also committed to improving workforce safety. Workforce
31 safety is focused on improvements in three key areas: motor vehicle safety,
32 contractor safety, and employee safety.

33 To improve motor vehicle safety, PG&E developed a Motor Vehicle
34 Safety program, which includes resources for all things related to motor

1 vehicle safety. Some of these resources include web-based training for
2 employees on defensive driving and ways to reduce driving-related risks.

3 EO continues to incorporate lessons learned to improve contractor
4 safety. For example, PG&E has improved processes related to Vegetation
5 Management work, which relies on contractors to perform tree trimming.
6 PG&E developed a procedure requiring contractors to provide a list of
7 subcontractors for PG&E approval prior to arriving at a job location. PG&E
8 also added Vegetation Management Inspectors focused on the safety and
9 quality of tree crews; the Inspectors provide field oversight and real time
10 feedback in an effort to reduce serious incidents.

11 To improve employee safety, EO has developed an office ergonomics
12 plan to prevent, evaluate, and manage office-based ergonomic issues.

13 **5. Continued Focus on Operational Excellence**

14 In alignment with the organizations across the Company, EO will
15 implement a Lean Operating System as further described in Exhibit
16 (PG&E-1), Chapter 1. This new management approach will improve safety
17 and operational outcomes by providing clear visibility into performance,
18 creating a daily dialog about results, reinforcing a consistent problem-solving
19 approach, and standardizing ways of working across the Company. The
20 Lean Operating System will standardize a culture of continuous
21 improvement.

22 In addition to implementing the Lean Operating System, continuous
23 improvement and innovation remain a key focus of EO. Accordingly, as
24 discussed above, EO is committed to obtaining PAS 55 and ISO 55001
25 certifications in 2021. Obtaining these certifications will build on existing
26 asset management advances and help further develop asset-centered
27 decisions, plans and activities using a risk-based approach.

28 EO is also focused on continuing to improve its asset knowledge
29 management. High quality asset data enhances business intelligence and
30 enables the operation of a safer, more reliable, and more affordable system.
31 In 2020, EO developed a Data Management and Analytics organization to
32 guide electric data strategy, data quality, and data management efforts.
33 This organization will help align data strategies across EO and the
34 enterprise to improve PG&E's ability to make data-driven decisions around

1 asset-related risk management. EO will be integrating an Enterprise Data
2 Platform that will establish key connections between disparate data
3 systems. Chapter 20 provides additional information regarding these
4 initiatives.

5 Identifying, developing, and demonstrating emerging technologies also
6 contributes to operational excellence. Demonstrating emerging
7 technologies, for example, can be critical in finding new ways to support
8 operations in areas such as wildfire risk mitigation and clean energy goals.
9 In this GRC forecast, EO will continue exploring emerging technologies
10 through the Electric Program Investment Charge (EPIC) Program.
11 Chapter 21 includes a forecast to continue Technology Demonstration and
12 Deployment work in the event that EPIC does not continue beyond the
13 current cycle.

14 **D. Overview of the Electric Distribution Exhibit**

15 As described above, EO's 2023 GRC forecast contains expenditures for
16 various programs that reduce wildfire risk, deliver on customer commitments,
17 support California's clean energy goals, improve safety, and pursue operational
18 excellence. The Electric Distribution Exhibit is organized as follows:

**TABLE 1-1
ELECTRIC DISTRIBUTION EXHIBIT CHAPTERS**

Chapter No.	Chapter Title
1	Electric Distribution Policy and Introduction
2	Electric Distribution Forecast and Investment Planning
3	Electric Distribution Risk Management
4	Wildfire Risk Mitigations
5	Emergency Preparedness and Response
6	Electric Emergency Recovery
7	Distribution System Operations
8	Field Metering
9	Vegetation Management
10	Overhead and Underground Electric Asset Inspections
11	Overhead and Underground Electric Distribution Maintenance
12	Pole Asset Management
13	Overhead and Underground Asset Management and Reliability
14	Network Asset Management
15	Substation Asset Management
16	Distribution System Automation and Protection
17	Electric Distribution Capacity, Engineering and Planning
18	New Business and Work at the Request of Others
19	Rule 20A
20	Electric Distribution Data Management and Technology
21	Integrated Grid Platform and Grid Modernization Plan
22	Electric Distribution Support Activities
23	Community Rebuild Program

1 Details of the forecast and changes in the exhibit organization from the 2020
2 GRC are provided in Chapter 2.

3 **E. Conclusion**

4 Since the 2020 GRC, PG&E has implemented programs to reduce wildfire
5 risk, improved risk management, and pursued operational excellence during
6 unprecedented times all while striving to serve customers safely and reliably.
7 The forecasts in this exhibit will enable EO to balance addressing our top safety
8 risks, delivering on customer commitments, supporting California's clean energy
9 goals, improving safety, and continuing to focus on operational excellence.

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
ELECTRIC DISTRIBUTION FORECAST
AND INVESTMENT PLANNING

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
ELECTRIC DISTRIBUTION FORECAST
AND INVESTMENT PLANNING

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
ELECTRIC DISTRIBUTION FORECAST
AND INVESTMENT PLANNING

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 2**
3 **ELECTRIC DISTRIBUTION FORECAST**
4 **AND INVESTMENT PLANNING**

5 **A. Introduction**

6 In this chapter, Pacific Gas and Electric Company (PG&E or the Company)
7 describes its cost forecasting methodology used to develop the operation and
8 maintenance (O&M) expense and capital expenditure forecasts for the Electric
9 Distribution work presented in the 2023 GRC.

10 This chapter provides an overview of the following: (1) the Electric
11 Distribution forecast; (2) key changes in the presentation of the forecast
12 compared to the 2020 General Rate Case (GRC); (3) Electric Distribution’s
13 funding prioritization and cost forecasting approach; (4) compliance with the
14 2020 GRC Settlement Agreement Principles for Deferred Work; and (5) a
15 summary of the forecast by GRC chapter and program area.

16 The remainder of this chapter is organized as follows:

- 17 • Section B – Overview of Forecast;
- 18 • Section C – Exhibit Changes Since the 2020 GRC;
- 19 • Section D – Managing Electric Operations Funding;
- 20 • Section E – Cost Forecasting Approach;
- 21 • Section F – Compliance with Section 5.2 of the 2020 GRC Settlement
22 “Deferred Work Principles”;
- 23 • Section G – Forecast by Chapter and Program Area; and
- 24 • Attachment A: Incrementality of Memorandum Account Recorded Costs.

25 **B. Overview of Forecast**

26 PG&E’s annual enterprise-wide strategic planning and budgeting process
27 sets the foundation for the work in Electric Operations (EO). The process brings
28 a systematic approach to PG&E’s planning by: (1) identifying top compliance,
29 enterprise, and operational risks; (2) developing a 5-year Operating Plan,
30 including specific goals and strategies; and, (3) establishing PG&E’s execution
31 and financial plan.

32 A fundamental part of EO’s business is to proactively manage risk and
33 comply with applicable rules and regulations. EO must continuously evaluate its

1 priorities, consider new data, leverage its risk management processes, and
2 incorporate regulatory direction, including feedback from its annual Wildfire
3 Mitigation Plan (WMP) report. The forecasts in this exhibit reflect that process,
4 incorporate changes since the 2020 GRC was filed, and represent the most
5 risk-informed plan right now.

6 PG&E requests that the Commission adopt its 2023 expense forecast of
7 \$2.2 billion for EO. PG&E's 2023 expense forecast for EO is \$51 million or
8 2 percent lower than 2020 recorded costs of \$2.3 billion.¹

9 PG&E further requests that the Commission adopt its capital forecast of
10 \$3.4 billion in 2021, \$3.9 billion in 2022, \$4.0 billion in 2023, \$4.0 billion in 2024,
11 \$4.0 billion in 2025, and \$4.0 billion in 2026. The 2023 capital forecast for EO is
12 \$833.3 million or 27 percent higher than 2020 recorded expenditures of
13 \$3.1 billion.² PG&E discusses the changes driving these increases relative to
14 2020 later in this chapter.

15 PG&E categorizes its EO expense and capital forecasts into six program
16 areas:

- 17 1) Risk Reduction;
- 18 2) Emergency Preparedness and Response;
- 19 3) Customer Requested and Load Growth;
- 20 4) Maintenance and Compliance;
- 21 5) Asset Management and Reliability;³ and
- 22 6) Operational Coordination.

23 PG&E provides further details regarding the expense and capital
24 expenditure forecasts for EO below.

1 Exhibit (PG&E-4), WP 2-1. Amounts in this chapter do not include confidential forecast amounts for Elkhorn energy storage project shown in Appendix A.

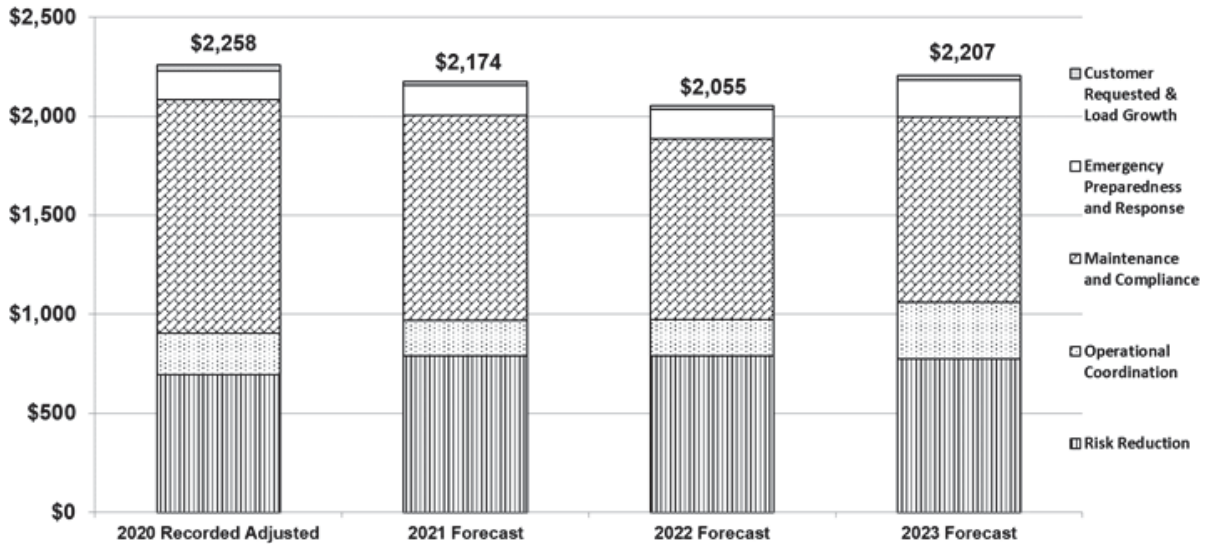
2 Exhibit (PG&E-4), WP 2-4. Amounts in this chapter do not include confidential forecast amounts for Elkhorn energy storage project shown in Appendix A.

3 Asset Management and Reliability are typically capital expenditures only.

1 **1. Expense Forecast**

2 Figure 2-1 shows the 2020 recorded and 2021-2023 forecast expenses
 3 for EO by program area.⁴ PG&E's forecast for 2023 electric distribution
 4 expenses is 2 percent lower than 2020 recorded adjusted expenditures.

**FIGURE 2-1
 EXPENSE FORECAST BY PROGRAM AREA 2020-2023**



Note These amounts included in testimony and workpapers in the operational chapters may vary from the values listed in the Standard Workpapers and Results of Operations (RO) model provided to the Public Advocates Office at the California Public Utilities Commission (Cal Advocates) at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

5 Figure 2-2 shows the changes from 2020 recorded to 2023 forecast
 6 expense by program area.⁵ The largest changes in the EO expense
 7 forecasts are:

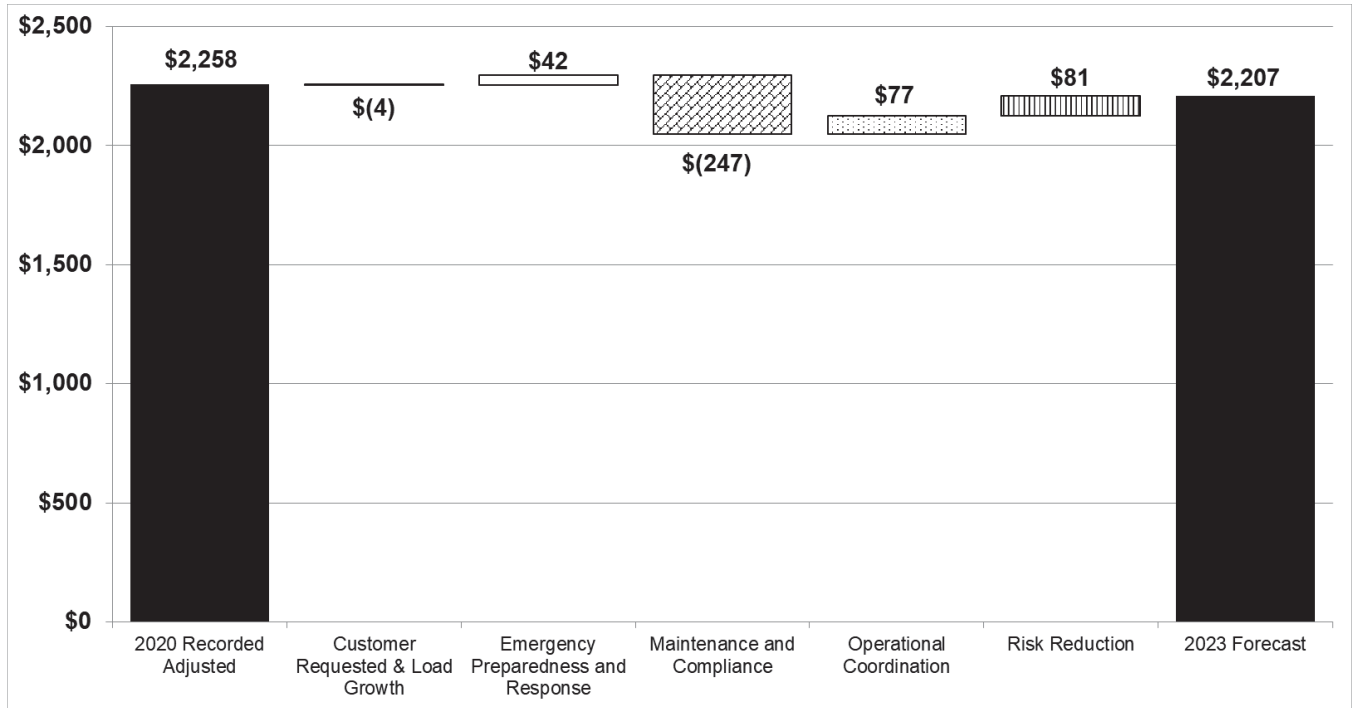
- 8 • Maintenance and Compliance (\$247 million decrease) – Driven primarily
 9 by reduced costs for (1) routine Vegetation Management (VM) due to
 10 savings from a new contracting strategy and a reduction from the
 11 number of trees worked in 2020; and (2) detailed overhead asset

⁴ Amounts for 2020-2022 include work tracked in memorandum accounts and other separately funded programs which will be rolled into the GRC starting in 2023, shown for trending purposes. See Exhibit (PG&E-4), WP 2-2.

⁵ See Exhibit (PG&E-4), WP 2-3.

- 1 inspections as a result of moving to a risk-informed approach for
2 scheduling inspections;
- 3 • Risk Reduction (\$81 million increase) – Driven by an increase in costs
4 related to Enhanced Vegetation Management’s (EVM) addition of staff
5 for safety oversight and quality work verification; additional technology
6 investments to support wildfire mitigations; and expanding PG&E’s
7 Safety and Infrastructure Protection Team;
 - 8 • Operational Coordination (\$77 million increase) – Driven by increased
9 work in Integrated Grid Platform and Grid Modernization; the inclusion of
10 a new Data Management and Analytics program, and increased
11 headcount to support the Regulatory Compliance and Quality Assurance
12 group and other EO work; and
 - 13 • Emergency Preparedness and Response (\$42 million increase) – Driven
14 by wildfire mitigation activities such as the Wildfire Safety Operations
15 Center moving out of the Wildfire Mitigation Balancing Account starting in
16 2023, and a new forecast for straight time labor costs associated with
17 Catastrophic Event Memorandum Account (CEMA)-eligible events in the
18 GRC.

**FIGURE 2-2
EXPENSE WALK BY PROGRAM AREA 2020-2023**



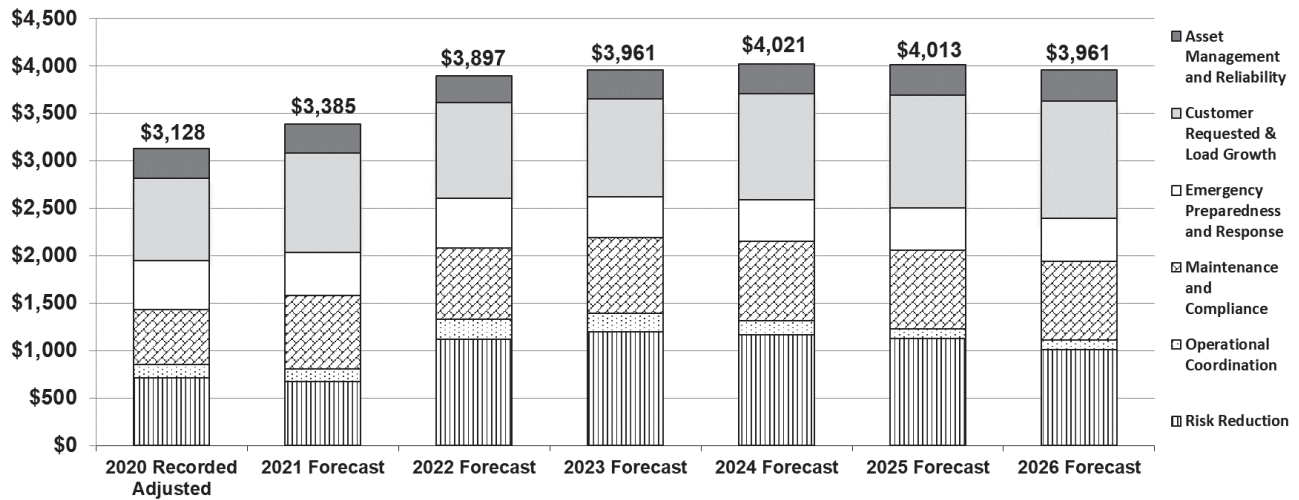
Note These amounts included in testimony and workpapers in the operational chapters may vary from the values listed in the Standard Workpapers and the RO model provided to Cal Advocates at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

1 **2. Capital Expenditures Forecast**

2 Figure 2-3 shows the 2020 recorded and 2021-2026 forecast capital
3 expenditures for EO by program area.⁶ EO's forecast 2023 capital
4 expenditures reflect an approximately 27 percent increase relative to 2020
5 recorded expenditures.

⁶ Amounts for 2020-2022 include work tracked in memorandum accounts and other separately funded programs which will be rolled into the GRC starting in 2023, shown for trending purposes. See Exhibit (PG&E-4), WP 2-5.

**FIGURE 2-3
CAPITAL FORECAST BY PROGRAM AREA 2020-2026**



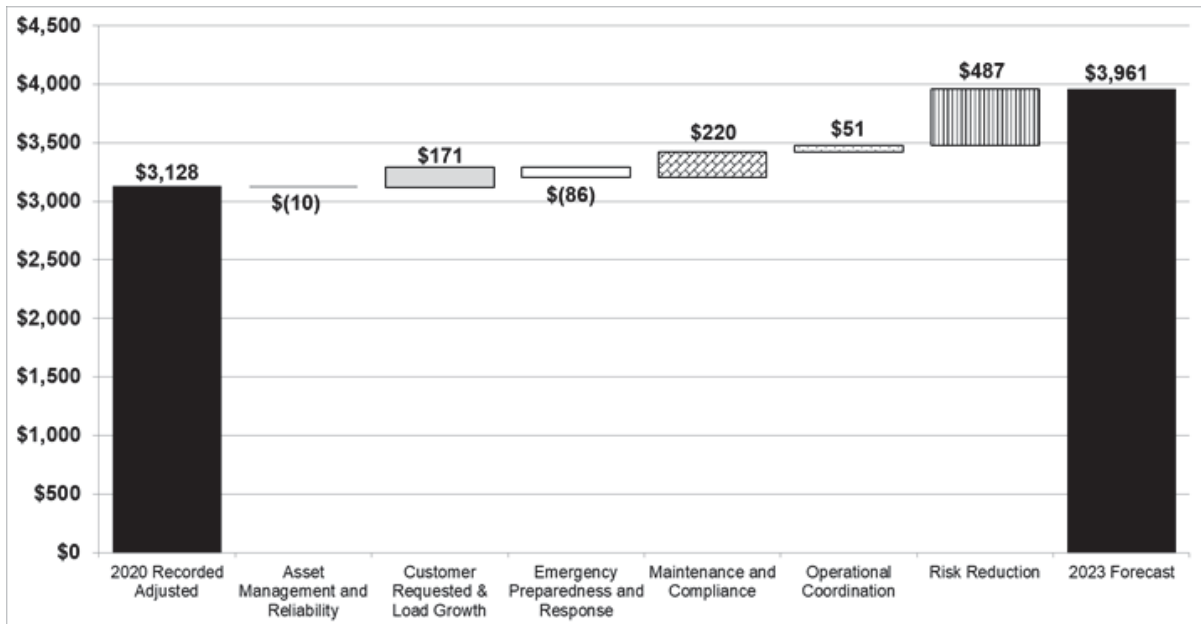
Note These amounts included in testimony and workpapers in the operational chapters may vary from the values listed in the Standard Workpapers and the RO model provided to Cal Advocates at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

- 1 Figure 2-4 shows the changes from 2020 recorded to 2023 forecast
 2 capital by program area.⁷ The largest changes in the EO capital forecasts
 3 are:
- 4 • Risk Reduction (\$487 million increase) – Driven primarily by the System
 5 Hardening program and costs for the Community Rebuild Program in
 6 Butte County;
 - 7 • Maintenance and Compliance (\$220 million increase) – Driven by a
 8 significant increase in the volume of pole replacements resulting from the
 9 enhanced inspection criteria initiated in 2019 and an increase in the
 10 number of non-communicating gas SmartMeter™ modules that need to
 11 be replaced;
 - 12 • Customer Requested and Load Growth (\$171 million increase) – Driven
 13 by a projected increase in demand for new residential customer
 14 connections and the inclusion in the GRC forecast of some Electric
 15 Vehicle (EV) charging infrastructure costs that were historically covered

⁷ See Exhibit (PG&E-4), WP 2-6.

- 1 by customers or recovered in other proceedings, and capacity upgrades
 2 driven by the new applications for service and EV charging applications;
 3 • Operational Coordination (\$51 million increase) – Driven by investments
 4 in the Advanced Distribution Management System to support PG&E’s
 5 Integrated Grid Platform;
 6 • Emergency Preparedness and Response (\$86 million decrease) –
 7 Driven by lower costs for the Distribution Substation Emergency
 8 Equipment Replacement Program due to the completion of capital
 9 wildfire-related projects, and decrease in emergency costs for the
 10 Community Rebuild program; and
 11 • Asset Management and Reliability (\$10 million decrease) – Driven by
 12 decreased costs related to the conclusion of milestone payments to the
 13 Elkhorn Battery Energy Storage System Engineering, Procurement, and
 14 Construction vendor. This decrease is offset by increased replacement
 15 rates in in overhead conductor, underground cable, and substation circuit
 16 breakers.

**FIGURE 2-4
 CAPITAL EXPENDITURES WALK BY PROGRAM AREA 2020-2023**



Note These amounts included in testimony and workpapers in the operational chapters may vary from the values listed in the Standard Workpapers and the RO model provided to Cal Advocates at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

1 Tables 2-6 and 2-7 at the end of this chapter show the forecasts by
2 Chapter and program areas.

3 **3. Balancing Accounts**

4 **a. Wildfire Mitigation Balancing Account**

5 PG&E proposes to continue the two-way Wildfire Mitigation
6 Balancing Account (WMBA) for its capital and expense costs incurred
7 for wildfire mitigations, with modifications to increase the
8 reasonableness review threshold.⁸ The WMBA will be used for
9 Community Wildfire Safety Program (CWSP) wildfire mitigation
10 expenditures, including the work in the System Hardening program and
11 other wildfire mitigations described in this Application as well as new risk
12 mitigation activities that PG&E may develop in future years.

13 **b. Vegetation Management Balancing Account**

14 PG&E proposes continuing its two-way Vegetation Management
15 Balancing Account (VMBA) through the 2023 GRC period, with
16 modifications to increase the reasonableness review threshold.⁹ The
17 VMBA is used to record PG&E's routine and EVM activities, and also
18 includes VM costs for dead and dying trees previously recorded in the
19 CEMA. To the extent that other lines of business (LOB) have similar
20 drought-related VM activities in the future that were previously booked to
21 CEMA, those expenses will also be booked to the VMBA.

22 **c. Major Emergency Balancing Account**

23 PG&E proposes to continue the two-way Major Emergency
24 Balancing Account (MEBA) for its capital and expense costs incurred for
25 major emergencies.

26 The purpose of the MEBA is to recover actual expenses and capital
27 revenue requirements resulting from responding to major emergencies
28 and catastrophic events not eligible for recovery through CEMA.¹⁰

8 See Exhibit (PG&E-4), Ch. 4 for the discussion on the WMBA.

9 See Exhibit (PG&E-4), Ch. 9 for the discussion on the VMBA.

10 See Exhibit (PG&E-4), Ch. 6 for more on MEBA.

1 **d. Catastrophic Events Straight Time Labor Balancing Account**

2 PG&E proposes to recover straight-time (ST) labor costs associated
3 with CEMA-eligible events through a new two-way balancing account
4 referred to as the Catastrophic Events Straight-Time Labor Balancing
5 Account (CESTLBA). If this proposal is approved, PG&E would stop
6 recording catastrophic event straight-time labor costs to the CEMA.
7 PG&E is proposing this change to simplify cost recovery in future CEMA
8 applications beginning in 2023.¹¹

9 **e. Rule 20A Balancing Account**

10 PG&E proposes to continue the one-way balancing account for its
11 capital and expense costs incurred for the Rule 20A program, and will
12 modify its proposal as needed to comply with the final decision on
13 Rulemaking (R.) 17-05-010, *Order Instituting Rulemaking (OIR) to*
14 *Consider Revisions to Electric Rule 20 and Related Matters.*¹²

15 **4. Reasonableness Review of 2020 Recorded Costs in Wildfire**
16 **Memorandum Accounts**

17 In this GRC, PG&E is also requesting recovery of 2020 recorded costs
18 incremental to funding approved in the 2020 GRC for activities associated
19 with wildfire risk reduction. These costs were recorded in the Fire Risk
20 Mitigation Memorandum Account (FRMMA) and the Wildfire Mitigation Plan
21 Memorandum Account (WMPMA). Attachment A to this chapter provides a
22 description of how PG&E determined the incrementality of these costs and
23 which costs are excluded because they were subject to the Wildfire Order
24 Instituting Investigation penalty reduction. The following chapters in the
25 electric exhibit have reasonableness review testimony on 2020
26 memorandum account costs:

- 27 • Chapter 4, “Wildfire Risk Mitigations”;
- 28 • Chapter 6, “Electric Emergency Recovery”;
- 29 • Chapter 10, “Overhead and Underground Electric Asset Inspections”;
- 30 • Chapter 11, “Overhead and Underground Electric Distribution
31 Maintenance”;

¹¹ See Exhibit (PG&E-4), Ch. 6 for more details on the proposed CESTLBA.

¹² See Exhibit (PG&E-4), Ch. 21 for more details on the Rule 20A balancing account.

- 1 • Chapter 12, “Pole Asset Management”; and
- 2 • Chapter 15, “Substation Asset Management.”

3 **C. Exhibit Changes Since the 2020 GRC**

4 PG&E reorganized the Electric Distribution exhibit as compared to the 2020
5 GRC exhibit by adding new chapters and reorganizing the way work is
6 presented. The most notable changes are listed below.

7 **1. Testimony on Electric Distribution Forecast and Investment Planning**

8 PG&E presents this chapter to provide testimony on the following:

- 9 (1) an overview of the Electric Distribution forecast; (2) key changes
- 10 compared to the 2020 GRC; (3) a demonstration of compliance with the
- 11 2020 GRC Settlement Agreement Principles for Deferred Work; (4) a
- 12 description of the Electric Operations Investment Planning process; and
- 13 (5) a summary of the forecast by program area.

14 **2. Reorganization of Wildfire Risk Mitigation Testimony**

15 PG&E consolidated most of its discussion of Wildfire Risk Mitigations
16 into one chapter (Chapter 4), which includes the following sub-chapters:

- 17 • Chapter 4.0 – “Wildfire Mitigations”
- 18 • Chapter 4.1 - “Situational Awareness and Forecasting”;
- 19 • Chapter 4.2 – “Public Safety Power Shutoff (PSPS) Operations”;
- 20 • Chapter 4.3 – “System Hardening, Enhanced Automation, and PSPS
- 21 Impact Mitigations”;
- 22 • Chapter 4.4 – “Community Wildfire Safety Program (CWSP) Program
- 23 Management Office (PMO)”;
- 24 • Chapter 4.5 – “Information Technology for Wildfire Mitigations.”

25 **3. Testimony on Community Rebuild Program**

26 PG&E presents new testimony as Chapter 23 to describe the work being
27 done to rebuild, in a safe and cost-effective manner, utility infrastructure
28 required to serve the Town of Paradise and surrounding areas.

29 **4. Other Organizational Changes**

30 In this GRC, PG&E is presenting inspections and maintenance
31 programs that in previous GRCs were all included in the Electric Distribution
32 Maintenance chapter in three chapters: “Overhead and Underground
33 Electric Asset Inspections” (Chapter 10), “Overhead and Underground

1 Electric Distribution Maintenance” (Chapter 11), and “Network Asset
2 Management” (Chapter 14). These chapters were separated to allow for a
3 more focused evaluation of their respective programs.

4 Field Metering Operations has moved from Exhibit (PG&E-6), “Customer
5 Care,” Chapter 6, to Chapter 8 of Exhibit (PG&E-4).

6 Table 2-1 below compares the 2020 GRC presentation to the 2023 GRC
7 presentation by chapter name and the MWCs presented in each chapter.

TABLE 2-1
COMPARING THE 2020 GRC TO 2023 GRC CHAPTERS

Line No.	2020 GRC		2023 GRC	
	Chapter Number and Title	MWCs	Chapter Number and Title	MWCs
1	Chapter 1: Electric Distribution Operations Policy and Introduction	All	Chapter 1: Electric Distribution Policy and Introduction	None
2	Chapter 2: Electric Distribution Risk Management	None	Chapter 2: Electric Distribution Forecast and Investment Planning	All
3	Chapter 2A: Wildfire Risk Policy and Overview	None	Chapter 3: Electric Distribution Risk Management	None
4	Multiple Chapters (2A, 3, 5, 6, 9, 10, 18)	AB, BA, HG, 2A, 08, 09, 21, 49	Chapter 4: Wildfire Risk Mitigations	Exp: AB, FZ, GE, IG, JV Cap: 21, 2F, 08, 48, 49
5	Chapter 3: Emergency Preparedness and Response	Exp: AB Cap: 21	Chapter 5: Emergency Preparedness and Response	Exp: AB Cap: 21
6	Chapter 4: Electric Emergency Recovery	Exp: IF, BH Cap: 17, 95	Chapter 6: Electric Emergency Recovery	Exp: IF, BH Cap: 17, 95
7	Chapter 5: Distribution System Operations	Exp: BA, DD, HG Cap: 63	Chapter 7: Distribution System Operations	Exp: BA, DD, HG Cap: 63
8	Exhibit (PG&E-6), Chapter 6: Metering	Exp: AR, DD, EY, EZ, HY, IG, IU, JV Cap: 01, 05, 21, 25, 74, 97, 2F, 3J	Chapter 8: Field Metering	Exp: AR, DD, EY, EZ, HY, IU Cap: 25, 74
9	Chapter 7: Vegetation Management	Exp: HN, IG Cap: None	Chapter 9: Vegetation Management	Exp: HN, IG Cap: None
10	Chapter 6: Electric Distribution Maintenance	Exp: BF, BK, KA, KB, KC Cap: 2A, 2B, 2C	Chapter 10: Overhead and Underground Electric Asset Inspections	Exp: BF Cap: None
11			Chapter 11: Overhead and Underground Electric Distribution Maintenance	Exp: BK, KA, KB Cap: 2A, 2B
12			Chapter 14: Network Asset Management	Exp: KC Cap: 2C, 56
13				

**TABLE 2-1
COMPARING THE 2020 GRC TO 2023 GRC CHAPTERS
(CONTINUED)**

Line No.	2020 GRC		2023 GRC	
	Chapter Number and Title	MWCS	Chapter Number and Title	MWCS
14	Chapter 8: Pole Asset Management	Exp: GA Cap: 07	Chapter 12: Pole Asset Management	Exp: GA Cap: 07
15	Chapter 9: Distribution Overhead System Hardening and Reliability	Exp: None Cap: 08, 49	Chapter 13: Overhead and Underground Asset Management and Reliability	Exp: None Cap: 08, 49, 56 (Wildfire mitigations moved to Ch 4)
16	Chapter 11: Underground Asset Management	Exp: None Cap: 56	Chapter 16: Distribution System Automation and Protection	Exp: HX Cap: 09
17	Chapter 10: Distribution Automation and System Protection	Exp: HX Cap: 09	Chapter 15: Substation Asset Management	Exp: GC Cap: 48, 54, 58, 59
18	Chapter 12: Substation Asset Management	Exp: GC Cap: 48, 54, 58, 59	Chapter 17: Electric Distribution Capacity, Engineering and Planning	Exp: FZ Cap: 06, 46
19	Chapter 13: Electric Distribution Capacity	Exp: None Cap: 06, 46	Chapter 20: Electric Distribution Data Management and Technology	Exp: GE, JV Cap: 21, 2F
20	Chapter 14: Electric Distribution Engineering and Planning	Exp: FZ Cap: None	Chapter 18: New Business and Work at the Request of Others	Exp: EV, EW Cap: 10, 16
21	Chapter 15: Electric Distribution Technology	Exp: JV Cap: 2F	Chapter 19: Rule 20A	Exp: IG Cap: 30
22	Chapter 16: New Business and Work at the Request of Others	Exp: EV, EW Cap: 10, 16	Chapter 22: Electric Distribution Support Activities	Exp: AB, IS, OM, OS Cap: 05, 21
23	Chapter 17: Rule 20A	Exp: None Cap: 30	Chapter 21: Integrated Grid Platform and Grid Modernization Plan	Exp: AB, AT, HG, IG, JV Cap: 21, 2F, 3M, 3R, 63, 82
24	Chapter 18: Electric Distribution Support Activities	Exp: AB, GE, IS, OM, OS Cap: 05, 21	Chapter 23: Community Rebuild Program	Exp: IF Cap: 95
25	Chapter 19: Integrated Grid Platform Program and Grid Modernization Plan	Exp: HG, JV Cap: 63, 2F		
26	None	N/A		

1 D. Managing Electric Operations Funding

2 1. Operating Rhythm

3 The 2023 GRC forecast includes funding for a risk-informed portfolio of
4 work that puts safety first while delivering on customer commitments and
5 supporting California's clean energy goals. In developing this portfolio, EO
6 must consider such factors as risk reduction, cost, efficiencies, overall
7 authorized GRC funding, the availability of PG&E and contractor resources,
8 synergies with other work, and dependencies and requirements such as
9 permitting and the different rules for working with California's counties and
10 cities.

11 When it emerged from its Chapter 11 proceeding, PG&E adopted a new
12 framework called the Operating Rhythm¹³ to run the business. This
13 framework provides a forum for reviewing Key Performance Indicators,
14 setting 5-year plans, developing more detailed shorter term plans, reviewing
15 work execution, and authorizing changes as needed to the annual work
16 plan.

17 The main decision-making entity within Electric Operations is the Work,
18 Resource and Financial Review (WRFR) Committee, a governing body
19 comprised of EO's Senior Vice President, Sr. Vice President Electric
20 Engineering, Vice President Asset Risk Management, Vice President Major
21 Projects and Programs, Sr. Director Electric Compliance, Sr. Director of
22 Electric Business Operations, and Director EO Business Finance. The
23 WRFR Committee approves the 5-year project/program targets and the
24 associated annual work plans. The committee meets monthly to review the
25 execution of the work plan from a units, dollars, and resources viewpoint.
26 When appropriate, the committee also authorizes changes to the annual
27 work plan, submittal into the Enterprise Operating Rhythm, and incremental
28 funding requests. The committee also provides guidance over resource
29 allocation decisions to ensure support of the work and financial plan.

30 Once an annual budget is established, managing it entails evaluating
31 the budget against planned and executed work and adjusting funding levels
32 on a monthly basis through change control and WRFR Committee meetings.

13 Exhibit (PG&E-2), Ch. 3.

1 The change control process encompasses the review and approval by the
2 WRFR Committee of funding level changes and proposed emergent work to
3 the work plan. These approved funding adjustments enable the Electric
4 Operations organization to execute a balanced portfolio of work.

5 The prioritization process PG&E followed in developing its forecast for
6 this GRC builds on this Operating Rhythm framework. Electric Operations is
7 continuing to refine its risk-prioritized spending methods and tools. This
8 may lead to spending on specific projects or programs to align with PG&E's
9 WMP and to address emerging issues. As in previous years, management
10 will exercise its judgment in determining how best to allocate funds.

11 **2. Funding the 2020-2022 Workplan**

12 PG&E's 2020 GRC presented a forecast which included significant
13 investments for wildfire risk reduction. The WMBA, which was authorized in
14 the 2020 GRC, provides funding for the wildfire mitigation activities
15 described in the 2020 GRC. Wildfire mitigations not eligible for recovery in
16 the WMBA are recorded in the WMPMA if approved as part of the WMP and
17 recorded in the FRMMA if not yet approved as part of the WMP.

18 As discussed in PG&E's 2020 GRC rebuttal testimony, the 2020 GRC
19 forecast did not include a forecast for the Wildfire Safety Inspection Program
20 (WSIP) and related repairs and replacements.¹⁴ Because the WSIP costs
21 and related repair and replacement costs exceeded PG&E's imputed
22 adopted amounts for maintenance tags, pole replacements, and other
23 identified work, those excess amounts have been recorded in the WMPMA.

24 Attachment A to this chapter describes the methodology used for
25 determining incrementality to the 2020 GRC imputed adopted amounts and
26 provides a summary of work recorded in the wildfire memorandum accounts
27 in 2020 for which PG&E is requesting reasonableness review in this
28 application.

29 While PG&E has other cost recovery mechanisms available for
30 incremental wildfire mitigation work, most of its work portfolio must be
31 prioritized within the 2020 GRC authorized revenue requirements. Exhibit
32 (PG&E-2), Chapter 3, "Operating Rhythm", describes the Company's Plan of

¹⁴ A.18-12-009, HE-20: Exhibit (PG&E-18), p. 2A-8, lines 11-31.

1 Reorganization (POR), which included 5-year LOB forecast targets from
2 2020-2025. The POR targets were anchored in the then-known/then-current
3 regulatory adopted amounts at the LOB level. For EO, given the increased
4 amount of work identified since the 2020 GRC was filed, Investment
5 Planning worked to develop an investment plan which funded necessary
6 work and was aligned with the POR targets. For 2021 and 2022, the bottom
7 up expense forecasts exceeded the POR targets, so the GRC forecast for
8 those years includes an expense challenge for many programs. The
9 forecast presented in the workpapers shows the costs expected for the
10 work, and an adjustment which represents unidentified work efficiencies to
11 align to the POR targets. The Electric Operations Performance
12 Improvement team is exploring opportunities for EO's organizations to work
13 more efficiently to achieve these cost savings. Also as discussed in Chapter
14 1 of this exhibit, EO is implementing a Lean Operating System to help
15 achieve these goals.

16 **3. Prioritizing Funding in the 2023 GRC**

17 At the time EO developed its forecast for the 2023 GRC, the Company
18 was in the process of retiring the Risk-Informed Budget Allocation (RIBA)
19 standard. During this transition period, EO applied a risk-based approach
20 for prioritizing its GRC portfolio. This approach centered around its Loading
21 Order, Circuit/Protection Zone Ranking, work execution analyses, and other
22 considerations.

23 The Loading Order is a prioritization framework specific to the EO
24 portfolio that ranks funding priorities by work type. Funding priorities act as
25 guidance for allocating funds to the highest risk areas for electric operations.
26 The top tier loading order assignments are aligned with electric operations
27 RAMP risks. The top priorities in the Loading Order is to fund work
28 addresses immediate safety emergencies and work that prevents wildfire
29 ignitions such as system hardening and VM. Other priorities include:
30 overhead work that addresses known safety risks such as conductor
31 replacement; work that prevents wires down and repair tags; and
32 emergency preparedness activities such as installing cameras and weather
33 stations and PSPS events. Work in the middle tier of the Loading Order
34 includes underground and network activities and compliance work with a

1 strong safety link; work that mitigates system-wide failure; and New
2 Business and Work at the Request of Others (NB/WRO). The lower priority
3 work addresses compliance and reliability work representing a low safety
4 risk.

5 The Circuit/Protection Zone Ranking supplements the Loading Order by
6 incorporating risk ranking prioritization and additional risk and value
7 analyses. The Circuit/Protection Zone Ranking: incorporates enhanced
8 wildfire spread modeling; addresses PSPS impact mitigations; assesses the
9 pace, scope, and combination of planned risk mitigations; and updates risk
10 ranking and prioritization for circuits in non-High Fire Threat District (HFTD)
11 areas.

12 Work Execution analyses centered around evaluating the number of
13 hours available to execute work based on current staffing levels and the
14 volume and type of work forecast in the GRC. Work Execution also
15 evaluated precursor and dependent work, such as the number of project
16 estimators needed and material availability, to support the GRC forecast.

17 Along with the frameworks and analyses described above, other issues
18 considered during the prioritization process included: funding for preferred
19 mitigation and control portfolios described in PG&E's 2020 RAMP Report;¹⁵
20 eliminating or reducing deferred work; and continued funding to complete
21 work in progress. EO also built into its portfolio affordability initiatives such
22 as reducing costs through aggressive contract pricing. The EO Investment
23 Planning team worked closely with program owners, asset managers and
24 EO leadership in finalizing the balanced GRC portfolio.

25 Finally, in developing its GRC portfolio, EO was constrained by the
26 targets established in the POR when PG&E emerged from bankruptcy on
27 July 1, 2020.¹⁶ While the EO forecast was anchored to the POR, PG&E
28 recognized the need to increase its forecast above POR targets in certain

¹⁵ PG&E's RAMP Report, A.20-06-012 (June 30, 2020).

¹⁶ PG&E discusses the POR financial targets in Exhibit (PG&E-2), Ch. 3.

1 key areas. The primary increases to EO's POR targets as approved by
 2 PG&E's Operating Plan Committee (OPC)¹⁷ are:

- 3 • Field Metering added additional funding to address gas meter module
 4 failures;
- 5 • EO Operational Management and Operational Support had increases for
 6 wildfire mitigation costs;
- 7 • Acceleration of the rebuild of Butte County in the Community Rebuild
 8 Program; and
- 9 • EO NB/WRO added additional funding to align with updated economic
 10 models and comply with a California Public Utilities Commission
 11 (Commission)-approved settlement.:

12 E. Cost Forecasting Approach

13 1. Cost Forecasting Methods

14 The forecast costs presented in Chapters 4 to 23 of this Electric
 15 Distribution exhibit generally include four cost types:

- 16 a) Unit costs for work that is recorded and forecast by unit (e.g., miles of
 17 conductor hardened, number of poles inspected);
- 18 b) Non-unitized costs for work that does not lend itself to unit cost
 19 estimation and, therefore, is recorded and forecast at a total MWC/MAT
 20 level (e.g., emergency response work, new programs for which there are
 21 no historical costs);
- 22 c) Project based forecasts for work that is forecast at the individual project
 23 level; and
- 24 d) Costs that are calculated by other methods (e.g., IT projects, work at the
 25 request of others).

¹⁷ PG&E's OPC is responsible for governance of the Operating Rhythm, an integrated enterprise-wide structure focused on planning, performance management and governance in order to provide clear line of sight to performance execution and accountability. The OPC is comprised of PG&E's senior leaders including the Chief Executive Officer, Chief Financial Officer, Chief Risk Officer, and Chief Operating Officer. See Exhibit (PG&E-2), Ch. 3 for more information about the Operating Rhythm and OPC.

1 The forecasting method for each of these cost types is described
2 below.¹⁸ Additional information is provided in the individual forecast
3 chapters.

4 The 2021 forecast amounts in PG&E's 2023 GRC presentation are
5 based on EO's approved 2021 budget. The budget represents a balanced
6 portfolio that prioritizes risk mitigation work, compliance work, and regulatory
7 and other commitments while staying within corporate capital and expense
8 targets.

9 **a. Method for Forecasting Unit Cost Work**

10 Much of the work forecast in Electric Distribution is based on the
11 costs to complete a unit of work. The unit cost forecasts are mostly
12 presented at the MAT code level where there is a single unit cost for
13 each MAT. For certain types of work the unit costs are presented at
14 MWC level (e.g., field metering). In other cases, there are very different
15 types of work in a single MAT that cannot be represented by a
16 single unit cost. In these cases, PG&E develops a unit cost for each
17 unique type of work, based on historical averages and incorporating
18 planned changes to the way the work will be conducted and
19 opportunities to reduce unit costs.

20 **b. Method for Forecasting Non-Unitized Work**

21 Certain MWCs and MAT codes in the Electric Distribution portfolio
22 are not tracked at a unit-cost level. For example, the costs recorded to
23 MAT code 05 (Tools and Equipment) are for miscellaneous capital tools
24 and equipment used on Electric Distribution projects across PG&E's
25 service area. Capital tools and equipment are purchased as needed
26 based on the different types of work occurring, and to replace tools and
27 equipment that are worn or broken. The costs forecast in this MAT code
28 do not lend themselves to the unit-cost forecasting methodology
29 because tools and equipment are considered more of a commodity type

¹⁸ PG&E's 2022 forecast for base electric distribution expense work (work that is not included in balancing memorandum accounts) is, for the most part, equal to the 2021 forecast. The 2022 forecast for non-base expense and capital work was developed as described in Section E.

1 item as opposed to specific numbers and types of tools and equipment
2 that can be reasonably forecast.

3 PG&E forecasts non-unitized work, also referred to as program
4 work, based on historic costs. Since the work in the program is
5 generally the same from year-to-year, PG&E uses the historic spend as
6 a basis for the forecast program work. Generally, program cost
7 forecasts are based on two prior years of historic spend, adjusted for
8 known program changes, and escalates the forecast using the approved
9 GRC forecast rates.

10 **c. Method for Forecasting Project Based Work**

11 PG&E's forecast includes individual projects such as adding
12 capacity in strategic locations to improve system flexibility and limit the
13 number of customers on a circuit. These individual project forecasts are
14 based on individual project estimates using historic cost data from
15 similar projects, vendor quotes, and/or engineering estimates.

16 **d. Methods for Forecasting Other Work**

17 The following three types of cost forecasts in PG&E's Electric
18 Distribution portfolio are calculated using different forecasting methods
19 because the type of work does not lend itself to any of the methods
20 described above.

- 21 1) Information Technology (IT) Projects – The IT cost forecast for
22 Electric Distribution is developed as a bottom-up forecast for each
23 IT project forecast in the rate case. PG&E uses its Project
24 Estimating Tool (PET) to develop each project forecast. The PET
25 and IT forecasting methodology are discussed in Exhibit (PG&E-7),
26 Chapter 8.
- 27 2) NB/WRO – The NB and WRO forecasts for Electric Distribution are
28 based on economic and government spending indices and historic
29 PG&E cost data. PG&E also works with a leading independent real
30 estate economics consulting firm which has developed a model to
31 forecast certain portions of the NB/WRO portfolio. More information
32 about the NB/WRO forecasting methodology is included in
33 Exhibit (PG&E-4), Chapter 18.

1 3) NB/WRO – State Infrastructure Projects – PG&E forecasts costs for
2 large-scale projects with schedules and scope dictated by third
3 parties, typically state and local governments. An individual forecast
4 for each project is developed based on the best information
5 available at the time and includes varying levels of cost
6 assumptions. More information about the NB/WRO State
7 Infrastructure Projects is included in Exhibit (PG&E-4), Chapter 18.

8 **2. Escalation Calculation**

9 Forecasts in this exhibit are escalated. For expense, PG&E developed
10 a blended escalation rate between Labor and Non-Labor, using escalation
11 rates developed by Global Insight,¹⁹ and applied it to all electric distribution
12 expense forecasts (with exceptions noted below). For capital, PG&E used a
13 combined Labor and Non-Labor escalation rate developed by Global Insight
14 and applied it to all electric distribution capital forecasts (again with
15 exceptions).

16 Two program areas, Emergency Preparedness and Response (EP&R)
17 and VM, have a significantly different mix of work from other programs and
18 their escalation rates were calculated accordingly.

19 EP&R work is considered Administrative and General (A&G) work and is
20 primarily labor, so PG&E used Global Insight's A&G-related escalation
21 factors to calculate a blended escalation rate for this work. For capital
22 components of EP&R costs, PG&E used a combined Labor and Non-Labor
23 common plant escalation rate instead of the Labor and Non-Labor electric
24 distribution only escalation rate.

25 Most VM work is performed by contractors, who are treated as a
26 Non-Labor expense. Therefore, PG&E calculated a blended escalation rate
27 for VM based on a Labor and Non-Labor split specific to the expense
28 forecast for the VM Program.

29 Details of PG&E's methodology for calculation of escalation rates are
30 provided in workpapers.²⁰ For a description of escalation calculations for
31 IT projects included in this exhibit, see Exhibit (PG&E-7), Chapter 8.

¹⁹ See Exhibit (PG&E-12), Chapter 3.

²⁰ See Exhibit (PG&E-4), WP 2-37.

1 **F. Compliance With Section 5.2 of the 2020 GRC Settlement “Deferred Work**
2 **Principles”**

3 The purpose of this Section is to describe how Electric Operations manages
4 its budget and balances its portfolio of rate case funded work over the rate case
5 period to ensure that all safety and reliability work is performed. The Section
6 also presents the results of Electric Operations’ deferred work analysis as
7 required by Section 5.2 of the 2020 GRC Settlement “Deferred Work Principles.”
8 The section is organized as follows:

- 9 • Section F.1 – Balancing Electric Operations Portfolio of Work;
- 10 • Section F.2 – Addressing Changing Priorities;
- 11 • Section F.3 – Analysis of “Deferred Work”;
- 12 • Section F.4 – Showing Required for Deferred Work; and
- 13 • Section F.5 – Consistency of EO’s Funding Request with the Six Principles
14 of Deferred Work.

15 **1. Balancing Electric Operations Portfolio of Work**

16 In Section D, PG&E describes the Electric Operations Investment
17 Planning process which leads to an annual Electric Operations budget that
18 is approved by the executive leadership team before the budget year
19 begins. Balancing the Electric Operations portfolio includes allocating
20 funding to the highest priority work, mandatory work, and new work by
21 identifying programs with available funding. Higher priority work is
22 determined through the processes described in Section D above and/or
23 addressing changing priorities across the Electric Operations portfolio.

24 **2. Addressing Changing Priorities**

25 PG&E’s 2020 GRC presented forecasts for a portfolio of work which
26 included substantial investments for the Community Wildfire Safety Program
27 and the foundation of an Integrated Grid Platform, while continuing to help
28 connect customers to the grid and maintain reliability. In late 2018, after the
29 2020 GRC was filed, PG&E began implementing the WSIP, a risk-based
30 approach to inspections of overhead distribution assets and substations in
31 high fire risk areas of its service territory. As described in PG&E’s Updated

1 Progress Report – Wildfire Mitigation Plan,²¹ the WSIP resulted in essential
2 findings about components in HFTD areas that could pose a risk of fire
3 ignition. These enhanced inspections and resulting maintenance tags,
4 which were not included in the 2020 GRC forecast or imputed adopted
5 amounts, required PG&E to reprioritize some investments planned in the
6 2020 GRC period in order to complete this higher priority risk mitigation
7 work. Additionally, building on the WSIP foundation, PG&E is incorporating
8 the enhanced inspection processes and tools into routine compliance
9 inspection and maintenance and using risk-informed maintenance cycles
10 going forward.

11 2020 presented additional challenges for work execution due to the
12 global COVID-19 pandemic. In order to protect the health and safety of our
13 employees, contractors and the general public, Electric Operations
14 developed COVID-19 work plan guidelines describing work that should
15 continue and work types that should be paused during shelter-in-place
16 protocols. These work plan guidelines prioritized critical work such as
17 emergency response, PSPS and wildfire mitigation work, critical new
18 business needs, and critical operating equipment work. As noted in
19 Chapter 1, EO will continue to work throughout this GRC cycle to complete
20 the work that was paused due to shelter-in-place guidelines.

21 As has been common in the last few years, 2020 had a devastating fire
22 season. In 2020, PG&E conducted six PSPS events. While PG&E
23 succeeded in making PSPS events shorter by reducing the average time to
24 restore power once the severe weather cleared, these events required
25 crews to inspect lines for damage prior to restoring power.

26 This mix of factors during the first year of the 2020 GRC cycle affected
27 the planned work for 2020 and subsequent years. As shown in Table 2-2
28 below, between 2020 and 2022, across the entire Electric Distribution
29 portfolio of work, PG&E expects to spend:

- 30 • Approximately \$6.3 billion in expense, which is \$3.2 billion more than the
31 imputed amount for expense projects and programs;²² and

²¹ Rulemaking (R.) 18-10-007, PG&E's Updated Progress Report – Wildfire Mitigation Plan (Jan. 15, 2020), pp. 3, 12, 13.

²² See Exhibit (PG&E-4), WP 2-35, line 60.

- 1 • Approximately \$10.0 billion in capital expenditures, which is \$2.3 billion
2 more than the imputed amount for capital projects and programs.²³

TABLE 2-2
ELECTRIC DISTRIBUTION INCURRED AND RECORDED/FORECAST COSTS 2020-2022
(MILLIONS OF NOMINAL DOLLARS)

Line No.	Type	2023 GRC (2020 Recorded Adjusted and 2021-2022 Forecast)	2020 GRC (2020-2022 Imputed Regulatory Values)	Difference
1	Expense Total	\$6,324	\$3,099	\$3,224
2	Capital Total	\$9,977	\$7,700	\$2,277

3 The numbers in the table above include amounts recorded in balancing
4 accounts (WMBA, VMBA, MEBA, Rule 20A) and wildfire memorandum
5 accounts (FRMMA and WMPMA). Amounts for separately-funded programs
6 rolling into the GRC starting in 2023²⁴ are excluded to provide an “apples to
7 apples” comparison with the 2020 GRC imputed adopted amounts.

8 For expense, the primary reasons for the higher than imputed spending
9 include: (1) higher costs for Routine VM and EVM; (2) a new requirement to
10 record Tree Mortality Program costs in the VMBA (these costs were not
11 included in PG&E’s 2020 GRC forecast as PG&E had been tracking these
12 costs in the CEMA); (3) PSPS event costs that were not forecast in the 2020
13 GRC; (4) implementation of a new enhanced inspection process; and
14 (5) WSIP-related equipment repairs.

15 Electric Operations’ 2020-2022 capital expenditures are forecast to be
16 higher than imputed in numerous programs including: (1) pole
17 replacements, (2) overhead maintenance, (3) new customer connections,
18 (4) capacity, (5) response to routine emergencies; (6) substation emergency
19 replacements, and (7) gas meter module replacements.

20 Some of the overspend shown above is subject to reasonableness
21 review through the wildfire memorandum accounts. See Attachment A of

²³ See Exhibit (PG&E-4), WP 2-36, line 55.

²⁴ These include amounts recovered in the CEMA, the Distribution Resources Plan memorandum accounts, and the Electric Program Investment Charge.

1 this chapter for a summary of the 2020 recorded wildfire memorandum
2 account amounts included in PG&E's reasonableness review request.
3 Forecast amounts in 2021 and 2022 include what PG&E currently expects to
4 record to the wildfire memorandum accounts. PG&E will determine the
5 incrementality of future year costs when recorded amounts are available.

6 **3. Analysis of "Deferred Work"**

7 Section 5.2 of the 2020 GRC Settlement Agreement (Principles for
8 Deferred Work) requires PG&E to include testimony in this GRC where the
9 following criteria are met:

- 10 a) The work was requested and authorized based on representations that it
11 was needed to provide safe and reliable service (Check 1);
12 b) PG&E did not perform all of the authorized and funded work,
13 as measured by authorized (explicit or imputed) units of work (Check 2);
14 and
15 c) PG&E continues to represent that the curtailed work is necessary to
16 provide safe and reliable service (Check 3).

17 The results from EO review to determine if any work was deferred are
18 summarized in the Deferred Work Analysis Summary workpaper.²⁵ Each
19 EO witness reviewed all of the MAT codes that are included in their 2023
20 GRC chapter and answered each of the three questions listed above to
21 determine if work meets the 2020 GRC Settlement deferred work criteria.
22 The three questions are shown as Check 1, Check 2, and Check 3 in the
23 workpaper. For purposes of the deferred work analysis, Check 2 is divided
24 into two Checks (2a and 2b). The answers to each Check are listed in
25 Columns G through J by MAT. After answering the three deferred work
26 questions, the witness provided the reason that work meets or does not
27 meet the deferred work criteria in Column K.

28 To analyze whether "the work was requested and authorized based on
29 representations that it was needed to provide safe and reliable service"
30 (Check 1), EO answered "Yes" for the following work: (1) any MAT codes
31 identified as safety, reliability, or maintenance (SRM)-related in the 2020

²⁵ See Exhibit (PG&E-4), WP 2-15.

1 Risk Spend Accountability Report (RSAR);²⁶ and (2) any activities not
2 captured in the 2020 RSAR under (1), but where some or all of the work was
3 requested in the 2020 GRC based on representations that the work was
4 “needed to provide safe and reliable service.”

5 Next, to analyze whether “PG&E did not perform all of the authorized
6 and funded work, as measured by authorized (explicit or imputed) units of
7 work” (Check 2), EO first evaluated whether units were imputed for the work
8 based on the 2020 GRC decision. For GRC work, EO then compared 2020
9 recorded units, and 2021 and 2022 forecasts to the units imputed for the
10 period 2020-2022. Under this analysis, Check 2 applies where 2020 actuals
11 and the 2021 and 2022 forecast indicate that the imputed units of work will
12 not be completed by the end of 2022.

13 Finally, to analyze whether “PG&E continues to represent that the
14 curtailed work is necessary to provide safe and reliable service” (Check 3),
15 EO reviewed its 2020 GRC testimony to establish whether it is again
16 proposing the same work for safety and reliability in the 2023 GRC. The
17 response to Check 3 is “No” for work even if the expected units are fewer
18 than the imputed units if the work is: demand-driven work conducted on an
19 “as-needed” basis; compliance work where PG&E expects to complete all
20 compliance work regardless of the number of units imputed and forecast;
21 work where the type or scope of work forecast under a particular MAT
22 changed from the type or scope of work originally forecast; work no longer
23 needed to improve safety and reliability; or if the difference is due to other
24 types of change such as revised work methods, changes in strategy or
25 approach, or a material difference in forecast assumptions.

26 For those areas of work where one or more of the three checks were not
27 met, PG&E determined that the area of work did not qualify as “deferred
28 work” as this term is used in the 2020 GRC Settlement.

29 If the checks all applied, EO determined that the work qualified as
30 “deferred work” as this term is used in the 2020 GRC Settlement.

31 Table 2-3 summarizes the deferred work identified by PG&E’s analysis
32 for Electric Operations by program and chapter.

26 See PG&E’s 2020 Risk Spend Accountability Report (March 31,2021).

**TABLE 2-3
LIST OF ELECTRIC DISTRIBUTION DEFERRED WORK PROGRAMS**

Line No.	Program, Chapter and Witness	Reason for Deferring Work	Volume and Cost of Work (Thousands of Dollars)
1	Overhead Notifications – Expense (MAT KAA) Chapter 11 – Electric Distribution Overhead and Underground Maintenance Witness: Trish Fabris	PG&E does not expect to complete 11,617 notifications out of the imputed units of 93,673. The program will be overspent by \$140 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority maintenance tags.	Imputed Volume and Cost of Work (MAT KAA) 2020 GRC (2020-2022) 93,674 notifications \$56,886 Recorded/Forecast Volume and Cost of Work 2020-2022: 82,057 notifications \$196,945
2	Underground Notifications – Expense (MAT KBA) Chapter 11 – Electric Distribution Overhead and Underground Maintenance Witness: Trish Fabris	PG&E does not expect to complete 5,240 notifications out of the imputed units of 18,479. The program will be overspent by \$8.1 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority maintenance tags.	Imputed Volume and Cost of Work (MAT KBA) 2020 GRC (2020-2022) 18,479 notifications \$33,027 Recorded/Forecast Volume and Cost of Work 2020-2022: 13,239 notifications \$41,092
3	Overhead Idle Facility Removal – Capital (MAT 2AF) Chapter 11 – Electric Distribution Overhead and Underground Maintenance Witness: Trish Fabris	PG&E does not expect to complete 1,783 removals out of the imputed units of 5,346. The program will be overspent by \$4.1 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority maintenance tags.	Imputed Volume and Cost of Work (MAT 2AF) 2020 GRC (2020-2022) 5,346 removals \$24,124 Recorded/Forecast Volume and Cost of Work 2020-2022: 3,563 removals \$28,198

TABLE 2-3
LIST OF ELECTRIC DISTRIBUTION DEFERRED WORK PROGRAMS
(CONTINUED)

Line No.	Program, Chapter and Witness	Reason for Deferring Work	Volume and Cost of Work (Thousands of Dollars)
4	Underground Notifications – Capital (MAT 2BA) Chapter 11 – Electric Distribution Overhead and Underground Maintenance Witness: Trish Fabris	PG&E does not expect to complete 2,632 notifications out of the imputed units of 7,676. The program will be underspent by \$8.9 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources and funding were reprioritized to complete higher priority maintenance tags.	Imputed Volume and Cost of Work (MAT 2BA) 2020 GRC (2020-2022) 7,676 notifications \$139,851 Recorded/Forecast Volume and Cost of Work 2020-2022: 5,044 notifications \$130,936
5	Underground Idle Facility Removals – Capital (MAT 2BF) Chapter 11 – Electric Distribution Overhead and Underground Maintenance Witness: Trish Fabris	PG&E does not expect to complete 37 removals out of the imputed units of 51. The program will be underspent by \$0.3 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority maintenance tags.	Imputed Volume and Cost of Work (MAT 2BF) 2020 GRC (2020-2022) 51 removals \$583 Recorded/Forecast Volume and Cost of Work 2020-2022: 14 removals \$263

TABLE 2-3
LIST OF ELECTRIC DISTRIBUTION DEFERRED WORK PROGRAMS
(CONTINUED)

Line No.	Program, Chapter and Witness	Reason for Deferring Work	Volume and Cost of Work (Thousands of Dollars)
6	<p>Overhead Conductor Replacement Program – Capital (MAT 08J) Chapter 13</p> <p>Overhead and Underground Asset Management and Reliability</p> <p>Witness: Jeff Borders</p>	<p>PG&E does not expect to complete 128 miles out of the imputed units of 289. The program will be underspent by \$67 million.</p> <p><u>Reasons:</u></p> <p><u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority work based on time dependency. Funding was used to support routine emergency and higher priority maintenance tags</p> <p><u>COVID-19 delays:</u> Project delays occurred in 2020 due to COVID-19 related work stoppages</p>	<p>Imputed Volume and Cost of Work (MAT 08J) 2020 GRC (2020-2022) 289 miles \$157,550</p> <p>Recorded/Forecast Volume and Cost of Work 2020-2022: 161 miles \$90,459</p>
7	<p>Grasshopper Switch Replacements – Capital (MAT 08S) Chapter 13</p> <p>Overhead and Underground Asset Management and Reliability</p> <p>Witness: Jeff Borders</p>	<p>PG&E does not expect to complete 26 switches out of the imputed units of 90. The program will be underspent by \$0.9 million.</p> <p><u>Reasons:</u></p> <p><u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority work based on time dependency. Funding was used to support routine emergency and higher priority maintenance tags</p> <p><u>COVID-19 delays:</u> Project delays occurred in 2020 due to COVID-19 related work stoppages</p>	<p>Imputed Volume and Cost of Work (MAT 08S) 2020 GRC (2020-2022) 90 switches \$3,372</p> <p>Recorded/Forecast Volume and Cost of Work 2020-2022: 64 switches \$2,410</p>

TABLE 2-3
LIST OF ELECTRIC DISTRIBUTION DEFERRED WORK PROGRAMS
(CONTINUED)

Line No.	Program, Chapter and Witness	Reason for Deferring Work	Volume and Cost of Work (Thousands of Dollars)
8	Overhead Fuses – Capital (MAT 49C) Chapter 13 Overhead and Underground Asset Management and Reliability Witness: Jeff Borders	PG&E does not expect to complete 66 fuses out of the imputed units of 297. The program will be underspent by \$0.6 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority work based on time dependency. Funding was used to support routine emergency and higher priority maintenance tags <u>COVID-19 delays:</u> Project delays occurred in 2020 due to COVID-19 related work stoppages	Imputed Volume and Cost of Work (MAT 49C) 2020 GRC (2020-2022) 297 fuses \$3,285 Recorded/Forecast Volume and Cost of Work 2020-2022: 231 fuses \$2,713
9	Trip Savers – Capital (MAT 49T) Chapter 13 Overhead and Underground Asset Management and Reliability Witness: Jeff Borders	PG&E does not expect to complete 92 units out of the imputed units of 239. The program will be underspent by \$0.9 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources were reprioritized to complete higher priority work based on time dependency. Funding was used to support routine emergency and higher priority maintenance tags <u>COVID-19 delays:</u> Project delays occurred in 2020 due to COVID-19 related work stoppages	Imputed Volume and Cost of Work (MAT 49T) 2020 GRC (2020-2022) 239 units \$3,290 Recorded/Forecast Volume and Cost of Work 2020-2022: 147 units \$2,403

**TABLE 2-3
LIST OF ELECTRIC DISTRIBUTION DEFERRED WORK PROGRAMS
(CONTINUED)**

Line No.	Program, Chapter and Witness	Reason for Deferring Work	Volume and Cost of Work (Thousands of Dollars)
10	Reliability Cable Replacement – Capital (MAT 56A) Chapter 13 Overhead and Underground Asset Management and Reliability Witness: Jeff Borders	PG&E does not expect to complete 5 miles out of the imputed units of 60. The program will be underspent by \$5.0 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources and funding were reprioritized to complete higher priority underground asset replacement work. <u>COVID-19 delays:</u> Project delays occurred in 2020 due to COVID-19 related work stoppages	Imputed Volume and Cost of Work (MAT 56A) 2020 GRC (2020-2022) 60 miles \$100,539 Recorded/Forecast Volume and Cost of Work 2020-2022: 55 miles \$95,556
11	COE Cable Replacement – Capital (MAT 56C) Chapter 13 Overhead and Underground Asset Management and Reliability Witness: Jeff Borders	PG&E does not expect to complete 164 units out of the imputed units of 662. The program will be underspent by \$11.9 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources and funding were reprioritized to complete higher priority underground asset replacement work. <u>COVID-19 delays:</u> Project delays occurred in 2020 due to COVID-19 related work stoppages	Imputed Volume and Cost of Work (MAT 56C) 2020 GRC (2020-2022) 662 units \$100,250 Recorded/Forecast Volume and Cost of Work 2020-2022: 498 units \$88,331
12	Battery Replacement – Capital (MAT 48C) Chapter 15 – Substation Asset Management Witness: Maria Ly	PG&E does not expect to complete 17 units out of the imputed units of 30. The program will be underspent by \$3.3 million. <u>Reasons:</u> <u>Reprioritization/higher risk work:</u> Resources and funding were reprioritized to complete higher priority substation work.	Imputed Volume and Cost of Work (MAT 48C) 2020 GRC (2020-2022) 30 units \$6,779 Recorded/Forecast Volume and Cost of Work 2020-2022: 13 units \$3,488

1 **4. Showing Required for Identified Deferred Work**

2 For each work area identified as “deferred work” the Settlement requires
3 that PG&E address the following:

4 a) Why the authorized work was not performed in the time forecasted;

- 1 b) Whether the deferral of the authorized work resulted in lower than
2 authorized spending for the authorized work;
3 c) How the funding was reallocated and whether such reallocation related
4 to the provision of safe and reliable service;
5 d) The reasonableness of the alternative work for the purpose of
6 evaluating the appropriateness of the new funding request; and
7 e) How the specific funding request is consistent with the deferred work
8 principles.

9 For the areas of deferred work identified by EO, elements (a) through
10 (d) are addressed for each deferred work area by the witnesses in the
11 chapters referenced in the table. PG&E also discusses element (c) is
12 addressed generally for EO below. Item (e), EO compliance with the
13 six principles of deferred work for all the 12 electric operations deferred work
14 areas, is addressed below.

15 The reasonableness of the alternative work is addressed below as part
16 of responding to Question (c).

17 **a. Response to Question (c) for Electric Distribution Expense**
18 **Programs**

19 Table 2-4 summarizes expense the recorded and forecast expense
20 spend compared to imputed adopted for the areas identified as deferred
21 work.²⁷

TABLE 2-4
ELECTRIC DISTRIBUTION EXPENSE DEFERRED WORK PROGRAMS SUMMARY
(THOUSANDS OF NOMINAL DOLLARS)

2023 GRC Chapter	Description	2020 Rec. Adj. + 2021 to 2022 Forecast	2020 to 2022 Imputed	Difference
11	Overhead Notifications (MAT KAA)	\$196,945	\$56,886	\$140,059
11	Underground Notifications (MAT KBA)	41,092	33,027	8,064
	Total	\$238,037	\$89,914	\$148,123

²⁷ See Exhibit (PG&E-4), WP 2-20, line 76 and WP 2-21, line 88.

1 PG&E expects to spend more than the imputed adopted amounts in
 2 the MAT codes where all units will not be completed, so no funding was
 3 reallocated to other programs.

4 **b. Response to Question (c) for Electric Distribution Capital Programs**

5 Table 2-5 summarizes the recorded and forecast capital
 6 expenditures spend compared to imputed adopted for the areas
 7 identified as deferred work.²⁸

TABLE 2-5
ELECTRIC DISTRIBUTION CAPITAL DEFERRED WORK PROGRAMS SUMMARY
(THOUSANDS OF NOMINAL DOLLARS)

2023 GRC Chapter	Description	2020 Rec. Adj. + 2021 to 2022 Forecast	2020 to 2022 Imputed	Difference
11	Overhead Idle Facility Removal (MAT 2AF)	\$28,198	\$24,124	\$4,073
11	Underground Notifications (MAT 2BA)	130,936	139,851	(8,916)
11	Underground Idle Facility Removals (MAT 2BF)	263	583	(320)
13	Overhead Conductor Replacement Program (MAT 08J)	90,459	157,550	(67,092)
13	Grasshopper Switch Replacements (MAT 08S)	2,410	3,372	(962)
13	Overhead Fuses (MAT 49C)	2,713	3,285	(572)
13	Trip Savers (MAT 49T)	2,403	3,290	(887)
13	Reliability Cable Replacement (MAT 56A)	95,556	100,539	(4,983)
13	COE Cable Replacement (MAT 56C)	88,331	100,250	(11,919)
15	Battery Replacement (MAT 48C)	3,488	6,779	(3,291)
	Total	\$444,757	\$539,625	\$(94,869)

8 For capital work identified as deferred, PG&E expects to spend
 9 approximately \$94.9 million less than imputed adopted amounts. For
 10 overhead and underground maintenance, underground asset
 11 replacement, and substation batteries, funding was reprioritized to
 12 address other work within the overall respective programs. For
 13 overhead asset replacement and reliability work, funding was
 14 reprioritized using the Loading Order framework discussed in Section D
 15 above.

16 The overhead asset replacement work (MATs 08J and 08S), while
 17 categorized as Loading Order 2 (Overhead work with a strong safety

²⁸ See Exhibit (PG&E-4), WP 2-19, line 57; WP 2-20, lines 66 and 69; WP 2-22, lines 111
 112, 117, 124 and 127; WP 2-23, line 129; WP 2-24, line 149.

1 link), was determined to be a lower near-term priority than (1) other
2 more time-dependent Loading Order 2 work such as poles, OH tags,
3 and (2) time-dependent Loading Order 6 (Customer Commitment work)
4 capacity work needed to serve customers. Reliability work in MATs 49C
5 and 49T are lower down in the Loading Order. These programs, while
6 effective at mitigating overhead safety and reliability risk, are “proactive”
7 replacement and equipment installation programs. When overhead
8 resources and funding are needed for higher risk wildfire mitigation
9 work, and time-dependent work such as emergency replacement and
10 high risk time-dependent maintenance work, PG&E’s prioritization
11 weighs this time dependency against the risks associated with not
12 completing the full annually forecasted proactive replacement and
13 equipment installation work. PG&E’s patrols and inspections programs
14 are aimed at finding imminent failure potential to somewhat mitigate the
15 near-term risk of a reduced amount proactive work.

16 **5. Consistency of EO’s Funding Request with the Six Principles of** 17 **Deferred Work**

18 Section 5.2 of the 2020 GRC Settlement lists six principles. The
19 Settlement requires that for all work meeting the definition of deferred work:

20 PG&E’s direct showing in support of the reasonableness of its forecast
21 in the rate case shall provide at a minimum, a demonstration of how the
22 specific funding request is consistent with the principles...

23 PG&E’s deferred work for EO is consistent with the six principles as
24 discussed below. In addition to being addressed below with respect to
25 deferred work identified by EO, the six principles are also discussed in the
26 context of PG&E’s overall, enterprise-level planning and budgeting
27 processes in Section F of Exhibit (PG&E-2), Chapter 3.

28 As stated in Section 5.2 of the GRC Settlement, the six principles below
29 should be viewed “in totality” and not in isolation. PG&E describes each
30 principle and its key element(s) in order to provide additional structure for
31 this discussion; these should be considered when determining whether
32 PG&E’s decisions are reasonable for the operation of its systems.

33 Overall, EO’s re-request for funding of part of the work identified as
34 “deferred work” under the Settlement, is reasonable, justified, and consistent

1 with the six principles because as summarized in Table 2-3 above, in all
2 cases resources and funding (where there was underspending of authorized
3 amounts) were reprioritized to complete higher priority work. In certain
4 cases, project delays occurred in 2020 due to COVID 19 related work
5 stoppages, contributing to deferred work. EO's deferred work represents
6 prudent management of risks and resources, and is consistent with PG&E's
7 obligation to provide safe and reliable service.

8 **Principle 1 – Where funds are originally collected from ratepayers**
9 **based on representations that the work is necessary to provide safe**
10 **and reliable service and, yet, PG&E does not perform all of the**
11 **designated work, the fact that PG&E must pay for a higher priority**
12 **activity or program does not nullify or extinguish its responsibilities to**
13 **fund forecasted and authorized work unless such work is no longer**
14 **deemed necessary for safe and reliable service.**

15 PG&E believes that the intention of this principle is to require funding by
16 PG&E of all work needed to deliver safe and reliable service regardless of
17 other funding demands.

18 EO has met, or will meet, the requirement to provide safe and reliable
19 service in 2020-2022. As discussed in Exhibit (PG&E-2) Chapter 3, the
20 Company's enterprise-wide planning and budgeting process ensures that
21 necessary work is funded. The Operating Rhythm and OPC process
22 provides an enterprise-level forum for LOBs to seek additional funding to
23 address changing conditions and emergent high priority work. Following the
24 Company's enterprise-wide planning and budgeting process, and consistent
25 with its "responsibility and its discretion to adjust priorities to accommodate
26 changing conditions" (see Principle 5 below), EO manages and reprioritizes
27 its spending as described in Section D above. These processes—the
28 Operating Rhythm and OPC process and EO's management of its
29 portfolio—align spending to meet all of PG&E's operational obligations and
30 provide safe and reliable service.

31 Each of EO's deferred work items are consistent with the obligation to
32 provide safe and reliable service. The reasons for deferral, reprioritization of
33 funding, and the alternative work are summarized in Table 2-3 and
34 addressed in detail by the witnesses in the chapters referenced in the table.

1 In sum, for all EO's "deferred work" items, PG&E's actions were
2 reasonable, did not compromise safety and reliability, and in the cases
3 where authorized funding was not spent, it was reprioritized to higher priority
4 work. For these reasons, PG&E believes that EO's deferred work decisions
5 as described in this chapter were consistent with the obligation to provide
6 safe and reliable service as required by Principle 1.

7 **Principle 2 – PG&E is responsible for providing safe and reliable**
8 **customer service whether or not its overall spending matches funding**
9 **levels authorized or imputed in rates.**

10 PG&E understands this principle to mean that PG&E's responsibility to
11 provide safe and reliable service is independent of PG&E's overall spending
12 level. PG&E discusses this principle at an enterprise level in
13 Exhibit (PG&E-2), Chapter 3.

14 As discussed under Principle 1, Electric Operations demonstrates
15 compliance with this principle and with its responsibility to provide safe and
16 reliable service by following its budget planning and management process
17 described in Section D. above. Furthermore, as explained under Principle 1,
18 the specific deferred work described in this exhibit will not compromise
19 system safety or near-term reliability.

20 Finally, while mindful of authorized funding levels, Electric Operations
21 does not limit its spending to authorized levels if greater expenditures are
22 needed to address safety concerns and meet reliability targets. As
23 discussed above, Electric Operations expects to spend more than the
24 imputed amounts on both expense and capital programs and projects
25 between 2020 and 2022. This increase in spending above imputed was
26 necessary to address findings from the WSIP, execute PSPS events,
27 complete VM work, and to address cost increases, emerging work, and
28 other conditions not forecast in the 2020 GRC. These decisions to spend
29 above imputed funding on both the portfolio level and the individual MAT
30 level are all reasonable and consistent with this principle, and with Principle
31 5 below which requires PG&E to adjust spending to meet changing
32 conditions.

1 **Principle 3** – PG&E bears the risk that, as a result of meeting spending
2 **obligations necessary to provide safe and reliable service, the earned**
3 **rate of return may be less than the authorized return.**

4 PG&E understands that under this principle PG&E is not guaranteed its
5 authorized rate of return and PG&E’s obligation to provide safe and reliable
6 service may cause PG&E’s earnings to be less than authorized.

7 PG&E discusses this principle at an enterprise level in Exhibit (PG&E-2),
8 Chapter 3.

9 **Principle 4** – While PG&E has finite funds to meet capital and
10 **operational needs, PG&E is not restricted to spending only up to the**
11 **forecast adopted in a GRC.**

12 PG&E understands this principle to be closely related to Principle 2, with
13 the important additional acknowledgment that PG&E has finite funds to meet
14 its capital and operational needs.

15 PG&E discusses this principle at an enterprise level in Exhibit (PG&E-2),
16 Chapter 3. With respect to Electric Operations, please see the discussion
17 regarding Principle 2.

18 **Principle 5** – PG&E bears the responsibility—and has discretion—to
19 **adjust priorities to accommodate changing conditions after test year**
20 **forecasts are adopted. Readjusting spending priorities, however, only**
21 **involves the ranking and sequence of spending. Reprioritizing**
22 **spending for new projects does not automatically justify postponing**
23 **projects previously deemed necessary for safe and reliable service.**

24 PG&E understands this principle to be very similar to Principles 1-3,
25 adding the explicit acknowledgment of PG&E’s responsibility and discretion
26 to readjust its spending priorities.

27 PG&E discusses this principle at an enterprise level in Exhibit (PG&E-2),
28 Chapter 3. With respect to Electric Operations, as explained in Section D
29 above, spending is managed to deliver system safety and reliability; meet
30 compliance, regulatory and public commitments; and perform mandatory
31 work (including new and emergent work). Electric Operations considers
32 factors such as risk reduction, cost, efficiencies, the availability of PG&E and
33 contractor resources, synergies with other work, and dependencies and
34 requirements such as permitting and the different rules for working with

1 California’s counties and cities. As a result of this risk-informed planning
2 and budgeting process, no project or program is “automatically” postponed.
3 As previously discussed under Principle 1, with respect to the specific areas
4 of deferred work identified by Electric Operations, the deferrals were
5 operationally reasonable and will not degrade system safety or near-term
6 reliability.

7 **Principle 6 – The GRC process is a tool in supporting PG&E’s ongoing**
8 **ability to provide safe and reliable service while affording a reasonable**
9 **opportunity to earn its rate of return and thereby attract capital to fund**
10 **its infrastructure needs. Adopted revenue requirements and the**
11 **disposition of disputed ratemaking issues should be consistent with**
12 **the goal of supporting PG&E’s ability to provide safe and reliable**
13 **service while maintaining its financial health and ability to raise capital.**

14 PG&E understands this principle to add important financial
15 counterweights to the operational points covered in Principles 1-5. PG&E
16 discusses this principle at an enterprise level in Exhibit (PG&E-2),
17 Chapter 3.

18 **G. Forecast by Chapter and Program Area**

19 Tables 2-6 and 2-7 summarize the 2023 expense and capital forecasts for
20 Electric Operations by chapter and program area.²⁹

²⁹ See Exhibit (PG&E-4), WP 2-12 and WP 2-13 for 2020 expense and capital recorded amounts and 2021-2026 forecast.

**TABLE 2-6
2023 EXPENSE FORECAST BY CHAPTER AND PROGRAM AREA
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Chapter	Chapter Title	Customer Requested and Load Growth	Emergency Preparedness and Response	Maintenance and Compliance	Operational Coordination	Risk Reduction	2023 Forecast Total
1	4.1	Situational Awareness and Forecasting	-	-	-	-	\$43,416	\$43,416
2	4.2	PSPS Operations	-	-	-	-	115,266	115,266
3	4.3	System Hardening, Enhanced Automation and PSPS Impact Mitigations	-	-	-	-	11,595	11,595
4	4.4	CWSP PMO	-	-	-	-	13,460	13,460
5	4.5	Information Technology for Wildfire Mitigation	-	-	-	-	35,700	35,700
6	5	Emergency Preparedness & Response	-	\$22,342	-	-	4,192	26,534
7	6	Electric Emergency Recovery	-	136,466	-	-	-	136,466
8	7	Distribution System Operations	-	-	-	\$58,646	-	58,646
9	8	Field Metering	-	-	\$21,574	-	-	21,574
10	9	Vegetation Management	-	-	645,996	-	-	645,996
11	10	Overhead and Underground Electric Asset Inspections	-	-	89,464	-	-	89,464
12	11	Overhead and Underground Electric Distribution Maintenance	-	-	94,985	-	-	94,985
13	12	Pole Asset Management	-	-	39,340	-	-	39,340
14	14	Network Asset Management	-	-	5,021	-	-	5,021
15	15	Substation Asset Management	-	14,069	36,871	-	-	50,940
16	16	Distribution System Automation and Protection	-	-	-	3,008	-	3,008
17	17	Electric Distribution Capacity, Engineering and Planning	-	-	-	19,943	-	19,943
18	18	NB/WRO	\$24,161	-	-	-	-	24,161
19	19	Rule 20A	-	-	-	-	-	-
20	20	Electric Distribution Data Management and Technology	-	-	-	26,026	-	26,026
21	21	Integrated Grid Platform and Grid Modernization Plan	-	-	-	49,065	-	49,065
22	22	Electric Distribution Support Activities	-	-	-	128,784	2,810	131,594
23	23	Community Rebuild Program	-	13,781	-	-	-	13,781
24		Total Expense	\$24,161	\$186,659	\$933,252	\$285,472	\$777,124	\$2,206,667

(PG&E-4)

**TABLE 2-7
2023 CAPITAL EXPENDITURE FORECAST BY CHAPTER AND PROGRAM AREA
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Chapter	Chapter Title	Asset Management and Reliability	Customer Requested and Load Growth	Emergency Preparedness and Response	Maintenance and Compliance	Operational Coordination	Risk Reduction	2023 Forecast Total
1	4.1	Situational Awareness and Forecasting	-	-	-	-	-	\$4,601	\$4,601
2	4.2	PSPS Operations	-	-	-	-	-	262	262
3	4.3	System Hardening, Enhanced Automation, and PSPS Impact Mitigations	-	-	-	-	-	990,063	990,063
4	4.5	Information Technology for Wildfire Mitigations	-	-	-	-	-	25,300	25,300
5	5	Emergency Preparedness and Response	-	-	\$3,359	-	-	2,143	5,502
6	6	Electric Emergency Recovery	-	-	319,184	-	-	-	319,184
7	7	Distribution System Operations	-	-	-	-	\$4,333	-	4,333
8	8	Field Metering	-	-	-	\$104,455	-	-	104,455
9	11	Overhead and Underground Electric Distribution Maintenance	-	-	-	318,467	-	26,067	344,534
10	12	Pole Asset Management	-	-	-	376,218	-	3,296	379,514
11	13	Overhead and Underground Asset Management and Reliability	\$157,223	-	-	-	-	7,214	164,438
12	14	Network Asset Management	25,673	-	-	-	-	18,750	44,423
13	15	Substation Asset Management	121,500	-	82,323	-	-	6,589	210,412
14	16	Distribution System Automation and Protection	-	-	-	-	27,003	-	27,003
15	17	Electric Distribution Capacity, Engineering and Planning	-	\$195,738	-	-	-	-	195,738
16	18	NB/WRO	-	799,328	-	-	-	-	799,328
17	19	Rule 20A	-	39,876	-	-	-	-	39,876
18	20	Electric Distribution Data Management and Technology	-	-	-	-	19,941	-	19,941
19	21	Integrated Grid Platform and Grid Modernization Plan	-	-	-	-	131,655	-	131,655
20	22	Electric Distribution Support Activities	-	-	-	-	8,394	-	8,394
21	23	Community Rebuild Program	-	-	28,139	-	-	114,341	142,480
22		Total Capital	\$304,396	\$1,034,942	\$433,006	\$799,140	\$191,325	\$1,198,626	\$3,961,436

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 2

ATTACHMENT A

**OVERVIEW AND DEMONSTRATION OF INCREMENTALITY FOR
THE RECOVERY OF COSTS RECORDED IN THE
WILDFIRE MITIGATION PLAN MEMORANDUM ACCOUNT AND
FIRE RISK MITIGATION MEMORANDUM ACCOUNT**

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
ATTACHMENT A
OVERVIEW AND DEMONSTRATION OF INCREMENTALITY FOR THE
RECOVERY OF COSTS RECORDED IN THE
WILDFIRE MITIGATION PLAN MEMORANDUM ACCOUNT AND
FIRE RISK MITIGATION MEMORANDUM ACCOUNT

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 2**
3 **ATTACHMENT A**
4 **OVERVIEW AND DEMONSTRATION OF INCREMENTALITY FOR**
5 **THE RECOVERY OF COSTS RECORDED IN THE**
6 **WILDFIRE MITIGATION PLAN MEMORANDUM ACCOUNT AND**
7 **FIRE RISK MITIGATION MEMORANDUM ACCOUNT**

8 **A. Introduction**

9 Pacific Gas and Electric Company (PG&E) respectfully requests the
10 California Public Utilities Commission (CPUC) approve recovery of
11 \$325.5 million of capital expenditures and \$64.7 million of expense costs
12 recorded in the Wildfire Mitigation Plan Memorandum Account (WMPMA) and
13 \$41 thousand of capital expenditures and \$6 million of expense costs recorded
14 in the Fire Risk Mitigation Memorandum Account (FRMMA) between January 1,
15 2020 and December 31, 2020 for various wildfire mitigation activities in High
16 Fire-Threat Districts (HFTDs). The mitigation work performed protects our
17 customers and improves the safety and reliability of PG&E’s electric distribution
18 system by reducing wildfire risk in California. This testimony also demonstrates
19 the incrementality of the recorded costs. “Incremental” costs are those labor,
20 equipment, material, contract, and other support costs associated with work
21 activities that are not included in PG&E’s General Rate Case (GRC) authorized
22 revenue requirements or other recovery mechanisms.

23 **B. Background**

24 **1. Regulatory and Legislative Background**

25 Following multiple catastrophic wildfires in 2017 and 2018, the California
26 Legislature enacted Senate Bill 901 on September 21, 2018. Effective January
27 1, 2019, the bill set in motion a series of activities to strengthen California’s ability
28 to prevent and recover from catastrophic wildfires. Among other measures,
29 Senate Bill 901 mandated additional requirements for utility operations,
30 maintenance, and infrastructure, including a requirement that electric IOUs with
31 lines or equipment in HFTDs annually submit a comprehensive wildfire mitigation
32 plan to the CPUC. Senate Bill 901 prescribed specific requirements for these

1 annual plans, including the timing and process for cost recovery.¹ The bill also
2 established two memorandum accounts for electric utilities to record incremental
3 costs incurred to implement their plans. One such memorandum account, the
4 Fire Risk Mitigation Memorandum Account (FRMMA), is intended to “track costs
5 incurred for fire risk mitigation that are not otherwise covered in the electrical
6 corporation’s revenue requirement.”² The second memorandum account, the
7 Wildfire Mitigation Plan Memorandum Account (WMPMA), is established upon
8 approval of a utility’s wildfire mitigation plan and used “to track costs incurred to
9 implement the plan.” PG&E records costs incremental to the GRC to these
10 accounts.

11 The Commission opened R.18-10-007 on October 25, 2018 to implement
12 Senate Bill 901. On November 1, 2018, PG&E submitted Advice Letter 5419-E
13 to establish the FRMMA to track costs incurred for fire risk reduction that are not
14 otherwise encompassed in our revenue requirement. The Commission approved
15 Advice Letter 5419-E on March 12, 2019, effective January 1, 2019.

16 PG&E subsequently submitted its first wildfire mitigation plan on
17 February 6, 2019 (the 2019 WMP), which the Commission approved on May 30,
18 2019 in D.19-05-037. In Ordering Paragraph 21, D.19-05-037 authorized PG&E
19 to open the WMPMA to track incremental wildfire-related costs incurred while
20 implementing approved programs within the 2019 WMP. On June 5, 2019,
21 PG&E submitted Advice Letter 5555-E to establish the WMPMA. The
22 Advice Letter was approved by the Commission on August 8, 2019 with an
23 effective date of June 5, 2019.

24 Assembly Bill 1054, enacted July 12, 2019, established mechanisms for
25 electric utilities to recover the costs of implementing their wildfire mitigation plans.
26 The bill requires the Commission to authorize cost recovery if the costs and
27 expenses are determined to reflect just and reasonable conduct by the electric
28 corporation. Assembly Bill 1054 also established a “Wildfire Fund” available to
29 IOUs that satisfy certain requirements, and created the Wildfire Safety Advisory
30 Board and Wildfire Safety Division within the CPUC.

1 Public Utilities Code (Pub. Util. Code) § 8386 (c) (effective Jan. 1, 2019).

2 Pub. Util. Code § 8386 (j) (effective Jan. 1, 2019) (emphasis added).

2. Cost Recovery Background

Historically, PG&E's GRC revenue requirements have contemplated routine or baseline levels of work activities, including among other things, vegetation management, electric asset inspection work, and electric asset maintenance and replacements based on inspection findings. In recent years, however, PG&E has incurred costs in these work areas and through new or increased wildfire mitigation activities that are incremental to the baseline work contemplated in its GRCs.

For 2020 specifically, PG&E incurred costs for wildfire mitigation activities that are new, or in addition to, what was contemplated in the 2020 GRC. In particular, PG&E submitted its 2020 GRC application in December 2018. However, the wildfire mitigation work PG&E planned and implemented for 2020 post-dates PG&E's 2020 GRC submittal. For example, PG&E performed much of the wildfire mitigation work described in this application pursuant to its 2019 and 2020 Wildfire Mitigation Plans (WMPs), which, as explained above, were submitted after PG&E filed its 2020 GRC application. Therefore, the 2020 GRC did not include all of the activities and associated costs for the work described in the 2019 and 2020 WMPs. In addition, as outlined in the 2019 and 2020 WMPs, PG&E has developed risk-informed inspection and work plans (as opposed to time-based plans) to enhance its wildfire mitigation efforts. PG&E's increased, risk-informed understanding of the mitigation activities required to address wildfire risks has led to an overall increased level of inspection and maintenance activities and associated costs that are incremental to what PG&E included in the 2020 GRC. In accordance with the legislative and regulatory requirements discussed above, PG&E records these incremental costs either to the WMPMA (for wildfire mitigation activities specifically outlined in the CPUC-approved WMPs) or the FRMMA (for other mitigation activities not specifically addressed in the WMPs). For these reasons, the costs recorded in the WMPMA and FRMMA submitted for review in this proceeding exceed GRC imputed amounts, and are appropriately recovered as incremental costs.

1 **C. Organization of Reasonableness Review Testimony**

2 PG&E requests reasonableness review and cost recovery for the 2020
3 recorded WMPMA and FRMMA costs in this GRC application. Each chapter in
4 our prepared testimony that has costs recorded the WMPMA or FRMMA for
5 which PG&E seeks recovery includes an attachment discussing the costs and
6 demonstrating that they were reasonably incurred. The 2020 recorded WMPMA
7 and FRMMA costs primarily include work performed by the Electric Distribution
8 line of business and also include costs in the Generation, Customer Care, and
9 Shared Services lines of business. As explained in more detail in the supporting
10 attachments, the costs are reasonable for several reasons. Most importantly,
11 PG&E's wildfire mitigation activities recorded to the WMPMA and FRMMA
12 reduce wildfire risks, and increase system reliability for the benefit of customers.
13 Further, the activities are consistent with the wildfire mitigation activities outlined
14 in the 2019 and 2020 WMPs approved by the CPUC or otherwise necessary for
15 to comply with the CPUC's requirements and industry standards and address
16 wildfire risks. Table 2A-1 provides the chapters that include a WMPMA and/or
17 FRMMA reasonableness review in the 2023 GRC.

18 Ratemaking for this activity is addressed in Exhibit (PG&E-10), Chapter 1.

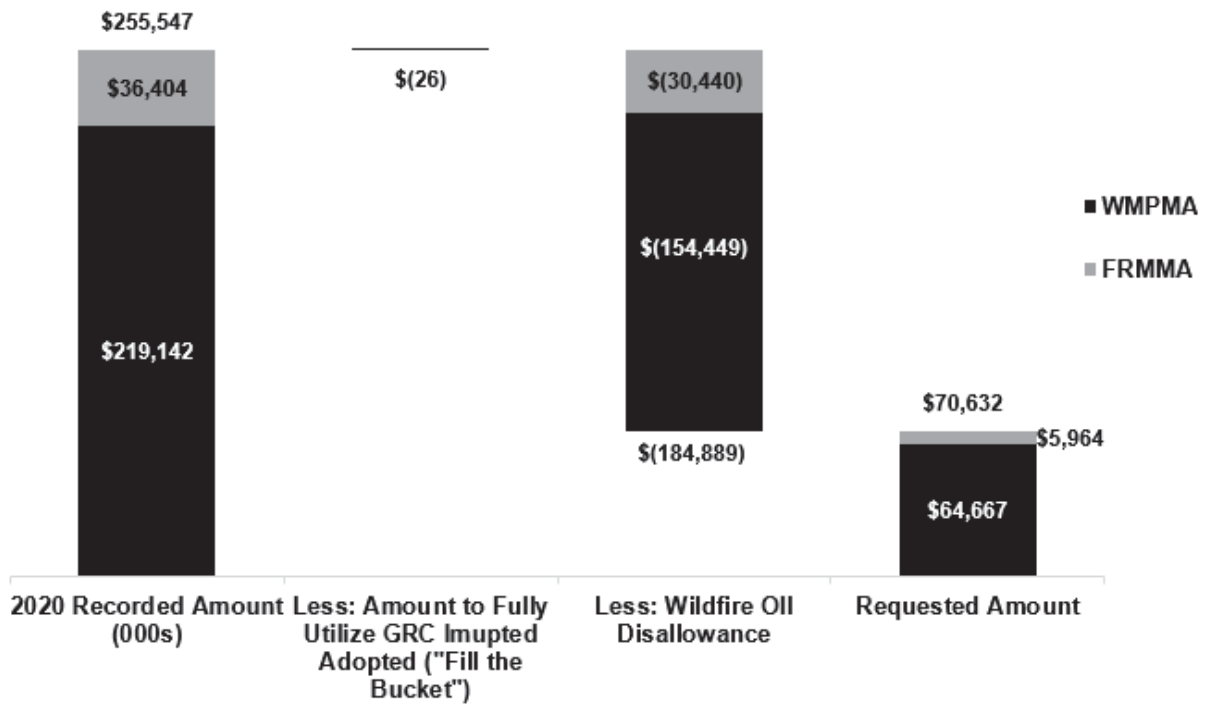
**TABLE 2A-1
REASONABLENESS REVIEW SUMMARY**

Exhibit and Chapter	Contents
PG&E-4, Ch 2	Overview and Demonstration of Incrementality for the Recovery of Costs Recorded in the Wildfire Mitigation Plan Memorandum Account And Fire Risk Mitigation Memorandum Account
PG&E-4, Ch 4.3	Recovery of Costs for System Hardening, Enhanced Automation and PSPS Impact Mitigations Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-4, Ch 4.4	Recovery of Community Wildfire Safety Program PMO Costs Recorded in the Fire Risk Mitigation Memorandum Account
PG&E-4, Ch 4.5	Recovery of Information Technology Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-4, Ch 6	Recovery of Electric Emergency Recovery Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-4, Ch 10	Recovery of Overhead Electric Asset Inspections Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-4, Ch 11	Recovery of Overhead Electric Maintenance Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-4, Ch 12	Recovery of Pole Asset Management Costs Recorded in the Wildfire Mitigation Plan Memorandum Account and Fire Risk Mitigation Memorandum Account
PG&E-4, Ch 15	Recovery of Substation Asset Management Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-5, Ch 4	Recovery of Costs Recorded in the Fire Risk Mitigation Memorandum Account
PG&E-6, Ch 11	Recovery of Communications Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-7, Ch 1	Recovery of Enterprise Health and Safety Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-7, Ch 5	Recovery of Real Estate Costs Recorded in the Wildfire Mitigation Plan Memorandum Account
PG&E-7, Ch 6	Recovery of Land and Environmental Management Costs Recorded in the Wildfire Mitigation Plan Memorandum Account

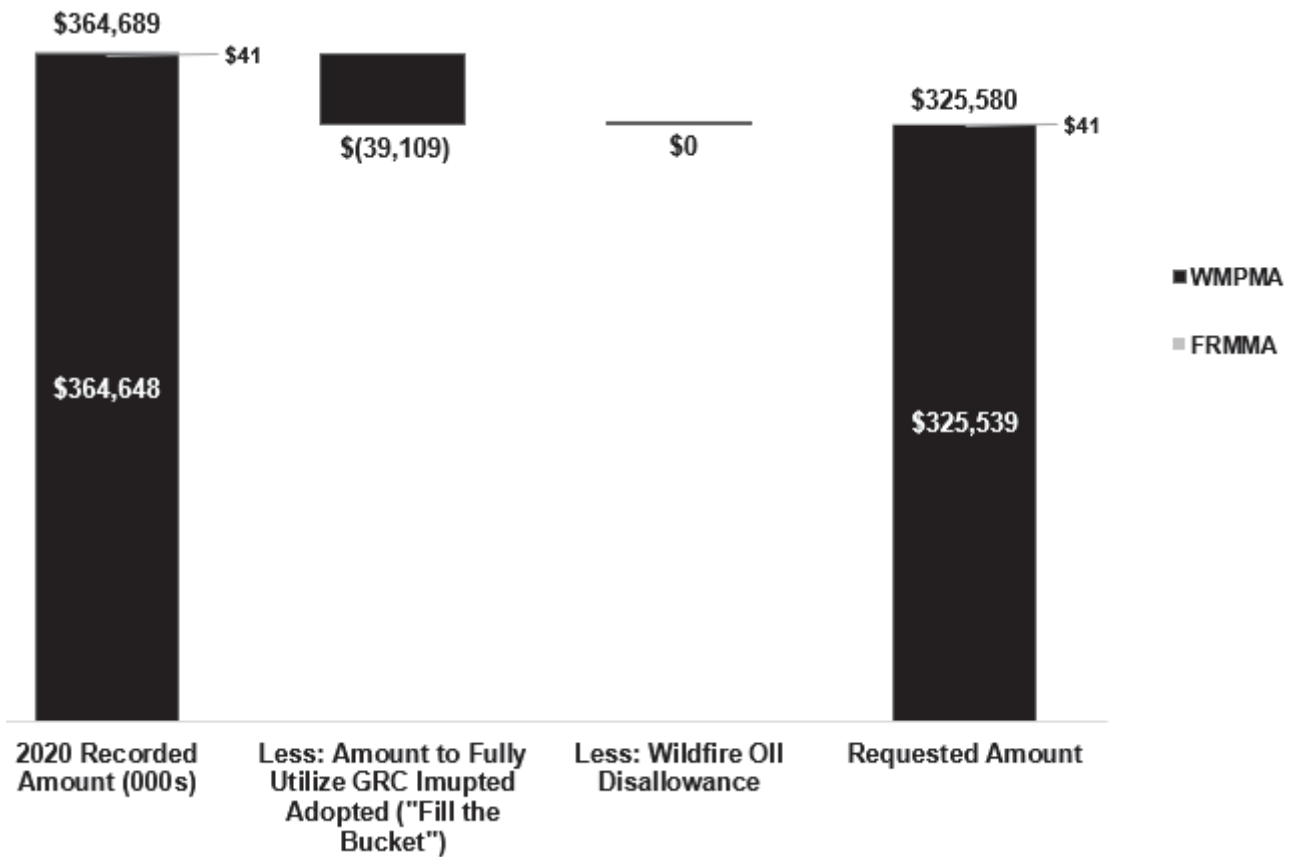
1 **D. Summary of Costs**

2 Figures 2A-1 and 2A-2 summarizes the total 2020 WMPMA and FRMMA
3 recorded costs, costs excluded from GRC to ensure incrementality of costs
4 relative to GRC imputed amounts for base work activities, pre-determined
5 wildfire disallowances provided under the Order Instituting Investigation
6 19-06-015 (Wildfire OII) decision and the net costs sought to be recovered in this
7 reasonableness review:

**FIGURE 2A-1
2020 WMPMA AND FRMMA EXPENSE REQUEST
(THOUSANDS OF DOLLARS)**



**FIGURE 2A-2
2020 WMPMA AND FRMMA CAPITAL REQUEST
(THOUSANDS OF DOLLARS)**



1 Section E explains the excluded disallowances required under the Wildfire
 2 OII decision. Section F explains PG&E's methodology for determining the
 3 incrementality of the costs sought to be recovered.

4 **E. Exclusions Required Under the Wildfire OII Decision**

5 On December 17, 2019, PG&E, Safety and Enforcement Division, Office of
 6 the Safety Advocate, and Coalition of California Utility Employees jointly
 7 submitted a proposed Settlement Agreement to the CPUC, in connection with
 8 the Wildfire OII. In Decision (D.) 20-05-019, the CPUC approved the Settlement
 9 Agreement with modifications.³ Under the Settlement Agreement, PG&E
 10 agreed to a disallowance of up to \$1,625 million in certain wildfire-related
 11 expenditures. In D.20-05-019, the CPUC also increased the disallowance by an

³ D.20-05-019, p. 81, Ordering Paragraph (OP) 1.

1 additional \$198 million in expense, to be applied to costs recorded to the
2 WMPMA and FRMMA within four years of the effective date of the decision.

3 In accordance with D.20-09-019, PG&E is excluding from its cost-recovery
4 request approximately \$185 million of the \$256 million of 2020 WMPMA and
5 FRMMA recorded expenses. The exclusion includes approximately \$35 million
6 of the \$1,625 million disallowance set forth in the approved Settlement
7 Agreement and approximately \$150 million of the \$198 million disallowance
8 added by the CPUC in D.20-09-019. There are no Wildfire OII disallowances for
9 PG&E's 2020 recorded WMPMA and FRMMA capital expenditures related to
10 this reasonableness review. PG&E will apply remaining Wildfire OII
11 disallowances in future reasonableness review applications for wildfire mitigation
12 costs in accordance with D.20-09-019 until all disallowances have been applied.

13 **F. Background and Context of Incrementality Discussion**

14 PG&E's GRC revenue requirements cover routine or baseline levels of
15 emergency response activity, vegetation management, electric asset inspection
16 work, and electric asset maintenance and replacements. As referenced above,
17 PG&E has incurred costs in these work areas through new initiatives or
18 increased work volume that are incremental to the work approved in the 2020
19 GRC. These incremental costs include the additional wildfire mitigation work
20 PG&E has undertaken to address heightened wildfire risks and comply with
21 various California legislative and CPUC policies in furtherance of this goal,
22 notably SB 901 and the CPUC's findings in R.18-10-007 to implement that bill's
23 provisions. As further discussed above, the 2020 WMPMA and FRMMA costs
24 submitted for reasonableness review here relate to wildfire mitigation activities
25 and costs that are incremental to activities and costs authorized in the 2020
26 GRC, and includes new and/or increased work volumes outlined in our 2019 and
27 2020 WMPs in response to legislative/policy changes. In addition, PG&E
28 continued to evolve and mature its work planning and activities (i.e., moving
29 from time-based activities to risk-informed activities) that post-date substantial
30 completion of the 2020 GRC forecast.

31 PG&E has several mechanisms in place to ensure the incrementality of the
32 costs requested in this reasonableness review. First, we tracked costs
33 associated with incremental wildfire mitigation activities in the WMPMA and
34 FRMMA, which are separate from utility accounts we use to track costs

1 comprising PG&E's base rates. The costs were also tied to specific work orders
2 to ensure that they had not already been recovered through existing rates, other
3 proceedings, or any other recovery mechanism. Second, we exhausted all
4 imputed adopted amounts for the MAT codes recorded in the memorandum
5 accounts spending first before determining the incremental amount, as
6 described below.

7 **1. The Costs for Which PG&E Seeks Recovery Are Incremental**

8 As explained below, the costs presented in this reasonableness review
9 are incremental to those recovered by PG&E through our 2020 GRC and
10 other cost recovery mechanisms.

11 **a. Overview of PG&E's Activity-Based Forecasting**

12 The WMPMA and FRMMA costs for which we seek recovery in this
13 reasonableness review were not included in PG&E's 2020 GRC
14 forecast. The following section describes our activity-based
15 methodology for forecasting and recording costs for recovery through
16 rates, which is foundational to the incrementality of the activities for
17 which we seek recover in this reasonableness review.

18 Under the GRC, the estimated costs for a particular PG&E activity is
19 determined by the activity scope. Activity-based forecasts in the GRC
20 involve cost estimates, scopes, and schedules for work that are not tied
21 to particular departments or staff.⁴ As an example, we forecast
22 electric-asset maintenance activities based on the anticipated volume
23 and complexity of work that is required to safely maintain the system in
24 compliance with established policies and requirements. At the time the
25 GRC forecast for the activity is developed, the resources to execute the
26 work are not specified. The maintenance work is either completed with
27 internal PG&E employees or contracted vendors, and the forecasted
28 cost does not include specific internal employee salaries. The
29 resources to complete the work ultimately are assigned closer in time to
30 the execution of the work.

4 For repeatable types of work, this forecasting process is tied to projecting total unit volumes and using a unit cost estimate to develop the financial forecast. The forecast typically does not specify whether internal or external resources will execute the work.

1 PG&E uses an activity-based forecast in the GRC to ensure proper
2 cost recovery in rate case filings. To that end, PG&E's GRC forecasts
3 typically present an aggregate estimated cost for an activity. The
4 forecasts generally are not associated with specific employees or
5 departments; instead they are based upon volumes of work, regardless
6 of how the work is executed or by whom. Moreover, PG&E's GRC
7 forecasting methodology is not so granular that materials or distinct
8 allocations are explicitly identified in the forecast. Since PG&E staff and
9 organizations often support work across multiple rate cases and
10 regulatory accounts, this methodology provides flexibility to use internal
11 and external resources as necessary to execute the work.

12 **b. Wildfire Mitigation: Work Comprised of New Activities and New**
13 **Volumes of Work**

14 **1) Incremental Memorandum Accounts**

15 As discussed above, PG&E first established and the CPUC
16 approved the FRMMA to track and record costs not included in
17 PG&E's GRC base revenue requirements. PG&E subsequently
18 established and the CPUC approved the WMPMA to track and
19 record PG&E's costs for implementing wildfire mitigation activities
20 outlined in PG&E's annual WMPs that also were not included in the
21 GRC. As part of our 2020 WMP, PG&E completed various new
22 activities and/or increased work volumes, which are incremental and
23 not part of the 2020 GRC or any other rate case. The 2020 GRC,
24 which covers 2020-2022, used 2017 recorded amounts as the "base
25 year" and was filed in 2018 before we substantially reassessed our
26 wildfire mitigation work and submitted the 2020 WMP.

27 PG&E recorded costs for incremental activities from the WMP in
28 the WMPMA. PG&E also completed other wildfire mitigation work
29 not included in the GRC nor in an WMP. PG&E recorded these
30 costs in the FRMMA.

31 **2) Wildfire Mitigation Incrementality Types**

32 Costs for each of the work categories included in this
33 reasonableness review are incremental to the amounts recovered in

1 customer rates in 2020-2022 authorized by the 2020 GRC Decision
2 on one of the following bases. There are two categories of
3 incremental activities: (1) new activities; and (2) increase work
4 volumes.

5 **a) New Activities**

6 Wildfire events in 2018 and 2019 and state legislation
7 implemented in response to them, led PG&E to implement
8 several new wildfire mitigation programs that were neither
9 contemplated by nor part of our requests in the 2020 GRC.

10 **b) Increased Work Volumes**

11 Developments in 2018 and 2019 – including a shift from
12 time-based work plans and activities to risk-informed work plans
13 and activities – led PG&E to significantly expand programs
14 (such as inspection and maintenance programs) that were
15 originally included in the 2020 GRC decision for purposes of fire
16 risk mitigation. For example, some programs saw a dramatic
17 increase in units of work completed over adopted amounts.

18 This reasonableness review seeks recovery for only costs of the
19 incremental fire risk mitigation work completed above and
20 beyond what was specifically authorized in or imputed from the
21 2020 GRC decision.

22 **c. PG&E’s Incrementality Analysis Ensures That 2020 GRC Imputed**
23 **Adopted Amounts Are Fully Utilized**

24 To further confirm and demonstrate that PG&E is only seeking
25 recovery of incremental costs recorded in the WMPMA and FRMMA,
26 PG&E developed and implemented a methodology that ensures that
27 2020 GRC imputed adopted amounts are fully utilized. As explained
28 below, it simply involves reducing PG&E’s FRMMA and WMPMA
29 cost-recovery request for certain activities (identified by MAT code) by
30 the amount of any unspent GRC imputed adopted funds for those
31 particular activities. PG&E refers to the methodology to determine
32 incrementality as the “fill the bucket” methodology. PG&E believes this
33 methodology provides a straightforward, quantifiable way to

1 demonstrate that costs recorded to the FRMMA and WMPMA and
2 requested here are incremental.

3 The incrementality assessment is performed on the basis of costs
4 for incremental wildfire mitigation activities in High Fire Threat District
5 Tier 2 and Tier 3 recorded in the FRMMA and WMPMA versus recorded
6 costs for base GRC work activities (which include activity in Tier 1 as
7 well as Tier 2 and Tier 3 areas). GRC imputed amounts represent an
8 adopted level of spend or “base bucket” for GRC work activities. Under
9 this approach, PG&E assesses its recorded costs for GRC base
10 spending for wildfire mitigation activities and evaluate whether those
11 costs are above or below the amount imputed for these activities in the
12 2020 GRC decision. The proposed method of demonstrating
13 incrementality is to apply the GRC revenue requirement first before
14 determining the amount of incremental costs in the memorandum
15 accounts.

16 Recorded costs for base GRC work activities are compared to GRC
17 imputed adopted:

- 18 1) Scenario 1 – If recorded costs for Tier 1 work are less than GRC
19 imputed adopted, costs for Tier 2 and Tier 3 incremental base work
20 (potential FRMMA and WMPMA costs) are applied as though it is
21 base work until recorded costs equal GRC imputed adopted
22 (i.e., the “Base Bucket” is completely filled). Remaining costs for
23 Tier 2 and Tier 3 work exceeding GRC imputed adopted are
24 deemed to be incremental costs recoverable in the FRMMA or
25 WMPMA (i.e., costs spill over into the “FRMMA or WMPMA
26 Bucket”). This is illustrated in Figure 2A-3 below.
- 27 2) Scenario 2 – If recorded costs for Tier 1 work is greater than GRC
28 imputed adopted, the excess Tier 1 costs will be funded by base
29 GRC revenues, as Tier 1 work is not considered wildfire mitigation,
30 and not eligible for the FRMMA or WMPMA. The costs for Tier 2
31 and Tier 3 incremental base non-balancing account related work in
32 this scenario are deemed to be incremental costs recoverable in the
33 FRMMA or WMPMA. This scenario is illustrated in Figure 2A-4
34 below.

FIGURE 2A-3
SCENARIO 1
DISTRIBUTION POLE REPLACEMENTS MAT 07D

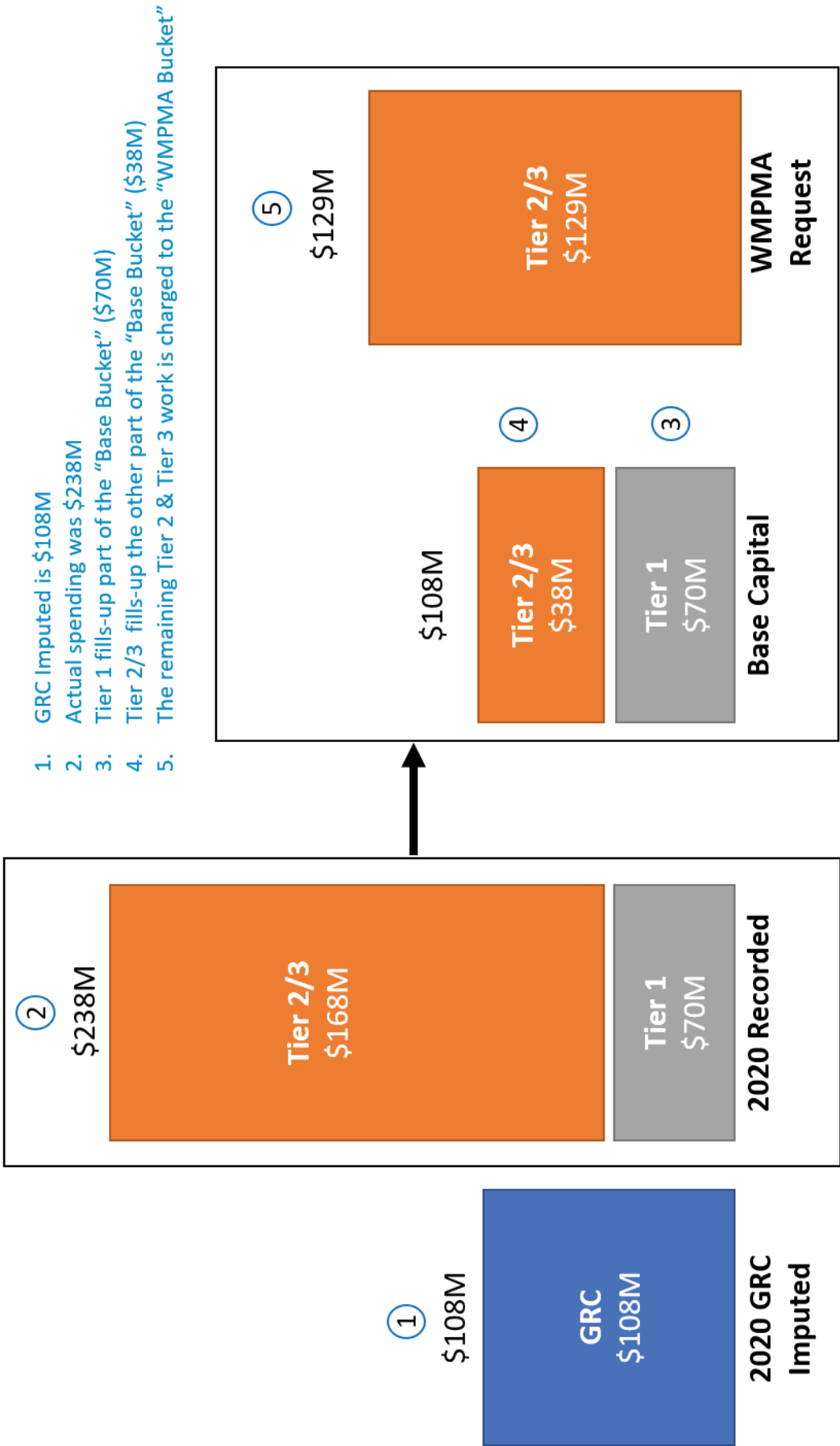
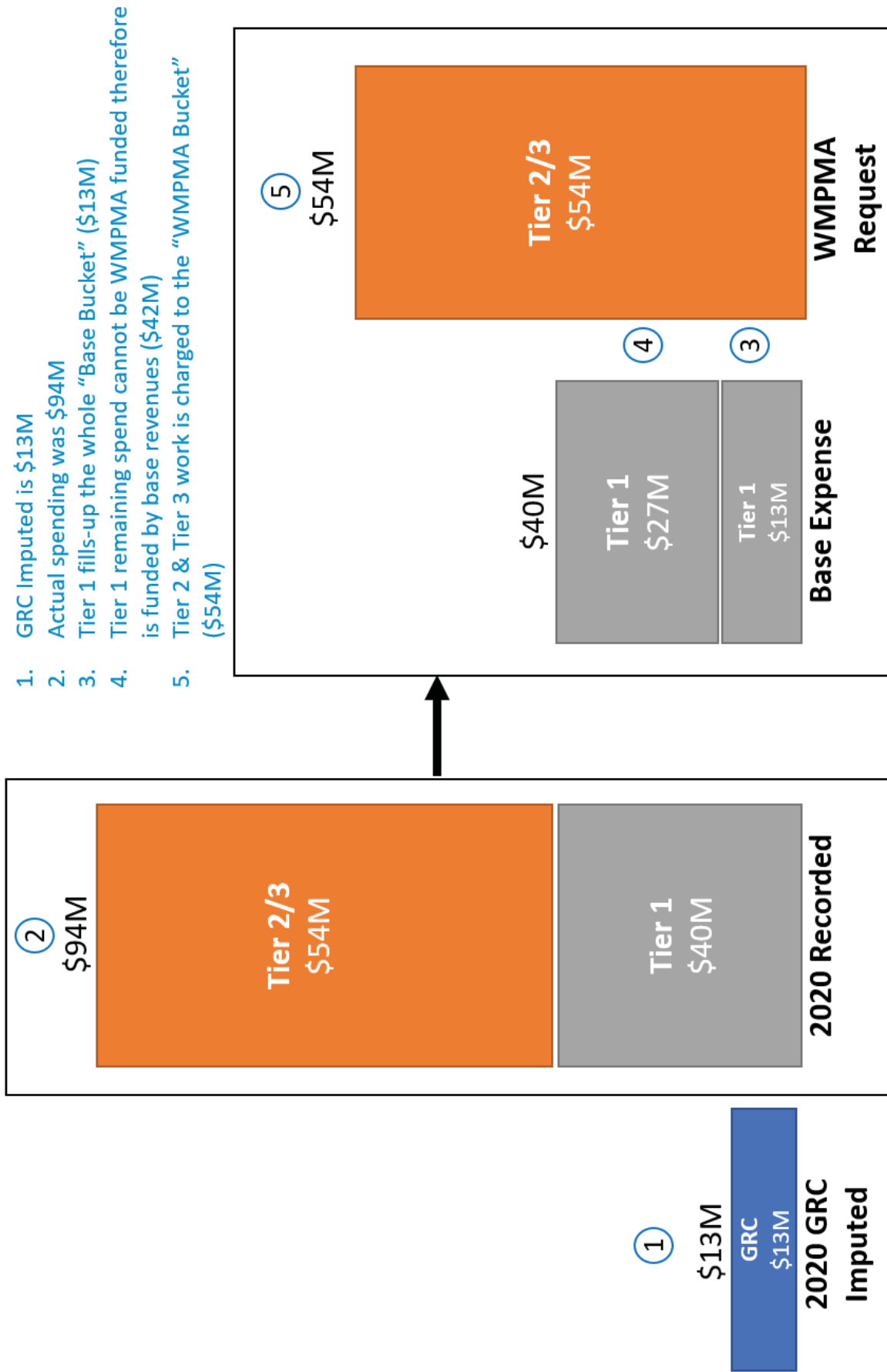


FIGURE 2A-4
SCENARIO 2
DISTRIBUTION OVERHEAD INSPECTIONS MAT BFB



1 As explained in this chapter, the method PG&E has applied to
2 demonstrate the incrementality of 2020 costs recorded in the FRMMA
3 and WMPMA is reasonable and assures the incrementality of those
4 costs versus what PG&E recovered through GRC-authorized
5 rates. PG&E may adjust its incrementality methodology in future years
6 to account for any applicable changes in PG&E's cost-recording
7 practices and direction from the Commission.

8 Tables 2A-2 and 2A-3 provide a detailed Maintenance Activity Type
9 (MAT) code summary of costs (expenses and capital expenditures)
10 included in this reasonableness review, including any pre-determined
11 wildfire disallowances provided under the Wildfire OII decision and costs
12 excluded under PG&E's methodology to ensure incrementality of costs
13 relative to GRC imputed amounts for base work activities, and the net
14 costs sought to be recovered in this reasonableness review.

15

TABLE 2A-2
DETAILED CAPITAL AMOUNTS
(THOUSANDS OF DOLLARS)

Line No.	Capital WMPMA		MAT Code	Description	2020 Recorded Amount (000s)	Less: Amount to Fully Utilize GRC Imputed Adopted ("Fill the Bucket")	Less: Wildfire Oil Disallowance	Requested Amount
	2023 GRC Exhibit	2023 GRC Chapter						
1	4	4.3	49I	Line Sensors	\$2,272	-	-	\$2,272
2	4	4.3	49R	Rapid Earth Current Fault Limiter	4,798	-	-	4,798
3	4	4.5	2FA	Information Technology	22,658	-	-	22,658
4	4	6	17B	Replace Damaged Facilities	5,536	-	-	5,536
5	4	11	2AA	Overhead Non-Pole Replacement	103,288	-	-	103,288
6	4	11	2AF	Idle Facilities Removal	903	\$(903)	-	-
7	4	12	07D	Pole Replacement	167,626	(38,206)	-	129,420
8	4	12	07O	Overloaded Pole Replacement	3,969	-	-	3,969
9	4	12	21A	Wind Loading Project	2,626	-	-	2,626
10	4	15	59F	Dist Sub Emergency Equipment Replacement	12,581	-	-	12,581
11	7	5	23C	Real Estate	38,391	-	-	38,391
12	Total				\$364,648	\$(39,109)	-	\$325,539
13	Capital FRMMA							
14	5	4	2L1	Hydro Operations	\$41	-	-	\$41

Note: The Line number 7, Column Heading "Requested Amount" value varies from the value listed in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

**TABLE 2A-3
DETAILED EXPENSE AMOUNTS
(THOUSANDS OF DOLLARS)**

Line No.	Expense WMPMA		MAT Code	Description	2020 Recorded Amount (000s)	Less: Fill the Bucket	Less: Wildfire Oil Disallowance	Requested Amount
	2023 GRC Exhibit	2023 GRC Chapter						
1	4	4.3	AB#	Sensor IQ	\$1,871	-	\$(1,806)	\$65
2	4	4.3	AB#	Remote Grid	755	-	(597)	158
3	4	4.3	IG#	Distributed Generation Enabled Microgrids	1,115	-	-	1,115
4	4	4.3	IG#	DGEMS - Red Bluff	2,003	-	(2,003)	-
5	4	4.5	IG#	Information Technology	21,358	-	-	21,358
6	4	6	BHB	Repairs	624	-	(624)	-
7	4	10	BFB	Enhanced Distribution Inspections	55,134	-	(50,505)	4,629
8	4	10	BFH	Enhanced Inspections Support Costs	30,617	-	(20,682)	9,935
9	4	11	KAA	OH Prev Maint & Equipment Repair	69,820	-	(69,819)	1
10	4	11	KAQ	OH Prev Maint & Equipment Repair	26	(26)	-	-
11	4	12	AB#	Wind Loading Project	61	-	(41)	20
12	4	12	GAC	Overload Analysis	13,648	-	-	13,648
13	4	15	GC2	Substation Support Activities	4,942	-	(4,942)	-
14	4	15	GC5	Substation Support Activities	5,067	-	(2,430)	2,637
15	4	15	GCG	Substation Support Activities	1,424	-	(1,000)	424
16	6	11	IG#	Wildfire Communications	7,592	-	-	7,592
17	7	1	IG#	Safety & Health	48	-	-	48
18	7	5	IG#	Real Estate	545	-	-	545
19	7	6	IG#	Land and Environmental Management	2,493	-	-	2,493
20	Total				\$219,142	\$(26)	\$(154,449)	\$64,667
21	Expense FRMMA							
22	4	4.4	IG#	Community Resiliency Project	\$119	-	-	\$119
23	4	4.4	AB#	Regulatory Compliance Quality Assurance	1,388	-	(859)	529
24	4	4.4	AB6	Management OS/OM Support	14,896	-	(10,392)	4,504
25	4	4.4	AB6	IWRMC	135	-	-	135
26	4	20	GE#	GIS Mapping	3,037	-	(3,037)	-
27	5	4	IGA	Hydro Operations	676	-	-	676
28	6	11	IG#	PSPS Customer Care	16,152	-	(16,152)	-
29	Total				\$36,404	-	\$(30,440)	\$5,964

1 Figures 2A-1 and 2A-2 above provides a graphical chart reflecting
2 total amounts recorded in the FRMMA and WMPMA costs prior to any
3 exclusion being applied and the amounts excluded or pre-determined
4 wildfire disallowances under the Wildfire OII decision and costs
5 excluded under PG&E's incrementality methodology to derive net costs
6 sought to be recovered in this reasonableness review.

7 For capital costs being securitized see Exhibit (PG&E-10),
8 Chapter 15.

9 **G. Orders and Financial Trackings**

10 To adhere to the activity-based forecasting methodology described above,
11 and to ensure that WMPMA and FRMMA costs are properly accounted for, all
12 costs for which we seek recovery in this reasonableness review were tracked in
13 distinct orders that were tagged with identifiers different from those that are
14 included in our GRC or other cost recovery mechanisms. Accordingly, this
15 reasonableness review is the appropriate mechanism to recover costs incurred
16 for the work described herein. This is applicable to all costs incurred, and, as
17 such, all costs captured in these orders are incremental to other recovery
18 mechanisms' revenues.

19 All PG&E orders are linked to distinct regulatory filings. The costs and
20 forecasts for activities associated with the GRC are only included in the GRC
21 filing process, and, similarly, the costs and forecasts for activities associated
22 with the WMPMA and FRMMA are only included in the filing process for this
23 reasonableness review. Due to this linkage, any forecasted or recorded cost is
24 addressed through a single regulatory process. This distinct order-tracking
25 methodology ensures that duplicative recovery is avoided. Consequently, all
26 costs captured in orders linked to this reasonableness review are incremental
27 and distinct from costs incurred and reviewed via the GRC or other rate case
28 filings.

29 **H. Conclusion**

30 The wildfire mitigation costs we present in the WMPMA and FRMMA
31 reasonableness review are for activities that are critically necessary to improve
32 the safety and reliability of our system, and are consistent with the policies
33 underlying the establishment of the WMPMA and FRMMA.

1 This attachment demonstrates that the costs requested in this
2 reasonableness review are incremental. The costs for which we seek recovery
3 in this reasonableness review are for activities that are different from and in
4 addition to those forecast in the 2020 GRC, 2019 Gas Transmission and
5 Storage, and other cost recovery mechanisms. We have tracked these costs
6 separately, and only those incremental costs are requested in this
7 reasonableness review. The costs therefore are eligible for recovery in this
8 reasonableness review.

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 3
ELECTRIC DISTRIBUTION RISK MANAGEMENT

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 3
ELECTRIC DISTRIBUTION RISK MANAGEMENT

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CHAPTER 3
ELECTRIC DISTRIBUTION RISK MANAGEMENT

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 3**
3 **ELECTRIC DISTRIBUTION RISK MANAGEMENT**

4 **A. Introduction**

5 This chapter describes how Pacific Gas and Electric Company (PG&E)
6 manages risks associated with its electric facilities.¹

7 Section B provides an overview of Electric Operations' (EO) Risk
8 organization and its management structure. This section also describes the
9 governance process over EO risks.

10 Section C describes EO's risk management policy, the tools used by EO to
11 manage its risks, and includes a discussion of EO programs that address
12 multiple risks.

13 Section D describes EO's top three safety risks (Wildfire, Failure of Electric
14 Distribution Overhead Assets, and Failure of Electric Distribution Network
15 Assets) and a cross-cutting factor (Emergency Preparedness and Response
16 (EP&R)),² which were included in PG&E's June 2020 Risk Assessment
17 Mitigation Phase (RAMP) filing (2020 RAMP Report). Updates to the
18 assessment of those risks are also included in this section.

19 Section E describes the remaining risks that impact electric distribution
20 (Failure of Electric Distribution Underground (UG) Assets and Failure of Electric
21 Distribution Substation Assets), including how the Step 3 Supplemental Analysis
22 stemming from the Safety Model Assessment Proceeding (S-MAP) Settlement
23 Agreement was applied to each risk.

24 Attachment A to this chapter provides a list of mitigations and controls by
25 risk, including changes since the 2020 RAMP Report.

26 **B. EO Risk Organization Structure and Governance**

27 Exhibit (PG&E-2), Chapter 1 describes PG&E's Enterprise and Operational
28 Risk Management (EORM) organization. EORM works across the enterprise to

1 While transmission facilities are not part of PG&E's General Rate Case (GRC) expenditure forecast, references to transmission assets are included to provide a more complete view of risk management within the electric line of business.

2 A cross-cutting factor is an item that is not a risk event itself, but rather impacts either the likelihood or consequence of other items on the Corporate Risk Register.

1 establish a consistent and repeatable risk management program. This program
2 ensures that individual PG&E Lines of Business (LOB) consistently identify,
3 evaluate, respond to, and monitor the risks associated with their LOB functions.

4 The EO Risk Management Team (EO Risk Team) is responsible for
5 implementing the EORM risk framework for risks related to PG&E's electric
6 assets. These assets include electric distribution and transmission line assets
7 and electric distribution and transmission substations. Transmission assets and
8 transmission substations are not funded through the GRC. Therefore, the
9 discussion in this section will focus on distribution assets and distribution
10 substations. There are five EO risks and one EO cross-cutting factor on PG&E's
11 Corporate Risk Register. PG&E describes each of these in the sections that
12 follow.

13 The EO Risk Management Team is led by the Director of Risk Management
14 and Analytics. The organization consists of three departments: (1) Risk
15 Management; (2) Risk Data Analytics; and (3) Electric Asset Excellence.
16 Together these departments implement the EORM risk framework for Electric
17 Operations, including managing EO's risk register and working directly with
18 representatives across EO to identify, assess, and monitor mitigation plans for
19 EO's risks. The EO Risk Management and Risk Data Analytics departments
20 focus on supporting data analytics that drive prioritization of major programs for
21 managing and mitigating EO's risks. The Electric Asset Excellence Department
22 focuses on ensuring a path and process for long-term asset management and
23 achieving PAS 55/International Organization for Standardization (ISO) 55001
24 certification.³ The EO Risk Management organization reports to the Senior
25 Director of Asset Strategy, which in turn reports to the Vice President, Asset
26 Risk Management.

27 Given its significant exposure to wildfire risk, PG&E established the Wildfire
28 Risk Organization in March 2021. This organization is focused on preparing for
29 the wildfire season and delivering on PG&E's Wildfire Mitigation Plan (WMP)

3 The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies. ISO 55001 is an asset management system standard to help organizations manage the lifecycle of its assets more effectively. See, <https://pecb.com/en/education-and-certification-for-individuals/iso-55001#:~:text=ISO%2055001%20is%20an%20asset,lifecycle%20of%20assets%20more%20effectively> (as of June 9, 2021).

1 commitments. This organization is focused on: Governance, Analytics and
2 Stakeholder Management; Program Management and Execution; and Public
3 Safety Power Shutoff (PSPS) Planning and Execution. Several members of EO,
4 including the Risk Management and Analytics Director, directly support this
5 organization.

6 Governance over the EO risk program is supported by multiple committees,
7 both within the EO organization and at the enterprise level. Within EO there is a
8 Risk and Compliance Committee (RCC) that is chaired by the Vice President
9 Asset Risk Management and the Senior Director of Electric Compliance. The
10 direct reports of the two RCC co-chairs are committee members and EORM,
11 Internal Audit, and Compliance and Ethics (C&E) representatives are standing
12 meeting invitees. The RCC meets monthly and serves as the main forum within
13 EO for discussing risk management activities.

14 At the enterprise level, EO representatives actively participate in other
15 forums that are part of PG&E's overall risk governance structure.⁴ The
16 enterprise-level risk committees that EO participates in are:

- 17 • Wildfire Risk Governance Steering Committee;
- 18 • Safety and Nuclear Oversight Committees;
- 19 • Board of Directors and Select Board Committees;
- 20 • L1 Key Risk Indicators Review Meeting;
- 21 • Public Safety Risk Committee;
- 22 • Climate Resilience Officer Coordination Committee; and
- 23 • Risk Management Community.

24 **C. EO Risk Management Policy and Tools**

25 **1. Risk Management Policy**

26 The EO Risk Team develops and manages an active list of risks. Each
27 risk is assigned a risk owner who works with the EO Risk Team to document
28 risk analysis and quantification activities; map the risk drivers, controls, and
29 consequences that impact the risk; identify and develop mitigations to

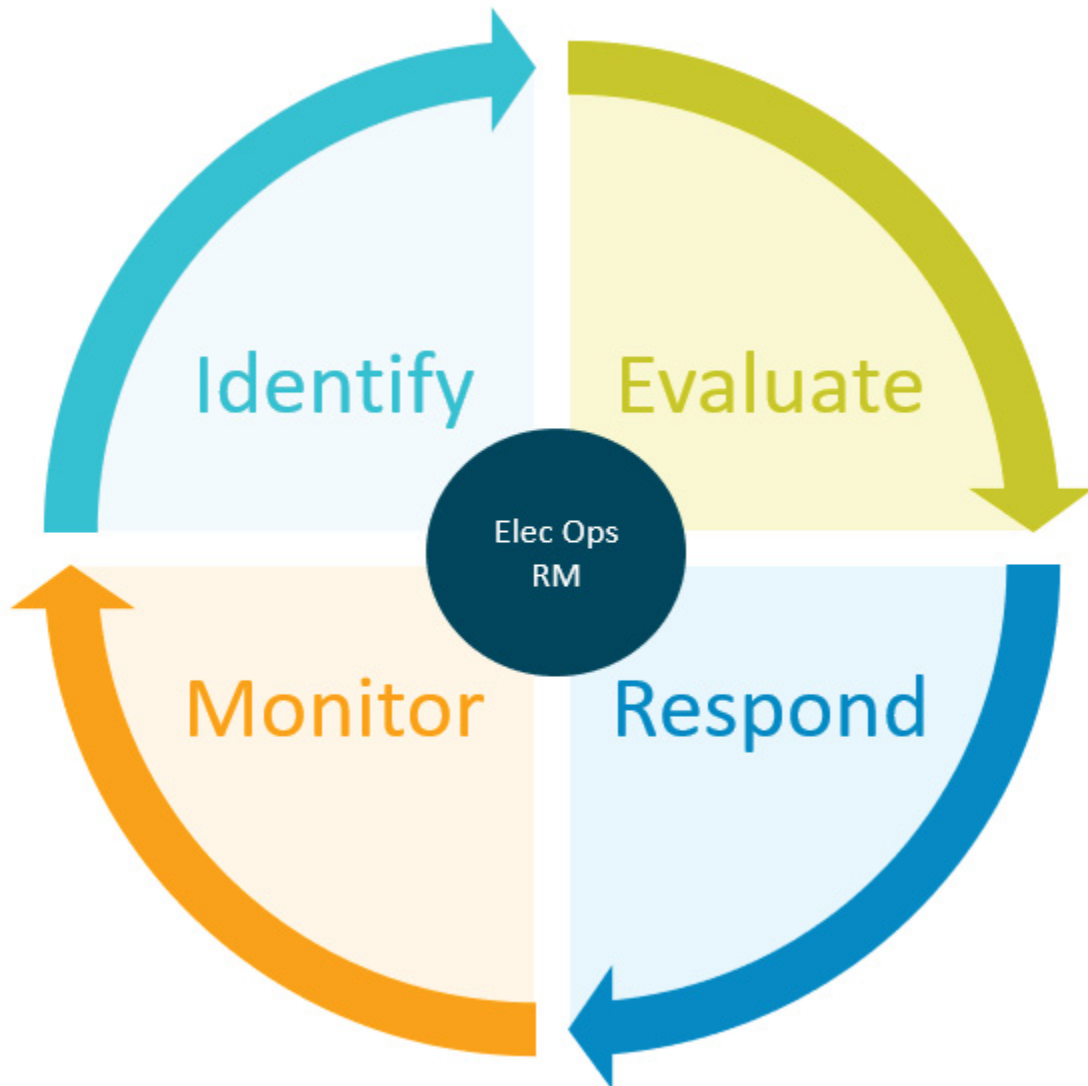
4 PG&E describes its Enterprise risk governance structure in Exhibit (PG&E-2), Ch. 1.

1 promote risk reduction; calculate Risk Spend Efficiencies (RSE);⁵ and
2 establish key performance indicators or metrics to monitor risk performance.

3 EO risk management policy is consistent with the EORM LOB risk
4 management policy as described in Exhibit (PG&E 2), Chapter 1. There are
5 four major steps included in the EO risk management process: (i) Risk
6 Identification; (ii) Risk Evaluation and Quantification; (iii) Risk Response;
7 and (iv) Risk Monitoring and Reporting. A simplified figure below shows the
8 risk management process.

5 Risk Spend Efficiency is a metric for representing the benefit to cost ratio of a mitigation, where benefit is described in terms of risk reduction. RSEs are calculated by dividing the mitigation risk reduction benefit by the mitigation cost estimate.

**FIGURE 3-1
ELECTRIC OPERATIONS RISK MANAGEMENT PROCESS**



1
2
3
4
5
6
7
8

a. Risk Identification

The Risk Identification process involves the EO Risk Team, risk owners, and subject matter experts (SME) who together identify and evaluate EO risks. Risks that are identified by the EO Risk Team are reviewed by the EO RCC. Ultimately, the RCC approves the list of risks that are included on the EO Risk Register. The risks that are on the EO-owned Risk Register are that same as the EO risks that are on the Corporate Risk Register.

- 1 Table 3-1 below shows EO's risks on the Corporate Risk Register.
 2 Transmission risks are shown in the table for completeness but are not
 3 included in the GRC.

**TABLE 3-1
 ELECTRIC OPERATIONS RISKS**

Line No.	Risk Name	Risk Description	Risk Type ^(a)	2023 Test Year (TY) Risk Score	2026 Mitigated Risk Score
1	Wildfire	PG&E assets or activities may initiate a fire that is not easily contained and endangers the public, private property, sensitive lands or environment	RAMP	23,033	18,449
2	Failure of Electric Distribution Overhead Assets	Failure of distribution overhead assets or lack of remote operation functionality may result in public or employee safety issues, property damage, environmental damage or inability to deliver energy.	RAMP	539	519
3	Failure of Electric Distribution Network Assets	Failure of distribution network assets or lack of remote operation functionality may result in public or employee safety issues, property damage, environmental damage or inability to deliver energy.	RAMP	17	13
4	Failure of Electric Distribution Underground Assets	Failure of distribution underground assets or lack of remote operation functionality may result in public or employee safety issues, property damage, environmental damage or inability to deliver energy.	Non-RAMP	117	115
5	Failure of Electric Distribution Substation Assets	Failure of distribution substation assets or lack of remote operation functionality may result in public or employee safety issues, property damage, environmental damage, disruption of major generation sources or inability to deliver energy.	Non-RAMP	44	39
6	Emergency Preparedness and Response	Impact of emergency preparedness and response controls that affect PG&E's risk drivers and consequences.	RAMP Cross Cutting Factor ^(b)	N/A	N/A
7	Failure of Electric Transmission Overhead Assets	Failure of transmission overhead assets or lack of remote operation functionality may result in public or employee safety issues, property damage, environmental damage, disruption of major generation sources and inability to deliver energy.	Outside CPUC Jurisdiction	N/A	N/A

**TABLE 3-1
ELECTRIC OPERATIONS RISKS
(CONTINUED)**

Line No.	Risk Name	Risk Description	Risk Type ^(a)	2023 Test Year Risk Score	2026 Mitigated Risk Score
8	Failure of Electric Transmission Underground Assets	Failure of transmission underground assets or lack of remote operation functionality may result in public or employee safety issues, property damage, environmental damage, reduced operational redundancy in critical urban centers, or large-scale prolonged outages.	Outside CPUC Jurisdiction	N/A	N/A
9	Failure of Electric Transmission Substation Assets	Failure of transmission substation assets or lack of remote operation functionality may result in public or employee safety issues, property damage, environmental damage, disruption of major generation sources or inability to deliver energy.	Outside CPUC Jurisdiction	N/A	N/A
10	Electric Transmission System-Wide Blackout	A system-wide disturbance leading to a cascading event that causes a blackout of PG&E's electrical system with the inability to restore the grid in a timely fashion	Outside CPUC Jurisdiction	N/A	N/A

(a) RAMP risk refers to those risks identified in the 2020 RAMP Report as one of PG&E's top safety risks based on the safety score risk ranking of all the risks on PG&E's Corporate Risk Register. Non-RAMP refers to risks that are on the Corporate Risk Register, but were not one of the highest scoring safety risks.

(b) PG&E does not calculate a risk score for the cross-cutting factors.

1 In addition to the risks on the Corporate Risk Register, EO also
2 assesses the following cross-cutting factors in partnership with other
3 organizations:⁶ EP&R, Skilled and Qualified Workforce, Physical
4 Attack, Information Technology Asset Failure, Cyber Attack, Records
5 and Information Management, Seismic, and Climate Change.⁷

6 **b. Risk Evaluation and Quantification**

7 PG&E uses the bow-tie methodology to evaluate risk events,
8 consistent with the S-MAP framework.⁸ The bow-ties illustrating the EO

⁶ Exhibit (PG&E-2), Ch. 1, Attachment B maps the cross-cutting factors to the risk events.

⁷ For Climate Change, EO recognizes that climate can impact the environmental conditions affecting the operations of Electric assets. EO has partnered with the Climate Resilience team to review the Climate Vulnerability Assessment (CVA) across PG&E's service territory. As the CVA is developed, the results of the assessments will be implemented in EO's risk modeling and specific programs that combat the impacts of Climate Change.

⁸ Decision (D.) 18-12-014, Phase Two Decision Adopting S-MAP Settlement Agreement with Modifications (Dec. 20, 2018). This Settlement Agreement achieves steps toward a more uniform and quantitative risk-based decision-making framework in the S-MAP.

1 risk are provided in each risk section below. The bow-tie methodology
2 provides (1) a high level visual summary of the risk event, and (2) a
3 detailed process for presenting the risk drivers, the likelihood or
4 frequency of the risk event, the potential consequences of the risk event,
5 and the score for the assessed risk. Developing the bow-tie
6 methodology includes defining exposure, drivers, tranches, and
7 consequences.

- 8 • Risk exposure is the scope of the assessment for PG&E to measure
9 the risk. Examples of exposure could include asset types and could
10 be measured in line miles or asset counts. Exposure is supported
11 by records associated with outages, ignitions, and other failure
12 mode data.
- 13 • Risk drivers represent various modes or causes that lead to failures.
14 Risk drivers can be broken into sub-drivers. An example of
15 driver/sub-driver is the outages caused by equipment failure driver,
16 where conductor failure is one of the corresponding sub-drivers of
17 the risk.
- 18 • Risk tranches include a group of assets, a geographic region or
19 other grouping that is intended to have a similar risk profile such as
20 having the same likelihood or consequence of risk events.
21 Examples of tranches could be circuits with high, moderate, or low
22 reliability performance.

23 Exposure to the risk is divided into different segments or tranches.
24 More granular tranches allow for a better understanding of risk profiles.
25 For example, for the Wildfire risk on a system level, equipment failure is
26 the largest cause of ignitions. However, when line miles in High Fire
27 Threat District (HFTD) areas are considered separately, the largest risk
28 driver becomes vegetation contact instead of equipment failure.

29 The consequences of a risk event are also identified as part of the
30 bow-tie. The separation of consequences into different outcomes allows
31 for a better understanding of the chances of a high frequency/low
32 consequence event or a low frequency/high consequence event.
33 Consequences include safety, reliability, and/or financial damages.

1 The outcome of the risk assessment is a bow-tie for each risk. The
2 risk bow-ties are presented in the individual risk sections that follow
3 (Section D for RAMP risks and Section E for non-RAMP risks).

4 **c. Risk Response**

5 The EO Risk Team works with SMEs to identify appropriate controls
6 and mitigations to manage the risk. Control programs are ongoing
7 activities that maintain the existing level of risk. Mitigation programs are
8 activities designed to further reduce the level of risk. Control and
9 mitigation programs are associated with risk drivers, risk consequences,
10 and/or risk tranches to accurately quantity the benefits of the program.
11 The outcome of risk quantification is the calculation of an RSE for
12 mitigations and controls.

13 The mitigations and controls presented herein represent EO's
14 mitigation and control portfolio as of the time of filing this GRC. PG&E
15 continually evaluates its risks, mitigations, and controls and expects that
16 the portfolio will change.

17 **d. Risk Monitoring and Reporting**

18 EO reports on the status of its risks and the performance of its risk
19 response programs through forums such as the Risk and Compliance
20 Committee and enterprise-level governance reporting. Based on the
21 performance of the risk and response programs, PG&E may accelerate
22 or adjust its responses to better manage the risk.

23 As part of the risk monitoring process, PG&E continues to look for
24 opportunities to improve risk modeling. For example, through the risk
25 assessment process, one gap that PG&E identified in its risk modeling
26 was that its historical data does not fully articulate the level of risk based
27 on condition and age of the existing infrastructure. To address this
28 issue, PG&E added three tranches to the 2023 GRC Enterprise Risk
29 Model for the Failure of Electric Distribution Network Assets risk and
30 incorporated estimated expected failure rates based on industry failure
31 curves instead of using PG&E historical data. PG&E plans to implement
32 this improved methodology to model other asset types in other EO risks.

1 **2. EO-Specific Risk Management Tools and Quantification Efforts**

2 The EO Risk Team relies on a combination of enterprise and Electric
3 LOB models to make risk-informed decisions related to mitigation programs,
4 investment planning, and real time operational decisions.

5 Table 3-2 below lists the key models that the EO Risk Team relies on.
6 Lines 1 and 2 on Table 3-2 both reference the Enterprise Multi-Attribute
7 Value Function (MAVF). The MAVF is listed twice in the table because
8 PG&E updated the model since it filed its 2020 RAMP Report. The two
9 models are referred to as: (1) the 2020 RAMP Enterprise Risk Model; and,
10 (2) the 2023 GRC Enterprise Risk Model. The updates to the 2020 RAMP
11 Enterprise Risk Model are described in Exhibit (PG&E-2), Chapter 1,
12 Section E.5.

**TABLE 3-2
EO RISK MANAGEMENT WILDFIRE MODELS**

Line No.	Model Name	Abbreviation	Description
1	Enterprise Multi Attribute Value Function Risk Model	2020 RAMP Enterprise Risk Model	<ul style="list-style-type: none"> • Model used in PG&E's 2020 RAMP • Aligned to the S-MAP requirements. • Assess enterprise risks using a common framework • Used to develop risk scores, safety scores, the risk bow-tie, and RSE values for individual risk events.
2		2023 GRC Enterprise Risk Model	<ul style="list-style-type: none"> • Model used in the PG&E's 2023 GRC • Aligned to the S-MAP requirements. • Assess enterprise risks using a common framework • Used to develop risk scores, safety scores, the risk bow-tie, and RSE values for individual risk events.
3	2021 Wildfire Distribution Risk Model (WDRM)	2021 WDRM	<ul style="list-style-type: none"> • Planning model • Calculates wildfire risk probabilities of ignition and consequence scores for the overhead distribution system in the HFTD at the circuit segment level • Informs the development of mitigation programs; and helps to prioritize highest wildfire risk miles on PG&E's distribution system in the HFTD. • Outputs inform PG&E's System Hardening and Enhanced Vegetation Management work planning and scheduling. • Includes three component models (described on lines 4, 5, and 6).
4	Conductor Risk Model	N/A	<ul style="list-style-type: none"> • One of three 2021 WDRM component models • Quantifies wildfire risk due to conductor failures by calculating a probability of ignition in combination with the Wildfire Consequence Model. • Provides a risk value that is aggregated to the circuit segment level and informs prioritization of system hardening and equipment replacement efforts.

**TABLE 3-2
EO RISK MANAGEMENT WILDFIRE MODELS
(CONTINUED)**

Line No.	Model Name	Abbreviation	Description
5	Vegetation Risk Model	N/A	<ul style="list-style-type: none"> • One of three 2021 WDRM component models • Quantifies wildfire risk due to vegetation contact with distribution facilities by calculating a vegetation probability of ignition. • Provides a risk value that is aggregated to the circuit segment level and informs the prioritization of vegetation management efforts. • Used in combination with the EVM Tree-Weighted Prioritization, which takes into account the tree count at the circuit segment level.
6	Wildfire Consequence Model	N/A	<ul style="list-style-type: none"> • One of three 2021 WDRM component models • The spatial data set based on Technosylva^(a) fire simulations under elevated fire conditions is calibrated to be compatible with PG&E's MAVF scoring. • Produces the wildfire risk value for each grid location.
<p>(a) Technosylva is a suite of wildfire simulation software applications whose propagation and consequence outcomes are based on available fuels, topography, and weather, as well as building and population locational data.</p>			

1 **3. Accounting for Programs That Address Multiple Risks**

2 There are several instances of overlap between programs across risk
3 profiles, where one mitigation or control offsets more than one risk. For
4 example, Enhanced Vegetation Management and the overhead conductor
5 replacement portion of the Wildfire System Hardening Program reduce both
6 the Wildfire risk and the Failure of Electric Distribution Overhead Assets
7 (Failure of DOH Assets) risk.⁹ To represent the full benefit of such a
8 program, the risk reduction is aggregated between the program's
9 management of Wildfire and Failure of DOH Assets risk.

⁹ The EVM mitigation is described in Exhibit (PG&E-4), Ch. 9. The System Hardening mitigation is described in Exhibit (PG&E-4), Ch. 4.3.

1 The 2023 GRC Enterprise Risk Model uses the expense and capital
2 forecast by risk to calculate the RSEs. In certain cases, forecast costs for
3 the same program are included in more than one risk model. For example,
4 the activities and costs to proactively replace batteries in substations appear
5 in two risk controls: Substation Proactive Asset Replacement – Batteries
6 (WLDFR-C10C) and Substation Proactive Asset Replacement – Batteries
7 (SUBSTN-C16C).¹⁰ In this example, the same forecast costs are used to
8 calculate the RSEs for WLDFR-C10C and SBSTN-C16C. Even through the
9 same costs are used to calculate the RSEs, PG&E is only requesting
10 recovery for these costs once.

11 In the Exhibit (PG&E-4) forecast chapters PG&E includes tables
12 showing the 2020-2023 recorded and forecast expense amounts and
13 2020-2026 recorded and forecast capital costs for mitigations. In supporting
14 workpapers PG&E also provides the 2024, 2025 and 2026 forecast expense
15 amounts for mitigations. The RSE calculations are based on the 2023
16 through 2026 forecast costs. Recorded and forecast costs for controls are
17 provided in supporting workpapers.

18 **4. Evolving Approaches to Risk Reduction Activities**

19 As PG&E continues to develop more granular planning risk models, it
20 has changed the way it prioritizes its work.

21 The 2021 WDRM analyzes risk at the circuit segment level for HFTD
22 areas. The 2021 WDRM uses a combination of the probability of failure and
23 the consequence of a failure to generate a risk score at a circuit segment
24 level, as opposed to generating a risk score only at the system level. The
25 ability to calculate a circuit segment risk score is an example of how PG&E
26 is continuing to improve its assessment and management of risk. This new
27 method for calculating a circuit segment risk score is used for developing
28 System Hardening and Enhanced Vegetation Management risk-based work
29 prioritization. PG&E uses the outputs from the Conductor Risk Model and
30 the Vegetation Risk Model to prioritize system hardening and vegetation

¹⁰ Substation Proactive Asset Replacement – Batteries is described in Exhibit (PG&E-4), Ch. 15.

1 management wildfire mitigation work, allowing PG&E to focus its efforts on
2 the highest risk segments.

3 Based on the lessons learned from using the 2021 WDRM, PG&E will
4 expand this approach to other programs. The EO Risk Team and Asset
5 Knowledge organizations are working together to improve data quality at the
6 asset level. Improved data quality will support the modelling of probability
7 and consequence of failure and ultimately lead to more granular asset level
8 risk models.

9 **D. Risk Assessment and Mitigation Phase (RAMP) Risks**

10 PG&E's 2020 RAMP Report included three EO distribution-related risks
11 (Wildfire, Failure of Electric Distribution Overhead Assets, Failure of Electric
12 Distribution Network Assets) and one cross-cutting factor (EP&R). In the
13 sections that follow PG&E describes the three RAMP risks along with any
14 changes to EO's enterprise risk models, mitigations, controls, and RSEs since
15 PG&E filed the 2020 RAMP Report.

16 **1. Wildfire**

17 **a. Risk Overview**

18 Wildfire was identified as a RAMP risk in PG&E's 2020 RAMP
19 Report.

20 The Wildfire risk is defined as PG&E assets or activities that may
21 initiate a fire that is not easily contained, endangers the public, private
22 property, sensitive lands, or the environment.

23 The majority of the wildfire risk is in HFTD areas.¹¹ The HFTD was
24 adopted by the Commission in 2017. The HFTD consists of three areas:

- 25 • Zone 1 consists of Tier 1 High Hazard Zones (HHZ) on the map of
26 Tree Mortality HHZ prepared jointly by the United States Forecast
27 Service and the California Department of Forestry and Fire
28 Protection (CAL FIRE). Tier 1 HHZs are in direct proximity to

¹¹ In addition to HFTD areas, PG&E also made incremental changes to reflect High Fire Risk Areas (HFRA). The HFRA map builds on the CPUC's HFTD Map by adding regions where the risk of utility triggered catastrophic wildfire from an offshore wind event is high and removing regions where it is not.

1 communities, roads, and utility lines and represent a direct threat to
2 public safety.

- 3 • Tier 2 consists of areas on the CPUC Fire-Threat Map where there
4 is an elevated risk for destructive utility-associated wildfires.
- 5 • Tier 3 consists for areas on the CPUC Fire-Threat Map where there
6 is an extreme risk for destructive utility-associated wildfires.¹²

7 Exposure to the Wildfire risk is modeled based on the approximately
8 99,000 overhead circuit miles in PG&E's electric distribution and
9 transmission system. Of the total overhead circuit miles, 25,462 miles
10 are associated with HFTD Distribution. The drivers for this risk are
11 Vegetation Contact, Equipment/Facility Failure, Contact from Object,
12 Wire-to-Wire Contact, Unknown, Other, Vandalism/Theft, Utility
13 Work/Operation, Contamination, and Seismic. The drivers for this risk
14 event have been modified since PG&E filed its 2020 RAMP Report to
15 align with the drivers outlined in the 2021 Wildfire Mitigation Plan
16 guidelines. The one exception is that in the WMP, Vegetation Contact is
17 a sub-driver of the Contact from Object driver, whereas in the 2023 GRC
18 Enterprise Risk Model, Vegetation Contact is a stand-alone risk driver.
19 The change in risk driver was made to reflect the vegetation contact
20 driver's contribution to the risk.

21 Wildfire includes approximately 481 risk events (ignitions)¹³ each
22 year; 154 (or 32 percent of) risk events occur in HFTD areas each year.
23 Risk events in HFTD areas accounted for 99 percent of the overall risk.
24 The Equipment Failure risk driver accounts for 36 percent of ignitions
25 systemwide and 21 percent of ignitions in HFTD areas.¹⁴ Conductor

¹² D.17-12-024, p. 2.

¹³ Based on the CPUC's reportable fire ignition definition, fire ignition is defined as an ignition resulting a fire that traveled more than one meter from the ignition point and burnt something other than PG&E facilities. (D.14-02-015, Appendix C, p. C-2, Section 1.A.4.) PG&E's current Wildfire risk model uses all reportable ignitions systemwide; previous versions of the model were limited to high fire risk areas (Fire Index Area's in the 2017 RAMP and HFTD areas in the 2020 GRC). PG&E's forecast of 2023 ignitions is 481, which is based on historical ignitions with certain adjustments.

¹⁴ The Equipment Failure risk driver accounts for 21 percent of ignitions in HFTD areas, 20 percent of ignitions in HFTD Distribution, and 32 percent of ignitions in HFTD Transmission.

1 and connection device failures account for most of these equipment
 2 failure incidents. The Vegetation risk driver accounts for 28 percent of
 3 ignitions systemwide and 48 percent of ignitions in HFTD areas.¹⁵

4 The cross-cutting factors Climate, EP&R, Records and Information
 5 Management and Seismic also impact this risk.¹⁶

6 PG&E identified 40 tranches in the 2023 GRC Enterprise Risk
 7 Model, including 25 tranches related to distribution assets in HFTD
 8 areas (HFTD Distribution). Separating HFTD and non-HFTD miles
 9 allows for additional focus in the HFTD areas. As discussed in Section
 10 D.1.b below, PG&E revised the number of tranches in its 2023 GRC
 11 Enterprise Risk Model for Wildfire model based on feedback from Safety
 12 Policy Division (SPD).

13 Wildfire consequences are separated between: (1) red flag
 14 warning¹⁷ and non-red flag warning periods; and (2) different
 15 magnitudes of wildfire (e.g., catastrophic, destructive, large, and small).
 16 89 percent of the Wildfire risk score is due to the small number of
 17 ignitions that result in catastrophic fires (defined as fires that burn 100 or
 18 more structures and result in a serious injury or fatality).¹⁸

19 PG&E proposed a suite of mitigations and controls in the 2020
 20 RAMP Report. Since filing the 2020 RAMP Report, the suite of
 21 mitigations and controls have changed.¹⁹ Tables 3A-1 and 3A-2 in
 22 Attachment A lists the mitigations and controls included in the RAMP,
 23 those that have been removed from the portfolio, and those forecast in
 24 the 2023 GRC.

15 The Vegetation risk driver accounts for 48 percent of ignitions in HFTD areas, 52 percent for HFTD Distribution, and 5 percent of ignitions in HFTD Transmission.

16 See Exhibit (PG&E-2), Ch. 1, Attachment B.

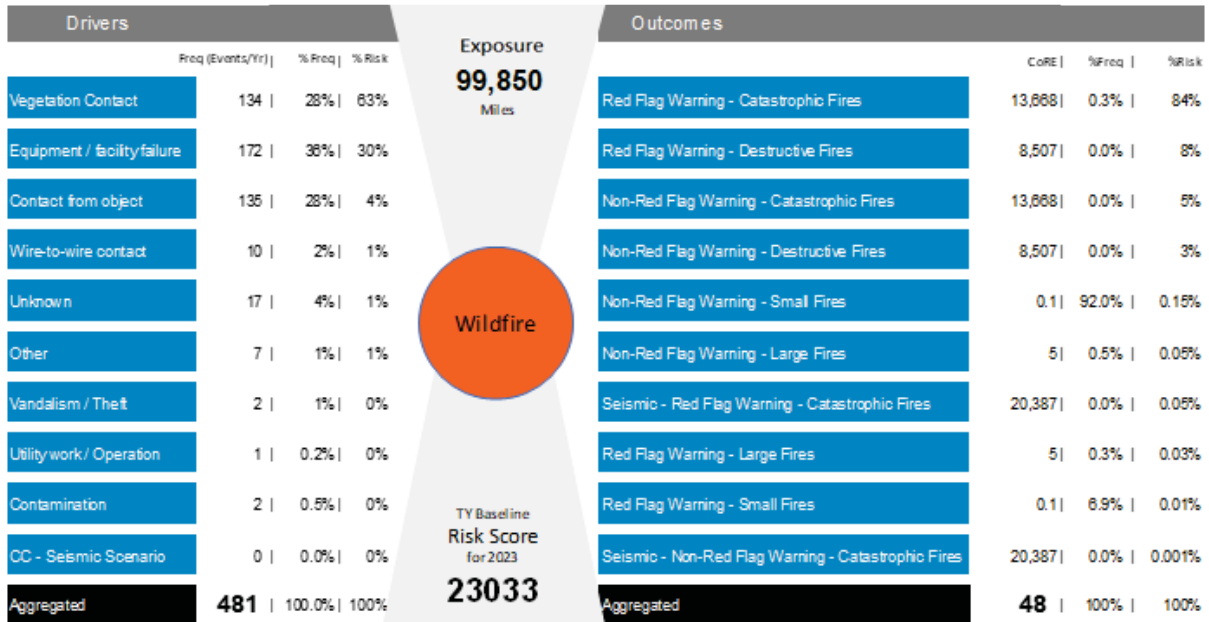
17 The National Weather Service issues Red Flag Warnings to alert fire departments of the onset, or possible onset, of critical weather and dry conditions that could lead to rapid or dramatic increases in wildfire activity. See <https://www.fire.ca.gov/programs/communications/red-flag-warnings-fire-weather-watches/> (as of June 13, 2021).

18 See PG&E's RAMP Report, A.20-06-012 (June 30, 2020), p. 10-19, lines 2-20 for additional information on how wildfires are categorized.

19 PG&E describes the changes to the mitigations and controls in the forecast chapters to which those mitigations and controls are aligned.

1 The 2023 TY baseline risk score presented in the 2020 RAMP
 2 Report was 25,127²⁰ and the 2026 post mitigation risk score was
 3 19,192. The 2023 TY baseline risk score and the 2026 post mitigation
 4 risk scores updated for the GRC are 23,033 and 18,449 respectively.
 5 This change in risk score is due to the activities described in
 6 Section D.1.b below and incorporating 2020 data into the 2023 GRC
 7 Enterprise Risk Model for Wildfire. Figures 3-2 and 3-3 below show the
 8 exposures, drivers, outcomes, and risk score for the Wildfire risk
 9 system-wide and in HFTD Distribution.

**FIGURE 3-2
 SYSTEM-WIDE (TRANSMISSION AND DISTRIBUTION) WILDFIRE
 BOW-TIE ILLUSTRATION**



²⁰ The 2020 RAMP Wildfire baseline risk score was updated in errata. See PG&E’s 2020 RAMP Report, Post-Filing Errata, A.20-06-012 (July 17, 2020), p. 2, line 33; and, p. 3, Figure 17-1, Figure B.

FIGURE 3-3
WILDFIRE – HFTD DISTRIBUTION
BOW-TIE ILLUSTRATION



1 The 2023 GRC Enterprise Risk Model and accompanying source
2 data is available upon request.

3 In addition to updating the risk scores, PG&E has updated RSE
4 scores for those mitigations that are included in both the 2020 RAMP
5 Report and this GRC as shown in Table 3-3 in Section D.1.e below.

6 **b. Responding to Feedback on PG&E’s 2020 RAMP Report**

7 On November 25, 2020, the SPD issued its Staff Evaluation Report
8 on PG&E’s 2020 RAMP Application (A.) 20-06-012. Subsequently on
9 January 15, 2021 and January 29, 2021, other interested parties also
10 provided feedback on PG&E’s 2020 RAMP Report. Along with SPD, the
11 Public Advocates Office at the California Public Utilities Commission
12 (Cal Advocates), The Utility Reform Network (TURN), the Mussey Grade
13 Road Alliance (MGRA), and FEITA Bureau of Excellence (FEITA) all
14 provided feedback to PG&E about its Wildfire risk analysis. PG&E
15 appreciates SPD and parties’ feedback and, as shown in supporting
16 workpapers, agrees with many of the comments and recommendations

1 received. A listing of the feedback and PG&E's response to each item is
2 provided in workpapers.²¹

3 SPD identified two key areas for improvement: (1) increased
4 granularity; and (2) the need to provide RSEs for individual to
5 understand the effectiveness and efficiency of each specific control and
6 mitigation.²² These findings suggest that PG&E should provide more
7 detailed information in its risk analysis to provide the Commission, SPD
8 and other interested parties sufficient information to evaluate PG&E's
9 GRC proposals.²³ PG&E agrees that more granular tranching and
10 more RSEs will improve risk analysis and as such:

- 11 • PG&E has increased the number of tranches in its 2023 GRC
12 Enterprise Risk Model for Wildfire. In HFTD Distribution, PG&E
13 increased the number of tranches from 3 to 25 tranches. More
14 information about tranching is provided in Section b.2 below.
- 15 • In the 2020 RAMP Report, PG&E provided RSEs for 6 Wildfire
16 mitigations and no controls whereas in this GRC PG&E is providing
17 RSEs for 17 mitigations and 22 controls.²⁴

18 SPD and parties' comments also included suggestions that PG&E:
19 incorporate additional risk drivers into the wildfire risk analysis; improve
20 focus on weather; and further develop PSPS modeling and incorporate
21 PSPS's consequences to PG&E's customers into the risk model. This
22 feedback is addressed in the Updates to PG&E's Risk Model
23 (Section D.1.b below).

24 **1) Changes in Mitigations and Controls**

25 PG&E described its plans for managing the Wildfire risk in its
26 2020 RAMP Report. Since filing the 2020 RAMP Report, PG&E has
27 divided certain mitigations into asset-specific mitigations to support

²¹ See Exhibit (PG&E-2), WP 1-12.

²² SPD Staff Evaluation Report on PG&E's 2020 RAMP, A.20-06-012 (Nov. 25, 2020) (SPD Staff Report), p. 4.

²³ PG&E Opening Comments, A.20-06-012, (Jan. 15, 2021), p. 2.

²⁴ In certain instances, PG&E has calculated more than one RSE for a single mitigation or control.

1 a more detailed risk analysis. Changes from the 2020 RAMP
2 Report are highlighted below:

- 3 • PSPS Impact Reduction Initiatives mitigation: PSPS impact
4 reduction initiatives were presented as a single mitigation in the
5 2020 RAMP Report and are now broken down into individual
6 activities. See Chapters 4.2 and 4.3 for additional information.
- 7 • Situational Awareness and Forecasting Initiatives mitigation:
8 PG&E presented a single Situational Awareness and
9 Forecasting Initiatives mitigation in the 2020 RAMP Report.
10 This mitigation is now divided into several individual mitigations.
11 See Chapters 4.1 and 4.3 for additional information.
- 12 • Additional System Automation and Protection mitigation: PG&E
13 presented one mitigation in the 2020 RAMP Report. In the GRC
14 this mitigation is now divided into subprograms. See
15 Chapter 4.3 for additional information.

16 PG&E shows the risk mitigations and controls presented in the
17 2020 RAMP Report and those forecast in the GRC in Attachment A,
18 Tables 3A-1 and 3A-2. The updated portfolio of mitigations and
19 controls is more closely aligned to PG&E's current risk management
20 strategy.

21 Information about the 2020 RAMP Report Wildfire mitigations
22 and controls is provided in Chapter 10 of PG&E's 2020 RAMP
23 Report. Changes to PG&E's forecast mitigations and controls are
24 discussed in the following Chapters in this exhibit.

25 Mitigations

- 26 • Chapter 4.1 – Wildfire Risk Mitigations – Situational Awareness
27 and Forecasting
- 28 • Chapter 4.2 – Wildfire Risk Mitigations – PSPS Operations
- 29 • Chapter 4.3 – Wildfire Risk Mitigations – System Hardening,
30 Enhanced Automation, and PSPS Impact Mitigations
- 31 • Chapter 4.4 – Wildfire Risk Mitigations – Community Wildfire
32 Safety Program (CWSP) Program Management Office (PMO)
- 33 • Chapter 9 – Vegetation Management

- 1 • Chapter 11 – Overhead and Underground Electric Distribution
- 2 Maintenance
- 3 • Chapter 12 – Pole Asset Management
- 4 • Chapter 23 – Community Rebuild Program

5 Controls

- 6 • Chapter 9 – Vegetation Management
- 7 • Chapter 10 – Overhead and Underground Electric Distribution
- 8 Inspections
- 9 • Chapter 11 – Overhead and Underground Electric Distribution
- 10 Maintenance
- 11 • Chapter 12 – Pole Asset Management
- 12 • Chapter 15 – Substation Asset Management

13 **2) Updates to PG&E’s 2020 RAMP Enterprise Risk Model**

14 For the 2023 GRC PG&E updated its 2020 RAMP Enterprise
15 Risk Model. Since PG&E filed its 2020 RAMP Report it has made
16 changes to its 2020 RAMP Enterprise Risk Model discussed below.
17 Certain changes were made in response to feedback from SPD and
18 parties as noted below, while other changes were made by PG&E
19 as it continues to update and refine its enterprise risk models.
20 PG&E also made many changes to align to the 2021 Wildfire
21 Distribution Risk Model discussed in the 2021 WMP.

22 **a) Tranching**

23 SPD and parties recommended that PG&E’s risk models
24 incorporate more granular tranching. For example, SPD stated
25 that given the diverse environments and conditions covered by
26 PG&E’s electric distribution system it was unreasonable to
27 assume a homogeneous risk profile as PG&E did in the 2020
28 RAMP Report.²⁵

29 PG&E agrees that the tranches included in the 2020 RAMP
30 Enterprise Risk Model for Wildfire can be improved. In
31 response to SPD and parties’ feedback, PG&E revised the
32 tranches in the 2023 GRC Enterprise Risk Model for Wildfire.

25 SPD Staff Report, p. 5.

1 PG&E expanded its overall tranches from 8 to 40.²⁶

2 Transmission tranches were further refined by voltage class and
3 HFTD tier, expanding from 2 to 12. HFTD Distribution tranches
4 were further refined, expanding from 3 to 25. The 25 tranches
5 represent the combination of 5 quintiles of the Likelihood of a
6 Risk Event (LoRE) and the Consequence of a Risk Event
7 (CoRE). An important aspect of the refinement in HFTD
8 Distribution tranching is the alignment of the 2023 GRC
9 Enterprise Wildfire Risk Model to the 2021 WDRM.

10 The 2021 WDRM provides support for prioritization of EVM
11 and System Hardening work. The 2023 GRC Enterprise Risk
12 Model assesses enterprise risks (including Wildfire) using a
13 common framework and develops RSEs using the MAVF
14 scoring approach agreed to in the S-MAP Settlement
15 Agreement. PG&E aligned the two models by using the outputs
16 from the 2021 WDRM in the 2023 GRC Enterprise Risk Model.
17 The 2021 WDRM informs the probability of ignition at the circuit
18 segment and the HFTD tiers in the 2023 GRC Enterprise Risk
19 Model, for the equipment/facility failure (conductor damage or
20 failure) and vegetation contact drivers. Further, Technosylva
21 simulation results in the 2021 WDRM inform the Wildfire
22 consequences at the circuit segment level.

23 **b) Drivers**

24 PG&E made three key changes to its risk drivers since the
25 2020 RAMP Report.

26 First, in its evaluation of PG&E's 2020 RAMP Report, TURN
27 stated that, "...[a] correct portrait of PG&E's Wildfire Risk
28 requires that the considerable risk resulting from PG&E's
29 operational failures be recognized and that the risk reduction
30 benefits from fixing those problems be quantified."²⁷ SPD

²⁶ There are two substation tranches and one non-HFTD distribution tranche that have not change since the 2020 RAMP Report.

²⁷ TURN's Opening Comments on PG&E's RAMP Report and the SPD's November 25, 2020 Evaluation Report, A.20-06-012 (Jan. 15, 2021) (TURN Opening Comments), p. 7.

1 agreed that this was a valid comment and that operational
 2 failures should be modeled as a risk driver.²⁸ PG&E agrees
 3 with TURN and SPD's recommendation. To capture operational
 4 failure in the 2023 GRC Enterprise Risk Model, PG&E matches
 5 ignitions to associated outages, and if the basic cause is
 6 Company initiated, additional review is performed to identify if
 7 the ignition was caused by human failure. The 2023 GRC
 8 Enterprise Risk Model for Wildfire includes Operational Failure
 9 as a risk driver, using ignitions associated with PG&E
 10 workforce-caused outages. PG&E will continue to explore other
 11 ways to represent operational failures in the risk model.²⁹

12 Second, PG&E updated the 2023 GRC Enterprise Risk
 13 Model for Wildfire drivers and sub-drivers to align with those
 14 presented in the 2021 WMP so that the information is consistent
 15 between the two regulatory filings.

16 Third, PG&E enhanced the substation drivers in the 2023
 17 GRC Enterprise Risk Model for Wildfire. To capture the
 18 potential substation failures that could lead to an ignition,
 19 substation outages that could cause an ignition were
 20 incorporated into the model.

21 c) Weather

22 Parties recommended further delineation of weather
 23 conditions, for example by using wind speed. MGRA noted that
 24 PG&E's risk model should be updated and stated that
 25 effectively, risk is a function of the frequency and severity of
 26 weather events impacting the PG&E systems.³⁰ In response to
 27 this feedback, PG&E incorporated weather into its risk model.
 28 Weather and environmental conditions are included in the

²⁸ SPD Staff Report, p. 71.

²⁹ For example, PG&E has introduced a new data entry field as part of its Corrective Action Program to identify and track ignitions that are submitted by PG&E workforce.

³⁰ MGRA Comments on the PG&E 2020 RAMP Report and the SPD Staff Evaluation Report, A.20-06-012 (Jan. 15, 2021), p. 10.

1 Wildfire Consequence Model from Technosylva fire simulations
2 based on the worst weather days.

3 **d) Public Safety Power Shutoff**

4 PG&E describes PSPS modeling updates in Section D.1.c
5 below.

6 **e) Additional Ignitions**

7 PG&E is including more ignitions in its 2023 GRC Enterprise
8 Risk Model for Wildfire than it included in the 2020 RAMP
9 Report. The additional ignitions were identified through two
10 audits: (1) an audit of other PG&E systems of record and (2) an
11 audit resulting from a self-identified data omission regarding fire
12 ignition data.³¹ This update to the 2023 GRC Enterprise Risk
13 Model for Wildfire was initiated by PG&E.

14 **f) Power Law Distribution**

15 SPD and Cal Advocates recommended that PG&E consider
16 using a power law³² distribution to characterize wildfire
17 consequence distribution.³³ PG&E agreed with these
18 recommendations and has incorporated power law into its
19 consequence distribution.

20 **c. PSPS Consequence Modeling**

21 **1) Complying with WSD-002**

22 The CPUC issued Resolution WSD-002³⁴ to give the electrical
23 corporations regulated by the Commission guidance on their 2020
24 WMPs. In the decision on PG&E's 2020 GRC, the Commission
25 required that in the next GRC (PG&E's 2023 GRC) PG&E must

31 Letter from Lise Jordan, PG&E, to Nika Kjensli, CPUC, Regarding Self-Report Notification Update: Fire Ignition Report (Mar. 31, 2021).

32 "Power law" is a functional relationship between two quantities, where a relative change in one quantity results in a proportional relative change in the other quantity. See Wikipedia, at: <https://en.wikipedia.org/wiki/Power_law> (as of June 9, 2021).

33 See, SPD Staff Report, p. 17, ¶ 5; and, Opening Comments of the Public Advocates Office on PG&E's RAMP Application and the SPD's Report, A.20-06-012, (Jan. 15, 2021), p. 2.

34 Res. WSD-002 (June 11, 2020).

1 include testimony that shows or explains how its RSE calculation
2 complies with Resolution WSD-002,³⁵ specifically the section of
3 Resolution WSD-002 that states:

4 RSE is not an appropriate tool for justifying the use of PSPS.
5 When calculating RSE for PSPS, electrical corporations
6 generally assume 100 percent wildfire risk mitigation and very
7 low implementation costs because societal costs and impact are
8 not included. When calculated this way, PSPS will always rise to
9 the top as a wildfire mitigation tool, but it will always fail to
10 account for its true costs to customers. Therefore, electrical
11 corporations shall not rely on RSE calculations as a tool to
12 justify the use of PSPS.³⁶

13 PG&E will not calculate an RSE for the benefits of PSPS as a
14 mitigation to the Wildfire risk per Resolution WSD-002.

15 **2) Complying with the CPUC Ruling Requiring Updated Analysis** 16 **of PSPS**

17 On June 3, 2021 the CPUC ruled on the joint motion filed by the
18 Public Advocates Office and FEITA Bureau of Excellence (the Joint
19 Motion)³⁷ requesting that PG&E be required to analyze and address
20 concerns regarding its PSPS program.³⁸ Specifically, the Joint
21 Motion requested that PG&E should analyze the full safety, health
22 and financial consequences of PSPS on its customers. The CPUC
23 denied the Joint Motion but found it appropriate for PG&E to provide
24 testimony in this GRC concerning updated risk analysis of the
25 estimated consequences of initiating PSPS events and that the
26 testimony must contain analysis and discussion of the
27 consequences of PSPS for customers and how PG&E analyzes
28 those consequences.

29 In response to party feedback and the Administrative Law
30 Judge's (ALJ) ruling on the Joint Motion, PG&E describes in this

35 D.20-12-005, p. 327.

36 Res. WSD-002 (June 11, 2020), Appendix A, p. A-1.

37 A.20-06-012, *ALJ Lirag E-Mail Ruling Denying Joint Motion by Cal Advocates and FEITA* (June 3, 2021).

38 Joint Motion of the Public Advocates Office and FEITA Bureau of Excellence, LLC, A.20-06-012 (Mar. 30, 2021).

1 section its updated analysis of the consequences of PSPS. PSPS is
 2 divided into three components: (1) the frequency of a PSPS event,
 3 (2) the scope of the event or customers impacted, and (3) the
 4 duration of the customer impact.

5 The frequency of PSPS is represented as the LoRE. In the
 6 2020 RAMP Report, PG&E estimated 5.4 PSPS events based on
 7 PG&E's 2019 PSPS protocols. To estimate the frequency of a
 8 PSPS event for the 2023 GRC Enterprise Risk Model, PG&E used a
 9 10-year historical review based on PG&E's 2020 PSPS protocols
 10 and estimated the number of expected events that would have
 11 occurred between 2010 to 2019. The historical review estimated
 12 that there would have been 29 events over the 10 years,³⁹ roughly
 13 2.9 events per year. In addition, given the uncertainty around the
 14 borderline weather events PG&E estimates 1 extra event per year,
 15 totaling a LoRE of 3.9.⁴⁰

16 The PSPS scope and duration is represented as the
 17 Consequence of a Risk Event. PG&E also uses the 10-year
 18 historical lookback based on PG&E's 2020 PSPS Protocols to
 19 estimate the number of customers impacted and the average
 20 duration of each event to develop its reliability consequence
 21 distribution. Based on the number of customers impacted by each
 22 event, PG&E evaluated the safety, reliability and financial
 23 consequences.

24 Safety consequences are evaluated based on equivalent
 25 fatalities. In the 2020 RAMP Report, PG&E only included PG&E's
 26 historical PSPS events in the PSPS safety consequence analysis.
 27 When evaluating the safety consequence, PG&E did not identify any
 28 serious injury or fatalities associated with PG&E's historical PSPS
 29 events, so there were no safety consequences for PSPS in the 2020

39 Variations in the number of events due to potential overlapping weather events being combined.

40 PG&E has recently modified its 2021 WMP to reflect an estimate of five PSPS events per year. The forecast in this GRC is based on three events plus one additional borderline event. (see Ch. 4.2, Section C.1). See PG&E's 2021 Wildfire Mitigation Plan Report, R.18-10-007 (Feb. 5, 2021).

1 RAMP Report. The safety risk to customers has been mitigated by
2 customer notifications and education on PSPS events.

3 For the 2023 GRC Enterprise Risk Model, PG&E used both
4 PG&E's historical PSPS events data and the data from large-scale
5 unplanned outages across the United States to represent safety.
6 The unplanned outages data PG&E used include the 2003
7 Northeast Blackout, 2011 Southwest Blackout, 2012 Superstorm
8 Sandy, 2017 Hurricane Irma, and the 2012 Derecho Windstorms.
9 The unplanned outage events do not provide customers with
10 notification of upcoming de-energization, and therefore, are not
11 comparable to PG&E's PSPS events, which are preceded by
12 extensive customer notifications and involve numerous mitigation
13 steps. However, to be responsive to party comments, in the 2023
14 GRC Enterprise Risk Model, PG&E combines the data of planned
15 PSPS outages with the unplanned outages across the industry to
16 provide an illustration of potential safety consequence for our
17 customers. A review of this data should keep in mind the
18 differences between planned PSPS outages and unplanned
19 outages.

20 The reliability consequences are based on customer minutes
21 interrupted. To estimate this impact, PG&E used historical PSPS
22 events. PG&E updated the 2023 GRC Enterprise Risk Model to
23 include 2020 PSPS events.

24 Financial consequences to customers are represented by
25 estimated ratepayer costs for a PSPS event. In the 2020 RAMP
26 Report, PG&E did not include any financial consequences. For the
27 2023 GRC Enterprise Risk Model, PG&E added the financial costs
28 of executing PSPS to the financial consequence.

29 While PG&E added both safety and financial consequences to
30 the 2023 Enterprise Risk Model, and updated additional data from
31 the 2020 RAMP Report, the reliability consequence is still the
32 predominant component of the overall consequence of PSPS.

33 After incorporating updated data and additional consequences,
34 PG&E calculated an RSE for its PSPS Impact Reduction Initiative

1 (referred to as WLDFR-M006 mitigations) so it could be assessed
2 against other Wildfire initiatives.⁴¹

3 EO is also undertaking more comprehensive and granular risk
4 analysis and modelling at the circuit level to help prioritize mitigation
5 activities at targeted locations. The output from this circuit-level
6 PSPS consequence analysis will help PG&E target PSPS impact
7 reduction programs to locations that may experience a high
8 frequency of PSPS events or where a PSPS event would have
9 considerable customer impact.

10 **d. Aligning the GRC Wildfire Risk Modeling to the Wildfire Mitigation**
11 **Plan**

12 PG&E filed its 2021 WMP on February 5, 2021.⁴² The 2021 WMP
13 details PG&E's plans for mitigating wildfire risk, with a focus on work
14 planned for 2021. PG&E has incorporated many of the improvements it
15 made to the 2021 WDRM into the 2023 GRC Enterprise Risk Model for
16 Wildfire. It is also including in the GRC forecast many of the mitigation
17 programs described in the WMP. There are, however, certain elements
18 in PG&E's 2023 GRC Wildfire risk analysis that do not align to the WMP
19 for the reasons noted below.

- 20 1) There is a difference in the forecast periods covered by the 2023
21 GRC and 2021 WMP. The GRC covers the expense forecast for
22 2023 and the capital forecasts for 2021-2026 whereas the 2021
23 WMP period includes capital and expense estimates for 2021-2022.
24 2) The GRC does not include mitigation or control programs related to
25 transmission assets, whereas the WMP does.
26 3) GRC controls and mitigations are aligned to how PG&E views its
27 programs. PG&E's forecasts and recorded costs are aligned
28 accordingly. The WMP initiatives are prescribed by the WSD; the
29 forecast and recorded costs, when aligned to the WMP initiatives,

⁴¹ Other PSPS impact reduction initiatives, such as those that are related to Electric Transmission, are not discussed in the GRC. Please refer to PG&E's annual WMP to review for more information about how PG&E is mitigating the impact of PSPS. PG&E's 2021 Wildfire Mitigation Plan Report, R.18-10-007 (Feb. 5, 2021).

⁴² PG&E's 2021 Wildfire Mitigation Plan Report, R.18-10-007 (Feb. 5, 2021).

1 may not line up with the way the program is tracked and managed
2 by PG&E. This difference between GRC and WMP programs and
3 costs can also impact the RSE calculations.

4 **e. Comparing RSEs from the 2020 RAMP Report to the 2023 GRC**

5 Table 3-3 below lists the mitigations that PG&E included in its 2020
6 RAMP Report and that are also included in the 2023 GRC. The table
7 shows the RSE from the 2020 RAMP Report compared to the 2023
8 GRC. PG&E describes reasons that RSEs for mitigations have changed
9 significantly between the time they were calculated for the 2020 RAMP
10 Report and for the GRC.

**TABLE 3-3
WILDFIRE
COMPARING MITIGATION RSES IN THE 2020 RAMP AND 2023 GRC**

Line No.	Mitigation No.	Mitigation Name (2023 GRC)	2020 RAMP RSE ^(a)	2023 GRC RSE
1	WLDFR-M001	Enhanced Vegetation Management	2.7 ^(b)	2.5 ^(b)
2	WLDFR-M002	System Hardening Overhead	7.8 ^{(b),(c)}	5.6 ^(b)
3	WLDFR-M002	System Hardening Underground	5.0 ^(c)	4.5 ^(b)
4	WLDFR-M003	Non-Exempt Surge Arrester Replacement	^(d)	0.1
5	WLDFR-M004	Expulsion Fuse Replacement	1.0 ^(b)	1.2
6	WLDFR-M005	PSPS Event	15.0 ^(e)	^(h)
7	WLDFR-M006	PSPS Program	^(e)	^(h)
8	WLDFR-M006	PSPS Impact Reduction Initiatives – CRC Preparedness	–	^(h)
9	WLDFR-M006	PSPS Impact Reduction Initiatives – Sectionalizer Device Install/Replace	–	12.7
10	WLDFR-M007	Situational Awareness and Forecasting Initiatives (SA&FI)	^(f)	^(g)
11	WLDFR-M07A	SA&FI - Line Sensors	–	16.9
12	WLDFR-M07B	SA&FI – Weather Stations	–	^(f)
13	WLDFR-M07C	SA&FI – Wildfire Safety Operations Center (WSOC)	–	^(f)
14	WLDFR-M07D	SA&FI – Cameras	–	19.4
15	WLDFR-M07E	SA&FI – Satellite Fire Detection	–	154.0
16	WLDFR-M07F	SA&FI – Sensor IQ	–	^(f)
17	WLDFR-M07G	SA&FI – Partial Voltage Detection	–	281.9
18	WLDFR-M07H	SA&FI – SOPP Improvements	–	^(f)
19	WLDFR-M07I	SA&FI – Advance Fire Modeling	–	^(f)
20	WLDFR-M07J	SA&FI – Meteorology	–	^(f)
21	WLDFR-M07K	SA&FI - Fire Potential Index	–	^(f)
22	WLDFR-M008	Safety and Infrastructure Protection Team (SIPT)	^(f)	1.0 ^(k)
23	WLDFR-M009	Community Wildfire Safety Program PMO	^(f)	^(f)
24	WLDFR-M010	Additional System Automation and Protection	^(f)	⁽ⁱ⁾

**TABLE 3-3
WILDFIRE
COMPARING MITIGATION RSES IN THE 2020 RAMP AND 2023 GRC
(CONTINUED)**

Line No.	Mitigation No.	Mitigation Name (2023 GRC)	2020 RAMP RSE ^(a)	2023 GRC RSE
25	WLDFR-M10B	Additional System Automation and Protection – FuseSaver	–	20.0
26	WLDFR-M10C	Additional System Automation and Protection – REFCL	–	23.0
27	WLDFR-M011	SA&FI -EFD	–	60.7
28	WLDFR-M012	SA&FI -DFA	–	(l)
29	WLDFR-M017	System Hardening - Remote Grid	17.8 ^{(b),(j)}	30.0

Notes:

- (a) See PG&E's 2020 RAMP Report, WP 3-2, lines 44-47. For the RSE for Remote Grid see PG&E's 2020 RAMP Report, p. 10-66.
- (b) The RSE includes the risk reduction for both the Wildfire and Failure of Distribution Overhead Assets risks.
- (c) PG&E did not calculate separate RSEs for System Hardening Overhead and System Hardening UG in the 2020 RAMP Report. PG&E presented separate RSEs for System Hardening Overhead and System Hardening UG during the post-RAMP filing scenario analysis meetings held with SPD and interested parties. <http://pgera.azurewebsites.net/Regulation/ValidateDocAccess?docID=629535>. See workbook tab called "SH RSE," workbook rows 13 and 14.
- (d) PG&E assumed in its 2020 RAMP Report that work in this program would be complete before 2023 and, therefore, did not calculate an RSE.
- (e) The RSE PG&E calculated in the 2020 RAMP for mitigation WLDFR-M005, PSPS, included the combined WLDFR-M005 (PSPS Event) and WLDFR-M006 (PSPS Impact Reduction Initiatives) mitigations.
- (f) PG&E considers this a foundational mitigation and did not calculate an RSE.
- (g) For this GRC, WLDFR-M007 was further divided into individual initiatives in order to analyze risk reduction at a more granular level.
- (h) To comply with guidance from the Safety Policy Division (SPD), PG&E is not calculating an RSE for the Wildfire risk mitigation benefits of PSPS, per Resolution (Res.) WSD-002 (June 11, 2020), Appendix A, p. A-1. PSPS is discussed on Section D.1.c above.
- (i) For GRC, Additional System Automation and Protection (WLDFR-M10) was divided into three individual initiatives in order to analyze risk reduction at a more granular level.
- (j) See PG&E's 2020 RAMP Report Post-Filing Errata, line 37.
- (k) The RSE shown represents only the elements of the SIPT program that can be quantified. Other elements of the SIPT program are considered foundational.
- (l) The RSE for Situational Awareness and Forecasting Initiative – DFA (WLDFR-M012) is incorporated into the Situational Awareness and Forecasting Initiative – Line Sensors program (WLDFR-M07A) because the two devices work in tandem and the risk reduction is combined.

1 Some of the variability in RSE scores is due to changes in the
2 MAVF, RSE methodology, and Enterprise Risk Model as discussed in
3 PG&E's Enterprise Operational and Risk Management testimony⁴³ and

⁴³ See Exhibit (PG&E-2), Ch. 1, Section E.5.

1 in response to SPD and party feedback on PG&E’s 2020 RAMP
2 Report.⁴⁴ Other changes to the RSEs are described below.

3 System Hardening (WLDFR-M002)

- 4 • Overhead: The change in RSE is due to the addition of the Present
5 Value Rate of Return (PVRR) factor into the 2023 Enterprise Risk
6 Model.⁴⁵
- 7 • Underground: The change in RSE is due to the model accounting
8 for decreasing the incremental Operations and Maintenance costs
9 due to undergrounding as compared to overhead lines.

10 System Hardening – Remote Grid (WLDFR-M011)

11 Since filing the 2020 RAMP Report, PG&E has better estimates of
12 the cost of the program. Despite the higher cost of the program, PG&E
13 also shifted the focus of the remote grid locations to the high-risk miles
14 as identified through the system hardening program, providing higher
15 risk reduction per project.

16 Safety and Infrastructure Protection Team (WLDFR-M008)

17 In the 2020 RAMP Report, PG&E considered this a foundational
18 activity and did not calculate an RSE for it. Since filing the 2020 RAMP
19 Report PG&E has identified quantifiable data and is now able to analyze
20 some of the risk reduction related to the SIPT Program. Some elements
21 of the SIPT Program cannot be quantified and are still considered
22 foundational.

23 **2. Failure of Electric Distribution Overhead Assets**

24 **a. Risk Overview**

25 Failure of Electric Distribution Overhead Assets was identified as a
26 RAMP risk in PG&E’s 2020 RAMP Report.

27 The Failure of DOH Assets risk is defined as failure of electric
28 distribution overhead assets or lack of remote operational functionality
29 that may result in public or employee safety issues, property damage,
30 environmental damage, or inability to deliver energy. The drivers for this
31 risk event are: Distribution Line Equipment Failure; Other; Vegetation;

⁴⁴ See Exhibit (PG&E-2), WP 1-12.

⁴⁵ See Exhibit (PG&E-2), Ch. 1, Section E.5.

1 Seismic Scenario; Animal; Natural Hazard; Other PG&E Assets or
2 Processes; Human Performance; Physical Attack; Skilled and Qualified
3 Workforce; and Records and Information Management. The
4 cross-cutting factors Information Technology Asset Failure, Climate
5 Change, and EP&R also impact this risk.⁴⁶

6 Exposure to this risk is based on the 80,715 circuit miles of primary
7 overhead distribution lines in PG&E's electric system. The 2023 GRC
8 Enterprise risk model estimates approximately 24,852 risk events
9 (outages) each year. The Distribution Line Equipment Failure and
10 Vegetation drivers together account for 55 percent of the risk events.
11 The Other driver accounts for 30 percent of the risk events. The
12 mitigations PG&E is forecasting in this GRC are designed to address
13 these key risk drivers.

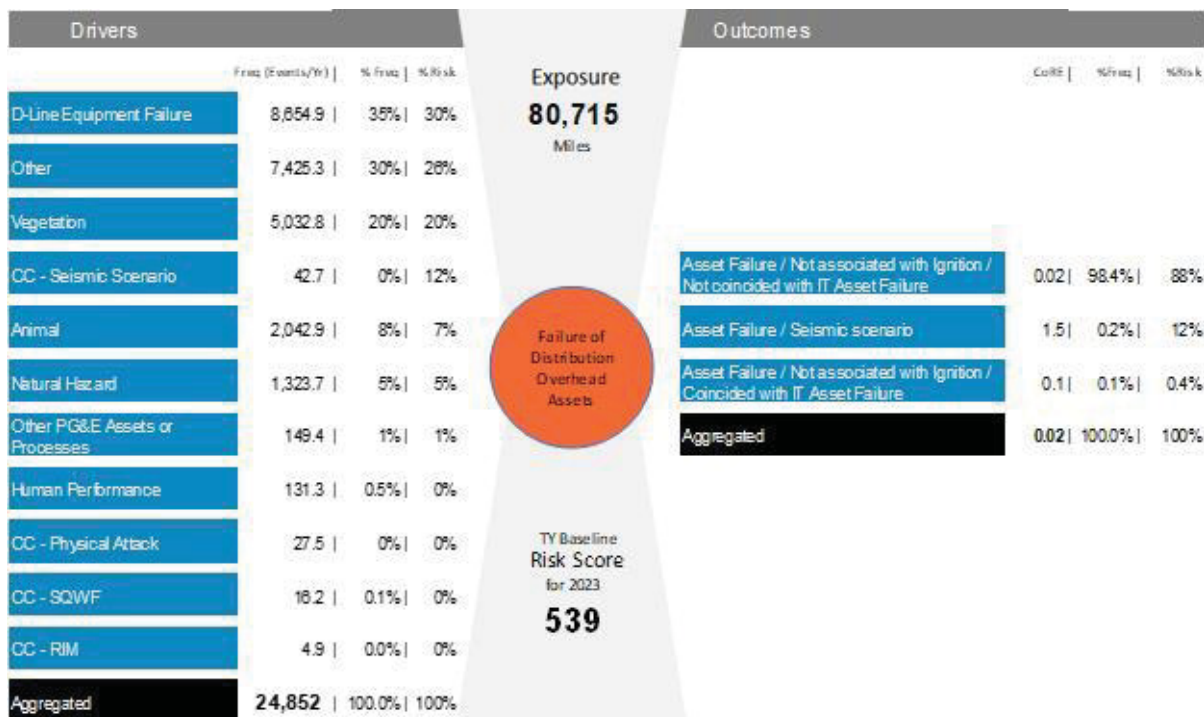
14 In terms of consequence, asset failures not coincident with IT Asset
15 Failure account for 98 percent of the risk events and 88 percent of the
16 risk score. Asset failures associated with seismic events account for
17 less than 1 percent of the risk events but 12 percent of the risk score.
18 The risk of ignitions associated with asset failures is modeled as part of
19 the Wildfire risk rather than the Failure of DOH Assets risk.

20 PG&E identified six tranches for this risk event: one tranche for
21 HFTD areas; two tranches for groups of circuits with issues historically
22 identified as carrying an increased risk for asset failure; and three
23 tranches based on circuits' reliability performance. The highest
24 tranche-level risk is associated with circuits in HFTD areas (39 percent
25 of the risk) and circuits with poor reliability performance (31 percent of
26 the risk).

27 The 2023 TY baseline risk score presented in the 2020 RAMP
28 Report was 525 and the 2026 post mitigation risk score was 500. The
29 2023 TY baseline risk score and the 2026 post mitigation risk scores
30 updated for the GRC are 539 and 519 respectively. The change in risk
31 score is due to including the 2020 data in the risk assessment.

⁴⁶ See Exhibit (PG&E-2), Ch. 1, Attachment B.

**FIGURE 3-4
FAILURE OF DISTRIBUTION OVERHEAD ASSETS
BOW-TIE ILLUSTRATION**



1 PG&E proposed a suite of mitigations and controls in the 2020
 2 RAMP Report. Tables 3A-3 and 3A-4 in Attachment A list the
 3 mitigations and controls included in the 2020 RAMP Report, those that
 4 have been removed from the portfolio, and those forecast in this GRC.

5 PG&E’s risk models and accompanying source data are available
 6 upon request.

7 **b. Responding to Feedback on PG&E’s 2020 RAMP Report**

8 Below PG&E addresses comments from SPD and parties that
 9 resulted in a change to the 2020 Enterprise RAMP risk model or other
 10 changes in the 2023 GRC. PG&E appreciates SPD feedback and, as
 11 shown in supporting workpapers, agrees with many of the comments
 12 and recommendations received. A listing of the feedback and PG&E’s
 13 response to each item is provided in workpapers.⁴⁷

14 SPD recommended that PG&E provide increased granularity and
 15 more RSE calculations to provide the Commission, SPD and other

⁴⁷ Exhibit (PG&E-2), WP 1-12.

1 interested parties sufficient information to evaluate PG&E’s GRC
2 proposals.⁴⁸ PG&E agrees with these recommendations and has made
3 changes based on this feedback in this GRC.

4 • SPD recommended that PG&E include risk analysis based on
5 outage and wire-down data, including whether that latter is
6 energized versus non-energized.⁴⁹ PG&E agrees with SPD’s
7 concern and, in response, PG&E is evaluating adding additional
8 tranches based on areas with elevated public safety risk. In the
9 interim, PG&E has added one tranche to its Failure of Electric DOH
10 risk analysis.

11 • In the 2020 RAMP Report, PG&E provided RSEs for 6 mitigations
12 and 1 control whereas in this GRC, PG&E is providing RSEs for 13
13 mitigations and 15 controls.

14 SPD also recommended that PG&E more accurately identify the
15 causes of undetermined outages in the “other” risk driver category.⁵⁰
16 PG&E agrees that “other” is not an ideal risk driver category and has
17 included Additional Asset Data Capture (DOVHD-M005) as a mitigation
18 to address this gap. This mitigation consists of various efforts to
19 improve PG&E’s ability to capture information about the location and
20 cause of outages, and about the reasons for equipment failures.

21 **1) Changes in Mitigations and Controls**

22 PG&E described its plans for managing the Failure of Electric
23 Distribution Overhead Assets risk in Chapter 11 of its 2020 RAMP
24 Report. PG&E has not modified its mitigations since filing the 2020
25 RAMP Report. However, PG&E added two controls:

- 26 • DOVHD-C09A – Overloaded Transformers Replacement; and
- 27 • DOVHD-C014 – Additional System Automation and
28 Protection - FuseSaver

29 Forecast mitigations and controls are discussed in the following
30 Chapters in this exhibit.

⁴⁸ PG&E Opening Comments, A.20-06-012 (Jan. 15, 2021), p. 2.

⁴⁹ SPD Staff Report, p. 145.

⁵⁰ SPD Staff Report, p. 83.

1 Mitigations

- 2 • Chapter 3 – Two mitigations are described in Section D.5 below
- 3 • Chapter 4.1 – Wildfire Risk Mitigations – Situational Awareness
- 4 and Forecasting
- 5 • Chapter 4.3 – Wildfire Risk Mitigations – System Hardening,
- 6 Enhanced Automation, and PSPS Impact Mitigations
- 7 • Chapter 9 – Vegetation Management
- 8 • Chapter 11 – Overhead and Underground Electric Distribution
- 9 Maintenance

10 Controls

- 11 • Chapter 9 – Vegetation Management
- 12 • Chapter 10 – Overhead and Underground Electric Distribution
- 13 Inspections
- 14 • Chapter 11 – Overhead and Underground Electric Distribution
- 15 Maintenance
- 16 • Chapter 12 – Pole Asset Management
- 17 • Chapter 13 – Overhead and Underground Asset Management
- 18 and Reliability
- 19 • Chapter 16 – Distribution Automation and System Protection
- 20 • Chapter 17 – Electric Distribution Capacity, Engineering, and
- 21 Planning

22 **2) Updates to PG&E’s 2020 RAMP Enterprise Risk Model**

23 For the 2023 GRC, PG&E updated its 2020 RAMP Enterprise

24 Risk Model. Since filing its 2020 RAMP Report, PG&E updated its

25 2023 GRC Enterprise Risk Model for the Failure of Electric

26 Distribution Overhead Assets risk to address SPD and party

27 feedback by adding an additional HFTD tranche. In addition, PG&E

28 is pursuing development of more granular tranching based on areas

29 with elevated public safety risk such as wire down energized lines.

30 These areas may include major transportation infrastructure, public

31 assembly areas, and public safety entities.

1 **c. Comparing RSEs from the 2020 RAMP Report to the 2023 GRC**

2 Table 3-4 below lists the mitigations and pilot control that PG&E
 3 included in its 2020 RAMP Report and that are included in the 2023
 4 GRC. The table shows the RSE from the 2020 RAMP Report compared
 5 to the GRC RSE. PG&E describes the reasons that RSEs for
 6 mitigations and pilot control have changed significantly between the time
 7 they were calculated for the 2020 RAMP Report and for the GRC.

**TABLE 3-4
 FAILURE OF ELECTRIC DISTRIBUTION OVERHEAD ASSETS
 COMPARING MITIGATION AND CONTROL RSES IN THE 2020 RAMP AND 2023 GRC**

Line No.	Mitigation No.	Mitigation Name (2023 GRC)	2020 RAMP RSE ^(a)	2023 GRC RSE
1	DOVHD-M001	Enhanced Vegetation Management	(b)	(d)
2	DOVHD-M002	System Hardening	(b)	(d)
3	DOVHD-M003	Non-Exempt Surge Arrester Replacement	0.02	0.1
4	DOVHD-M004	Expulsion Fuse Replacement	(b)	(d)
5	DOVHD-M005	Additional Asset Data Capture	(c)	(c)
6	DOVHD-M006	Grasshopper and KPF Switch Replacement	3.69	7.9
7	DOVHD-M007	Regulated Output Streetlight Replacement	<0.01	<0.01
8	DOVHD-M008	Ceramic Post Insulator Replacement	0.72	0.4
9	DOVHD-M009	Improved Distribution Risk Model	(c)	(c)
10	DOVHD-M010	3A and 4C Line Recloser Replacement	1.39 ^(e)	(f)
11	DOVHD-M011	System Hardening - Remote Grid	(b)	(d)
12	DOVHD-C005	Inspections – Distribution Overhead	0.37	48.0 ^(d)

(a) See PG&E's 2020 RAMP Report, WP 3-1, lines 17-21. The RSE for Enhanced Inspections is provided in PG&E's 2020 RAMP Report, p. 11-34.

(b) The costs for this work was aligned to the Wildfire risk in the RAMP Report and, therefore, the RSE is aligned to Wildfire and shown in Table 3.3 above.

(c) PG&E considers this a foundational mitigation and did not calculate an RSE.

(d) RSE represents the combined benefit of Wildfire and Failure of Distribution Overhead Asset. This control was referred to as Enhanced Inspections in PG&E's 2020 RAMP Report.

(e) See PG&E's 2020 RAMP Report, Post-Filing Errata, line 8.

(f) PG&E calculated two RSEs for this mitigation: 3A and 4C Line Recloser Replacement [3A], RSE 0.6; and, 3A and 4C Line Recloser Replacement [4C], RSE 1.4

1 Some of the variability in RSE scores is due to changes in the
2 MAVF, RSE methodology and Enterprise Risk Model and in response to
3 SPD and party feedback on PG&E's 2020 RAMP Report.⁵¹ Other
4 changes to the RSEs are described below.

5 Non-Exempt Surge Arrester Replacement (WLDFR-M003)

6 The contribution to risk reduction in the Failure of Distribution
7 Overhead Assets in the GRC remains consistent with the 2020 RAMP
8 Report. The difference is due to the increased contribution to risk
9 reduction for the Wildfire risk.

10 Grasshopper and KPF Switch Replacement (DOVHD-M006)

11 The change in RSE between the 2020 RAMP Report and the GRC
12 is due to: a decrease in the unit cost for replacing switches; allocating
13 more switches to a higher risk tranche in the GRC (in the 2020 RAMP
14 Report more switches were allocated to the elevated wire down tranche
15 and in the GRC more switches are allocated to the higher risk HFTD
16 tranche); and prioritizing the replacement of switches with higher
17 customer counts.

18 Inspections - Distribution Overhead (DOVHD-C005)⁵²

19 The change in RSE is driven by the lowered unit costs⁵³ and the
20 inclusion of risk reduction benefits of inspections as a control to Wildfire.
21 In the 2020 RAMP Report PG&E did not include the benefits to Wildfire
22 in the RSE calculation.

23 **3. Failure of Electric Distribution Network Assets**

24 **a. Risk Overview**

25 Failure of Electric Distribution Network Assets was identified as a
26 RAMP risk in PG&E's 2020 RAMP Report.

27 The Failure of Electric Distribution Network Assets risk is defined as
28 the failure of distribution network assets or lack of remote operation
29 functionality that may result in public or employee safety issues,

51 Exhibit (PG&E-2), WP 1-12.

52 This control was identified as C13 in PG&E's RAMP Report, A.20-06-032 (June 30, 2020), p. 11-16, line 25.

53 See MAT BFB, Exhibit (PG&E-4), WP 10-8, lines 15 and 18.

1 property damage, environmental damage, or inability to deliver energy.
2 The drivers for this risk event are: Underground Network Equipment
3 Failure; Human Performance; Skilled and Qualified Workforce; Seismic
4 Scenario; Physical Attack; and Records and information Management.
5 The cross-cutting factors EP&R, Climate Change, and Cyber Attack,
6 also impact this risk.⁵⁴

7 Exposure to this risk is based on the 188 circuit miles of networked
8 circuits and 73 pieces of equipment targeted for replacement in
9 downtown areas of San Francisco and Oakland. The risk model
10 estimates approximately 15 risk events each year where network
11 equipment fails resulting in an outage. Equipment failure, human
12 performance, and the Skilled and Qualified Workforce cross-cutting
13 factor together account for 99 percent of the risk events. Catastrophic
14 asset failures (defined as failures that result in a vault explosion,
15 manhole cover displacement, and/or a fire) unrelated to a seismic
16 scenario account for 97 percent of the risk and 17 percent of the risk
17 events; asset failures associated with a seismic scenario account for
18 1 percent of risk and 1 percent of the risk events. The mitigations PG&E
19 is forecasting in this GRC are designed to address these key risk
20 drivers.

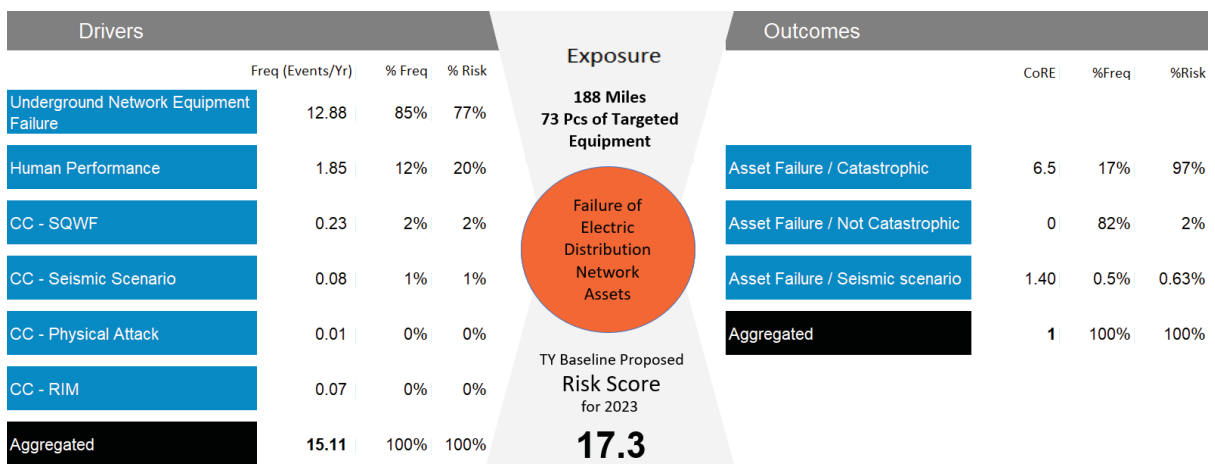
21 PG&E identified six tranches for this risk event. Three tranches are
22 based on differences in the network asset replacement strategy: circuits
23 with a high failure rate that are a current priority for replacement; circuits
24 where older network cable has already been replaced; and all other
25 circuits. PG&E added three additional asset-specific tranches
26 (CMD-type network protector, high-rise dry type transformers, and
27 high-rise dry type network protectors) to provide more granularity for risk
28 analysis.

29 The 2023 TY baseline risk score presented in the 2020 RAMP was
30 7 and the 2026 post mitigation risk score was 6. The 2023 TY baseline
31 risk score and the 2026 post mitigation risk scores updated for the GRC
32 are 17 and 13 respectively. This change in risk score is due to factoring

⁵⁴ See Exhibit (PG&E-2), Ch. 1, Attachment B.

1 in the additional risk associated with the new CMD-type network
 2 protector, high-rise dry type transformer, and high-rise dry type network
 3 protector tranches. The change in risk score is also impacted by
 4 changes in frequency modeling. In the 2020 RAMP Report, PG&E used
 5 historical failure rates as the measure of frequency whereas in the GRC
 6 PG&E uses an expected estimated failure rate based on a failure curve.

**FIGURE 3-5
 FAILURE OF ELECTRIC UNDERGROUND NETWORK ASSETS
 BOW-TIE ILLUSTRATION**



7 Additional details about the risk model, mitigations and controls are
 8 in PG&E’s 2020 RAMP Report.⁵⁵

9 PG&E proposed a suite of mitigations and controls in the 2020
 10 RAMP Report. Since the 2020 RAMP filing, the suite of mitigations has
 11 stayed the same but the control programs have changed. Tables 3A-5
 12 and 3A-6 in Attachment A lists the mitigations and controls included in
 13 the 2020 RAMP Report, those that have been removed from the
 14 portfolio and those forecast in the GRC.

b. Responding to Feedback on PG&E’s 2020 RAMP Report

15 On November 25, 2020, the SPD issued its Staff Evaluation Report
 16 on PG&E’s 2020 RAMP Report (A.20-06-012). Subsequently on
 17 January 15, 2021, other interested parties also provided feedback on
 18 PG&E’s 2020 RAMP Report.
 19

⁵⁵ PG&E’s RAMP Report, A.20-06-012 (June 30, 2020), Ch. 12.

1 SPD's key recommendations were that PG&E provide increased
2 granularity and more RSE calculations to provide the Commission, SPD
3 and other interested parties sufficient information to evaluate PG&E's
4 GRC proposals.⁵⁶ SPD found that the tranches in PG&E's risk model
5 not only allowed for evaluation and assessment of the risks but also
6 enabled prioritization of high failure rate secondary network assets to
7 mitigate this high-risk tranche.⁵⁷ After filing the 2020 RAMP Report
8 PG&E further refined its 2023 GRC Risk Model by adding three
9 additional tranches.

10 In the 2020 RAMP Report, PG&E provided RSEs for 3 mitigations
11 and no controls. In the GRC, PG&E has updated the 4 mitigation RSEs
12 and is also providing RSEs for 4 controls.

13 PG&E lists the feedback received from SPD and parties' and
14 PG&E's response to each in workpapers.⁵⁸

15 **1) Changes Mitigations and Controls**

16 PG&E described its plans for managing the Failure of Electric
17 Distribution Network Assets risk in its 2020 RAMP Report. PG&E
18 has not modified its proposed mitigations. Controls C004 (Asset
19 Information Improvements/Asset Data Comparison and Updates),
20 C005 (Network Health Reports), and C006 (Standards, Processes
21 and Training) were included in the 2020 RAMP Report but are not
22 included in the 2023 GRC. PG&E determined that these controls
23 did not reduce risk.

24 Information about the RAMP mitigations and controls is
25 provided in Chapter 12 of PG&E's 2020 RAMP Report. Changes to
26 PG&E's forecast mitigations and controls are discussed in
27 Chapter 14, Network Asset Management, in this exhibit.

28 **2) Updates to PG&E's Risk Model**

29 For the 2023 GRC PG&E updated its 2020 RAMP Enterprise
30 Risk Model. PG&E changed its risk modeling approach by:

56 PG&E's Opening Comments, A.20-06-012 (Jan. 15, 2021), p. 2.

57 SPD Staff Report, p. 91.

58 Exhibit (PG&E-2), WP 1-12.

1 (1) adding three new tranches; and (2) updating frequency data by
 2 estimating expected failure rate for some equipment based on
 3 failure curves and age. In addition, PG&E incorporated 2020 data
 4 into the risk model.

5 PG&E's risk models and accompanying source data are
 6 available upon request.

7 **c. Comparing RSEs from the 2020 RAMP Report to the 2023 GRC**

8 Table 3-5 below lists the mitigations that PG&E included in its 2020
 9 RAMP Report and that are included in the 2023 GRC. The table shows
 10 the RSE from the 2020 RAMP Report compared to the GRC RSE.
 11 PG&E describes reasons that RSEs for mitigations have changed
 12 significantly between the time they were calculated for the 2020 RAMP
 13 Report and for the GRC.

**TABLE 3-5
 FAILURE OF ELECTRIC DISTRIBUTION NETWORK ASSETS
 COMPARING MITIGATION RSEs IN THE 2020 RAMP AND 2023 GRC**

Line No.	Mitigation No.	Mitigation Name (2023 GRC)	2020 RAMP RSE ^(a)	2023 GRC RSE
1	DNTWK-M001	Network Component Replacements – Targeted Replacement of Oil-Filled Transformers in High-Rise Buildings	(b)	(b)
2	DNTWK-M002	Venting Manhole Cover Replacements	(b)	(b)
3	DNTWK-M003	Installation of SCADA Equipment for Safety Monitoring	(c)	(c)
4	DNTWK-M004	Incremental Primary Network Cable Replacements	0.07	0.08
5	DNTWK-M005	Network Component Replacements - Targeted Replacement of Dry-Type Transformers in High-Rise Buildings	<0.01	(d)
6	DNTWK-M006	Network Component Replacements - Targeted Replacement of CMD-Type Network Protectors	0.37	5.2

(a) See PG&E's 2020 RAMP Report, WP 3-1, lines 14-16.

(b) PG&E assumed in its 2020 RAMP Report that work in this program would be complete before 2023 and, therefore, did not calculate an RSE.

(c) PG&E considers this a foundational mitigation and did not calculate an RSE.

(d) PG&E calculated two RSEs for this mitigation: Network Component Replacements – High-Rise Dry-Type Transformers [Protector], RSE 5.6; and Network Component Replacements – High-Rise Dry-Type Transformers [Transformer], RSE 0.6. PG&E calculated separate RSEs in order to better understand the benefits of these specific asset replacement programs.

1 Some of the variability in RSE scores is due to changes in the
2 MAVF, RSE methodology and Enterprise Risk Model and in response to
3 SPD and party feedback on PG&E's 2020 RAMP Report.⁵⁹

4 Changes in the RSEs are due to changes in frequency modeling on
5 the additional tranches PG&E added to the 2023 Enterprise Risk Model
6 that are discussed above.

7 **4. Emergency Preparedness and Response**

8 **a. Cross-Cutting Factor Overview**

9 The EP&R cross-cutting factor examines the drivers and
10 consequences of inadequate planning or response to catastrophic
11 emergencies. Inadequate emergency planning or response could have
12 significant safety, reliability, and regulatory impacts. EP&R advances
13 PG&E's response to emergencies by improving governance,
14 strengthening coordination among LOBs, and improving collaboration
15 with external partners such as the Federal Emergency Management
16 Agency and the California Governor's Office of Emergency Services.

17 EP&R is a cross-cutting factor that is aligned to several risk events.
18 PG&E provides a mapping of cross-cutting factors to risk events in
19 Exhibit (GP&E-2), Chapter 1, Attachment B.

20 **b. Responding to Feedback on PG&E's 2020 RAMP Report**

21 Parties did not have any specific recommendations related to the
22 EP&R cross-cutting factor.

23 **1) Changes in Mitigations and Controls**

24 PG&E described its plans for managing the EP&R risk in its
25 2020 RAMP Report. PG&E has modified its portfolio of controls and
26 mitigations. In the 2020 RAMP Report, PG&E presented several
27 individual mitigations and controls. In the GRC, PG&E is presenting
28 a single mitigation that consists of many of the 2020 RAMP Report
29 mitigations and a single control that includes both 2020 RAMP
30 Report controls and new controls.

⁵⁹ Exhibit (PG&E-2), WP 1-12.

1 Starting in 2023, certain Wildfire controls transition to All Hazard
2 controls aligned to EP&R. PG&E considers that this work controls
3 several risks, not just Wildfire. For example, the WSOC
4 (Chapter 4.2, Section C.1.a) is a Wildfire mitigation through 2022
5 and then becomes an all hazards center aligned to EP&R starting in
6 2023, where it will be referred to as the Hazard Awareness and
7 Warning Center.

8 PG&E describes its EP&R mitigations and controls in Chapter 5
9 of this exhibit. A list of mitigations and controls is provided in
10 Tables 3A-7 and 3A-8.

11 **2) Updates to PG&E's 2020 RAMP Enterprise Risk Model**

12 For the 2023 GRC PG&E updated its 2020 RAMP Enterprise
13 Risk Model. Since filing the 2020 RAMP Report, PG&E updated its
14 2023 GRC Enterprise Risk Model for EP&R by refreshing the
15 mapping of the EP&R benefits to risk outcomes. PG&E made
16 updates to the risk events on the Corporate Risk Register and the
17 outcomes related to those risks. In response, EP&R refreshed its
18 analysis and remapped the EP&R program to those updated
19 outcomes. PG&E also incorporated 2020 data into the model.

20 PG&E's risk models and accompanying source data are
21 available upon request.

22 **c. Comparing RSEs from the 2020 RAMP Report to the 2023 GRC**

23 In the 2020 RAMP Report PG&E calculated two RSEs for EP&R:
24 one RSE for mitigations associated with Emergency Operations Center
25 Enhancements and a second RSE for mitigations associated with
26 Mutual Assistance. In this GRC, PG&E is forecasting one mitigation that
27 consists of several programs.⁶⁰ Table 3-6 below compares the RSEs
28 calculated in the 2020 RAMP Report to the GRC RSEs for those same
29 programs.

⁶⁰ See Exhibit (PG&E-4), Chapter 5, Table 5-3.

**TABLE 3-6
EMERGENCY PREPAREDNESS AND RESPONSE
COMPARING MITIGATION RSES IN THE 2020 RAMP AND 2023 GRC**

Line No.	Mitigation No.	Mitigation Name (2023 GRC)	2020 RAMP RSE ^(a)	2023 GRC RSE
1	EPNDR-M000	EP&R Mitigations – Emergency Operations Center Enhancements Program	440	360
2	EPNDR-M000	EP&R Mitigations – Mutual Aid Enhancements Program	14,918	21,219

(a) A.20-06-012, p. 20-AtchA-35, Tables 14 and 15.

1 **5. Other Electric Distribution Risk Mitigations and Controls**

2 **a. Mitigations**

3 In the 2020 RAMP Report, PG&E described the mitigations listed in
4 Table 3-7 below and associated them with the Failure of DOH Assets
5 risk. Both mitigations are presented in this chapter because they apply
6 to all distribution assets, not just the Failure of DOH Assets risk.

**TABLE 3-7
MITIGATIONS THAT APPLY TO ALL ELECTRIC DISTRIBUTION ASSETS**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	DOVHD-M005	Additional Asset Data Capture – Outage Information Reporting, Outage Cause, and Failure Analysis	<p>This mitigation consists of various efforts to improve PG&E's ability to capture information about the location and cause of outages, and about the reasons for equipment failures. It may include facilitating asset data capture on mobile devices in the field or automatically, efforts to improve PG&E's outage database, and changes in standards and procedures to expand the amount of asset failure information gathered by field personnel. These improvements will facilitate PG&E's move towards a more data-driven, risk-based asset management strategy. PG&E considers this to be a foundational activity because it supports other controls and mitigations rather than directly reducing risk. As a result, PG&E is not calculating a risk reduction score or an RSE for this mitigation.</p>	Foundational	Forecast included in Exhibit PG&E-4, Chapter 22 See WIP 3-26	AB#

**TABLE 3-7
MITIGATIONS THAT APPLY TO ALL ELECTRIC DISTRIBUTION ASSETS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
2	DOVHD-M009	Improved Distribution Risk Model	<p>PG&E continues development of an improved distribution risk model that when fully implemented will provide a more risk-based framework for decisions about asset inspection, maintenance, and replacement of all overhead electric distribution assets. Each asset will receive a risk score, in line with the Multi-Attribute Value Function Framework, that considers the probability of failure (based on asset health factors) and the resulting consequences (based on the function and location of the assets). PG&E believes this risk-based approach will address drivers of asset failure more effectively than the traditional, compliance-based approach. In 2020 PG&E implemented the Conductor Failure Risk Model and Vegetation Risk Model that focus on two of the largest drivers of distribution overhead risk specifically focused on ignition risk for wildfire. PG&E will be continually evolving this improved model through at least 2026. PG&E considers this to be a foundational activity because it supports other controls and mitigations rather than directly reducing risk. As a result, PG&E is not calculating a risk reduction score or an RSE for this mitigation.</p>	Foundational	Forecast included in Exhibit PG&E-4, Chapter 22 See WP 3-27	AB#

1 **b. Controls**

2 In the 2020 RAMP Report, PG&E presented two controls as part of
3 the Human Resources (HR) LOB. Since the 2020 RAMP Report, PG&E
4 has re-evaluated the controls and transferred the controls to Electric
5 Operations. EO and HR will partner to deliver both trainings, as
6 appropriate.

**TABLE 3-8
CONTROLS MANAGED BY HUMAN RESOURCES AND ELECTRIC OPERATIONS**

Line No.	Control Number	Control Name	Description	Risk Drivers Addressed	Additional Information
1	WLDFR-C016	Design Standards Training	This control relates to training on general standards that describe the proper application of equipment to ensure safe and reliable operation in high fire-threat areas.	Foundational	Forecast is included in Exhibit (PG&E-8), Chapter 5
2	WLDFR-C017	Operational Procedures Training	This control relates to training associated with work standards for high fire-threat areas.	Foundational	Forecast is included in Exhibit (PG&E-8), Chapter 5

7 Additionally, in the 2020 RAMP Report, PG&E presented three
8 controls associated with the Third-Party Safety Incident Risk⁶¹ that are
9 executed by EO. These controls have not changed.

- 10 • TPTSI-C011 Design Pole Locations is part of work completed in
11 pole design and estimating, tracked in Major Work Category (MWC)
12 07.
- 13 • TPTSI-C012 Visibility Strips on Electric Distribution Poles and Guy
14 Markers is part of routine inspections, tracked in MWC BF.⁶²
- 15 • TPTSI-C013 Anti-Climbing Guard Assemblies for Steel Towers is
16 part of PG&E's transmission portfolio and is not discussed here.

⁶¹ See Exhibit (PG&E-7), Ch. 1 for more information about this risk.

⁶² Costs for TPTSI-C011 and TPTSI-C012 are not tracked separately.

1 **c. Cost Tables**

2 Table 3-9 below shows the recorded and forecast costs for
3 mitigations. Tables showing the GRC costs compared to the costs
4 estimated in the 2020 RAMP Report are provided in workpapers.⁶³

⁶³ See Exhibit (PG&E-4), WP 3-20 to WP 3-24.

**TABLE 3-9
FAILURE OF ELECTRIC DISTRIBUTION OVERHEAD ASSETS
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 –EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020		2021 Forecast	2022 Forecast	2023 Forecast	Total	RSE
				Rec. Adj.						
1	DOVHD-M005	Additional Asset Data Capture	AB#	-	-	-	\$1,269	\$1,297	\$2,566	(a)
2	DOVHD-M009	Improved Distribution Risk Model	AB#	-	-	-	1,473	1,513	2,986	(a)
3		Total		-	-	-	\$2,742	\$2,810	\$5,552	

(a) PG&E considers this a foundational mitigation and, as such, does not calculate an RSE for it.

1 E. Non-RAMP Risks

2 1. Failure of Electric Distribution Underground Assets Risk

3 a. Risk Overview

4 Failure of Electric Distribution UG Assets was not a 2020 RAMP
5 risk.

6 The Failure of Electric Distribution UG Assets risk is defined as a
7 failure of distribution UG assets or lack of remote operation functionality
8 that may result in public or employee safety issues, property damage,
9 environmental damage or an inability for PG&E to deliver power to
10 its customers.

11 PG&E manages its UG distribution assets in its UG Asset
12 Management Program. PG&E's UG assets include over 26,000 circuit
13 miles of UG primary distribution cable. Most UG cable is installed in
14 urban and suburban areas.

15 The scope of this risk includes a failure of assets associated with the
16 UG electrical distribution system including primary and secondary UG
17 cables, line equipment, and subsurface and pad-mount transformers.

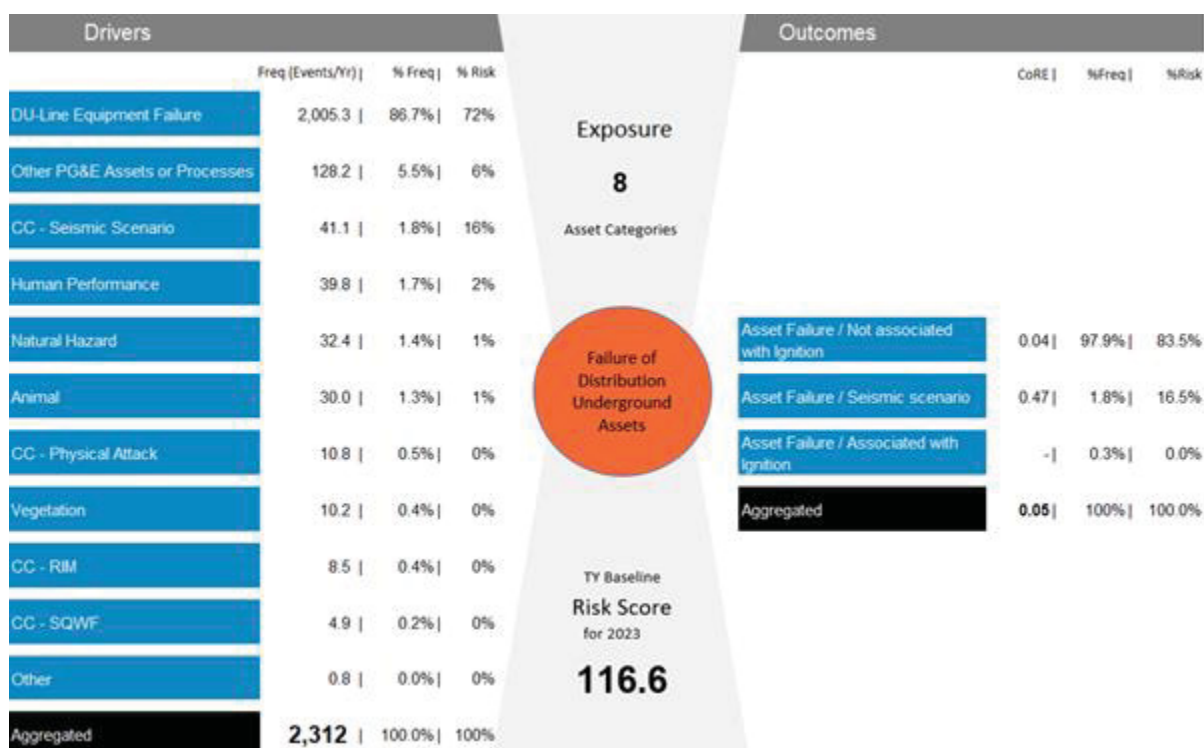
18 PG&E models its exposure to the Failure of Electric Distribution UG
19 Assets risk based on population density (high/low) and the following:
20 primary and secondary cable circuit length, transformers, and line
21 equipment – these categories equate to the eight asset categories
22 shown in the bow-tie illustration (Figure 3-6 below). The risk model
23 estimates approximately 2,312 outages, or risk events, each year. The
24 model includes eight tranches: primary and secondary cable length
25 (4 tranches); transformers (2 tranches); and, line equipment
26 (2 tranches). The cross-cutting factors that impact the Failure of Electric
27 Distribution UG risk are: Climate Change, Seismic, Information
28 Technology Asset Failure, Cyber Attack, Physical Attack, Skilled &
29 Qualified Workforce, Records and Information Management, and
30 Emergency Preparedness & Response.⁶⁴

⁶⁴ Exhibit (PG&E-2), Ch. 1, Attachment B.

1 The risk drivers include: Distribution UG Line Equipment Failure;
2 Seismic Scenario; Other PG&E Assets or Processes; Human
3 Performance; Animal; Natural Hazard; Physical Attack; Records and
4 Information Management; Skilled and Qualified Workforce; Vegetation
5 and Other.

6 The 2023 TY baseline risk score for Failure of Electric Distribution
7 UG Assets is 117 and the 2026 post mitigation risk score is 115.

**FIGURE 3-6
FAILURE OF ELECTRIC UNDERGROUND ASSETS
BOW-TIE ILLUSTRATION**



8 PG&E’s risk models and accompanying source data are available
9 upon request.

b. Risk Management – Mitigations and Controls

11 In this GRC, PG&E is proposing no mitigations and eight controls to
12 manage this risk.⁶⁵ PG&E describes these mitigations and controls in
13 the following chapters. A list of the controls is provided in Table 3A-11.

⁶⁵ See Exhibit (PG&E-4), WP 3-16 (DUNGD controls, expense); and, WP 3-17 (DUNGD controls, capital).

1 Controls

- 2 • Chapter 10 – Overhead and Underground Electric Distribution
3 Inspections
4 • Chapter 11 – Overhead and Underground Electric Distribution
5 Maintenance
6 • Chapter 13 – Overhead and Underground Asset Management

7 **c. S-MAP Settlement Agreement, Step 3 Supplemental Analysis**

8 PG&E has calculated RSEs for its mitigations for both RAMP and
9 non-RAMP risks (excluding foundational mitigations). PG&E has also
10 calculated RSEs for its controls for RAMP risks. To determine whether
11 to calculate an RSE for non-RAMP risk controls, PG&E performed the
12 “Step-3 Supplemental Analysis” (Step-3 Analysis) from the S-MAP
13 Settlement Agreement.⁶⁶

14 The Step-3 Analysis requires PG&E to calculate an RSE for any
15 control: (1) that was not part of the 2020 RAMP Report; (2) that is for a
16 program that PG&E justifies primarily on the basis of reducing a safety
17 or reliability risk; and (3) that is for a program is associated with the
18 Electric Distribution or Gas Distribution, Transmission or Storage
19 Facilities.⁶⁷

20 The Failure of Electric Distribution UG Assets risk is subject to the
21 Step-3 Analysis. Based on the outcome of the analysis, PG&E is
22 required to provide RSEs for the following control programs:

- 23 • DUNGD-C001: Underground Patrols and Inspections
24 • DUNGD-C002: Underground Notifications
25 • DUNGD-C003: Underground General Replacements
26 • DUNGD-C06A: Primary Cable Replacement Program
27 • DUNGD-C007: LBOR Switch Replacement

⁶⁶ D.18-12-014.

⁶⁷ D.18-12-014, Appendix A, Row 28(1), p. A-14 to p. A-15.

1 The results of the Step-3 analysis, the recorded and forecast costs
2 for control programs and the RSEs for control programs are included in
3 workpapers.⁶⁸

4 **2. Failure of Electric Distribution Substation Assets Risk**

5 **a. Risk Overview**

6 The Failure of Electric Distribution Substation Assets was not a
7 2020 RAMP risk.

8 Failure of Electric Distribution Substation Assets is defined as the
9 failure of distribution substation assets or lack of remote operation
10 functionality that may result in public or employee safety issues,
11 property damage, environmental damage, or inability to deliver energy.

12 PG&E has 758 distribution substations, consisting of power
13 transformers, circuit breakers, switchgears, protective relays, bus
14 structures, voltage regulation equipment, disconnect switches, motor
15 operated air switches, station batteries, battery energy storage systems,
16 reactive equipment, and grounding systems. Each substation
17 transforms high voltage electricity from PG&E's electric transmission
18 system to lower voltage for delivery to PG&E's customers. Exposure to
19 this risk is based on 21 total unique combinations in the categories of
20 HFTD, criticality, and asset type. The 2023 GRC Enterprise risk model
21 estimates approximately 66 substation outages each year. The
22 substation model includes 21 tranches divided among asset types,
23 HFTD, and criticality. The cross-cutting factors that impact the Failure of
24 Electric Distribution Substation Assets risk are: Climate Change, Cyber
25 Attack, EP&R, Physical Attack, Records and Information Management,
26 Seismic, and Skilled and Qualified Workforce.⁶⁹

27 The drivers of the Failure of Electric Distribution Substation risk are:
28 Substation Equipment Failure; Animal; Human Performance; Other;
29 Natural Hazard; Physical Attack; Skilled and Qualified Workforce;

⁶⁸ Exhibit (PG&E-4), WP 3-16 and 3-17 (recorded and forecast costs and RSEs for control programs); and, WP 3-26 (Step-3 Analysis).

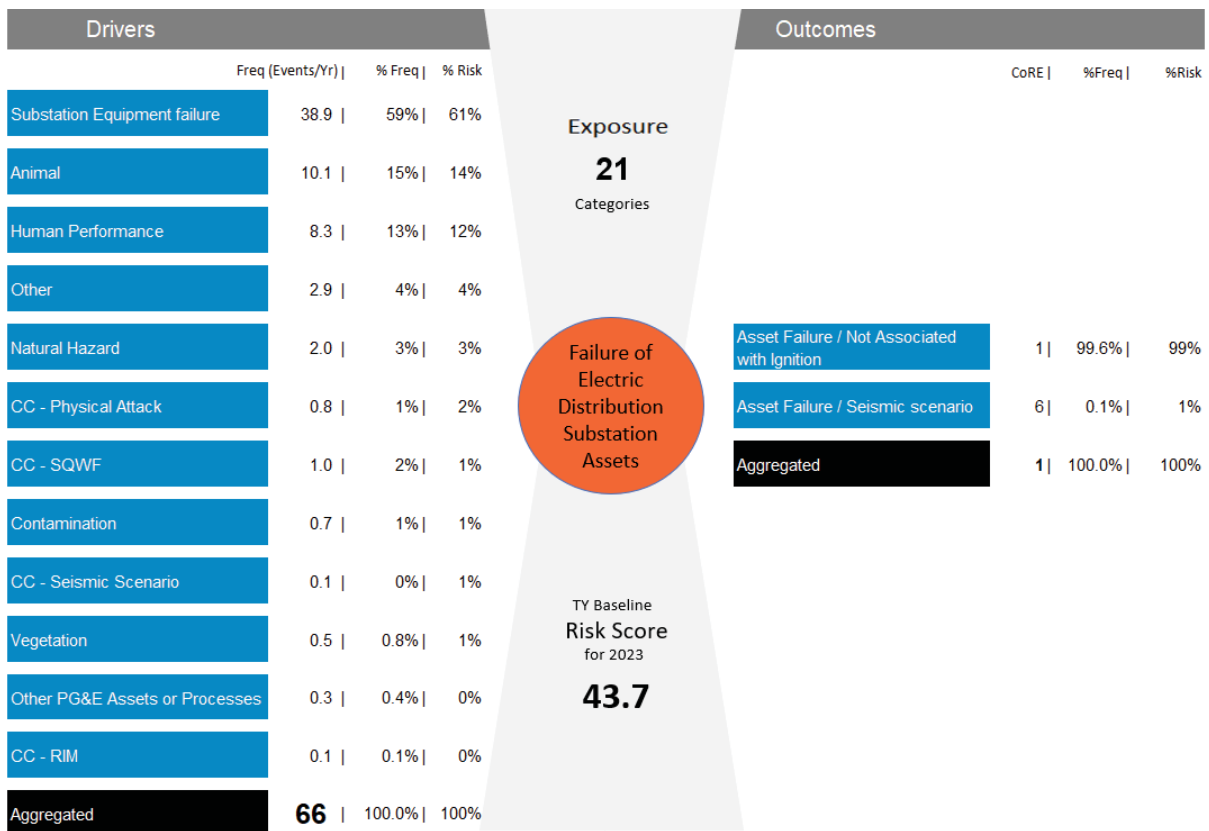
⁶⁹ Exhibit (PG&E-2), Ch. 1, Attachment B.

1 Contamination; Seismic Scenario; Vegetation; and Other PG&E Assets
2 or Processes.

3 Through the risk assessment process, one gap that PG&E identified
4 in its risk modeling was that historical data does not fully articulate the
5 level of risk based on condition and age of the existing infrastructure.
6 PG&E will continue to look for opportunities to reflect the impacts of an
7 aging infrastructure in future risk model iterations.

8 The 2023 TY baseline risk score for Failure of Electric Distribution
9 Substation Assets is 44 and the 2026 post mitigation risk score is 39.

**FIGURE 3-7
FAILURE OF ELECTRIC DISTRIBUTION SUBSTATION ASSETS
BOW-TIE ILLUSTRATION**



10 PG&E’s risk models and accompanying source data are available
11 upon request.

1 **b. Risk Management – Mitigations and Controls**

2 While PG&E did not receive feedback from parties specifically on its
3 Failure of Electric Distribution Substation Assets risk as part of the 2020
4 RAMP process, PG&E integrated some feedback received more broadly
5 into this risk model. In response to feedback recommending more
6 granular tranches in risk models, PG&E added an asset type tranche
7 into the Distribution Substation risk model to capture the unique risk
8 profiles of the various asset types within the risk. In addition, PG&E
9 divided its substation risk model into two separate substation risk
10 models – one for the Failure of Electric Transmission Substation Assets
11 and one for the Failure of Electric Distribution Substation Assets –
12 because the drivers, controls, mitigations, and consequences of these
13 two risks are distinct.

14 In this GRC PG&E is proposing several mitigations and controls to
15 manage this risk as shown in Attachment A, Tables 3A-9 and 3A-10.
16 PG&E describes these mitigations and controls in Chapter 15 –
17 Substation Asset Management and Maintenance.

18 **c. S-MAP Settlement Agreement, Step 3 Supplemental Analysis**

19 The Failure of Electric Distribution Substation Assets risk is subject
20 to the Step-3 Analysis. Based on the outcome of the analysis, PG&E is
21 required to provide RSEs for the following control programs:

- 22 • SBSTN-C003: Patrols and Inspections – Substation
- 23 • SBSTN-C16D: Substation Proactive Asset Replacement – Circuit
24 Breakers
- 25 • SBSTN-C16F: Substation Proactive Asset Replacement –
26 Switchgear
- 27 • SBSTN-C16K: Substation Proactive Asset Replacement –
28 Transformer
- 29 • SBSTN-C017: Substation Proactive Maintenance

30 The results of the Step-3 analysis are included in workpapers along
31 with the RSEs for these control programs.⁷⁰

⁷⁰ Exhibit (PG&E-4), WP 3-13 to 3-15 (recorded and forecast costs and RSEs for mitigations and controls); and, WP 3-25 (Step-3 Analysis).

1 **F. Additional Information Supporting PG&E's Electric Operations Risk**
2 **Testimony**

3 The workpapers associated with this chapter include the Electric Operations
4 Risk Placemat.⁷¹ The placemat is divided into mitigations and controls and
5 shows where the costs for all the mitigations and controls PG&E is forecasting in
6 this GRC is included in PG&E's testimony.

7 The forecast amounts shown on the placemat are the 2023 – 2026 costs
8 used to calculate the RSE values. Additional workpapers in this chapter are
9 provided that include the forecasts for each risk mitigation and control from
10 2020-2026.⁷² While the recorded and forecast costs are provided in the Chapter
11 3 workpapers for completeness, the forecast chapter witnesses are responsible
12 for those recorded and forecast costs.

13 PG&E's 2020 RAMP Report included estimated costs to implement the
14 mitigations and one pilot control (Enhanced Inspections addressing the Failure
15 of Electric Distribution Overhead Assets risk). Workpapers associated with this
16 chapter compare the estimated costs from the 2020 RAMP Report for
17 mitigations and the pilot control to the forecast costs for the mitigations and pilot
18 control included in this GRC.⁷³

⁷¹ Exhibit (PG&E-4), WP 3-1.

⁷² Exhibit (PG&E-4), WP 3-2 to WP 3-19.

⁷³ Exhibit (PG&E-4), WP 3-20 to WP 3-24.

1 **Attachment A: Electric Operations Mitigations and Controls**

2 The tables below list the mitigations and controls PG&E is forecasting in this
3 GRC for each of the Electric Operations risk events and the cross-cutting factor.
4 For the RAMP risks the tables also include the associated RAMP mitigation or
5 control.

**TABLE 3A-1
WILDFIRE MITIGATIONS**

Line No.	RAMP RISK ID	RAMP Mitigation Name	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	M1	Enhanced Vegetation Management	WLDLFR-M001	Enhanced Vegetation Management	9		IGJ
2	M2	System Hardening	WLDLFR-M002	System Hardening ^(a)	4.3	08W	
3	M3	Non-Exempt Surge Arrester Replacement	WLDLFR-M003	Non-Exempt Surge Arrester Replacement	11	2AR	
4	M4	Expulsion Fuse Replacement	WLDLFR-M004	Expulsion Fuse Replacement	4.3	2AP	
5	M5	PSPS	WLDLFR-M005	Public Safety Power Shutoff – PSPS Event Distribution	4.2		AB6
6	M6	PSPS Impact Reduction Initiatives	WLDLFR-M006	EP&R Field Operations	4.2		AB6
7			WLDLFR-M006	EP&R Field Ops Tech Expense	4.2		AB6
8			WLDLFR-M006	GRC Preparedness	4.2	21A	AB6
9			WLDLFR-M006	PSPS - EP&R Field Ops Tech Expense	4.2		AB6
10			WLDLFR-M006	PSPS Collateral/Segment Creations Exp	4.2		AB6
11			WLDLFR-M006	PSPS EP&R Field Ops Misc.	4.2		AB6
12			WLDLFR-M006	PSPS Field Exercise Dist. Exp	4.2		AB6
13			WLDLFR-M006	PSPS Increased Helicopter EU (Dist)	4.2		AB6
14			WLDLFR-M006	PSPS PMO	4.2		AB6
15			WLDLFR-M006	PSPS PMO Projects	4.2		AB6
16			WLDLFR-M006	PSPS Pre-flights Expense	4.2		AB6
17			WLDLFR-M006	Wildfire Public Engagement Team	4.2		AB6
18			WLDLFR-M006	PSPS Field Ops Tech Capital	4.2	21A	
19			WLDLFR-M006	EP&R Field Operations (Includes Tech, Training, and Other Misc)	4.2		AB6
20			WLDLFR-M006	PSPS Reduction Initiatives - Sectionalizer Device Install/Replace	4.3	49H	
21			WLDLFR-M006	PSPS Reduction Initiatives - Temporary Distribution Microgrids	4.3	49M	

**TABLE 3A-1
WILDFIRE MITIGATIONS
(CONTINUED)**

Line No.	RAMP RISK ID	RAMP Mitigation Name	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
22			WLDFR-M006	Generation Enablement and Deployment PMO	4.3		AB#, IG#
23	M7	SA&FI	WLDFR-M07A	SA&FI – Line Sensors	4.3	49I	FZA, HG#
24			WLDFR-M07B	SA&FI – Weather Station	4.1	21A	AB6
25			WLDFR-M07C	SA&FI – WSOC	4.1	21A	AB6
26			WLDFR-M07D	SA&FI – Cameras	4.1		AB6
27			WLDFR-M07E	SA&FI – Satellite Fire Detection	4.1		AB6
28			WLDFR-M07F	SA&FI – Sensor IQ	4.3	21A	AB#
29			WLDFR-M07G	SA&FI – Partial Voltage Detection	4.1	21A	AB6
30			WLDFR-M07H	SA&FI – Storm Outage Prediction Project (SOPP) Improvements	4.1		AB6
31			WLDFR-M07I	SA&FI – Advance Fire Modeling	4.1	21A	AB6
32			WLDFR-M07J	SA&FI – Meteorology	4.1	21A	AB6
33			WLDFR-M07K	SA&FI – Fire Potential Index	4.1		AB6
34	M8	SIPT	WLDFR-M008	SIPT	4.2	21A	AB6
35	M9	CWSP PMO	WLDFR-M009	Community Wildfire Safety Program Project Management Office	4.4	21#	AB#
36	M10	Additional System Automation and Protection	WLDFR-M10A	Additional System Automation and Protection	4.3	49A	
37			WLDFR-M10B	Additional System Automation and Protection – FuseSaver	4.3	49T	

**TABLE 3A-1
WILDFIRE MITIGATIONS
(CONTINUED)**

Line No.	RAMP RISK ID	RAMP Mitigation Name	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
38			WLDLFR-M10C	Additional System Automation and Protection - REFCL	4.3	49R	
39			WLDLFR-M011	Situational Awareness – Early Fault Detection (EFD)	4.3	49I	
40			WLDLFR-M012	Situational Awareness – Distribution Fault Anticipation (DFA)	4.3	49I	
41			WLDLFR-M013	Pole Programs – Replace Tree Attachments	12	07C	
42			WLDLFR-M014	Butte County Rebuild	23	95F	
43	M11	Remote Grid (2020-2022)	WLDLFR-M017	Alternative Mitigation – Remote Grid	4.3	08W	KAT, AB#

(a) System Hardening 08W includes: System Hardening – Overhead, System Hardening Underground, and System Hardening – Butte County Rebuild.

**TABLE 3A-2
WILDFIRE CONTROLS**

Line No.	RAMP RISK ID	RAMP Control Name	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	C1	Patrols and Inspections – Distribution Overhead	WLDFR-C001	Patrols – Distribution Overhead	10		BFA
2			WLDFR-C01A	Inspections – Distribution Overhead	10		BFB
3			WLDFR-C01B	Infrared Inspections – Distribution Overhead	10		BFC
4			WLDFR-C01E	Inspections	10		BFH
5	C2	Patrols and Inspections – Transmission Overhead					
6	C3	Patrols and Inspections - Substations	WLDFR-C003	Proactive Maintenance	15		GCD
7	C4	Vegetation Management – Distribution Overhead	WLDFR-C004	Vegetation Management – Distribution Overhead	9		HNN#, HNA
8	C5	Vegetation Management – Transmission Overhead					
9	C6	Vegetation Management – Substation	WLDFR-C006	Vegetation Management – Substation	15		GCG
10	C7	Vegetation Management – Catastrophic Event Memorandum Account (CEMA)	WLDFR-C007	Vegetation Management – CEMA/Tree Mortality	9		IGI
11	C8	Equipment Maintenance and Replacement – Distribution Overhead	WLDFR-C008	Equipment Maintenance and Replacement – Distribution Overhead	11	2AA, 2AF	KAA, KAF, KAQ
12	C9	Equipment Maintenance and Replacement – Transmission Overhead					

**TABLE 3A-2
WILDFIRE CONTROLS
(CONTINUED)**

Line No.	RAMP RISK ID	RAMP Control Name	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
13	C10	Equipment Maintenance and Replacement – Substation					
14			WLDFR-C10A	Substation Proactive Asset Replacement – Ground Grid	15	48A	
15			WLDFR-C10C	Substation Proactive Asset Replacement - Batteries	15	48C	
16			WLDFR-C10D	Substation Proactive Asset Replacement – Circuit Breakers	15	48D	
17			WLDFR-C10E	Substation Proactive Asset Replacement – Switches	15	48E	
18			WLDFR-C10F	Substation Proactive Asset Replacement – Switchgear	15	48F	
19			WLDFR-C10H	Substation Proactive Asset Replacement – Line Support Work	15	48L	
20			WLDFR-C10I	Substation Proactive Asset Replacement – Insulators	15	48N	
21			WLDFR-C10K	Substation Proactive Asset Replacement – Transformer	15	54A	
22			WLDFR-C10M	Substation Security Enhancements	15	54S	
23							
24	C11	Animal Abatement	WLDFR-C011	Animal Abatement	11	2AB, 2AC	KAC, KAD
25	C12	Pole Programs					
26			WLDFR-C12A	Wood Pole Inspection Program	12		GAA
27			WLDFR-C12B	Pole Analyze Loading	12		GAC
28			WLDFR-C12C	Pole Replacement	12	07D	
29			WLDFR-C12D	Overloaded Pole Replacement	12	07O	

**TABLE 3A-2
WILDFIRE CONTROLS
(CONTINUED)**

Line No.	RAMP RISK ID	RAMP Control Name	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
30			WLDFR-C12E	Pole Programs – Pole Reinforcements	12		GAD
31							
32	C13	Transmission Structure Maintenance and Replacement					
33	C14	System Automation and Protection					
34	C15	Reclose Blocking					
35	C16	Design Standards	WLDFR-C016	Design Standards Training	3		Tracked in HR
36	C17	Restoration, Operational Procedures, and Training	WLDFR-C017	Operational Procedures Training	3		Tracked in HR
37			WLDFR-C018	Fire Protection/Suppression Systems	15	58A	

**TABLE 3A-3
FAILURE OF ELECTRIC DISTRIBUTION OVERHEAD ASSETS
MITIGATIONS**

Line No.	RAMP RISK ID	RAMP Mitigation Name	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	M1	Enhanced Vegetation Management	DOVHD-M001	Enhanced Vegetation Management	9		IGJ
2	M2	System Hardening	DOVHD-M002	System Hardening	4.3	08W	
3	M3	Non-Exempt Surge Arrester Replacement	DOVHD-M003	Non-Exempt Surge Arrester Replacement	11	2AR	
4	M4	Expulsion Fuse Replacement	DOVHD-M004	Expulsion Fuse Replacement	4.3	2AP	
5	M5	Additional Asset Data Capture – Outage Information Reporting, Outage Cause, and Failure Analysis	DOVHD-M005	Additional Asset Data Captures	3		AB#
6	M6	Grasshopper/KPF Switch Replacement	DOVHD-M006	Grasshopper and KPF Switch Replacement	13	08S	
7	M7	Regulated Output Streetlight Replacement	DOVHD-M007	Regulated Output Streetlight Replacement	11	2AG	
8	M8	Ceramic Post Insulator Replacement	DOVHD-M008	Ceramic Post Insulator Replacement	11	2AQ	
9	M9	Improved Distribution Risk Model	DOVHD-M009	Improved Distribution Risk Model	3		AB#
10	M10	3A and 4C Line Recloser Controller Replacement	DOVHD-M010	3A and 4C Line Recloser Replacement	4.3, 13	49A, 49B	
11	M11	Remote Grid	DOVHD-M011	Remote Grid	4.3		AB#, KAT

**TABLE 3A-4
FAILURE OF ELECTRIC DISTRIBUTION OVERHEAD ASSETS
CONTROLS**

Line No.	RAMP RISK ID	RAMP Control Name	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	C1	Vegetation Management	DOVHD-C001	Vegetation Management	9		HN#, HNA
2	C2	CEMA Vegetation Management	DOVHD-C002	Vegetation Management – CEMA/Tree Mortality	9		IGI
3	C3	Overhead Electric Distribution Preventive Maintenance	DOVHD-C003	Equipment Maintenance and Replacement – Distribution Overhead	11, 13	2AA, 2AB, 2AE, 2AF, 2AH, 2AI, 2AS, 49C	KAA, KAC, KAH, KAM, KAO, KAP, KAS
4	C4	Overhead Conductor Replacement	DOVHD-C004	Overhead Conductor Replacement	13	08J	
5	C5	Overhead Patrols and Inspections	DOVHD-C005	Inspections – Distribution Overhead	10		BFB, BFH
6	C6	Overhead Infrared Inspections	DOVHD-C006	Infrared Inspections – Distribution Overhead	10		BFC
7	C7	Supervisor Control and Data Acquisition	DOVHD-C007	Supervisory Control and Data Acquisition	16	09B, 09D, 09E, 09F	HX#, HXA
8	C8	Annual Protection Reviews	DOVHD-C008	Annual Protection Reviews	17		FZA
9	C9	Electric Distribution Line and Equipment Capacity					
10			DOVHD-C09A	Overloaded Transformers Replacement	17	06B	
11	C10	Design Standards					
12	C11	Pole Programs	DOVHD-C011	Pole Programs	11, 12	07D, 07O	GAA, GAD, GAF, GAH, KAC
13	C12	Targeted Circuits Program	DOVHD-C012	Targeted Reliability Programs	13	49X	
14			DOVHD-C013	Patrols – Distribution Overhead	10		BFA
15			DOVHD-C014	Additional Automation and System Protection – Fusesavers	13	49T	

**TABLE 3A-5
FAILURE OF ELECTRIC DISTRIBUTION NETWORK ASSETS
MITIGATIONS**

Line No.	RAMP RISK ID	RAMP Mitigation Name	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	M1	Network Component Replacements – Targeted Replacement of Oil Filled Transformers in High-Rise Buildings	DNTWK-M001	Network Component Replacements - Targeted Replacement of Oil Filled Transformers in High-Rise Buildings	14	2CC	
2	M2	Venting Manhole Cover Replacements	DNTWK-M002	Venting Manhole Cover Replacements	14	2CD	
3	M3	Installation of SCADA Equipment for Safety Monitoring	DNTWK-M003	Installation of SCADA Equipment for Safety Monitoring	14	2CE	
4	M4	Incremental Primary Network Cable Replacements	DNTWK-M004	Incremental Primary Network Cable Replacements	14	56N	
5	M5	Network Component Replacements - Targeted Replacement of Dry-Type Transformers in High-Rise Buildings	DNTWK-M005	Network Component Replacements - High-Rise Dry-Type Transformers	14	2CC	
6	M6	Network Component Replacements – Targeted Replacement of CMD-Type Network Protectors	DNTWK-M006	Network Component Replacements - Targeted Network Protector Replacement	14	2CC	

**TABLE 3A-6
FAILURE OF ELECTRIC DISTRIBUTION NETWORK ASSETS
CONTROLS**

Line No.	RAMP RISK ID	RAMP Control Name	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	C1	Network Cable Replacement and Switch Installations	DNTWK-C001	Network Cable Replacement	14	56N	
2	C2	Network Maintenance and Corrective Work	DNTWK-C002	Network Component (Transformer, Protector) Replacements - Condition Based	14		KCA, KCB, KCC, KCD, KCE, KCF
3	C3	Network Component (Transformer, Protector) Replacements Condition Based	DNTWK-C003	Maintenance and Corrective Work	14	2CA, 2CC	
4	C4	Asset Information Improvements/Asset Data Comparison and Updates	N/A				
5	C5	Network Health Report (Units Offline)	N/A				
6	C6	Standards, Processes, and Training	N/A				

**TABLE 3A-7
EMERGENCY PREPAREDNESS AND RESPONSE
MITIGATIONS**

Line No.	RAMP RISK ID	RAMP Mitigation Name	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1			EPNDR-M000	EP&R Mitigations	5	21A	AB6
2	M1	Base Camp Project (a)					
3	M2	Check In/Check Out with Salesforce ^(a)					
4	M3	Secondary Emergency Roles, Enterprise-Wide ^(a)					
5	M4	Mutual Assistance Tools and Equipment					
6	M5	Mutual Assistance Improvement ^(a)					
7	M6	New Incident Specific Annexes					
8	M7	EOC/ICS Training Program Enhancements					
9	M8	Early Earthquake Warning Enhancements					

(a) In the GRC PG&E consolidated certain individual mitigations from RAMP into a single mitigation (EPNDR-M000).

**TABLE 3A-8
EMERGENCY PREPAREDNESS AND RESPONSE
CONTROLS**

Line No.	RAMP RISK ID	RAMP Control Name	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1			EPNDR-C000	EP&R Controls	5		AB6
2	C1	Company Emergency Operations Plans and Standards for Response ^(a)					
3	C2	Emergency Response Technology ^(a)					
4	C3	EOC/Incident Command System Training Program ^(a)					
5	C4	EOC Response ^(a)					
6	C5	EOC Exercises ^(a)					
7	C6	Weekly Situational Awareness Calls and Enhancements					
8	C7	Early Earthquake Warning ^(a)					
9	C8	Debris Flow Modeling ^(a)					
10	C9	Gas Systems Operations Temperature Forecasting					
11	C10	Power Generation Hydro Management Forecasting					
12	C11	Short-Term Electric Supply Forecasting					
13	C12	Diablo Canyon Power Plant Emergency Response Organization Support					

**TABLE 3A-8
EMERGENCY PREPAREDNESS AND RESPONSE
CONTROLS
(CONTINUED)**

Line No.	RAMP RISK ID	RAMP Control Name	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
14			EPNDR-C001	Situational Awareness and Forecasting Initiatives – SOPP Improvements	5		AB6
15			EPNDR-C002	Situational Awareness and Forecasting Initiatives – WSOC	5	21A	AB6
16			EPNDR-C003	EP&R Field Operations Misc.	5		(b)
17			EPNDR-C004	EP&R Field Operations Technology	5	21A	
18			EPNDR-C005	EP&R Field Operations (Includes Tech, Training and Other Misc.)	5		AB6
19			EPNDR-C006	EP&R Field Operations (Support Headcount)	5		AB6
<p>(a) In the GRC PG&E consolidated certain individual controls from RAMP into a single control (EPNDR-C000).</p> <p>(b) Costs for this work are not separately tracked.</p>							

**TABLE 3A-9
FAILURE OF ELECTRIC DISTRIBUTION SUBSTATION ASSETS
MITIGATIONS**

Line No.	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	SBSTN-M001	Transformer Life Extension	15	54L	
2	SBSTN-M002	Increase Capitalized Emergency Material (CEM) Stock for Transformers, Emergency Mobile Transformers.	15	54A	
3	SBSTN-M006	Minimize Wood in Substations	15	48H	

**TABLE 3A-10
FAILURE OF ELECTRIC DISTRIBUTION SUBSTATION ASSETS
CONTROLS**

Line No.	GRC RISK ID	GRC Control Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	SBSTN-C001	Substation Security Enhancements	15	58S	
2	SBSTN-C002	Animal Abatement Substation	15	48X	
3	SBSTN-C005	Civil Structures Replacement	15	48H	
4	SBSTN-C007	Substation Seismic Retrofit	15	58B	
5	SBSTN-C008	Design Criteria	15		GC1
6	SBSTN-C009	Fire Protection/Suppression Systems	15	58A	
7	SBSTN-C16A	Substation Proactive Asset Replacement - Ground Grid	15	48A	
8	SBSTN-C16C	Substation Proactive Asset Replacement - Batteries	15	48C	
9	SBSTN-C16D	Substation Proactive Asset Replacement - Circuit Breakers	15	48D	
10	SBSTN-C16E	Substation Proactive Asset Replacement - Switches	15	48E	
11	SBSTN-C16F	Substation Proactive Asset Replacement - Switchgear	15	48F	
12	SBSTN-C16G	Substation Proactive Asset Replacement - Line Support Work	15	48L	
13	SBSTN-C16H	Substation Proactive Asset Replacement - Insulators	15	48N	
14	SBSTN-C16J	Substation Proactive Asset Replacement - Transformer	15	54A	
15	SBSTN-C017	Substation Proactive Maintenance	15		GC1, GCA, GCB, GCC, GCD, GCE, GCF, GCH, GCI, GCM, GCO, GCS, GCV, GCW
16	SBSTN-C021	Vegetation Management	15		GCG

**TABLE 3A-11
FAILURE OF ELECTRIC DISTRIBUTION UNDERGROUND ASSETS
CONTROLS**

Line No.	GRC RISK ID	GRC Mitigation Name	GRC Chapter	GRC Capital MAT	GRC Expense MAT
1	DUNGD-C001	Patrols	10		BF3, BF4, BFD, BFE
2	DUNGD-C002	UG Notifications	11		KBA
3	DUNGD-C003	Equipment Maintenance and Replacement	11, 13	2BA, 2BB, 2BD, 56C	KBC, KBD, KBE
4	DUNGD-C004	Planned Major Projects	11	2BP	KBP
5	DUNGD-C005	UG Idle Facility Removal	11	2BF	
6	DUNGD-C06A	Primary Cable Replacement Program	13	56A	
7	DUNGD-C06B	Primary Cable Rejuvenation Program	13	56B	
8	DUNGD-C007	Load Break Oil Rotary Switch Replacement	13	56S	
9	DUNGD-C008	UG Transformers Temperature Sensor	13	56T	

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4
WILDFIRE RISK MITIGATIONS

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4
WILDFIRE RISK MITIGATIONS

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CHAPTER 4
WILDFIRE RISK MITIGATIONS

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4 **A. Introduction**

5 **1. Scope and Purpose**

6 This chapter introduces Pacific Gas and Electric Company's (PG&E or
7 the Company) wildfire risk mitigation activities and provides an overview of
8 the expenditure forecasts for this work discussed in subsequent chapters.
9 PG&E's wildfire risk mitigation activities are managed by our Community
10 Wildfire Safety Program (CWSP). The purpose of the CWSP is to reduce
11 the risk of catastrophic wildfires from electric utility infrastructure in PG&E's
12 service territory through a number of programs and activities that have been
13 presented and explained in PG&E's Wildfire Mitigation Plan (WMP).¹ The
14 WMP is filed or updated annually with the CPUC's Wildfire Safety Division
15 and comprehensively addresses PG&E's activities to reduce wildfire risk.
16 As outlined in the WMP, some of PG&E's key wildfire risk reduction activities
17 include hardening of our electric system, vegetation management, Public
18 Safety Power Shutoffs (PSPS), situational awareness and emergency
19 response, community engagement, and enhanced safety measures. All
20 these activities are directed and supported by PG&E's robust wildfire risk
21 modeling to identify where wildfire risk is highest and inform our programs in
22 reducing wildfire risk. PG&E's WMP and CWSP continue to improve and
23 evolve in response to new information, lessons learned, and evolving
24 conditions and policies, including those of the California Public Utilities
25 Commission (CPUC or Commission). The costs associated with our wildfire
26 risk mitigation activities are primarily recorded to the Wildfire Mitigation
27 Balancing Account (WMBA). Certain incremental wildfire costs not included
28 in PG&E's revenue requirement for the WMBA authorized in the 2020 GRC
29 decision are recorded to the Fire Risk Mitigation Memorandum Account
30 (FRMMA) or the Wildfire Mitigation Plan Memorandum Account (WMPMA).

1 PG&E's 2021 Wildfire Mitigation Plan – Revised Report, Rulemaking (R.)18-10-007
(June 3, 2021) (Revised 2021 WMP), available at:
<www.pge.com/wildfiremitigationplan> (as of June 21, 2021).

1 This chapter introduces PG&E's wildfire mitigation efforts, particularly,
2 for:

- 3 • Situational Awareness and Forecasting (Chapter 4.1);
- 4 • PSPS Operations (Chapter 4.2);
- 5 • System Hardening, Enhanced Automation, and PSPS Impact
6 Mitigations (Chapter 4.3);
- 7 • CWSP Program Management Office (PMO) (Chapter 4.4); and
- 8 • Information Technology for Wildfire Mitigations (Chapter 4.5).

9 Additional wildfire mitigations are discussed in Chapters 9, 11, 12, and
10 23 of this exhibit. PG&E is presenting the mitigations in this chapter
11 because they make up the bulk of what was approved in the 2020 GRC for
12 inclusion in the WMBA.² The alignment of this chapter with other chapters
13 is further discussed in Section A.5.

14 **2. Summary of Request**

15 PG&E's 2023 expense forecast for wildfire mitigation activities in
16 Chapters 4.1 through 4.5 is \$219.4 million, which is \$24.8 million less than
17 2020 recorded amounts.³

18 PG&E's capital forecasts for wildfire mitigation activities in Chapters 4.1
19 through 4.5 are: \$557.8 million for 2021, \$1,058.4 million for 2022,
20 \$1,020.2 million for 2023, \$979.9 million for 2024, \$967.0 million for 2025,
21 and \$923.1 million for 2026.⁴ PG&E's 2023 forecast is \$399.1 million more
22 than 2020 recorded amounts.

23 PG&E proposes to continue the WMBA with minor modifications to
24 adjust the reasonableness review threshold. As described in Section D.1
25 below, the variability associated with PG&E's wildfire workstreams, which
26 are continuously evolving to address the growing and changing wildfire risk
27 in our service territory, continues to support the need for a two-way
28 balancing account.

29 PG&E also requests authorization to recover 2020 costs recorded in the
30 FRMMA and WMPMA, as described in Section D.2.

2 See Exhibit (PG&E-4), WP 4-34 and 4-35

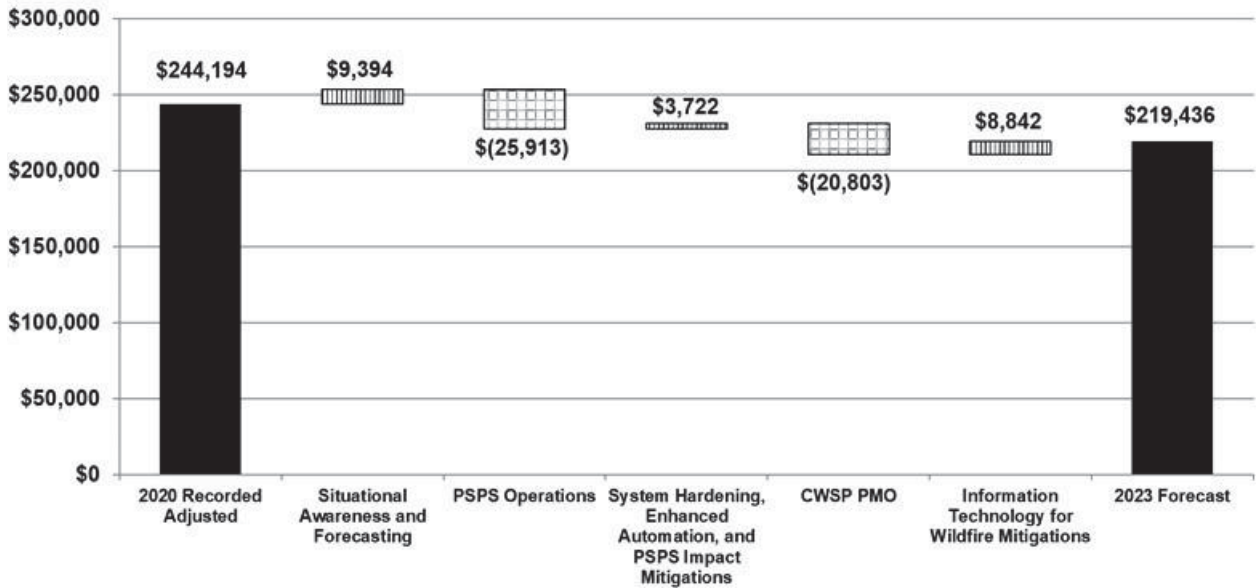
3 See Exhibit (PG&E-4), WP 4-1, line 12.

4 See Exhibit (PG&E-4), WP 4-11, line 10.

1 **3. Overview of Recorded and Forecast Costs**

2 Figure 4-1 shows the walk from 2020 recorded wildfire mitigation
3 expense costs to the 2023 expense forecast.⁵

**FIGURE 4-1
EXPENSE WALK 2020-2023
(THOUSANDS OF NOMINAL DOLLARS)**



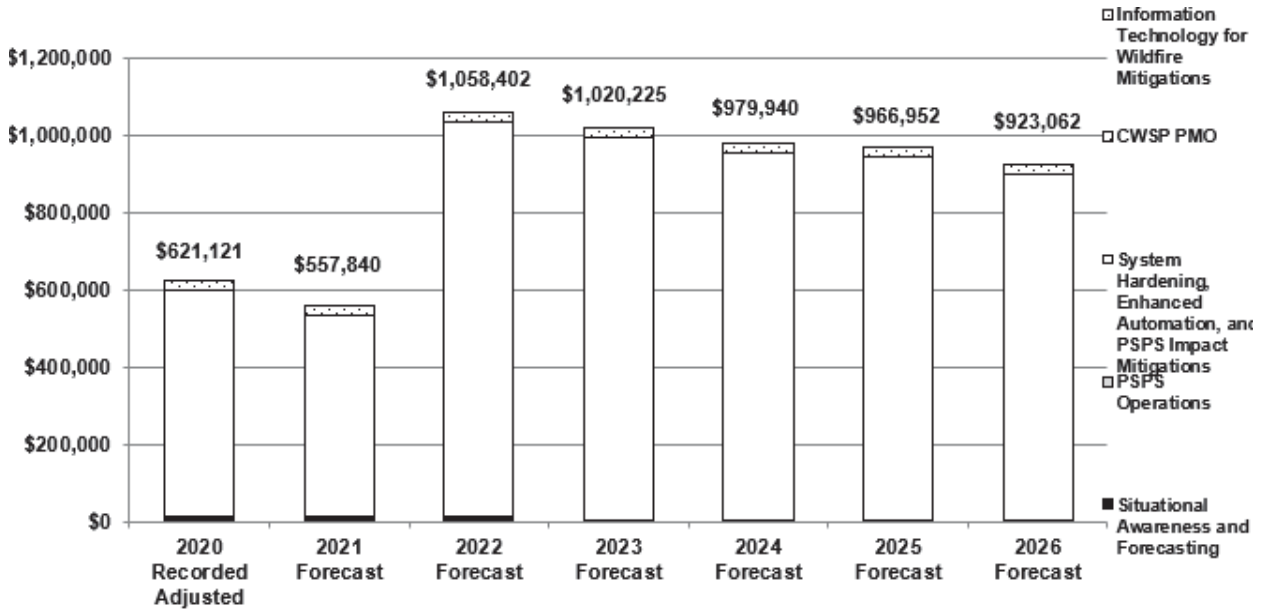
4 Wildfire mitigation expense costs are forecast to decrease in 2023
5 relative to 2020 recorded costs. This decrease is due to:

- 6 • Reduced PSPS Operations costs primarily resulting from: (1) decreases
7 in PSPS event costs; (2) a decrease in the allocation of helicopter fees
8 to PSPS events; and (3) the move of Field Operations Expense to
9 Emergency Preparedness and Response (Chapter 5) as part of the
10 all-hazards approach.
- 11 • Reductions in CWSP PMO costs due to cost allocation changes and a
12 reduced use of consultants in 2023.

⁵ Values vary from the values in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal. See Exhibit (PG&E-4) WP 4-1, lines 8-11.

1 Figure 4-2 shows the wildfire mitigation capital 2020 recorded
2 expenditures and 2021-2026 forecasts.⁶

**FIGURE 4-2
CAPITAL RECORDED AND FORECAST COSTS 2020-2026
(THOUSANDS OF NOMINAL DOLLARS)**



3 Wildfire mitigation capital expenditures are forecast to increase in 2023
4 relative to 2020 recorded costs. This increase is primarily driven by an
5 increase in the number of forecasted System Hardening miles beginning in
6 2022. From 2023 to 2026, capital expenditures are expected to decrease
7 due to expected execution efficiency gains through stabilization of the
8 system hardening workplan based on current assumptions, including those
9 regarding the amount of overhead system hardening miles as compared to
10 underground system hardening miles PG&E will install during the 2023 GRC
11 period.

12 Forecasts in Chapter 4 are shown with escalation at the Major Work
13 Category (MWC) level and escalation is included in all expense and capital

⁶ Values vary from the values in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal. See Exhibit (PG&E-4) WP 4-11, lines 8-9.

1 totals. For more information on escalation, please refer to Chapter 2 of this
2 exhibit.

3 **4. Support for Request**

4 Over half of PG&E's service territory lies in High Fire Threat District
5 (HFTD) Tier 2 and 3 areas as identified by the CPUC in 2018.⁷ The wildfire
6 threat in these areas has increased significantly over the past decade.
7 Unfortunately, 2020 was another unprecedented wildfire season with five of
8 the six largest wildfires in California's history occurring in 2020, all in
9 PG&E's service territory, including the first fire to ever impact over 1 million
10 acres.⁸ The unprecedented weather patterns, including late-summer dry
11 lightning storms, that drove the 2020 wildfire season and continued to
12 present significant wildfire risk and the need for PSPS events into January
13 2021 further indicate the unpredictable, dynamic, and growing nature of the
14 wildfire risk we all face.

15 Approximately 25,500 line-miles of distribution assets lie within these
16 HFTDs, roughly one-third of PG&E's total overhead assets. Many of these
17 are long lines that serve low-density, non-urban customers and communities
18 located within the "wildland-urban interface," who face increased fire risk.
19 Approximately 10 percent of PG&E's electric customers⁹ reside within HFTD
20 areas, and with population migration brought on by COVID-19 and other
21 causes, the number of customers living in wildland-urban interfaces or
22 HFTD areas may increase in coming years. PG&E is continuing to evaluate
23 its wildfire risk and may expand wildfire risk mitigations to include additional
24 areas.

25 Given this increasingly perilous environment, the wildfire mitigation
26 programs described in PG&E's WMP and this chapter are necessary to
27 address the growing wildfire risk associated with PG&E's electric distribution
28 facilities.

7 CPUC, Fire-Threat Maps & the High Fire-Threat District (HFTD), at:
<www.cpuc.ca.gov/firethreatmaps> (as of May 24, 2021).

8 CAL FIRE, Top 20 Largest California Wildfires (Apr. 28, 2021), at:
<https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf> (as of May 24, 2021).

9 With a "customer" defined as an electric meter or service point, each of which generally represents at least one household or business.

5. Alignment and Organization of This Chapter

The remainder of this chapter is organized as follows:

- Section B – Wildfire Mitigation Program and Risk Overview;
- Section C – Compliance with Prior Commission Decisions;
- Section D – Balancing and Memorandum Accounts; and
- Section E – Cost Tables.

The discussion of PG&E wildfire mitigation programs in this exhibit is organized so that most programs included in the WMBA are discussed in detail in Chapters 4.1 through 4.5 of this exhibit:

- Chapter 4.1 – Situational Awareness and Forecasting;
- Chapter 4.2 – PSPS Operations;
- Chapter 4.3 – System Hardening, Enhanced Automation, and PSPS Impact Mitigations;
- Chapter 4.4 – Community Wildfire Safety Program PMO; and
- Chapter 4.5 – Information Technology for Wildfire Mitigations

Outside of Chapter 4 there are a few additional programs which are currently included or will be included in the WMBA starting in 2023.¹⁰

Table 4.5 in Section E below summarizes the forecast for the WMBA for all PG&E Exhibits and Chapters.

To better align with the overall structure of the Electric Distribution exhibit, certain wildfire mitigation programs are discussed outside of Chapters 4.1 through 4.5. These include Vegetation Management (Chapter 9),¹¹ Overhead and Underground Electric Distribution Maintenance (Chapter 11),¹² Pole Asset Management (Chapter 12),¹³ and Community Rebuild Program (Chapter 23).¹⁴

¹⁰ See Exhibit (PG&E-4), WP 4-34 and 4-35 for the complete list of programs in Chapter 4 included the WMBA.

¹¹ See Enhanced Vegetation Management, Ch. 9, Section C.2 of this exhibit.

¹² See Non-Exempt Surge Arrester Replacement Program in Ch. 11, Section C.1.e of this exhibit.

¹³ See Tree Attachments, Ch. 12, Section C.2.c. of this exhibit.

¹⁴ See Electric Underground Main-Line Construction, Ch. 23, Section C.2.a of this exhibit.

B. Wildfire Mitigation Program and Risk Overview

1. Program Description

a. Program Overview and Goals of PG&E's Wildfire Mitigation Activities

As described above, the wildfire mitigation programs described in this chapter serve three overarching goals: reducing wildfire ignition potential, enhancing situational awareness, and reducing the impact of PSPS events. Below is a discussion of the primary mitigations that support these goals.

1) Reducing Wildfire Ignition Potential – System Hardening

To reduce the risk of ignition in our service territory, we are continuing to expand our System Hardening Program. System hardening entails replacing or eliminating existing distribution lines in HFTD areas and installing stronger and more resilient equipment. Hardening methods include replacing bare overhead conductor with covered conductor and installing stronger poles or converting the line from overhead to underground. Some lines can be eliminated entirely if the energy needs of customers or a community can be supplied through some other means, including permanent remote grids. In addition to the wholesale hardening of the highest priority circuit segments, PG&E is also continuing to replace specific, individual assets on other circuit segments to reduce wildfire risk including replacing nonexempt fuses and surge arresters with California Department of Forestry and Fire Protection (CAL FIRE) approved “exempt” equipment that is less likely to create a spark during operations. PG&E's System Hardening, Enhanced Automation, and PSPS Impact Mitigations are discussed in detail in Chapter 4.3.

2) Enhancing Wildfire Situational Awareness – Situational Awareness and Forecasting

PG&E is continuing to invest in tools, equipment, resources, and a skilled workforce to improve our understanding of upcoming and real-time weather and fire conditions, so we can act proactively

1 reduce fire ignitions and mitigate the potential spread of a fire if one
2 were to start. As part of our Situational Awareness and Forecasting
3 Program, PG&E is installing a variety of weather and fire monitoring
4 devices across HFTD areas. These monitoring devices allow early
5 warning of high fire risk conditions and real-time identification of
6 emerging wildfires, which in turn enable faster action by first
7 responders and more proactive system operations to avert fire
8 ignition and spread. In addition, PG&E's situational awareness tools
9 in the HFTD areas include weather stations, high-definition
10 cameras, enhanced abnormal condition or wire-down detection
11 tools, and satellite fire-detection monitoring of the PG&E service
12 territory. PG&E's Situational Awareness and Forecasting activities
13 are discussed in detail in Chapter 4.1.

14 **3) Reducing the Impact of PSPS Events – PSPS Operations**

15 In 2018, the CPUC ordered utilities to present plans and
16 protocols to deenergize portions of their electric distribution system
17 in the interest of public safety. Significant wildfires are most likely to
18 occur under the highest-risk conditions of high winds, low humidity,
19 and where there is a high level of dry fuel—as in the late summer or
20 fall in the heavily forested mountain areas of Northern California,
21 where many of our distribution and transmission assets are located.
22 Under extremely high-risk conditions, it is necessary to deenergize
23 some transmission or distribution lines to reduce the risk of
24 equipment failures or vegetation or other items contacting live wires.

25 PG&E's focus is on continuing to improve our PSPS program to
26 reduce the impact of PSPS on our customers by working to make
27 future PSPS events smaller in scope, shorter in duration, and
28 smarter in performance while safeguarding customers and
29 communities from wildfire risk during times of severe weather.
30 PG&E's PSPS Operations activities are discussed in detail in
31 Chapter 4.2.

32 In addition to these overarching goals, PG&E's wildfire
33 mitigation efforts include key programs that support the
34 coordination, logistics and technical needs required to effectively

1 execute our wildfire mitigation programs. These programs include
2 the CWSP PMO (described in Chapter 4.4) and Information
3 Technology for Wildfire Mitigations (described in Chapter 4.5).

4 **b. Management Structure**

5 Wildfire mitigation planning and implementation is conducted
6 by leaders, employees, and contractors throughout multiple PG&E
7 teams and organizations. Currently, wildfire mitigation programs are
8 primarily managed and implemented by two teams: Electric Operations
9 (EO) and the Wildfire Risk Organization. EO currently consists of the
10 departments that manage Electric Transmission and Distribution
11 Operations, Asset Management, Major Projects and Programs, and
12 Compliance. The EO team, in collaboration with the Wildfire Risk
13 Organization, plans and executes several of the major wildfire programs
14 like the System Hardening, Enhanced Automation and PSPS Impact
15 Mitigation programs described in Chapter 4.3.

16 The Wildfire Risk Organization manages many of the wildfire risk
17 mitigation programs including PSPS Execution and the Operations and
18 the CWSP PMO that are described in Chapter 4.2 and Chapter 4.4,
19 respectively. Further, the Situational Awareness functions described in
20 Chapter 4.1 are managed within the PSPS Execution and Operations
21 organization within the Wildfire Risk department. The Wildfire Risk
22 Organization also manages other wildfire safety programs like
23 Vegetation Management, System Inspections, and External
24 Engagement which are described in other chapters in Exhibit PG&E-4.

25 Electric Operations reports into PG&E's Chief Operating Officer and
26 the Wildfire Risk Organization reports directly to the Chief Executive
27 Officer.

28 The Wildfire Risk Governance Steering Committee (WRGSC)
29 governs PG&E's wildfire risk modelling and wildfire mitigation workplans.
30 The WRGSC reviews and approves the workplans for the most critical
31 wildfire risk mitigation programs to ensure they are in alignment with the
32 latest wildfire risk model and monitors regular reporting of work
33 completed and quality results so that we are accountable and effective
34 in reducing the most risk through these workstreams.

1 The WRGSC is chaired by the Senior Vice President and Chief Risk
2 Officer (CRO) and the voting members are the SVP of EO, the Vice
3 President (VP) of Asset, Risk Management and CWSP, the VP of Major
4 Projects and Programs in EO, the VP of Wildfire Safety and Public
5 Engagement and the VP, Chief Audit Officer. Representatives from
6 PG&E's Federal Monitor, as well as the Operational Observers from the
7 Governor's office also participate in WRGSC meetings.

8 Chapter 4.5 describes IT Investment associated with wildfire
9 mitigation programs. The management structure of the IT department is
10 described in Exhibit (PG&E-7), Section B.1.d.

11 Management of Wildfire Mitigation departments continue to evolve
12 to serve PG&E's wildfire mitigation strategy. PG&E will continue to look
13 for opportunities to improve performance by continuing to improve and
14 adjusting management structure when applicable.

15 **c. Key Metrics and Other Performance Measures**

16 PG&E's wildfire mitigation strategy is structured around the three
17 strategic imperatives outlined above: reducing wildfire ignition potential,
18 enhancing situational awareness, and reducing the impact of PSPS
19 events. Through PG&E's annually filed WMP a number of targets and
20 performance measures have been established. Sections 5 and 6 and
21 Attachment 1¹⁵ of the Revised 2021 WMP provide a complete overview
22 of key metrics and performance measures to meet PG&E's wildfire
23 mitigation strategy. Examples include the list of annual work and
24 performance commitments provided in Table PG&E-5.2-1.¹⁶ These
25 metrics, targets, and performance against them will continue to be
26 updated in future WMP submissions. PG&E's annual WMPs and

¹⁵ PG&E's Revised 2021 WMP. See PG&E's 2021 WMP website, at:
<www.pge.com/wildfiremitigationplan> (as of June 21, 2021).

¹⁶ See PG&E's Revised 2021 WMP, starting on page 258, at PG&E's 2021 WMP website,
at: <www.pge.com/wildfiremitigationplan> (as of June 21, 2021).

1 associated, CPUC-directed reports like the Quarterly Initiative Update¹⁷
 2 and Quarterly Data Report¹⁸ are the best resources for metrics and
 3 performance measures for the wildfire mitigation programs in this
 4 chapter and other chapters of Exhibit (PG&E-4).

5 **d. Emerging Technology for Wildfire Mitigation**

6 This section provides a summary of emerging technologies that may
 7 prove instrumental in mitigating wildfire risk in the future. There are no
 8 costs associated with these projects in this application, and they are
 9 provided here for transparency into technologies that are currently being
 10 explored as potential mitigations which could emerge during the 2023
 11 GRC period.

12 As detailed in Section 7.1.D of the 2021 Wildfire Mitigation Plan,¹⁹
 13 PG&E is conducting ongoing projects to evaluate or pilot new or
 14 emerging technologies that may have wildfire risk mitigation potential.
 15 These projects aim to further reduce wildfire risk by improving upon
 16 existing approaches including vegetation and asset management,
 17 system inspections, and grid design and system hardening. As these
 18 projects are being conducted at limited scope and scale, subsequent
 19 funding will be required to deploy successful technologies at a broader
 20 scale across PG&E's service territory. While the activities and funding
 21 required for production deployment of most of these technologies are
 22 already accounted for in this GRC, there are six projects for which these
 23 follow-on activities and funding have not been included. High-level
 24 descriptions of five of these projects and the expected follow-on work
 25 are provided below. The sixth project, DTS-FAST, is discussed in

17 PG&E's quarterly reports on wildfire mitigation activities are posted on PG&E's 2021 WMP website (see fn 1 link), including the Q1 2021 Quarterly Initiative Update, available at: <https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan/PGE-2021-Q1-QIU.xlsx> (as of June 10, 2021).

18 PG&E's quarterly reports on wildfire mitigation activities are posted on PG&E's 2021 WMP website (see fn 1 link), including our Q1 2021 Quarterly Data Report, available at: <https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan/PGE-Q1-2021-WMP-Quarterly-Data-Report.zip> (as of June 10, 2021).

19 PG&E's Revised 2021 WMP, starting at p. 336.

1 Chapter 4.3, Section C.3.f. For these six projects, either the
 2 technologies have not yet been sufficiently proven, or there is still too
 3 much uncertainty in the production requirements to include in this GRC.
 4 If these projects prove to be effective in mitigating wildfire risk, then
 5 PG&E will plan to deploy them in production and will appropriately
 6 record the associated costs in wildfire-mitigation related balancing or
 7 memorandum accounts.

**TABLE 4-1
 EMERGENCY TECHNOLOGIES FOR WILDFIRE MITIGATION**

Line No.	Project Name	Project Description
1	EPIC 3.13 Transformer Temperature Monitoring	This project will design and build an overhead transformer temperature sensor and associated analytical tools to identify transformer issues and risk of failures. Post-project funding would be required to scale the devices and analytics by purchasing and more broadly deploying temperature sensors across PG&E's service territory.
2	EPIC 3.32 System Harmonics	This project will collect harmonics data using modern SmartMeters and develop an algorithm engine that will proactively detect, investigate, and mitigate harmonics issues. Post-project funding would be required to scale analytics by purchasing and deploying additional meters for data collection in targeted locations across PG&E's service territory.
3	EPIC 3.41 Drone Enablement	This project will demonstrate the effectiveness of automated and Beyond Visual Line-of-Sight (BVLOS) drone operation for system inspection and asset alert investigation use cases. Post-project funding would be required to scale drone operations by purchasing and deploying additional drone systems across PG&E's service territory.
4	EPIC 3.43 Momentary Outage	This project will demonstrate new approaches for proactively identifying potential system or asset issues related to locations with frequent momentary outages. Post-project funding would be required to purchase and deploy more high-fidelity SmartMeters to scale analytics for predictive equipment failure.
5	Mobile LiDAR	This project will demonstrate the effectiveness of vehicle and backpack-mounted LiDAR and imagery units to reduce fire risk and improve the effectiveness and compliance of PG&E's Vegetation Management processes. Post-project funding would be required for the execution of expanded mobile LiDAR scanning, particularly in HFTDs, to support and validate wildfire risk mitigation activities.

2. Risk Integration

Chapter 3 of this exhibit describes how EO uses the Enterprise and Operational Risk Management program to manage electric system risks. Table 4-2 below shows the EO risks associated with the forecasts discussed in the Wildfire Mitigations chapters.

**TABLE 4-2
RISKS DISCUSSED IN THIS CHAPTER**

Line No.	Risk Name	Risk ID	Type of Risk	Chapter Reference
1	Failure of Electric Distribution Overhead Assets	DOVHD	Risk Assessment Mitigation Phase (RAMP)	4.3
2	Wildfire	WLDFR	RAMP	4.1, 4.2, 4.3, 4.4

A risk overview is provided for each applicable risk in each chapter. Each chapter also describes the mitigations and controls presented in the GRC, including a description of any changes since filing PG&E's 2020 RAMP Report. PG&E's mitigations and controls presented in the GRC are very similar to the ones proposed in the 2020 RAMP Report, with the exception that mitigations and controls are more granular in the GRC to enable a more detailed evaluation of risk.

Costs and Risk Spend Efficiencies (RSEs) for mitigations are presented in each chapter. Costs and RSEs for controls are presented in workpapers.

Chapter 4.1 mitigation categories include:

- Situational Awareness and Forecasting Initiatives; and
- Safety and Infrastructure Protection Team.

Chapter 4.2 mitigation categories include:

- PSPS Event; and
- PSPS Program.

Chapter 4.3 mitigation categories include:

- System Hardening – Overhead, Underground, and Remote Grid (addresses both Wildfire and the Failure of Electric Distribution Overhead Assets risks);
- Expulsion Fuse Replacements (addresses both Wildfire and the Failure of Electric Distribution Overhead Assets risks);

- 1 • PSPS Impact Reduction Initiatives;
- 2 • Situational Awareness and Forecasting Initiatives; and
- 3 • Automation System and Protection Initiatives.

4 Chapter 4.4 mitigation categories include:

- 5 • The CWSP PMO.

6 Table 4-3 and 4-4 below show the expense and capital forecasts for the
7 mitigations discussed in each wildfire mitigation chapter.

**TABLE 4-3
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 – EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Chapter	Chapter Name (2023 GRC)	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Total
1	Chapter 4.1	Situational Awareness and Forecasting	\$34,022	\$59,348	\$54,559	\$43,416	\$191,345
2	Chapter 4.2	PSPS Operations	141,178	127,920	119,254	115,266	503,618
3	Chapter 4.3	System Hardening, Enhanced Automation and PSPS Impact Mitigations	7,872	7,949	6,679	11,595	34,095
4	Chapter 4.4	CWSP PMO	34,263	27,801	14,994	13,460	90,519
5		Total	\$217,336	\$223,018	\$195,486	\$183,736	\$819,576

**TABLE 4-4
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2026 – CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Chapter	Chapter Name (2023 GRC)	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	Total
1	Chapter 4.1	Situational Awareness and Forecasting	\$11,649	\$9,451	\$9,375	\$4,601	\$3,290	\$3,341	\$3,446	\$45,153
2	Chapter 4.2	PSPS Operations	2,397	3,084	3,237	262	269	277	284	9,809
3	Chapter 4.3	System Hardening, Enhanced Automation and PSPS Impact Mitigations	584,417	520,005	1,020,491	990,063	951,082	938,034	894,031	5,898,122
4		Total ^(a)	\$598,463	\$532,540	\$1,033,102	\$994,925	\$954,640	\$941,652	\$897,762	\$5,953,085

(a) The 2020 recorded adjusted total includes \$287 associated with Chapter 4.4 that is not shown on this table because costs are rounded to the nearest thousand.

1 **C. Compliance With Prior Commission Decisions**

2 **1. Compliance With Section 5.2 of the 2020 GRC Settlement Agreement**
3 **(“Deferred Work Principles”)**

4 The 2020 GRC Settlement Agreement requires PG&E to include
5 testimony in this GRC on deferred work if the following criteria are met:

- 6 a) The work was requested and authorized based on representations that it
7 was needed to provide safe and reliable service (Check 1);
8 b) PG&E did not perform all of the authorized and funded work, as
9 measured by authorized (explicit or imputed) units of work (Check 2);
10 and
11 c) PG&E continues to represent that the curtailed work is necessary to
12 provide safe and reliable service (Check 3).

13 Work that was authorized in the 2020 GRC for MWCs in the wildfire
14 mitigation chapters is needed to provide safe and reliable service, however
15 there was not work that met the criteria for deferred work as described in the
16 Settlement Agreement. This analysis is presented in the workpapers in
17 Chapter 2 of this exhibit.²⁰

18 **2. Compliance with the Wildfire Mitigation Plan**

19 In 2018, the Legislature, recognizing the need for bold and immediate
20 action to reduce the risk of catastrophic wildfires, provided utilities with
21 several mechanisms to facilitate urgent wildfire mitigation efforts. Senate
22 Bill (SB) 901, enacted in September 2018, requires utilities to submit annual
23 WMPs for approval by the CPUC. The WMP must identify and prioritize
24 wildfire risks and the drivers of those risks. It must also describe plans for
25 vegetation management, system hardening, preparation for and response to
26 wildfire events, and protocols for disabling reclosers and deenergizing the
27 electric system.²¹ Subsequent bills, including Assembly Bill (AB) 1054,
28 AB 111, SB 70, SB 167, SB 247, and SB 560, modified the WMP
29 requirements. Through AB 1054, the Legislature expanded the plan

²⁰ Exhibit (PG&E-4), WP 2-13.

²¹ Pub. Util. Code, § 8386 (describing elements of the WMP).

1 coverage to three years, adding requirements, and transferred review of the
2 plans to the Wildfire Safety Division.²²

3 The intent in this application is to support compliance with the WMP
4 goals and objectives, completion of forecasted work to fulfill WMP
5 commitments, and manage cost recovery as applicable. The Wildfire Risk
6 Mitigation in Chapter 4, as well as some of the work presented in
7 Chapters 9 – Vegetation Management, 10 – Overhead and Underground
8 Electric Asset Inspections, 11 – Overhead and Underground Electric
9 Distribution Maintenance, 12 – Pole Asset Management, 15 – Substation
10 Asset Management, 20 – Technology Mapping and Asset Data
11 Management, and 23 – Community Rebuild, all represent work activities and
12 programs that were submitted, reviewed and approved in the 2019, 2020,
13 and 2021 WMP.²³

14 **D. Balancing and Memorandum Accounts**

15 **1. Wildfire Mitigation Balancing Account (WMBA)**

16 The Commission authorized the WMBA in the 2020 GRC Decision
17 (D.) 20-12-005²⁴ (2020 GRC Decision). The WMBA is a two-way balancing
18 account used to track CWSP expenses beginning January 1, 2020. The
19 primary CWSP expenses recorded to the WMBA include both operations
20 and maintenance (O&M) and capital wildfire mitigation costs incurred by
21 Electric Distribution. Additionally, other CWSP costs include O&M expenses
22 and capital expenditures for Shared Services and Human Resources
23 support for CWSP activities. PG&E proposes continued use of the two-way
24 WMBA to record wildfire mitigation related activities, including those
25 activities described in this application, as well as new activities in PG&E's
26 approved Wildfire Mitigation Plan.

27 While PG&E now has more experience with these programs than we did
28 when the two-way WMBA was established, there continues to be significant

²² Pub. Util. Code, § 8386.3(a).

²³ As of June 30, 2021, PG&E's 2021 WMP was still under review and had not been formally approved.

²⁴ D.20-12-005, p. 396, Conclusion of Law (COL) 29: Authority to establish a two-way WMBA to record CWSP O&M and capital expenditures is supported by the record and should be authorized.

1 uncertainty and variability associated with wildfire mitigation activities and
2 their associated costs. As an example, the exact scope of PG&E's System
3 Hardening Program will continue to evolve as PG&E performs detailed
4 planning and engineering for the remaining circuit miles to be hardened. For
5 this reason, there is some uncertainty regarding the exact number of miles
6 of overhead system hardening versus undergrounding PG&E will complete.
7 PG&E's forecast is based on its current assumptions about the number of
8 overhead system hardening miles and underground miles it will complete.
9 To the extent PG&E undergrounds more miles in HFTDs to further reduce
10 risk as compared to overhead system hardening, PG&E's capital
11 expenditures will increase.

12 There are similar adjustments PG&E may make to other components of
13 the CWSP, based on further planning and engineering, field conditions, and
14 PG&E's understanding of evolving wildfire risks. Consequently, there is
15 uncertainty regarding the wildfire mitigation costs PG&E ultimately will incur
16 versus forecast in this GRC. The continuation of the two-way WMBA
17 ensures that customers only pay for the actual work performed and if our
18 forecast is higher than the actual costs, the difference is returned to
19 customers.

20 In addition, the wildfire risk in northern and central California continues
21 to grow and change. As of 2021 portions of PG&E's service territory have
22 entered another significant drought²⁵ that may exacerbate wildfire risks
23 going forward and each wildfire season teaches us more about how to
24 further reduce risk to protect our customers and communities. Given the
25 growing and evolving wildfire risk that PG&E, first responders, regulators,
26 and others are battling, a two-way balancing account remains the
27 appropriate tool to ensure that important wildfire risk mitigation work is
28 adequately funded while also ensuring that rates collected from customers
29 for this work are solely spent on wildfire risk mitigation.

30 The 2020 GRC Decision ordered PG&E to file a Tier 3 Advice Letter if
31 its total spending is above 115 percent of the approved CWSP amounts or if

²⁵ See the Governor's Drought Emergency Proclamation, dated April 21, 2021, at:
<<https://www.gov.ca.gov/wp-content/uploads/2021/04/4.21.21-Emergency-Proclamation-1.pdf>> (as of May 25, 2021).

1 its recorded average per mile unit costs for system hardening exceed
 2 115 percent of the authorized unit costs.²⁶ PG&E proposes that the WMBA
 3 reasonableness review threshold for total spending and recorded average
 4 per mile for the various types of unit costs²⁷ be raised from 115 percent to
 5 125 percent. As noted above, wildfire risk presents significant uncertainty
 6 due to drought, wind patterns, vegetation growth and other factors beyond
 7 PG&E's control. In addition, based on these factors and further planning
 8 and engineering of the specific locations where PG&E will be performing
 9 wildfire mitigation activities, PG&E may adjust its planned mix of wildfire
 10 mitigation activities as necessary to address evolving wildfire risks.
 11 Increasing the reasonableness review threshold provides a slight reduction
 12 in administrative burden for the Commission and parties in the case of a
 13 limited variation in the wildfire risk mitigation spend (up to 125 percent) while
 14 still protecting customers through a transparent reasonableness review
 15 process should the costs exceed the authorized amounts by more than
 16 25 percent.

17 The forecasts for Wildfire Mitigations tracked in the WMBA are in
 18 Section E, Table 4-5, below.

19 In addition to authorizing the WMBA and setting thresholds for the
 20 review of costs, the 2020 GRC Decision also provides that PG&E cannot
 21 earn an equity return on the first \$3.21 billion of capital expenditures it
 22 spends on wildfire mitigation measures included in its approved WMP.²⁸
 23 Costs requested in Chapter 4 are in excess of the \$3.21 billion as discussed
 24 in Exhibit (PG&E-10), Ch. 15, Section D.

26 D.20-12-005, p. 397, COL 32: PG&E should be required to file an application for recovery of CWSP costs recorded in the WMBA if CWSP expenditures are in excess of 115 percent of the authorized amount or if recorded per mile unit costs are in excess of 115 percent of the authorized unit costs.

27 The unit costs for each type of system hardening work are shown in Chapter 4.3, Table 4.3-5 in this exhibit.

28 D.20-12-005, p. 397, COL 33.

2. Wildfire Memorandum Account Reasonableness Review

In addition to the WMBA, PG&E has established two memorandum accounts where certain wildfire-related costs can be recorded – the FRMMA and the WMPMA.

The purpose of the FRMMA is to record incremental costs of fire risk mitigation work that are not otherwise recovered in PG&E's adopted revenue requirements.²⁹ Such costs include wildfire mitigation activities that were not contemplated as part of the prior GRCs or WMPs. Costs to be recovered through the FRMMA do not include costs approved for recovery in PG&E's GRCs or through other cost recovery mechanisms including WMPMA. Costs in the FRMMA are subject to reasonableness review.

The purpose of the WMPMA is to record incremental costs incurred to implement an approved WMP that are not otherwise recovered in PG&E's adopted revenue requirements.³⁰ Such costs include expense and capital expenditures for wildfire risk mitigation activities outlined in PG&E's WMP, including enhanced inspection activities in excess of what was authorized in PG&E's existing GRC, incremental IT costs to support wildfire mitigation workstreams, and deployment of line sensors and other system monitoring technologies that can help identify potential wildfire risks. Costs in the WMPMA are subject to reasonableness review.

In this proceeding PG&E requests recovery of certain costs for wildfire risk mitigation work that are recorded in the FRMMA and WMPMA.

Attachments A of Chapters 4.3, 4.4, and 4.5 are PG&E's prepared testimony which demonstrates the reasonableness of incremental 2020 costs incurred for wildfire mitigations recorded in the WMPMA and FRMMA. Attachment A of Chapter 2 summarizes the amounts recorded in the

²⁹ On November 1, 2018, PG&E submitted Advice Letter (AL) 5419-E to establish the FRMMA to track costs incurred for fire risk reduction that are not otherwise encompassed in the Company's revenue requirement. The Commission approved AL 5419-E on March 12, 2019, effective January 1, 2019.

³⁰ D.19-05-037, p. 64, OP 21, authorized PG&E to open the WMPMA to track incremental wildfire-related costs incurred while implementing approved programs within the 2019 WMP. On June 5, 2019, PG&E submitted AL 5555-E to establish the WMPMA. The AL was approved by the Commission on August 8, 2019 with an effective date of June 5, 2019.

1 WMPMA and FRMMA in 2020 and requested in this application.³¹ For
2 Chapters 4.3, 4.4, and 4.5, PG&E is seeking recovery of \$29.7 million of
3 capital expenditures and \$22.7 million of expense costs recorded in the
4 WMPMA and \$5.3 million of expense costs recorded in the FRMMA.³²
5 PG&E seeks a determination that these costs were reasonably incurred and
6 that recovery of these costs in rates is appropriate as further described in
7 these attachments.

8 E. Cost Tables

9 Table 4-5 below summarizes the forecast costs for the wildfire mitigations
10 for which PG&E will record in the WMBA or the Vegetation Management
11 Balancing Account (VMBA). Most of the work included in Table 4-5 is described
12 in Chapters 4.1, 4.2, 4.3, 4.4, and 4.5 but there is also work in a few other
13 Exhibit (PG&E-4) chapters. In addition to the wildfire mitigation work in this
14 exhibit, PG&E is forecasting Wildfire Safety and Customer Communications
15 activities in the Customer Care exhibit.³³

16 Tables 4-6 and 4-7 show the expense and capital forecasts for the individual
17 Wildfire mitigations described in chapters 4.1, 4.2, 4.3, and 4.4. The information
18 technology work described in Chapter 4.5 of this exhibit enables the Wildfire
19 mitigations described in the other Electric Operations chapters. The Wildfire
20 mitigations presented in the other Electric Operations chapters are not included
21 on Tables 4-6 and 4-7 but are included in the sponsoring chapter.³⁴

³¹ Requests for amounts recorded in the WMPMA and FRMMA in 2020 are found in Exhibits (PG&E-4), (PG&E-5), (PG&E-6), (PG&E-7).

³² Exhibit (PG&E-4), Ch. 2, Attachment A, Tables 2A-3 and 2A-4, p. 2AtchA-10, and p. 2AtchA-11.

³³ Exhibit (PG&E-6), Ch. 11, Section B.2.c. This work is associated with the PSPS mitigation (WLDLFR-M006).

³⁴ See Ch. 11, Section B.2.d; Chapter 12, Section B.2.c; and Chapter 23, Section B.2.a.4.

**TABLE 4-5
FORECASTED COSTS 2021-2026
WILDFIRE MITIGATION FORECAST SUMMARY
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Chapter Name	Ex.	Ch..	Expense Forecast					Capital Forecast				
				2021	2022	2023	2021	2022	2023	2024	2025	2026	
1	Situational Awareness and Forecasting	4	4.1	\$59,348	\$54,559	\$43,416	\$9,451	\$9,375	\$4,601	\$3,290	\$3,341	\$3,446	
2	PSPS Operations	4	4.2	127,920	119,254	115,266	3,084	3,237	262	269	277	284	
3	System Hardening, Enhanced Automation, and PSPS Impact Mitigations	4	4.3	6,903	6,679	11,595	520,005	1,020,491	990,063	951,082	938,034	894,031	
4	CWSP PMO	4	4.4	27,801	14,994	13,460	-	-	-	-	-	-	
5	Information Technology for Wildfire Mitigations	4	4.5	35,700	35,700	35,700	25,300	25,300	25,300	25,300	25,300	25,300	
6	Overhead and Underground ED Maintenance	4	11	-	-	-	88,859	16,804	-	-	-	-	
7	Pole Asset Management	4	12	-	-	-	-	3,303	3,296	3,500	3,709	3,924	
8	Community Rebuild Program	4	23	-	-	-	-	-	114,341	104,985	77,163	-	
9	Communications	6	11	15,700	15,700	9,550	-	-	-	-	-	-	
10	Total WMBA ^(a)			\$273,372	\$246,886	\$228,987	\$646,699	\$1,078,510	\$1,137,863	\$1,088,426	\$1,047,824	\$926,985	
11	Vegetation Management	4	9	535,952	553,916	550,686	-	-	-	-	-	-	
12	Total Wildfire Mitigations ^(b)			\$809,324	\$800,802	\$779,673	-	-	-	-	-	-	

(a) Certain 2021 and 2022 costs shown in this table are tracked in the FRMMA and/or the WMPMA. All 2023 and later forecast amounts shown on line 11 will be tracked in the WMBA.

(b) Differences due to rounding.

TABLE 4-6
WILDFIRE MITIGATIONS – CHAPTERS 4.1, 4.2, 4.3, AND 4.4
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 – EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Mitigation Number	Mitigation Name (2023 GRC)	MAT	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Total
1	Chapter 4.1							
	Situational Awareness and Forecasting Initiatives							
2	WLDFR-M07B	Weather Stations	AB6	\$111	\$1,572	\$1,641	\$1,764	\$5,088
3	WLDFR-M07C	Wildfire Safety Operations Center (WSOC)	AB6	4,348	9,139	7,181	-	20,668
4	WLDFR-M07D	Cameras	AB6	6,956	9,385	11,532	8,234	36,107
5	WLDFR-M07E	SA&FI -Satellite Fire Detection	AB6	-	341	351	362	1,054
6	WLDFR-M07G	Partial Voltage Detection	AB6	3,657	-	85	233	321
7	WLDFR-M07H	SOPP Improvements	AB6	1,627	1,969	2,029	-	5,625
8	WLDFR-M07I	Advance Fire Modeling	AB6	5,541	5,969	6,152	6,345	24,007
9	WLDFR-M07J	Meteorology	AB6	-	515	531	438	1,483
10	WLDFR-M07K	Fire Potential Index	AB6	93	154	159	174	580
11	WLDFR-M008	Safety and Infrastructure Protection Teams	AB6	15,342	30,304	24,899	25,867	96,411
12		Total Situational Awareness and Forecasting Initiatives		\$34,022	\$59,348	\$54,559	\$43,416	\$191,345
13	Chapter 4.2							
	PSPS Operations							
14	WLDFR-M005	PSPS Event (Distribution)	AB6	\$80,706	\$82,741	\$70,782	\$72,998	\$307,227
15	WLDFR-M006	EP&R Field Operations	AB6	3,691	9,974	-	-	13,665
16	WLDFR-M006	EP&R Field Operations (Includes Tech, Training and Other Misc)	AB6			6,903		6,903
17	WLDFR-M006	EP&R Field Ops Tech Expense	AB6	18	103	106	-	227
18	WLDFR-M006	CRC Preparedness Program	AB6	15,423	14,774	15,226	15,703	61,126
19	WLDFR-M006	PSPS - EP&R Field Ops Tech Expense	AB6	92	206	212		510
20	WLDFR-M006	PSPS - Collateral/Segment Creations Exp	AB6	249	103	106	109	568
21	WLDFR-M006	PSPS - EP&R Field Ops Misc.	AB6	108	257	265	-	630
22	WLDFR-M006	PSPS - Field Exercise Dist. Exp	AB6	1,073	2,470	2,546	2,625	8,714
23	WLDFR-M006	PSPS - Increased Helicopter EU (Dist.)	AB6	28,668	7,976	14,944	15,411	66,999
24	WLDFR-M006	PSPS - PMO	AB6	2,180	5,533	4,502	4,643	16,857
25	WLDFR-M006	PSPS - PMO Projects	AB6	6,898	1,544	1,591	1,641	11,674
26	WLDFR-M006	PSPS - Pre-flights Expense	AB6	1,775	1,081	1,114	1,149	5,118
27	WLDFR-M006	Wildfire Public Engagement Team	AB6	298	1,158	957	987	3,399
28		Total PSPS Operations		\$141,178	\$127,920	\$119,254	\$115,266	\$503,618

**TABLE 4-6
WILDFIRE MITIGATIONS – CHAPTERS 4.1, 4.2, 4.3, AND 4.4
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 – EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name (2023 GRC)	MAT	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Total
29	Chapter 4.3 System Hardening, Enhanced Automation and PSPS Impact Initiatives							
30	WLDFR-M006	Generation Enablement and Deployment PMO	AB#	–	–	\$2,063	\$1,957	\$4,020
31	WLDFR-M006	Generation Enablement and Deployment PMO	IG#	\$3,494	\$3,031			6,525
	WLDFR-M07A	Situational Awareness and Forecasting Initiative – Line Sensors	FZA	\$1,487	\$2,344	\$2,576	\$3,437	9,844
	WLDFR-M07A	Situational Awareness and Forecasting Initiative – Line Sensors	HG#	10	–	–	–	10
32	WLDFR-M07F	Situational Awareness and Forecasting Initiative – Sensor IQ	AB#	\$1,871	\$145	–	3,783	5,799
33	WLDFR-M017	System Hardening – Remote Grid	AB#	1,010	1,382	1,423	1,464	4,269
34	WLDFR-M017	System Hardening – Remote Grid	KAT			617	953	1,571
35		Total System Hardening, Enhanced Automation and PSPS Impact Initiatives		\$7,872	\$6,903	\$6,679	\$11,595	\$33,048
36	Chapter 4.4 CWSP PMO							
37	WLDR-M009	CWSP PMO	AB#	\$19,113	\$19,086	\$14,994	\$13,460	\$66,653
	WLDR-M009	CWSP PMO	AB6	15,031	8,715	–	–	23,746
	WLDR-M009	CWSP PMO	IG#	119	–	–	–	119
38		Total CWSP PMO		\$34,263	\$27,801	\$14,994	\$13,460	\$90,518
39		Total Expense ^(a)		\$217,335	\$221,972	\$195,486	\$183,736	\$818,530

(a) See WP 4-34.

TABLE 4-7
WILDFIRE MITIGATIONS – CHAPTERS 4.1, 4.2, AND 4.3
RECORDED AND FORECAST MITIGATION COSTS 2020-2026 – CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Mitigation Number	Mitigation Name (2023 GRC)	MAT	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	Total	
1	Chapter 4.1											
	Situational Awareness and Forecasting Initiatives											
2	WLDFFR-M07B	Weather Stations	21A	\$8,315	\$6,399	\$6,377	\$3,270	\$1,122	\$1,155	\$1,189	\$27,827	
3	WLDFFR-M07C	Wildfire Safety Operations Center (WSOC)	21A	(38)	1,542	129	–	–	–	–	1,637	
4	WLDFFR-M07G	Partial Voltage Detection	21A	1,216	331	627	–	–	–	–	2,174	
5	WLDFFR-M07I	Advanced Fire Modeling	21A	899	1,028	–	–	–	–	–	1,927	
6	WLDFFR-M07J	Meteorology	21A	–	–	1,055	1,083	1,890	1,905	1,967	7,900	
7	WLDFFR-M008	Safety and Infrastructure Protection Teams	21A	1,254	152	1,187	248	278	281	290	3,689	
8		Total Situational Awareness and Forecasting Initiatives		\$11,649	\$9,451	\$9,375	\$4,601	\$3,290	\$3,341	\$3,446	\$45,153	
9	Chapter 4.2											
	PSPS Operations											
10	WLDFFR-M006	PSPS Field Ops Tech Capital	21A	–	\$1,028	\$994.09	–	–	–	–	\$2,022.09	
11	WLDFFR-M006	CRC Preparedness Program	21A	1,021	–	255	261	269	277	284	2,368	
12	WLDFFR-M006	PSPS Capital Equipment	21A	1,376	2,056	1,987.19	–	–	–	–	5,419.34	
13		Total PSPS Operations		\$2,397	\$3,084	\$3,237	\$261	\$269	\$277	\$284	\$9,810	

**TABLE 4-7
WILDFIRE MITIGATIONS – CHAPTERS 4.1, 4.2, AND 4.3
RECORDED AND FORECAST MITIGATION COSTS 2020-2026 – CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name (2023 GRC)	MAT	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	Total
14	Chapter 4.3	System Hardening, Enhanced Automation and PSPS Impact Initiatives									
15	WLDLFR-M002	System Hardening	08W	\$484,915	\$415,654	\$927,949	\$908,947	\$879,971	\$864,454	\$817,209	\$5,299,099
16	WLDLFR-M004	Expulsion Fuse Replacement	2AP	7,847	15,125	15,388	15,752	16,257	16,777	17,314	104,460
17	WLDLFR-M006	PSPS Reduction Initiatives - Sectionalizer Device Install/Replace	49H	69,441	42,890	20,919	11,933	12,255	12,586	12,926	182,949
18	WLDLFR-M006	PSPS Reduction Initiatives - Temporary Distribution Microgrids	49M	3,746	16,448	13,559	-	-	-	-	33,753
19	WLDLFR-M07A	Situational Awareness and Forecasting Initiatives - Line Sensors	49I	2,272	12,369	8,037	8,254	6,474	5,964	6,125	49,496
20	WLDLFR-M07F	Situational Awareness and Forecasting Initiatives - Sensor IQ	21A	-	-	-	10,507	-	-	-	10,507
21	WLDLFR-M10A	Additional System Automation and Protection	49A	1,456	6,990	-	-	-	-	-	8,446
22	WLDLFR-M10B	Additional System Automation and Protection – FuseSaver	49T	-	2,305	2,764	2,940	3,087	3,241	3,403	17,740
23	WLDLFR-M10C	Additional System Automation and Protection – REFCL	49R	4,798	8,224	16,876	17,331	17,800	18,280	18,774	102,083
24	WLDLFR-M011	Situational Awareness and Forecasting Initiatives – EFD	49I	-	-	4,647	5,434	6,234	7,486	8,786	32,588
25	WLDLFR-M012	Situational Awareness and Forecasting Initiatives – DFA	49I	-	-	10,351	8,965	9,002	9,245	9,495	47,058
26		Total System Hardening, Enhanced Automation and PSPS Impact Initiatives		\$574,476	\$520,005	\$1,020,491	\$990,063	\$951,082	\$938,034	\$894,031	\$5,888,182
27		Total Capital(a)(b)		\$588,522	\$532,540	\$1,033,102	\$994,926	\$954,641	\$941,652	\$897,761	\$5,943,145

(a) The 2020 recorded adjusted total includes \$287 associated with Chapter 4.4 that is not shown on this table because costs are shown rounded to the nearest thousand dollars.

(b) See WP 2-35.

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.1
SITUATIONAL AWARENESS AND FORECASTING

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.1
SITUATIONAL AWARENESS AND FORECASTING

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 4.1**
3 **SITUATIONAL AWARENESS AND FORECASTING**

4 **A. Introduction**

5 **1. Scope, Purpose, and Support for this Request**

6 This chapter presents Pacific Gas and Electric Company's (PG&E or the
7 Company) 2023 expense and capital forecast for its Electric Distribution
8 Situational Awareness and Forecasting activities. This chapter
9 demonstrates that the forecast for these activities is reasonable and should
10 be adopted by the California Public Utilities Commission (CPUC
11 or Commission). The programs described in this chapter represent critical
12 elements of PG&E's wildfire risk mitigation program. Electric Distribution
13 Situational Awareness includes the Wildfire Safety Operations Center
14 (WSOC),¹ Safety and Infrastructure Protection Team (SIPT), wildfire
15 cameras, Partial Voltage Detection, and meteorology and fire detection.

16 WSOC serves as a physical hub for coordination, facilitation, and
17 communications of PG&E's wildfire-response activities.

18 SIPT crews perform high priority fire mitigation work, protect PG&E
19 assets, and gather critical data to help prepare for and manage wildfire risk.

20 Wildfire cameras improve PG&E's overall situational awareness and are
21 used by California Department of Forestry and Fire Protection, California
22 Office of Emergency Services (OES), United States Forest Service (USFS),
23 PG&E, and other local agencies to identify and track wildfires in real-time,
24 from ignition to containment.

25 PG&E's Partial Voltage Detection program enhances customer/public
26 safety and helps to mitigate wildfires.

27 Programs associated with meteorology, weather forecasting, the fire
28 potential index (FPI) and fire detection projects help to maintain and
29 enhance PG&E's weather forecasting capabilities and wildfire detection
30 capabilities. Many of these capabilities are foundational to the Public Safety

¹ PG&E describes the forecast for WSOC in this chapter through 2022. In 2023 and beyond, the WSOC forecast moves to Ch. 5 of this exhibit to reflect a shift towards an All Hazards approach.

1 Power Shutoff (PSPS) program. This work includes expanded weather
 2 station deployment, a satellite-based fire detection system, and Advanced
 3 Fire Modeling (AFM).

4 **2. Summary of Request**

5 PG&E requests that the Commission adopt its 2023 expense forecast of
 6 \$43.4 million² for five activities addressed in this chapter: (1) SIPT;
 7 (2) Wildfire Cameras; (3) Partial Voltage Detection; (4) Expanded Weather
 8 Station Deployment; and (5) Meteorology Weather Forecasting, FPI and Fire
 9 Detection Projects. PG&E's 2023 forecast is \$9.4 million higher than its
 10 2020 recorded expenses of \$34 million.³

11 PG&E further requests that the Commission adopt its capital
 12 expenditure forecasts for five activities addressed in this chapter: (1) the
 13 WSOC;⁴ (2) SIPT; (3) Partial Voltage Detection; (4) Expanded Weather
 14 Station Deployment; and (5) Meteorology Information Technology (IT)
 15 Support. PG&E forecasts \$9.5 million 2021, \$9.4 million for 2022,
 16 \$4.6 million for 2023, \$3.3 million for 2024, \$3.3 million for 2025, and
 17 \$3.4 million for 2026.⁵ PG&E's 2023 forecast is \$7.0 million lower than its
 18 2020 recorded expenses of \$11.6 million.

19 Forecasts in this chapter are shown with escalation at the Major Work
 20 Category (MWC) level and escalation is included in all expense and capital
 21 totals. For more information on escalation, please refer to Chapter 2 of this
 22 exhibit.

23 **3. Overview of Recorded and Forecast Costs**

24 Expenditures for the activities described herein are divided into one
 25 expense and one capital MWC, listed in Table 4.1-1 below. The following
 26 sections describe each of the MWCs and explain how the cost forecasts for
 27 each were derived. Tables 4.1-6 and 4.1-7 at the end of this chapter show

2 See Exhibit (PG&E-4), WP 4-6, line 12.

3 Values vary from the values listed in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal. 2020 recorded amounts include the WSOC.

4 PG&E's capital forecast in this chapter includes the WSOC through 2022.

5 See Exhibit (PG&E-4), WP 4-19, line 5.

1 the 2016-2020 capital and expense recorded amounts, the 2021-2023
 2 expense forecast, and the 2021-2026 capital forecast by MWC.

TABLE 4.1-1
ELECTRIC DISTRIBUTION SITUATIONAL AWARENESS AND FORECASTING MWCS

Line No.	MWCs	Title
1	<u>Expense</u>	
2	AB	Miscellaneous Expense
3	<u>Capital</u>	
4	21	Miscellaneous Capital

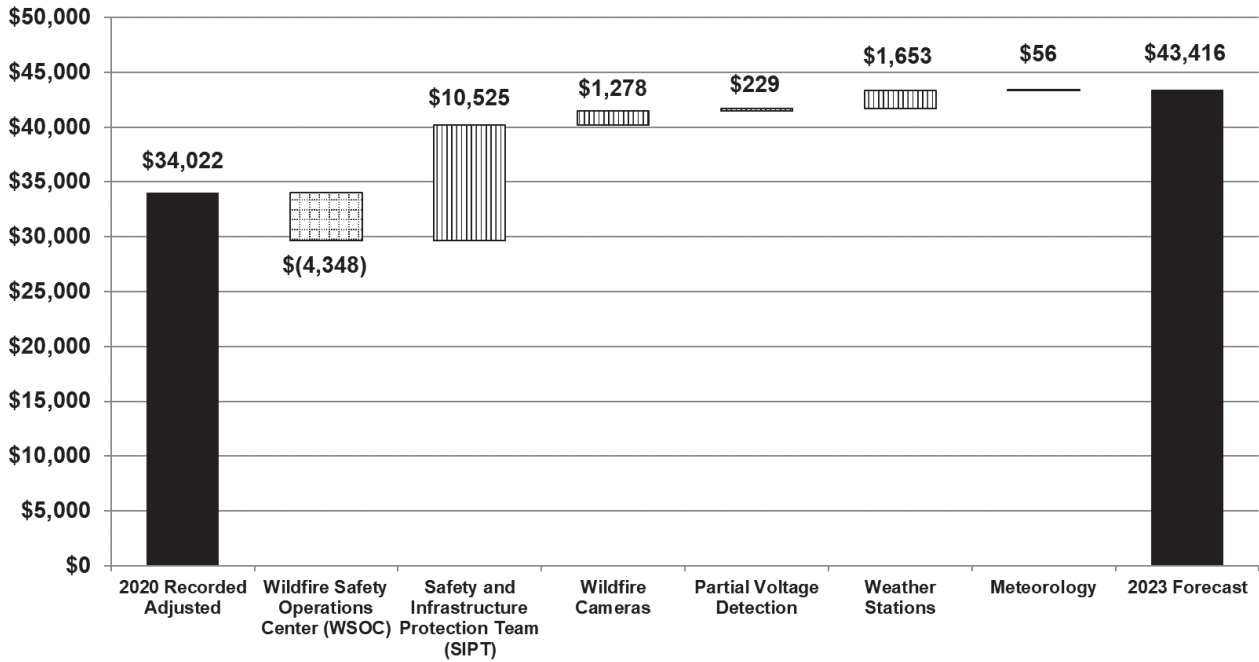
3 **a. Expense**

4 Expense activities in this chapter are recorded in MWC AB. As
 5 shown in Figure 4.1-1 below, forecast costs for expense activities are
 6 expected to increase by \$9.4 million, or 28 percent, between 2020 and
 7 2023.⁶ PG&E describes below the major expense drivers of the
 8 forecast shown in Figure 4.1-1. PG&E's 2023 expense forecast for
 9 Situational Awareness and Forecasting wildfire mitigation activities in
 10 2023 is \$43.4 million, which is \$9.4 million higher than 2020 recorded
 11 costs of \$34 million.⁷

⁶ Values vary from the values listed in the RO Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

⁷ See Exhibit (PG&E-4), WP 4-6, line 12.

**FIGURE 4.1-1
EXPENSE WALK 2020-2023
(THOUSANDS OF NOMINAL DOLLARS)**



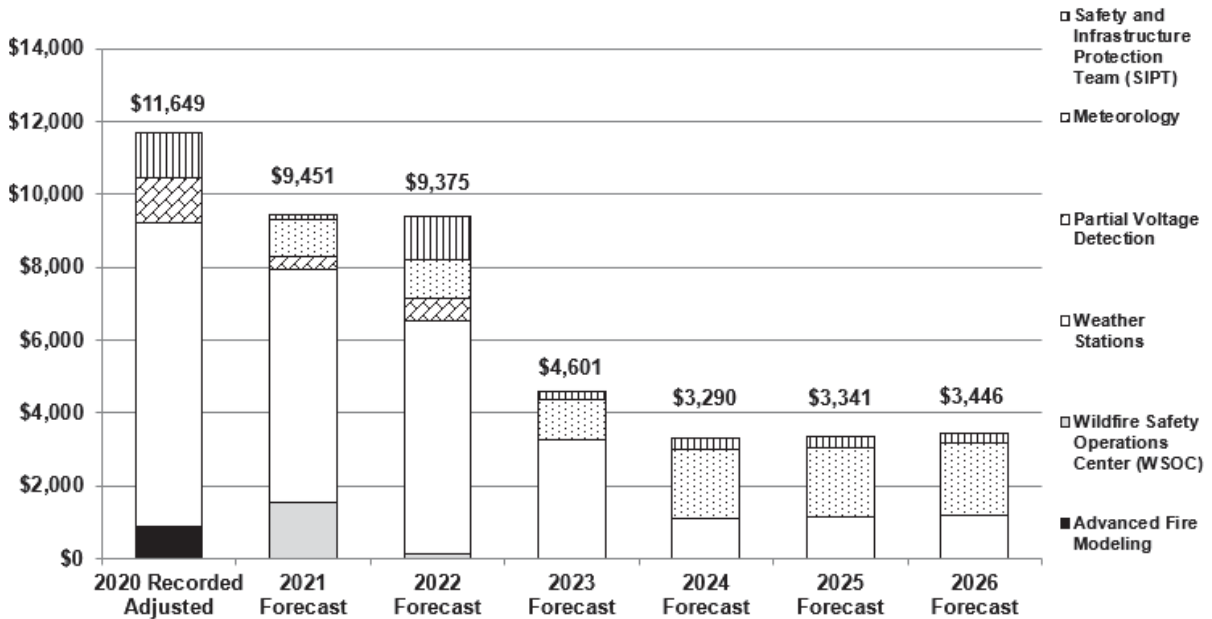
1 The activities driving this increase include increased costs due to
 2 the expansion of the SIPT and expanded weather station deployment.
 3 These increases are partially offset by the removal of the WSOC from
 4 PG&E's 2023 forecast in this chapter. In 2023, the former WSOC will
 5 transition to become the Hazard Awareness and Warning Center
 6 (HAWC)⁸ supporting PG&E's overall emergency response, as opposed
 7 to just wildfire response. The 2023 expense forecast for the HAWC is
 8 discussed Chapter 5 of this exhibit.

9 **b. Capital**

10 Capital activities in this chapter are recorded in MWC 21. As shown
 11 in Figure 4.1-2 below, forecast costs for capital activities are expected to
 12 decrease by \$7.0 million, or 61 percent, between 2020 and 2023.

⁸ The control/mitigation name associated with the WSOC as well as its future state (HAWC) will remain "WSOC" across Ch. 4.1 and Ch. 5.

FIGURE 4.1-2
CAPITAL RECORDED AND FORECAST 2020-2026
(THOUSANDS OF NOMINAL DOLLARS)



1 The activities driving this decrease include: a reduction in costs for
 2 WSOC capital equipment; deploying fewer weather stations; and
 3 reduced capital expenditures for the Partial Voltage Detection program.

4 PG&E describes below the major capital drivers of the forecast
 5 shown in Figure 4.1-2. In 2020, recorded capital expenditures were
 6 \$11.6 million. Situational Awareness and Forecasting is forecasting
 7 capital expenditures of \$9.5 million for 2021, \$9.4 million for 2022,
 8 \$4.6 million for 2023, \$3.3 million for 2024, \$3.3 million for 2025, and
 9 \$3.4 million for 2026.⁹ PG&E’s 2023 capital forecast is \$7.0 million
 10 lower than its 2020 recorded expenditures of \$11.6 million.

11 **B. Program and Risk Overview**

12 **1. Program Overview**

13 The work forecast in this chapter is designed to reduce the risk of
 14 wildfire through activities and services aimed at improving situational
 15 awareness, weather forecasting and fire risk modeling that is used by PG&E
 16 and other agencies to help protect all Californians.

⁹ See Exhibit (PG&E-4), WP 4-19, line 5.

2. Risk Integration

Chapter 3 of this exhibit describes how Electric Operations (EO) uses the Enterprise and Operational Risk Management Program to manage electric system risks. In Chapter 3 of this exhibit, PG&E describes how management of the Wildfire risk has changed since the filing of the 2020 RAMP Report, provides updated Risk Spend Efficiency (RSE) scores, and lists each Wildfire mitigation and control and indicates if it has changed since the 2020 RAMP Report filing. PG&E provides more information about the wildfire mitigations associated with activities in this chapter and the work needed to implement them.

Table 4.1-2 below shows the EO risks associated with the forecasts discussed in this chapter.

**TABLE 4.1-2
RISKS DISCUSSED IN THIS CHAPTER**

Risk Name	Risk ID	Type of Risk	Maintenance Activity Type (MAT)
Wildfire	WLDFR	Risk Assessment and Mitigation Phase (RAMP)	AB6, 21A

a. RAMP Risk – Wildfire

1) Risk Overview

The Wildfire risk is defined as PG&E assets or activities that may initiate a fire that is not easily contained and endangers the public, private property, sensitive lands, or environment. Wildfire was one of PG&E's 2020 RAMP risks.¹⁰

2) General Rate Case (GRC) Risk Mitigations

As shown in the tables below, PG&E is forecasting two mitigations in this chapter, one of which has nine subparts. These mitigations were determined to reduce the frequency or consequence of risk of wildfire. A brief description of each

¹⁰ PG&E's RAMP Report, A.20-06-012 (June 30, 2020), Ch. 10.

1 mitigation is provided in the tables below. More detail is included in
2 the 2020 RAMP Report.¹¹

¹¹ PG&E's RAMP Report, A.20-06-012 (June 30, 2020), starting at page 10-22.

**TABLE 4.1-3
WILDFIRE
FORECAST MITIGATIONS**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	WLDFFR-M07B	Situational Awareness and Forecasting Initiatives - Weather Station	Purchase, installation, maintenance, and operation of weather stations. Collection, recording, and analysis of weather data from weather stations and from external sources.	Consequence only	See Section C.1.c.1 and Section C.2.b for more information	21A, AB6
2	WLDFFR-M07C	Situational Awareness and Forecasting Initiatives - WSOC	The WSOC is a physical facility which serves as PG&E's central information hub for all wildfire-related data. The WSOC team monitors, analyzes, and initiates wildfire mitigation and response efforts throughout the service area.	Foundational	This becomes EPNDR-C002 in 2023. See Section C.1.a and Section C.2.a for more information	21A, AB6
3	WLDFFR-M07D	Situational Awareness and Forecasting Initiatives - Cameras	Purchase, installation, maintenance, and operation of HD cameras. Cameras used to identify and track wildfires in real-time, from ignition to containment.	All drivers	See Section C.1.b for more information	AB6
4	WLDFFR-M07E	Situational Awareness and Forecasting Initiatives - Satellite Fire Detection	Collection, recording, and analysis of Satellite data indicating fires in our service territory	All drivers	See Section C.1.c.3 for more information	AB6
5	WLDFFR-M07G	Situational Awareness and Forecasting Initiatives – Partial Voltage Detection	Single-Phase and Three-phase SmartMeters™ send real-time alarms indicating partial voltage conditions to the Distribution Management System. Detection of partial voltage conditions allows Control Center Operators to dispatch field personnel to locations where equipment may be in a condition that increases wildfire risk.	Equipment Failure	See Section C.1.e and Section C.2.c for more information. Formerly called Enhanced Wire Down.	21A, AB6
6	WLDFFR-M07H	Situational Awareness and Forecasting Initiatives – Storm Outage Prediction Project (SOPP) Improvements	Develop methodology for forecast of weather conditions relevant to utility operations. forecasting weather conditions and conducting analysis to incorporate into utility decision-making.	Consequence only	See Section C.1.c.2 for more information; This mitigation was named Meteorology/Fire and Storm Modeling in RAMMP	AB6
7	WLDFFR-M07I	Situational Awareness and Forecasting Initiatives – Advance Fire Modeling	Foundational element to the PSPS program and daily mitigation activities that reduce the risk of utility caused ignition. Fuel sampling and fire spread modeling initiatives improve, deploy, and maintain operational models that help PG&E predict the consequence and risk of fires.	Consequence only	See Section C.1.d for more information; Advance Fire Modeling includes Dead and Live Fuel Moisture Modeling, Fire Spread Modeling and FPI (WLDFFR-M07K).	AB6

**TABLE 4.1-3
WILDFIRE
FORECAST MITIGATIONS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
8	WLDFR-M07J	Situational Awareness and Forecasting Initiatives – Meteorology	Deployment of high-resolution models which are based on historical datasets which are used to develop outage potential and FPI forecasts.	Foundational	See Section C.1.c.2 for more information. The meteorology IT support, discussed in Section C.1.g and Section C.2.e, provides foundational support to this mitigation.	21A, AB6
9	WLDFR-M07K	Situational Awareness and Forecasting Initiatives – FPI	The FPI model combines weather (wind, temperature, and relative humidity) and vegetative fuels (10-hour dead fuel moisture, live fuel moisture, and fuel type) into an index that represents the probability of large fires to occur.	Foundational	See Section C.1.d.3 for more information	AB6
10	WLDFR-M008	SIPT	Personnel position within utility service territory to monitor system conditions and weather on site. Field observations shall inform operational decisions.	Consequence only	See Section C.1.f and Section C.2.d.2 for more information	21A, AB6

3) Changes to Mitigations

PG&E modified its portfolio of mitigations associated with Situational Awareness and Forecasting since filing the 2020 RAMP Report. The work for some of the mitigations proposed in the 2020 RAMP Report has also changed as described below.

In the 2020 RAMP Report, PG&E proposed an omnibus mitigation that contained several distinct situational awareness and forecasting activities: M7—Situational Awareness and Forecasting Initiatives. For the 2023 GRC, PG&E has divided the M7 mitigation into eleven subparts (M07A-M07K) to provide a more granular view of its forecast and risk modeling. Nine of these Situational Awareness and Forecasting mitigations are discussed in this chapter; the remaining two are discussed in Chapter 4.3. In the 2020 RAMP Report, the activities associated with the M7 mitigation were identified and have not changed.

Additionally, PG&E has refined its forecast for the SIPT mitigation described in the 2020 RAMP Report. PG&E's 2023 GRC forecast for SIPT is lower than what was presented in the 2020 RAMP Report.¹² PG&E believes that this forecast more accurately reflects the level of staffing needed for SIPT to meet its goals and commitments. In this GRC, PG&E has also added a small capital forecast for SIPT for radios, pumps, lighting, and other equipment for crews.

4) Cost Tables

Tables 4.1-4 and 4.1-5 below shows the forecast costs for the mitigations described above.¹³

¹² See Exhibit (PG&E-4), WP 3-20, lines 62 and 63.

¹³ See Exhibit (PG&E-4), WP 3-5, line 31 (WLDLFR mitigations, capital) and WP 3-7, line 31 (WLDLFR mitigations, expense).

**TABLE 4.1-4
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 – EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020 Record Adjusted	2021 Forecast	2022 Forecast	2023 Forecast	Total	RSE ^(a)
1	WLDFR-M07B	Situational Awareness and Forecasting Initiatives – Weather Station	AB6	\$111	\$1,572	\$1,641	\$1,764	\$5,088	^(b)
2	WLDFR-M07C	Situational Awareness and Forecasting Initiatives – WSOC	AB6	4,348	9,139	7,181	–	\$20,668	^(b)
3	WLDFR-M07D	Situational Awareness and Forecasting Initiatives – Cameras	AB6	6,956	9,385	11,532	8,234	\$36,107	19.4
4	WLDFR-M07E	Situational Awareness and Forecasting Initiatives – Satellite Fire Detection	AB6	–	341	351	362	\$1,054	154.01
5	WLDFR-M07G	Situational Awareness and Forecasting Initiatives – Partial Voltage Detection	AB6	4	–	85	233	\$318	281.9
6	WLDFR-M07H	Situational Awareness and Forecasting Initiatives – SOPP Improvements	AB6	1,627	1,969	2,029	–	\$5,625	^(b)
7	WLDFR-M07I	Situational Awareness and Forecasting Initiatives – Advance Fire Modeling	AB6	5,541	5,969	6,152	6,345	\$24,007	^(b)
8	WLDFR-M07J	Situational Awareness and Forecasting Initiatives – Meteorology	AB6	–	515	531	438	\$1,484	^(b)
9	WLDFR-M07K	Additional System Automation and Protection – FPI	AB6	93	154	159	174	\$580	^(b)
10	WLDFR-M008	SIPT	AB6	15,342	30,304	24,899	25,867	\$96,412	1.0
11		Total		\$34,021	\$59,348	\$54,560	\$43,416	\$191,345	

(a) RSE values include all the MATs associated with a mitigation or control, not for individual MATs. While the RSEs may be shown for the individual MATs, the RSE value is assumed to incorporate the combined costs and risk reduction for all the assigned MATs.

(b) PG&E considers these foundational mitigations and, as such, does not calculate and RSE for them.

**TABLE 4.1-5
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2026 – CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020 Record Adjusted	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	Total	RSE ^(a)
1	WLDFFR-M07B	Situational Awareness and Forecasting Initiatives – Weather Station	21A	\$8,315	\$6,399	\$6,377	\$3,270	\$1,122	\$1,155	\$1,189	\$27,827	(b)
2	WLDFFR-M07C	Situational Awareness and Forecasting Initiatives – WSOC	21A	(34)	1,542	129	-	-	-	-	1,637	(b)
3	WLDFFR-M07G	Situational Awareness and Forecasting Initiatives – Partial Voltage Detection	21A	1,216	331	627	-	-	-	-	2,174	281.9
4	WLDFFR-M07I	Situational Awareness and Forecasting Initiatives – Advance Fire Modeling	21A	899	1,028	-	-	-	-	-	1,927	(b)
5	WLDFFR-M07J	Situational Awareness and Forecasting Initiatives – Meteorology	21A	-	-	1,055	1,083	1,890	1,905	1,967	7,900	(b)
6	WLDFFR-M008	SIPT (Capital)	21A	1,254	152	1,187	248	278	281	290	3,689	1.0
7		Total		\$11,649	\$9,451	\$9,375	\$4,601	\$3,290	\$3,341	\$3,446	\$45,153	

(a) RSE values include all the MATs associated with a mitigation or control, not for individual MATs. While the RSEs may be shown for the individual MATs, the RSE value is assumed to incorporate the combined costs and effectiveness for all the assigned MATs.

(b) PG&E considers these foundational mitigations and, as such, does not calculate and RSE for them.

1 C. Activities, Costs, and Forecast Drivers by Risk Mitigation

2 1. Expense (MWC AB)

3 PG&E's Situational Awareness and Forecasting activities are a
4 combination of expense and capital work. The expense work, recorded in
5 MWC AB, is described in this section. The capital work, recorded in MWC
6 21, is described in Section C.2. below.

7 a. WSOC/HAWC (WLDFR-M07C)

8 PG&E opened the WSOC in May 2018 to serve as a physical hub
9 for coordination, facilitation, and communications of PG&E's
10 wildfire-response activities. The WSOC plays a key role in PG&E's
11 efforts to provide customer and community safety while addressing the
12 challenges of climate-driven extreme weather events such as wildfires.
13 In future years, PG&E plans to change the WSOC charter to provide "All
14 Hazards" monitoring. The WSOC currently monitors for fire ignitions
15 across PG&E's service area 24-hours a day, seven days a week,
16 leveraging PG&E's resources and publicly available weather
17 information, wildfire camera data, and first responder (local and state)
18 data. This program is a Wildfire mitigation referred to as Situational
19 Awareness and Forecasting Initiatives – WSOC (WLDFR-M07C).

20 PG&E's WSOC monitors, assesses, and directs specific wildfire
21 prevention and response efforts throughout its service territory. The
22 WSOC interfaces and collaborates with various PG&E lines of business
23 (LOB) to assist in deploying technology, processes, and procedures for
24 wildfire prevention, response, and recovery. The WSOC also obtains
25 information from PG&E field personnel, including Public Safety
26 Specialists (PSS) and SIPT crews. When wildfires meet established
27 criteria (e.g., certain proximity to PG&E assets), the WSOC generates
28 and distributes notifications or reports via text message or email. These
29 reports include the wildfire status, a list of PG&E assets threatened or
30 impacted, and the location of the wildfire. The WSOC sends the reports
31 to internal distribution lists within PG&E, including field staff, control
32 center personnel, executive staff, supporting LOBs, and other PG&E
33 emergency responders.

1 In addition, the WSOC communicates fire threat information to the
2 various operations centers within PG&E (Gas Control, Electric Grid
3 Control, Electric Distribution Control, IT/Telecom, Security, Power
4 Generation, etc.). The real-time risk information communicated to
5 internal control centers and field employees enables PG&E to act swiftly
6 to protect customers and property. These notifications also facilitate the
7 sharing of critical incident information so that PG&E can effectively
8 coordinate with external emergency response agencies.

9 To that end, the WSOC coordinates with PG&E's PSS team, who
10 interfaces with CAL FIRE, federal fire agencies and other jurisdictional
11 agencies overseeing the response to wildfire threats and incidents. The
12 WSOC and PSS Team share information regarding ongoing fires and
13 new ignitions that have a potential to impact PG&E's customers and
14 property.

15 In the event of a potential fire threat to one of the communities in
16 PG&E's service area, the WSOC coordinates and helps mobilize
17 response efforts with first responders, media, local government, and
18 other safety officials. These response efforts may involve some of the
19 new and enhanced safety measures PG&E is implementing to further
20 reduce the risk of future wildfires, including temporarily de-energizing
21 electric power lines in high fire-threat areas when extreme fire conditions
22 are present. In 2020, the WSOC played an integral role in PG&E's effort
23 to protect communities during the August Lightning Complex fires, as
24 well as multiple PSPS events.

25 In 2021, PG&E will pursue expanding the charter of the WSOC into
26 the HAWC. Additional hazards monitored will include debris
27 flow/landslide events, Company response to earthquakes, and severe
28 weather events. The center will remain staffed 24/7 with employees
29 monitoring and reporting on broader real-time emergency events. The
30 center will serve as a centralized hub for emergency and hazard
31 communications and intelligence to internal stakeholders. PG&E's
32 HAWC will not replace existing communication processes within the
33 respective lines of businesses, but rather will operate as a centralized
34 resource for real-time situational awareness and intelligence.

1 PG&E plans to implement phase one of the HAWC in 2021, and
2 further stabilize and mature the center in 2022.

3 PG&E's 2020 recorded costs were \$4.3 million.¹⁴ PG&E's expense
4 forecast for the WSOC is \$9.1 million in 2021 and \$7.2 million in 2022.
5 Costs include labor-related costs for field, support, and leadership
6 employees. In 2023, the WSOC will fully transition into the HAWC; the
7 expense forecast for the HAWC from 2023 on is discussed in Chapter 5
8 of this exhibit. Comparisons from WSOC's recorded 2020 expenses
9 and the 2023 forecast for the HAWC will be covered in Chapter 5 of this
10 exhibit. For reference, the control/mitigation name of the HAWC will
11 remain "WSOC" in Chapter 5 as mentioned above.

12 **b. Wildfire Cameras (WLDFR-M07D)**

13 Wildfire cameras improve PG&E's overall situational awareness and
14 are a valuable tool for assisting the WSOC (including in its future state
15 as a HAWC), first responders, and fire agencies. Wildfire cameras are
16 used by CAL FIRE, OES, USFS, PG&E, and other local agencies at no
17 cost to identify and track wildfires in real-time, from ignition to
18 containment. These cameras allow PG&E employees and other
19 stakeholders, including jurisdictional agencies, to more quickly confirm
20 reports of fire, assess the size and spread, and ultimately help deploy
21 resources directly to areas where they can have the most impact. After
22 wildfire containment, the cameras allow PG&E, firefighting agencies,
23 and other interested stakeholders to monitor conditions to ensure a
24 wildfire does not re-ignite. First responders and external agencies such
25 as CAL FIRE and the USFS have access to control PG&E's cameras
26 (pan/tilt/zoom) to assist with their respective fire response efforts. Live
27 feeds and time-lapse data from this camera network are available to the
28 public.¹⁵ ALERT Wildfire owns the camera infrastructure and camera
29 data on its platform, including PG&E funded cameras. This program is a
30 Wildfire mitigation referred to as Situational Awareness and Forecasting
31 Initiatives – Cameras (WLDFR-M07D).

¹⁴ See Exhibit (PG&E-4), WP 4-6, line 1.

¹⁵ Available at <<http://www.alertwildfire.org>> (as of June 10, 2021).

1 By using camera technology, PG&E gains valuable visual
2 intelligence and potential early warning of wildfires that could impact our
3 electric and gas facilities. Wildfire cameras give us the information
4 needed to: (1) issue alerts in the event of a fire and direct employees to
5 seek safety; (2) suspend or reduce services that may be hazardous if
6 damaged (such as lowering pressure in certain gas transmission pipes;
7 or de-energizing power to electrical substations that may be adversely
8 affected); and (3) initiate emergency management and response.

9 Benefits of wildfire cameras include:

- 10 • Heightened awareness of lightning strikes and wildfire; Increased
11 ability to take safety precautions prior to a wildfire event, leading to
12 increased employee safety;
- 13 • Increased ability to take damage mitigation actions prior to a wildfire
14 event, leading to increased public safety;
- 15 • Increased ability to manage crews, assets, and individual personnel
16 through knowledge of geographic areas likely to receive the most
17 damage prior to a wildfire event; and
- 18 • Scaled wildfire response based on wildfire intelligence provided by
19 the camera network; and potential for decreased restoration times
20 due to improved situational awareness for senior management
21 directing crew allocation and assignments.

22 PG&E plans to install approximately 134 additional cameras per
23 year in 2021 and 2022,¹⁶ for a total of 600 cameras. These camera
24 installations will provide 90 percent viewshed coverage of Tier 2 and
25 Tier 3 High Fire Threat District (HFTD) areas across PG&E's service
26 territory. Between 2023-2026, forecasts are intended to cover
27 replacement installations and operations and maintenance (O&M) costs.
28 PG&E's partner (UCSD/ALERT Wildfire) will continue to provide and
29 install the cameras; maintain and operate the cameras; and support and
30 manage the program and software applications, as well as a Data
31 Center with redundancy.

¹⁶ See Exhibit (PG&E-4), WP 4-7, line 15.

1 The number of cameras PG&E plans to install will exceed its
2 capability to manually monitor each feed. PG&E currently leverages
3 other information, such as satellite fire detections and Integrated
4 Reporting Wildfire Information (IRWIN) to help determine which
5 camera(s) should be viewed. PG&E plans to continue research with
6 UCSD and leading vendors in a collaborative effort aimed at further
7 advancing automated monitoring capabilities. This research is aimed at
8 identifying and incorporating Artificial Intelligence (AI) early fire detection
9 software which incorporates machine learning, and visualization
10 techniques to display 360-degree imagery from spinning cameras. The
11 technology would program cameras to automatically rotate and zoom to
12 view emerging incidents based on input from fire incident reports (such
13 as detections from the PG&E Fire Detection and Alert System). Due to
14 the emergent nature of these new technologies, PG&E is unable to
15 quantify a forecast at this time for testing/implementing advanced
16 AI-capability software and incorporating it into the preexisting camera
17 network. However, PG&E plans to record costs for any pilot and/or
18 continued research through the Wildfire Mitigation Balancing Account
19 (WMBA).

20 PG&E's expense forecast for Wildfire Cameras is \$9.4 million in
21 2021, \$11.5 million in 2022, and \$8.2 million in 2023.¹⁷ The forecast
22 covers installation and on-going O&M expenses.¹⁸ PG&E's 2023
23 forecast is \$1.3 million higher than its 2020 recorded costs of
24 \$7.0 million. The primary reason for the increase is ongoing O&M
25 expenses.

26 **c. Wildfire Detection Meteorology Projects**

27 **1) Expanded Weather Station Deployment (WLDFR-M07B)**

28 To bolster wildfire prevention and emergency response efforts,
29 PG&E has expanded its weather monitoring capability by installing a
30 network of PG&E-owned and operated weather stations across the
31 service area. PG&E's meteorology team is leading the project to

¹⁷ See Exhibit (PG&E-4), WP 4-6, line 3.

¹⁸ See Exhibit (PG&E-4), WP 4-36.

1 install 1,300 new weather stations across its territory between 2018
2 and 2022, with project management help from IT and other
3 organizations. Our robust weather station network provides
4 continuous, localized weather information that facilitates improved
5 understanding of weather conditions in localized areas and real-time
6 awareness of wildfire danger. Additionally, the weather station data
7 improves weather modeling capabilities, and contributes to the
8 selection of the most accurate weather model configuration for
9 PG&E's service territory. This program is a Wildfire mitigation
10 referred to as Situational Awareness and Forecasting Initiatives –
11 Weather Station (WLDLFR-M07B)

12 PG&E Meteorology Department staff uses data from the
13 weather stations to model and monitor real-time weather and fire
14 danger conditions. For example, the weather stations provide
15 temperature, humidity, and wind speed data which are key inputs in
16 PG&E's AFM system. Weather station data is also foundational to
17 the PSPS program and helps facilitate operational decision-making
18 during PSPS events, both during the de-energization and
19 re-energization (all clear) decision-making phases of a PSPS event.

20 As mentioned above, PG&E is in the process of expanding its
21 weather station program to at least 1,300 weather stations by the
22 end of 2022. From 2023-2026, PG&E plans to continue to install
23 additional weather stations as needed to fill in data gaps and better
24 support PSPS operations. PG&E also plans to optimize the
25 placement of some existing weather stations by moving them to
26 more ideal and windier locations on circuits if possible.

27 Operating and maintaining the weather stations requires an
28 annual calibration by a technician and replacement of equipment as
29 needed. These costs scale to the size of the network as each
30 weather station requires calibration to ensure data fidelity for PSPS
31 purposes.

32 PG&E's expense forecast for Expanded Weather Station
33 Deployment is \$1.6 million in 2021, \$1.6 million 2022, and
34 \$1.8 million in 2023. PG&E's 2023 forecast is \$1.7 million higher

1 than its 2020 recorded costs of \$0.1 million.¹⁹ The primary reason
2 for the increase is growth in ongoing O&M costs as the size of the
3 network increases.

4 This is primarily a capital project and is discussed further in
5 Section C.2.b below.

6 **2) Numerical Weather Prediction and SOPP Model Automation** 7 **(WLDFR-M07H, WLDFR-M07J)**

8 PG&E Meteorology remains committed to advancing its weather
9 forecasting capabilities by working with external numerical weather
10 prediction experts. Weather model data is foundational and informs
11 many operational decisions throughout PG&E to prepare for
12 forecasted conditions and mitigate risk, including through PSPS.
13 PG&E has tested and deployed high-resolution models and built
14 high-resolution historical datasets. These high-resolution historical
15 datasets and forecasts drive outage potential and FPI models, which
16 are the main inputs into PG&E's PSPS decision-making framework.
17 More accurate forecasts and historical datasets may lead to smaller
18 and more targeted PSPS events as well as improved ability to
19 communicate the potential of a PSPS event to customers and all
20 stakeholders. The work described in this section includes two
21 Wildfire mitigations: (1) Situational Awareness and Forecasting
22 Initiatives – SOPP Improvement (WLDFR-M07H); and
23 (2) Situational Awareness and Forecasting Initiatives – Meteorology
24 (WLDFR-M07J).

25 PG&E first deployed the PG&E Operational Mesoscale
26 Modeling System (POMMS) in 2014, upgraded the system to
27 POMMS 2.0 in 2018, and upgraded again to POMMS V3.0 in 2020.
28 POMMS is a customized version of the National Center for
29 Environmental Prediction Weather Research and Forecast model
30 that is run at 2x2 km resolution across Northern and Central
31 California. PG&E will continue operating this foundational numerical
32 weather prediction program in 2021-2026 and plans to improve the

¹⁹ See Exhibit (PG&E-4), WP 4-6, line 5.

1 model's capabilities in future years, consistent with historical
2 advancements described above. Advances in future years are
3 expected to keep pace with advances in weather prediction
4 technology and increases in forecast granularity.

5 PG&E's SOPP Model is the primary tool utilized by PG&E's
6 Meteorology Department to forecast the magnitude and timing of
7 unplanned outage activity on the distribution and transmission
8 system that may occur due to weather events (e.g., wind, rain,
9 snow, heat).

10 In addition, the SOPP model provides key input to PG&E's
11 operational staffing and logistical decisions to support PG&E's
12 planning for upcoming weather/storm emergency events. The
13 primary goal of this program is to be prepared for storms and reduce
14 customer outages to the extent possible. For example, the model
15 informs PG&E's decisions regarding whether to open the
16 Emergency Operations Center, and if the storm is severe enough,
17 execute PG&E's mutual aid and mutual assistance agreements in
18 advance of storms. The SOPP model mitigates operational risk and
19 reduces customer outage times arising from weather events that
20 create high unplanned outage volumes.

21 The SOPP model is comprised of multiple sub-models that
22 predict wind-to-outage, heat-to-outage, and snow-to-outage
23 relationships in specific geographic areas. PG&E plans to continue
24 to improve certain aspects of these sub-models in future years to
25 improve the overall SOPP model and PG&E's operational decisions
26 based on the model.

27 PG&E's forecast for Numerical Weather Prediction and SOPP
28 Model Automation in Chapter 4.1 is approximately \$2.0 million in
29 2021 and \$2.0 million in 2022.²⁰ The forecast covers continued
30 advancements of the Outage Producing Wind (OPW),
31 improvements to the heat-outage prediction model, and other
32 developments described in more detail above. PG&E's 2020

²⁰ See Exhibit (PG&E-4), WP 4-6, line 7.

1 recorded costs were \$1.6 million. Beginning with 2023, forecasts for
2 this program are discussed in Chapter 5 (Emergency Preparedness
3 and Response) of this exhibit to reflect the fact that this program is
4 intended to be applicable to other emergencies in addition to
5 wildfires (e.g., storms).

6 **3) Satellite Fire Detection System (WLDFR-M07E)**

7 This project involves continued operation of and improvements
8 to a fully operational satellite-based fire detection and alert system.
9 Satellite fire detection provides PG&E with valuable timely
10 information about new fires and the spread of existing fires. This
11 information can be used to ensure the safety of customers and utility
12 workers in the area, help identify assets at risk, and provide
13 situational awareness as to the burn severity and rate of spread.
14 PG&E determined that a satellite-based fire detection system, which
15 monitors continuously, was more effective than its prior approach,
16 daily fixed-wing flight patrols.²¹ This program is a Wildfire mitigation
17 referred to as Situational Awareness and Forecasting Initiatives –
18 Satellite Fire Detection (WLDFR-M07E).

19 As of December 31, 2020, the system ingested and reconciled
20 fire detection data from two Geosynchronous Satellites and four
21 polar orbiting satellites. PG&E developed the system to incorporate
22 new fire detection data feeds as they become available and plans to
23 incorporate new satellite feeds from 2023 to 2026 as more satellites
24 are deployed by National Oceanic and Atmospheric Administration
25 (NOAA) and National Aeronautics and Space Administration. PG&E
26 will continue to work with industry-leading fire detection algorithm
27 developers and experts from the Space Science and Engineering
28 Center at the University of Wisconsin-Madison to procure
29 customized feeds of satellite fire detection data with the lowest
30 latency available.

²¹ As of 2019, only one plane remained, and fixed-wing patrols were discontinued altogether by 2020.

1 To visualize and interact with the fire detection data, PG&E
2 developed a proprietary internal application in 2019 and an external
3 application available to the public in 2020 that combines and
4 displays fire detection alerts as they arrive. PG&E plans to continue
5 to support these websites and will make incremental improvements
6 through 2023-2026. PG&E is committed to sharing this data with
7 interested stakeholders and the public. This tool helps the PG&E
8 respond to new and emerging events quickly and make faster
9 operational decisions.

10 PG&E's expense forecast for the Satellite Fire Detection System
11 is \$0.3 million in 2021, \$0.4 million in 2022, and \$0.4 million in
12 2023.²² This forecast covers internal labor and vendor costs. 2020
13 recorded costs associated with Satellite Fire Detection were
14 \$0.1 million.²³ The increase from 2020 to 2023 supports increased
15 labor and increased integrations with other data systems throughout
16 PG&E. The forecast also supports additional enhancements such
17 as migrating the fire detection data pipelines and visualizations from
18 on-premise infrastructure to Amazon Web Services (AWS). In
19 addition, new satellites with Fire Detection capabilities are expected
20 to come online in the 2023-2026 timeline and will need to be
21 evaluated and incorporated into the system. An example is the
22 NOAA – Joint Polar Satellite System program, where 2 additional
23 satellites are expected to be launched into orbit from late 2022 to
24 2026.

25 **4) Light Detection and Ranging (LiDAR) Wind Measurements**

26 Although much can be learned about the atmosphere's
27 meteorological conditions from a network of weather stations on the
28 ground, these networks cannot provide information regarding
29 conditions in certain areas of the atmosphere, most notably the
30 Planetary Boundary Layer (PBL). The behavior of the PBL, defined

²² See Exhibit (PG&E-4), WP 4-6, line 8.

²³ 2020 recorded dollars for Satellite Fire Detection were primarily recorded in the Vegetation Management program, thus are not reflected in the same planning order as Satellite Fire Detection's current and future forecasts.

1 as the lowest portion of the atmosphere, is directly influenced by its
2 contact with the planetary surface. Understanding the PBL is not
3 only important for current situational awareness, but if readily
4 measured, it will improve our understanding, and our ability to
5 forecast the timing and severity of extreme weather events.

6 Instrumentation to measure the PBL continues to evolve and,
7 with the emergence of renewable wind energy over the last two
8 decades, entities have started to move away from erecting large
9 meteorological towers to collect data, in favor of ground-based
10 LiDAR and/or microwave radiometers. These instruments
11 continuously sample vertical profiles of temperature, humidity, and
12 winds from the surface to around 1-3 kilometers (km) in the air. In
13 comparison, entities like the National Weather Service only measure
14 this part of the atmosphere with weather balloons twice a day. The
15 continuous sampling of meteorological conditions in the PBL with
16 LiDAR will provide a more complete, three-dimensional
17 understanding of current conditions.

18 In 2021-2023, PG&E plans to investigate instrument options to
19 continuously measure wind conditions with LiDAR. The project will
20 include selecting test locations and evaluating the performance of
21 LiDAR instrumentation. During the evaluation period, PG&E will
22 plan additional LiDAR deployments, design support tools, and
23 establish partnerships for modeling efforts. PG&E's long-term plan
24 for 2024-2026 is to design and establish a network of LiDAR
25 instruments. The information provided by the LiDAR network will
26 support the Company's situational awareness and operational
27 decision making.

28 The project has the potential to greatly improve PG&E's
29 meteorology forecasts, while also providing additional information to
30 track and study weather events. With new machine learning
31 applications, the information from these instruments should
32 significantly improve the accuracy and lead times for forecasting
33 large scale changes in local and surface winds. The ultimate goal

1 will be to reduce PG&E's operational costs, continue to reduce our
2 PSPS footprint, and reduce other negative reliability impacts.

3 At this time, PG&E is unable to predict a forecast for this project.
4 PG&E will record costs for this program through the WMBA.

5 **d. Advanced Fire Modeling (WLDFR-M07I)**

6 The AFM project is foundational to the PSPS program and daily
7 mitigation activities that reduce the risk of utility-caused ignitions. The
8 main goals of the program are to improve, deploy and maintain
9 operational models that help PG&E predict the consequence and risk of
10 fires. This program is a Wildfire mitigation referred to as Situational
11 Awareness and Forecasting Initiatives – AFM (WLDFR-M07I).

12 This program supports the following projects:

- 13 • Fire spread model operations utilizing Technosylva's fire spread
14 model technology;
- 15 • Development of Dead Fuel Moisture (DFM) models that are required
16 by PG&E's FPI;
- 17 • Development of Live Fuel Moisture (LFM) models that are required
18 by PG&E's FPI;
- 19 • Live fuel moisture sampling efforts for field validation and model
20 calibration;
- 21 • Improvements in PG&E's FPI, that predicts the probability of large
22 fires based on weather and fuels; and
- 23 • Improvements in fire occurrence datasets to enhance the predictive
24 skill of the FPI.

25 Most of these projects have a historical component as well as a
26 forecast component. The historical component involves creating
27 datasets across PG&E's weather climatology to create a history of dead
28 and live fuels and fire spread simulations, in order to calibrate and train
29 FPI and PSPS models.

30 PG&E's expense forecast for AFM is \$6.0 million in 2021,
31 \$6.2 million in 2022, and \$6.3 million in 2023.²⁴ This forecast supports
32 the various activities discussed in more detail below. In addition to this

²⁴ See Exhibit (PG&E-4), WP 4-6, line 9.

1 overall AFM forecast, FPI has its own small, separate expense forecast,
2 which is highlighted in its subsection below. PG&E's 2023 AFM forecast
3 is \$0.8 million higher than its 2020 recorded costs of \$5.5 million.²⁵ The
4 primary reason for the increase is escalation.

5 **1) Dead Fuel Moisture and Live Fuel Moisture Modeling**
6 **(WLDFR-M07I)**

7 The moisture content in living and dead vegetation is a critical
8 input to PG&E's FPI and the National Fire Danger Rating System
9 used by state and federal fire agencies. PG&E meteorologists
10 remain committed to advancing models utilized to simulate fuel
11 moistures in dead and living vegetation. This work is part of the
12 AFM Wildfire mitigation (WLDFR-M07I).

13 In 2020, PG&E partnered with Atmospheric Data Solutions and
14 Technosylva to develop the next generation of LFM and DFM
15 models deployed at PG&E. These models provide hourly DFM
16 forecasts out four days for various types of vegetative fuel. PG&E
17 also deployed 2x2 km LFM models for Chamise as well as
18 Manzanita plant species. These are machine-learning models
19 developed by Automated Dispatch System using National Fuel
20 Moisture Database observations.

21 In addition to creating new forecast models, PG&E created a
22 30-year climatology of DFM and LFM output at 2x2 km resolution as
23 well. These robust historical datasets allow PG&E meteorologists
24 and data scientists to evaluate the fuel conditions present during
25 historical fires.

26 From 2023 to 2026, PG&E plans to continue to operate the
27 DFM and LFM models operationally as they are foundational to
28 PG&E's FPI, Fire Spread Modeling, and PSPS programs. Each
29 year, PG&E plans to add to its existing weather and fuels
30 climatology such that additional studies to recalibrate and improve
31 FPI predictions are possible.

²⁵ See Exhibit (PG&E-4), WP 4-6, line 9.

2) Fire Spread Modeling (WLDFR-M07I)

Fire spread modeling helps PG&E understand the impact and potential consequences of an ignition. Some ignitions may have minimal impact on the surrounding area and communities, while other ignitions could create significant risks including loss of life and property damage, as well as other wildfire related impacts such as air quality impacts. This work is part of the AFM Wildfire mitigation (WLDFR-M07I).

PG&E has developed several new models to better understand the impact of ignitions on surrounding areas and communities. In 2019-2020, PG&E partnered with Technosylva, an external expert in the wildfire modeling field, to test and deploy cloud-based wildfire spread model capabilities. PG&E also has the ability through a Technosylva application (Wildfire Analyst Enterprise) to simulate fires on-demand across historical, real-time, and future time horizons. The technology allows PG&E to forecast 100 million virtual fires daily across its territory in forecast mode, simulate fires on demand as they start, simulate hypothetical fires based on PSPS damage and hazard reports, and simulate fires in past weather scenarios.

Finally, PG&E has also developed a Wildfire Consequence Model using the Technosylva fire simulations. This model, in combination with wildfire ignition probability models, is used in PG&E's 2021 Wildfire Distribution Risk Model. The model can then be used to inform initiatives such as Enhanced Vegetation Management and System Hardening.

In 2021, PG&E will continue to evaluate and test a methodology to incorporate fire spread model outputs into PSPS decision making and expand the forecast horizon from three to four days. PG&E will also work with Technosylva to update the fuel model layers on an annual basis. This includes modeling new vegetation growth in recently burned areas as well as accounting for recent fire disturbances.

1 From 2022 to 2026, PG&E plans to continue using this
2 technology, which will undergo annual improvements. These
3 improvements involve an annual update to the fuels mapping
4 datasets, updates to incorporate recent fire disturbances (fire scars),
5 updates to building and population datasets, and updates to the
6 core fire spread model engine and risk outputs and metrics.

7 **3) Fire Potential Index (WLDFR-M07K)**

8 To understand the potential for large fires to occur across its
9 service territory, PG&E developed the FPI in 2015 and significantly
10 enhanced the model in 2018 and 2019. The current FPI is modeled
11 on historical fires using PG&E's 30-year downscaled climatology,
12 DFM and LFM models, fire weather indices, and other models and
13 data. The FPI model outputs the probability from 0 to 100 percent of
14 observing a large (>1000 acre) fire, given an ignition. This program
15 is a Wildfire mitigation referred to as Situational Awareness and
16 Forecasting Initiatives – FPI (WLDFR-M07K).

17 From 2022 to 2026, the work around FPI will focus on annual
18 recalibration, which will support operations and help inform fire
19 mitigations on a daily basis.

20 PG&E's expense forecast for FPI is \$0.2 million in 2021,
21 \$0.2 million in 2022, and \$0.2 million in 2023.²⁶

22 **e. Partial Voltage Detection (WLDFR-M07G)**

23 As part of its effort to enhance customer/public safety and further
24 mitigate wildfires, PG&E initiated the Partial Voltage Detection (formerly
25 referred to as Enhanced Wire Down Detection) project in 2018. This
26 program is a Wildfire mitigation referred to as Situational Awareness and
27 Forecasting Initiatives – Partial Voltage Detection (WLDFR-M07G).

28 Prior to implementing SmartMeter™ technology, Control Center
29 Operators and Dispatch were not provided with information on partial
30 voltage conditions, which indicate loss of phase/conductor on the
31 distribution circuit. In addition, SmartMeters™ only informed Control
32 Center Operators of full power-out conditions. PG&E has now enabled

²⁶ See Exhibit (PG&E-4), WP 4-6, line 10.

1 single-phase SmartMeters™ to send real-time alarms occurring in the
 2 Distribution Management System under partial voltage conditions (25 to
 3 75 percent of nominal voltage). Detection of partial voltage conditions
 4 allows Control Center Operators to dispatch field personnel to locations
 5 where equipment may be in a condition that increases wildfire risk. This
 6 technology will help PG&E detect and locate a wire down condition
 7 within minutes, instead of relying on a customer phone call or employee
 8 assessment to provide notification of a wire down. This may reduce the
 9 amount of time a line is down (where it can cause an ignition) and allow
 10 first responders to extinguish wire down-related ignitions more quickly if
 11 they occur.

12 In the initial phase of the project in 2019, the technology was
 13 deployed in to 4.5 million single-phase SmartMeters™. The second
 14 phase, which began in 2020 and is continuing in 2021, will deploy the
 15 technology to 365,000 three-phase meters.²⁷

16 The project will be complete after the second phase. After 2021,
 17 costs will be tied to ongoing O&M (steady state) unless additional
 18 modifications are necessary.

19 PG&E's expense forecast for Partial Voltage Detection is
 20 \$0.1 million in 2022, and \$0.2 million in 2023, which will cover on-going
 21 and future software maintenance for existing meters and any additional
 22 meters that may be installed.²⁸

23 PG&E's 2023 forecast is \$0.2 million higher than its 2020 recorded
 24 costs of \$0.004 million.^{29,30} The primary reason for the increase is to
 25 cover additional meters and software maintenance to installed meters.

27 Due to unforeseen issues with contract negotiations and software issues discovered in testing, PG&E submitted a request to the CPUC Wildfire Safety Division to extend the project completion time from February 2021 to June 2021. Approval for the extension was granted in January 2021.

28 PG&E is not including a forecast for this program for 2021 but may incur some minor costs. Any such costs will be absorbed in the overall IT budget.

29 See Exhibit (PG&E-4), WP 4-6, line 4.

30 Values vary from the values listed in the Results of Operation (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

1 There is also a small capital expenditure forecast associated with
2 this program, which is discussed in Section C.2.c below.

3 **f. Safety and Infrastructure Protection Team (WLDFR-M008)**

4 As a result of SB 901, PG&E established in-house fire protection
5 services. Planning for these services began in December of 2018, and
6 the SIPT was established in 2019 to support resources performing work
7 in high fire risk areas. SIPT crews consist of two to three International
8 Brotherhood of Electrical Workers-represented employees who are
9 trained and certified as SIPT personnel. The SIPT crews provide
10 standby resources for PG&E crews performing work in high fire hazard
11 areas, pre-treatment of PG&E assets during any ongoing fire, fire
12 protection to PG&E assets, and emergency medical services. SIPT
13 crews perform high priority fire mitigation work, protect PG&E assets,
14 and gather critical data to help prepare for and manage wildfire risk.
15 SIPT crews perform both routine and emergency work. This program is
16 a Wildfire mitigation referred to as SIPT (WLDFR-M008).

17 While SIPT crews do not respond to wildfires without Agency Having
18 Jurisdiction (AHJ) approval, they can help suppress any potential
19 ignition at PG&E work sites when protecting our crews and assets.
20 When first responders arrive on scene, SIPT crews follow the incident
21 command system established by the responding AHJ. SIPT crews may
22 also perform non-wildfire related emergency response work and charge
23 their time for these responses to the appropriate cost centers
24 (e.g., Major Emergency response activities, maintenance work).

25 During PSPS events, SIPT crews are deployed to collect real-time
26 weather and field conditions data to report to the WSOC. This data is
27 used to inform and validate PG&E's PSPS decision making process.
28 SIPT crews provide information to support a finding of "all clear"
29 conditions necessary to authorize power restoration activities. As
30 additional support following a decision to restore power, they patrol
31 sections of re-energized lines.

32 SIPT crews also gather fuel samples at regular intervals at
33 30 locations across the service territory, which are then analyzed for

1 their live moisture content. PG&E Meteorology uses this information as
2 a key input to their advanced fire modelling.

3 Currently, the SIPT team consists of one manager,
4 seven supervisors, two clerks, one analyst, and 40 two to three-person
5 crews. PG&E expects to continue staffing about 40 SIPT crews
6 year-round throughout PG&E's service territory, focusing on Tier 2 and
7 Tier 3 HFTD areas.

8 In 2022, SIPT plans to add five additional engines and
9 corresponding crews, additional supervisors, and additional clerks.
10 These additions will help create a stable and adequately staffed SIPT
11 program, capable of meeting the Company's needs for the foreseeable
12 future. The additional engines and crews will increase coverage to
13 critical areas of our service territory (particularly those that have been
14 impacted by devastating wildfires over the last five years), and areas
15 that are especially susceptible to PSPS events.

16 In 2023, SIPT aims to add a dedicated facility for base of operations.
17 The facility will serve as a designated location to store reserve engines,
18 program supplies, and administrative staff. No amounts for this facility
19 is reflected in PG&E's GRC forecast; if construction of the facility goes
20 forward, PG&E will record costs to the WMBA. By 2026, planning
21 should commence to determine upgrades to existing equipment
22 (specifically engines), and enhancements to the program overall. PG&E
23 will continue to assess the SIPT program's effectiveness and develop
24 risk-informed business cases to determine if increases to staffing and or
25 equipment are recommended.

26 PG&E's expense forecast for SIPT is \$30.3 million in 2021,
27 \$24.9 million in 2022, and \$25.9 million in 2023.³¹ Costs include
28 labor-related costs for field, support, and leadership employees.³²
29 PG&E's 2023 forecast is \$10.5 million higher than its 2020 recorded
30 costs of \$15.3 million. The primary reason for this increase is additional

³¹ See Exhibit (PG&E-4), WP 4-6, line 2.

³² See Exhibit (PG&E-4), WP 4-58.

1 headcount. The increase from 2020 recorded to 2021 forecast is also
2 driven by increased headcount.

3 **g. Meteorology IT Support**

4 Meteorology IT Support expense costs primarily entail labor
5 activities such as planning and data migration/conversion, certain
6 third-party contracts as well as incremental AWS costs resulting from
7 new development activities that are necessary to deliver the technology
8 solutions described earlier in Sections C.1.c and C.1.d (Meteorology
9 Projects) and later in C.2.e.

10 PG&E's expense forecast to support these various projects and
11 programs (primarily AFM and the SOPP Numerical Weather Prediction
12 Program) is \$0.5 million in 2021, \$0.5 million in 2022, and \$0.4 million in
13 2023.³³ 2020 recorded costs were not separately tracked for the
14 various projects and programs that were supported; they are woven into
15 each respective project or program's recorded dollars. The capital
16 portion which includes the majority forecast dollars for Meteorology IT
17 Support is discussed in more detail in Section C.2.e.

18 Meteorology IT Support provides foundational support to the
19 meteorological Wildfire mitigations including Numerical Weather
20 Prediction and SOPP Model Automation. This program does not have a
21 unique mitigation number.

22 **2. Capital (MWC 21)**

23 **a. WSOC (WLDFR-M07C)**

24 The capital expenditures associated with the WSOC include costs
25 for establishing a physical monitoring site outside of San Francisco in a
26 new or upgraded facility, which is projected to take place in 2021.
27 Equipment costs (new laptops or other technical upgrades) are also
28 included in the forecast. The work described in this section is a Wildfire
29 mitigation referred to as Situational Awareness and Forecasting
30 Initiatives – WSOC (WLDFR-M07C).

³³ See Exhibit (PG&E-4), WP 4-6, line 11.

1 PG&E's 2020 recorded capital expenditures were \$(0.03) million.
2 The credit was due to vendor invoice returns/true-ups. PG&E's capital
3 expenditure forecast for the WSOC is \$1.5 million in 2021 and
4 \$0.1 million in 2022.³⁴ In 2023, the WSOC will transition into the
5 HAWC; expenditures for the HAWC are discussed in Chapter 5 of this
6 exhibit.

7 **b. Expanded Weather Station Deployment (WLDFR-M07B)**

8 As described in Section C.1.c.1 above, PG&E's Meteorology team
9 will be leading the project to install a minimum of 1,300 weather stations
10 between 2018 and 2022. Weather station data facilitates improved
11 understanding, modeling, and prediction of fire danger and better
12 real-time awareness of fire danger. From 2023 to 2026, PG&E plans to
13 continue to optimize and install additional weather stations as needed to
14 fill in data gaps and support PSPS operations in order to reduce the
15 scope of PSPS. PG&E plans to install 150 new weather stations in
16 2023, and an additional 50 weather stations each year in 2024-2026.³⁵
17 This program is a Wildfire mitigation referred to as Situational
18 Awareness and Forecasting Initiatives – Weather Station
19 (WLDFR-M07B). PG&E's capital expenditure forecast for Expanded
20 Weather Station Deployment is \$6.4 million per year in 2021 and 2022,
21 \$3.3 million in 2023, and \$1.1 million in 2024, \$1.2 million in 2025, and
22 \$1.2 million in 2026.³⁶ PG&E's 2023 forecast is \$5 million lower than its
23 2020 recorded expenditures of \$8.3 million because PG&E plans to
24 install fewer weather stations in 2023 than it did in 2020. The capital
25 forecast for weather stations covers material and labor costs.

26 **c. Partial Voltage Detection (WLDFR-M07G)**

27 As described in Section C.1.e above, EP&R will initiate a Partial
28 Voltage Detection project. This technology will help inform PG&E of a
29 wire down condition within minutes, instead of relying on a customer
30 calls or employee assessments to provide notification of a wire down.

34 See Exhibit (PG&E-4), WP 4-20, line 2.

35 See Exhibit (PG&E-4), WP 4-21, line 15.

36 See Exhibit (PG&E-4), WP 4-20, line 3.

1 This program is a Wildfire mitigation referred to as Situational
2 Awareness and Forecasting Initiatives – Partial Voltage Detection
3 (WLDFR-M07G).

4 PG&E’s capital expenditure forecast for this project is \$0.3 million in
5 2021 and \$0.6 million in 2022. There are no forecasted capital dollars
6 past 2022. PG&E’s 2020 recorded capital expenditures were
7 \$1.2 million.³⁷

8 **d. Safety and Infrastructure Protection Team (WLDFR-M008)**

9 PG&E’s capital expenditure forecast for SIPT is \$0.2 million in 2021,
10 \$1.2 million in 2022, \$0.2 million in 2023, \$0.3 million in 2024,
11 \$0.3 million in 2025, and \$0.3 million in 2026. PG&E’s 2023 forecast is
12 \$1.0 million less than its 2020 recorded capital expenditures of
13 \$1.3 million.³⁸ The reason for this decrease is start-up vehicle-related
14 (engine) costs in 2020 which are not present in later years. Capital
15 investments will include replacement pumps and additional safety
16 equipment. This program is a Wildfire mitigation referred to as SIPT
17 (WLDFR-M008).

18 **e. Meteorology IT Support**

19 As described in Section C.1.g above, the funds in Meteorology IT
20 Support will support improvements and initiatives across several
21 meteorology projects and programs. As mentioned in previous sections,
22 the data processing, computing, and storage environments required by
23 meteorology have increased significantly as weather model output has
24 become more granular and hundreds of millions of fire spread
25 simulations are performed each day. Each day Meteorology processes
26 several terabytes of data. In order to process and store these vast
27 quantities of weather model data, as well as to run internal models such
28 as the FPI and OPW model, a robust computing infrastructure and IT
29 support structure will need to continue to be improved.

30 Meteorology IT Support will also support the continued migration of
31 the Meteorology Department’s web applications into PG&E’s AWS

³⁷ See Exhibit (PG&E-4), WP 4-20, line 4.

³⁸ See Exhibit (PG&E-4), WP 4-20, line 6.

1 cloud. This will include the implementation of new connectivity required
2 to enable those applications, the development of interfaces for any
3 systems that require access to the migrated applications and any
4 networking or firewall updates to support the migration of those
5 applications.

6 PG&E deployed its upgraded POMMS v3.0 into AWS in
7 2020. PG&E will continue to mature its POMMS system by (1) updating
8 data transfer and storage policies; (2) improving the patching process;
9 and (3) implementing improved data life cycling policies to drive more
10 cost-effective data storage and archival costs while remaining in
11 compliance with data retention requirements. Starting in 2021,
12 Meteorology IT Support will update the data transfer and storage
13 policies within AWS. Doing this will allow the POMMS system to
14 minimize the copies of data that are required from the processing of
15 POMMS data and thus reduce future AWS usage costs.

16 With on-premise infrastructure, PG&E has an existing patching
17 process that helps to keep systems secure and up-to-date, but this
18 process is not yet applied within AWS. In 2021, Meteorology IT Support
19 will establish a recurring process that will provide new patches to both
20 production and non-production systems.

21 From 2022 to 2026, Meteorology IT Support will focus on scaling the
22 computing infrastructure that is needed to support the operation of its
23 models and inform daily fire mitigations and PSPS (utilizing FPI). As it
24 continues to develop the next generation of PSPS forecast models,
25 Meteorology IT Support will enable regular asset data updates by
26 integrating Geographic Information System data into the POMMS
27 system. Work will also focus on developing new model pipelines to
28 support new/emerging data streams, as well as a more granular weather
29 prediction model. Meteorology IT Support will enable PG&E to transition
30 to a 1km weather model starting in 2024 that will increase the granularity
31 of its fire weather modeling.

32 PG&E's capital expenditures associated with these initiatives are
33 forecasted to be \$1.0 million in 2021, \$1.1 million in 2022, \$1.1 million in

1 2023, \$1.9 million in 2024, \$1.9 million in 2025, and \$2.0 million in
2 2026.³⁹

3 2020 recorded expense dollars related to IT Support were
4 embedded into each respective program's recorded dollar planning
5 orders. It was not until 2021 that the Meteorology IT support dollars that
6 support various meteorology programs/projects were broken out into
7 their own planning order.

8 Meteorology IT Support provides foundational support to the
9 meteorological guidance Wildfire mitigations including Numerical
10 Weather Prediction and SOPP Model Automation. This program does
11 not have a unique mitigation number.

12 **D. Estimating Methods**

13 PG&E used both the unit cost forecast methodology and program cost
14 estimating methodology for forecasting the costs for the work described herein.
15 PG&E describes its basic method for developing unit and program cost
16 estimates in Chapter 2 of this exhibit. PG&E describes below how those
17 methods were used to forecast each of the work types described in this chapter.

18 Forecasts in this chapter are shown with escalation. For more information
19 on escalation, please refer to Chapter 2 in this exhibit.

20 **1. Unit Cost Estimating**

21 Unit cost estimating calculates the cost to install one unit of work and is
22 generally based on recent historic actual unit costs for similar work. The
23 work in this chapter that was forecast using this method includes:

- 24 • Wildfire Cameras
- 25 • Expanded Weather Station Deployment (capital and expense costs)

26 **2. Program Cost Estimating**

27 Program cost estimating is used to forecast costs for work that is not
28 unit driven and that includes similar work year after year. Work is generally
29 forecast based on 2020 recorded costs with adjustments for any known
30 changes to the scope of work. The work in this chapter that was forecast
31 using this method includes:

39 See Exhibit (PG&E-4), WP 4-20, line 5.

- 1 • Partial Voltage Detection (expense and capital)
- 2 • Numerical Weather Prediction and SOPP Model Automation
- 3 • AFM
- 4 • Meteorology IT Support (expense and capital)
- 5 • WSOC (capital)
- 6 • SIPT (capital)

7 **3. Cost Estimating Based on Headcount**

8 Cost estimating based on headcount is used for work where the costs
9 are driven by the number of people (often referred to as full time
10 equivalents) who make up the team executing the work. The work in this
11 chapter that was forecast using this method includes:

- 12 • WSOC (expense)
- 13 • SIPT (expense)

14 **E. Cost Tables**

15 The expense and capital forecasts for Situational Awareness and
16 Forecasting are summarized in the following tables:

- 17 • Table 4.1-6 lists expense MWCs showing 2016 through 2020 recorded
18 adjusted expenses and 2021 through 2023 forecast expenses; and
- 19 • Table 4.1-7 lists capital MWCs showing 2016 through 2020 recorded capital
20 adjusted expenditures and 2021 through 2026 forecast expenditures.

**TABLE 4.1-6
EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Workpaper Reference
			2016	2017	2018	2019	2020	2021	2022	2023	
1	AB	Misc. Expense	-	-	\$18,960	\$24,321	\$34,022	\$59,348	\$54,559	\$43,416	WP 4-6, line 12
2		Total ^(a)	-	-	\$18,960	\$24,321	\$34,022	\$59,348	\$54,559	\$43,416	

(a) Values may vary from the values listed in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

**TABLE 4.1-7
CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Workpaper Reference			
			2016	2017	2018	2019	2020	2021	2022	2023		2024	2025	2026
1	21	Misc. Capital	-	-	\$7,167	\$10,368	\$11,649	\$9,451	\$9,375	\$4,601	\$3,290	\$3,341	\$3,446	WP 4-19, line 5
2		Total	-	-	\$7,167	\$10,368	\$11,649	\$9,451	\$9,375	\$4,601	\$3,290	\$3,341	\$3,446	

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.2
PSPS OPERATIONS

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.2
PSPS OPERATIONS

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 4.2**
3 **PSPS OPERATIONS**

4 **A. Introduction**

5 **1. Scope, Purpose, and Support for this Request**

6 This chapter presents Pacific Gas and Electric Company's (PG&E or the
7 Company) expense and capital forecasts for its Public Safety Power Shutoff
8 (PSPS) program. This chapter demonstrates that the forecast for this
9 program is reasonable and should be adopted by the California Public
10 Utilities Commission (CPUC or Commission). PSPS is a critical element of
11 PG&E's wildfire mitigation program.

12 The Commission has affirmed that regulated utilities should implement
13 PSPS events when—and only when—necessary to prevent catastrophic
14 wildfires. The Commission has ordered that, pursuant to Sections 451 and
15 399.2(a) of the Public Utilities Code, the "statutory obligation ... to operate [a
16 utility's] system safely requires [the utility] to shut off its system if doing so is
17 necessary to protect public safety." That is, when utilities "reasonably
18 believe there is an imminent and significant risk that strong winds will topple
19 its power lines onto tinder dry vegetation ... during periods of extreme fire
20 hazard,"¹ they may exercise their statutory authority to de-energize.

21 PG&E's expense and capital forecasts for its PSPS program are
22 reasonable and necessary to mitigate wildfire risk. PG&E's PSPS program
23 includes activities supporting information-gathering, decision-making, and
24 customer-outreach processes when PG&E considers proactively
25 de-energizing portions of the PG&E electric system in the interest of public
26 safety. Line de-energization may be necessary when a combination of
27 winds and location-specific factors are forecast to present a statistically high
28 likelihood of damage or disruption to PG&E's above-ground power lines,
29 suggesting a heightened risk of a catastrophic wildfire.

30 The expense and capital costs for the PSPS program are recorded to
31 the Wildfire Mitigation Balancing Account (WMBA). This treatment is

¹ D.12-04-024, pp. 3, 4 and 31.

1 necessary due to the uncertainty in forecasting the number of PSPS events,
2 along with the associated event and program support costs. For the
3 forecast period, PG&E has forecast the number of PSPS events based on a
4 10-year historical weather analysis. The analysis evaluates prior weather
5 events from the past decade, modeling the PSPS events that would have
6 occurred had the PSPS program been in place during that time frame,
7 including associated transmission and distribution system impacts.

8 Although a valuable planning tool, the historical lookback can only give a
9 general estimate as to the probability of occurrence of future PSPS events.
10 Weather is highly variable year to year, which drives variability in not only
11 the location of events, but also the number of events and their size and
12 duration.

13 The historical lookback is a computationally intensive analysis that
14 PG&E completed in the fall of 2020. It does not fully include updates to the
15 PSPS scoping models anticipated to be incorporated before the 2021 fire
16 season, based on work done by PG&E meteorologists and data scientists.
17 A more granular climatology lookback and additional studies are still
18 underway and are not expected to be complete until the end of summer
19 2021. While our data and analysis are constantly improving and evolving,
20 waiting for an improved data set before planning for PSPS-mitigation
21 activities was not feasible given the lead times required to execute the work
22 required for our PSPS impact reduction initiatives.

23 In addition, PG&E is in the process of incorporating conditions not
24 currently included in the scoping of PSPS events that may drive an
25 expansion in PSPS scope in the future. PG&E is reviewing its criteria for
26 what conditions warrant initiating a PSPS event to prevent catastrophic
27 wildfires, in alignment with external feedback on this issue. Specifically, we
28 are assessing how to incorporate asset health as well as the presence of
29 known, high-risk vegetation conditions adjacent to powerlines into PSPS
30 decision making. This assessment will result in PG&E executing PSPS in

1 2021 and beyond for powerlines where high priority vegetation tags² have
 2 been identified, including on lines that may not have met the 2020 PSPS
 3 event criteria.

4 Based on an initial assessment of these factors, PG&E has recently
 5 modified its 2021 Wildfire Mitigation Plan (WMP)³ to reflect five PSPS
 6 events per year. The forecast in this GRC is based on three events plus
 7 one additional borderline event. The inherent nature of PSPS events make
 8 it difficult to predict accurately the number of events in a given year and the
 9 associated event costs. In light of these factors, PG&E will continue to
 10 record its PSPS Operations costs in the WMBA. Use of the WMBA will
 11 allow PG&E to account for the variability in number of events during the
 12 forecast period.

13 **2. Summary of Request**

14 PG&E requests that the Commission adopt its 2023 expense forecast of
 15 \$115.3 million⁴ for PSPS event costs and associated programs including:
 16 field training and field exercises; Community Resource Center (CRC)
 17 preparedness projects; aviation costs; the Wildfire Safety Public
 18 Engagement (WSPE) team; the PSPS Program Team; and, Emergency
 19 Preparedness and Response (EP&R) Field Operations.

20 PG&E further requests that the Commission adopt its capital
 21 expenditure forecasts for CRC preparedness projects, PSPS field
 22 operations technology equipment and PSPS Information Technology (IT)
 23 projects. PG&E's capital expenditure forecast is \$3.1 million in 2021,

2 Namely "Priority 1" and "Priority 2" vegetation tags which are created when trained vegetation inspectors identify trees or limbs that currently present elevated risk and must be worked on an expedited basis. Inspectors use Priority 1 tags for vegetation (i) in contact or showing signs of previous contact with a primary conductor; (ii) actively failing or at immediate risk of failing and which could strike PG&E's facilities; or (iii) presenting an immediate risk to PG&E's facilities. Inspectors use Priority 2 tags for vegetation that does not rise to the level of Priority 1 but has encroached within the PG&E minimum clearance requirements or has an identifiable potential safety issue requiring expedited work.

3 PG&E's 2021 WMP – Revised Report, R.18-10-007 (June 3, 2021) (Revised 2021 WMP).

4 See Exhibit (PG&E-4), WP 4-8, line 23.

1 \$3.2 million in 2022, \$0.3 million in 2023, \$0.3 million in 2024, \$0.3 million in
2 2025, \$0.3 million in 2026.⁵

3 Forecasts in this chapter are shown with escalation at the Major Work
4 Category (MWC) level and escalation is included in all expense and capital
5 totals. For more information on escalation, please refer to Chapter 2 of this
6 exhibit.

7 **3. Overview of Recorded and Forecast Costs**

8 Expenditures for the activities described herein are forecast in one
9 expense and one capital MWC, listed in Table 4.2-1 below. The following
10 sections describe each of the MWCs and explain how the cost forecasts for
11 each were derived. Tables 4.2-6 and 4.2-7 at the end of this chapter show
12 the 2020 recorded amounts, the 2021-2023 expense forecast, and the
13 2021-2026 capital forecast by MWC.

**TABLE 4.2-1
PSPS PROGRAM MWCS**

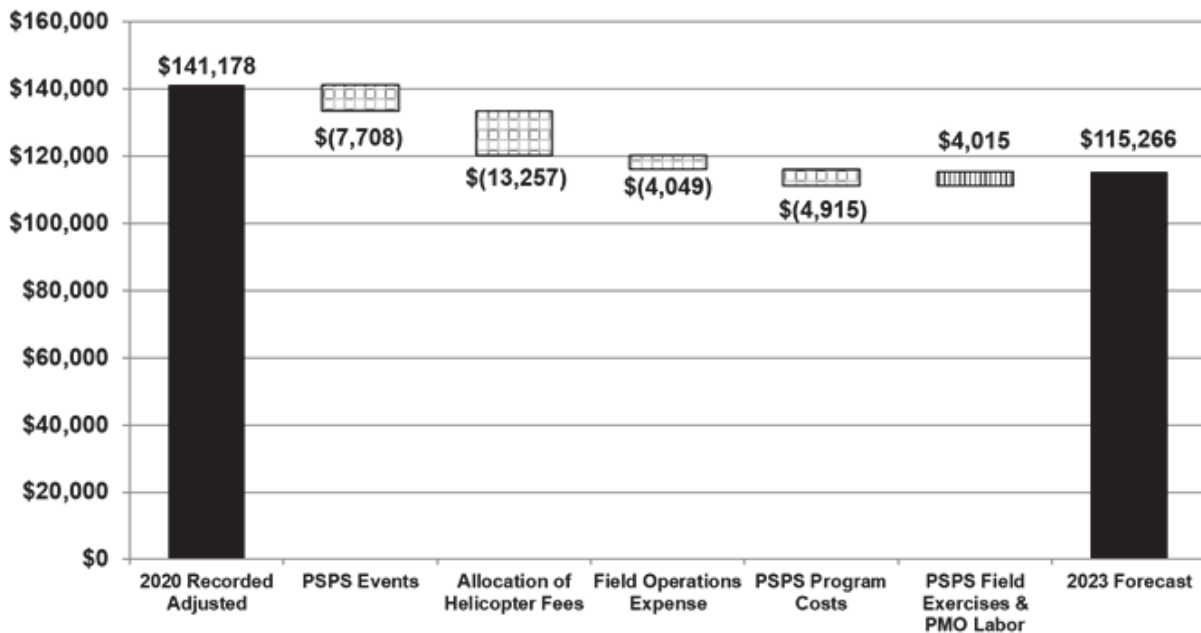
Line No.	MWCs	Description
1	<u>Expense</u>	
2	AB	Miscellaneous Expense
3	<u>Expense</u>	
4	21	Miscellaneous Capital

14 **a. Expense**

15 Expense activities in this chapter are recorded in MWC AB. As
16 shown in Figure 4.2-1 below, forecast costs for expense activities are
17 expected to decrease by approximately \$25.9 million between 2020 and
18 2023.

⁵ See Exhibit (PG&E-4), WP 4-19, lines 6 and 7.

**FIGURE 4.2-1
EXPENSE WALK 2020-2023
(THOUSANDS OF NOMINAL DOLLARS)**



1 The activities driving this decrease include: a decrease of
2 \$7.7 million for PSPS event costs; a decrease of \$13.3 million due to
3 allocation of helicopter fees recorded to non-PSPS programs⁶, a
4 decrease of \$4.0 million due to Field Operations Expense forecast being
5 moved to Chapter 5 as part of all-hazards approach, a \$5.1 million
6 decrease mainly for PSPS Program Costs; and an increase of
7 \$4.0 million primarily for PSPS field exercises and PSPS Program Team
8 labor.

9 **b. Capital**

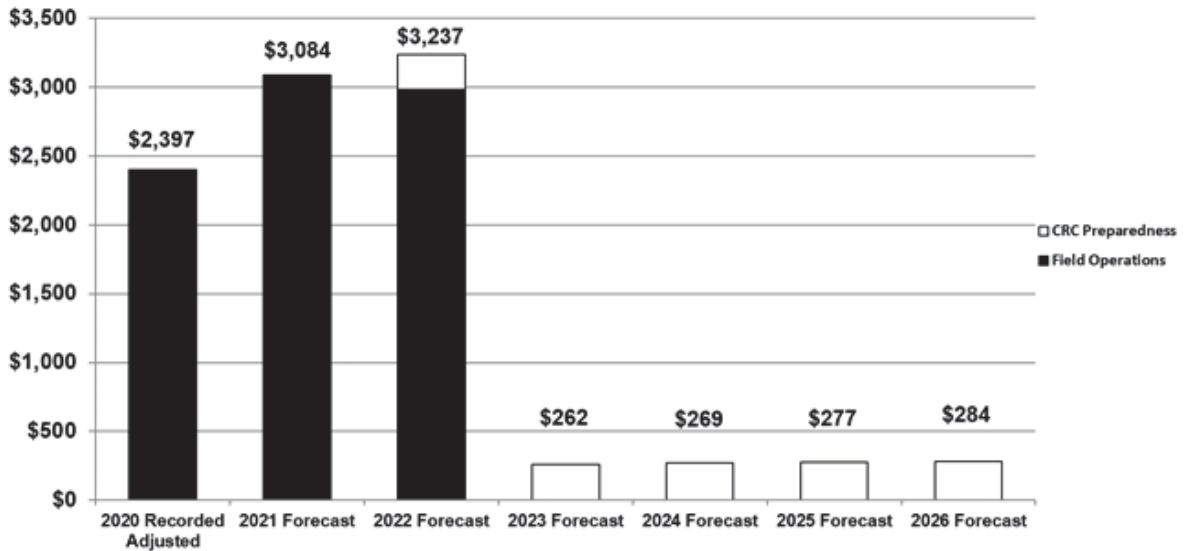
10 The PSPS program's capital expenditures are recorded in MWC 21,
11 which is further broken down into Maintenance Activity Types (MAT).

12 As shown in Figure 4.2-2 below, forecast costs for capital activities
13 are expected to decrease by approximately \$2.1 million from 2020 to

⁶ Due to timing of GRC preparations, the 2020 recorded helicopter cost of \$28.7 million did not reflect post-close adjustments to move \$14.4 million out of PSPS and into other programs for the prorated use of helicopters. See Exhibit (PG&E-4), WP 4-8, line 20 and fn (2).

1 2023 mainly due to the Field Operations Capital forecast moving to
2 Chapter 5 as part of an all-hazards approach.

**FIGURE 4.2-2
CAPITAL RECORDED AND FORECAST 2020-2026
(THOUSANDS OF NOMINAL DOLLARS)**



3 **B. Program and Risk Overview**

4 **1. Program Overview**

5 PSPS event costs consist of the cost for activities directly associated
6 with PG&E’s proactive de-energization of its electric transmission⁷ or
7 distribution lines following a determination of weather-related imminent
8 threats to power line assets and increased risk of catastrophic wildfire. This
9 includes the sequence of activities associated with activating the Emergency
10 Operations Center (EOC), sending customer and agency notifications,
11 de-energizing power lines to reduce the risk of those lines igniting a wildfire
12 during a weather-related event, and re-energizing the lines once the event
13 has ended.

14 PSPS program costs include the costs for all activities supporting but
15 not directly connected to PSPS events. PG&E’s PSPS program involves

⁷ Transmission patrol costs are funded through the Transmission Owner rate case.

1 various activities supporting PG&E's information-gathering, decision-making,
2 and customer-outreach processes when PG&E considers initiating a PSPS
3 event.

4 The PSPS program encompasses PG&E electric lines in High Fire
5 Threat District (HFTD) areas, including both distribution and transmission
6 lines. The most common electric lines considered for de-energization are
7 those in Tier 2 or Tier 3 HFTD areas. Often, lines that traverse Tier 2 or
8 Tier 3 HFTD areas also feed customers outside those areas, meaning
9 customers could be impacted by the risk associated with lines many miles
10 away. While customers in HFTD areas are more likely to be affected by a
11 PSPS event, any of PG&E's more than five million electric customers could
12 have their power shut off if their community relies upon a line that passes
13 through an HFTD area.

14 As described in PG&E's testimony in the PSPS Rulemaking, the wildfire
15 risk in northern California has changed dramatically in the past several
16 years.⁸ As of 2012, only 15 percent of PG&E's service area was designated
17 as having an elevated wildfire risk on the fire-threat maps recognized by the
18 CPUC at that time. Today, more than 50 percent of PG&E's service territory
19 is in a designated Tier 2 or Tier 3 HFTD area according to the CPUC's
20 designated HFTD Map.⁹

21 In 2020, the first version of the High Fire Risk Area (HFRA) map was
22 developed to identify approximately 115 additional areas not designated as
23 HFTD areas that PG&E is including in its PSPS scope. Many of these areas
24 do not contain a high number of customers or PG&E assets and are in rural,
25 hard to access locations where fire could grow and spread rapidly. The
26 purpose of developing the HFRA map is to ensure that all areas of
27 catastrophic wildfire risk are fully captured in PG&E's PSPS program.
28 PG&E will continue to evaluate the inclusion of additional areas requiring
29 wildfire risk reduction activity.

30 The scope and duration of a PSPS event is based upon PG&E's
31 near-term modeling of weather forecasts and vegetation fire potential.

8 PG&E's Opening Testimony, R.18-12-005 (February 5, 2020), p. 1-2, lines 8-10.

9 CPUC, Fire-Threat Maps & the High Fire-Threat District (HFTD), at:
<<https://www.cpuc.ca.gov/FireThreatMaps/>> (as of May 27, 2021).

1 PG&E's models develop near-term forecasts four times a day. These
2 forecasts, in conjunction with other global and local forecasts from external
3 agencies, are evaluated by members of PG&E's Fire Science and
4 Meteorology teams to determine if a heightened outage risk from a wind
5 event and the potential for large wildfires to occur if there is an ignition are
6 both present. If severe weather conditions exist, PG&E determines the
7 potential scope of a PSPS event by identifying which distribution and
8 transmission facilities, if any, are within the area forecast to be impacted by
9 the weather event and therefore require de-energization. PG&E's
10 Meteorology team closely monitors changing forecasts and conditions,
11 updates the PSPS Incident Command team in the event of any changes,
12 and continually revises the scope of a possible event, both in terms of the
13 estimated magnitude and timing. Forecast updates may add to or remove
14 additional areas from the scope of a PSPS event or change the timing of a
15 PSPS event.

16 One of the key components of PG&E's PSPS response plan is the EOC.
17 The EOC is tasked with executing PSPS events in compliance with the
18 CPUC's Phase One and Phase Two Guidelines¹⁰ and in a manner that
19 minimizes disruptions to PG&E's customers.

20 PG&E has developed a process for determining whether to activate the
21 EOC and what to do once the EOC is activated for a PSPS event. The
22 process includes: (1) monitoring weather conditions before the EOC is
23 activated; (2) activating the EOC when conditions indicate a PSPS event
24 may become necessary; (3) identifying and approving the initial scope of the
25 de-energization event along with watch notifications to Public Safety
26 Partners and customers impacted by that scope; (4) deciding whether to
27 de-energize based on updated forecast and situational intelligence
28 information; (5) sending final warning notifications to impacted Public Safety
29 Partners and customers; (6) de-energizing transmission and distribution
30 assets identified to be in scope; and (7) making the weather all-clear
31 determination to begin patrolling affected Tier 2 and 3 circuits and
32 re-energizing the power grid.

¹⁰ D.19-05-042 and D.20-05-051, respectively.

1 PG&E understands that PSPS events cause significant disruptions to
2 our customers, and we aim to reduce the size and duration of these events.
3 As described in Chapter 4.1 on Situational Awareness and Chapter 4.3 on
4 Impact Mitigations, we are making every effort to mitigate PSPS impacts to
5 PG&E's customers by using advanced meteorology models to forecast
6 wildfire risk conditions more granularly, applying improved analyses to
7 determine which portions of PG&E's electric system face high fire risk, and
8 improving switching and sectionalization such that PSPS events affect
9 smaller portions of the grid. We have adopted a new goal of conducting
10 inspections of the de-energized power lines prior to re-energization, and
11 restoring service to 100 percent of PSPS-affected customers within 24 hours
12 of the "weather all-clear" declaration. We are also working to improve
13 PG&E's coordination with state, local, and community agencies, and to
14 provide extensive information and support to customers before, during, and
15 after PSPS events.

16 In 2020, PG&E used improved scoping techniques and mitigation
17 strategies to significantly reduce the size of our PSPS events. We reduced
18 the number of customers impacted by each PSPS event by approximately
19 55 percent on average in 2020, when compared to the number of customers
20 that would have been impacted by the same weather conditions under our
21 2019 PSPS program. For instance, October 25th was PG&E's largest
22 PSPS event in 2020. It had a weather footprint similar to the large weather
23 events that drove the initiation of PSPS in October 2019. However, our
24 2020 PSPS improvements resulted in PG&E's de-energizing approximately
25 300,000 fewer customers (47 percent) during the October 25, 2020 event
26 than we would have de-energized for the same weather event in 2019.

27 Despite improvements already made and future planned improvements,
28 PG&E is evaluating conditions not currently included in the scoping of PSPS
29 events that may drive an expansion in PSPS scope in the future. PG&E is
30 reviewing its criteria for initiating a PSPS event in alignment with external
31 feedback on this issue. Specifically, we are assessing how to incorporate
32 the presence of known, high-risk vegetation conditions adjacent to
33 powerlines into PSPS decision making. This assessment may result in
34 PG&E executing PSPS in 2021 and beyond for powerlines where high

1 priority vegetation tags have been identified, including on lines that may not
 2 have met the 2020 PSPS event criteria. PG&E is still working to finalize
 3 what changes to the PSPS decision making criteria may be needed to
 4 account for this risk. Following that activity over the next few months, PG&E
 5 will need to analyze the likely impact of that updated criteria in making PSPS
 6 events larger and compare that impact to the actions being taken to make
 7 PSPS events smaller.

8 **2. Risk Integration**

9 Chapter 3 of this exhibit describes how Electric Operations (EO) uses
 10 the Enterprise and Operational Risk Management program to manage
 11 electric system risks. In Chapter 3 of this exhibit PG&E described how
 12 management of the Wildfire risk has changed since the filing of the 2020
 13 Risk Assessment and Mitigation Phase (RAMP) Report; provided updated
 14 Risk Spend Efficiency (RSE) scores; and listed each mitigation and control
 15 and indicated if it has changed since the 2020 RAMP Report filing. In this
 16 chapter PG&E provides more information about the mitigations and the work
 17 needed to implement them.

18 Table 4.2-2 below shows the EO risks associated with the forecasts
 19 discussed in this chapter.

**TABLE 4.2-2
 RISKS DISCUSSED IN THIS CHAPTER**

Line No.	Risk Name	Risk ID	Type of Risk	MATs
1	Wildfire	WLDFR	RAMP	AB6, 21A

20 **a. RAMP Risk – Wildfire**

21 **1) Risk Overview**

22 The Wildfire risk is defined as PG&E assets or activities may
 23 initiate a fire that is not easily contained and endangers the public,
 24 private property, sensitive lands, or environment. Wildfire was one
 25 of PG&E's 2020 RAMP risks.¹¹

¹¹ PG&E's RAMP Report, A.20-06-012 (June 30, 2020), Ch. 10.

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2) Risk Mitigations

As shown in the tables below, PG&E is forecasting two mitigations, one of which has several subparts, related to work forecast in this chapter. These programs were determined to reduce the frequency or consequence of wildfire. A brief description of these mitigations is provided in the tables below. More detail is included in the 2020 RAMP Report.¹²

¹² PG&E's RAMP Report, A.20-06-012 (June 30, 2020), Ch. 10, starting at page 10-22.

**TABLE 4.2-3
WILDFIRE
FORECAST MITIGATIONS**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	WLDLFR-M005	PSPS Event (Distribution)	PG&E's PSPS program proactively de-energizes select transmission and distribution circuit segments within (or that pass through) Tier 2 and Tier 3 HFTD areas when elevated fire danger conditions occur. Include patrol and inspection costs	N/A	See Section C.1 for more information.	AB6
2	WLDLFR-M006	PSPS Capital Equipment	The cost to provide radio and communications equipment necessary to support PSPS events.	Consequence – PSPS	See Section C.2 for more information.	21A
3	WLDLFR-M006	EP&R Field Operations	Response group to maintain established relationships with external agency partners and to support emergency planning and information sharing during emergencies.	Consequence – PSPS	See Section C.2 for more information. Starting in 2023, this mitigation moves to EP&R.	AB6
4	WLDLFR-M006	PSPS Field Exercises	Our crews conduct restoration drills in HFTD areas across northern and central California. These efforts focused on practicing the coordination of emergency response teams, inspecting lines for damage, and quickly restoring power while maintaining public and employee safety.	Consequence – PSPS	See Section C.2 for more information. Starting in 2023, this mitigation moves to EP&R.	AB6
5	WLDLFR-M006	PSPS Project	PG&E's PSPS expense forecast also includes the cost to build out and improve tools that are critical to PSPS execution, such as: PSPS Viewer, PSPS Portal, PSPS Situational Intelligence Platform, and PSPS FORCE Tool.	Consequence – PSPS	See Section C.2 for more information.	AB6

**TABLE 4.2-3
WILDFIRE
FORECAST MITIGATIONS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
6	WLDFR-M006	PSPS Pre-Flights	The PSPS circuit pre-flights project will identify the HFRAs additions, Tier 2 and Tier 3 portions of circuits that must be patrolled by air and the portions of circuits that must be patrolled by ground. The pre-flights also capture the number of circuit miles patrolled by air and ground and capture the time needed to patrol the circuits. This allows a more accurate allocation of helicopters for patrols and ultimately faster restoration.	Consequence – PSPS	See Section C.2 for more information.	AB6
7	WLDFR-M006	PSPS Impact Reduction Initiatives - PSPS Increased Helicopter Exclusive Use (EU)	Helicopter contracts associated with PG&E's PSPS activities. These contracts ensure PG&E has access to 65 helicopters during the peak PSPS season. The amount of helicopters available allows PG&E to shorten the patrol time of our circuits following an all-clear, therefore, reducing the duration of a PSPS event.	Consequence – PSPS	See Section C.2 for more information.	AB6
8	WLDFR-M006	PSPS Collateral/Segment Creations	This project is to support the enhancement of PG&E's Segment Guides for distribution circuits (Segment Guides). These guides are the primary reference documents that Distribution Control Centers and field patrol personnel utilize for alignment in executing "step restoration" efforts during PSPS restoration.	Consequence – PSPS	See Section C.2 for more information.	AB6

**TABLE 4.2-3
WILDFIRE
FORECAST MITIGATIONS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
9	WLDLFR-M006	CRC Preparedness Program	Community Resource Centers (CRC) provide a safe, energized space for impacted customers and residents experiencing a PSPS related outage. This mitigation builds out a portfolio of indoor and outdoor CRC locations and preparing to staff and set up CRCs during PSPS events.	Consequence – PSPS	See Section C.2 for more information.	AB6, 21A
10	WLDLFR-M006	Wildfire Public Engagement Team	The Wildfire Safety Public Engagement (WSPE) team is focused on increasing the transparency of PG&E's wildfire safety and PSPS program with external stakeholders — in particular, local and tribal government and public agencies — to increase mutual trust and cooperation. The WSPE mission is to organize and execute planning and outreach work to provide external stakeholders with increased understanding and coordination, with a focus on county and tribal emergency management.	Consequence – PSPS	See Section C.2 for more information.	AB6
11	WLDLFR-M006	EP&R Field Ops Misc.	This project is for items including (but not limited to) the additional subject matter expert support needed to develop and formalize strategic activities associated with enhancing and improving the overall PSPS processes and procedures to provide for the safe and efficient execution of PSPS activities.	Consequence – PSPS	See Section C.2 for more information Starting in 2023, this mitigation moves to EP&R.	AB6

**TABLE 4.2-3
WILDFIRE
FORECAST MITIGATIONS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
12	WLDLFR-M006	EP&R Field Ops Training	Develop and deliver training based upon training needs identified during field exercises and gaps in performance. Training includes, but is not limited to emerging technology, tools and skills required for Field Operations to successfully and safely prepare in advance of PSPS restoration events.	Consequence – PSPS	See Section C.2.h for more information. Starting in 2023, this mitigation moves to EP&R.	AB6
13	WLDLFR-M006	EP&R Field Ops Tech Expense	The expense component allows the Public Safety Specialist team to utilize the Salesforce database platform to capture activity and regulatory compliance engagement.	Consequence – PSPS	See Section C.3 for more information.	AB6
14	WLDLFR-M006	PSPS Field Ops Tech Capital	The goal of this project is to continue to provide the appropriate complement of IT solutions enabling a safe, scalable, and expedient response posture for planned and unplanned events.	Consequence – PSPS	See Section C.3 for more information. Starting in 2023, this mitigation moves to EP&R.	21A
15	WLDLFR-M006	PSPS Program Team	The PSPS Program team is focused on continuously improving and refining the overall program.	Consequence – PSPS	See Section C.2.f for more information.	AB6
16	WLDLFR-M006	PSPS Projects	This program builds out and improves tools that are critical to PSPS execution.	Consequence – PSPS	See Section C.2.f for more information.	AB6

3) Changes to Mitigations

PG&E modified its portfolio of mitigations since filing the 2020 RAMP Report. The work forecast in some of the mitigations proposed in the 2020 RAMP Report has also changed as described below.

In its 2020 RAMP Report, PG&E proposed one mitigation for PSPS events (M5) and a second mitigation—PSPS Impact Reduction Initiatives (M6)—that combined a number of different activities. In this GRC, PG&E is separately forecasting the individual activities that make up the PSPS Program and Impact Reduction Initiatives to enable more granular evaluation of risk reduction by activity.

The overall forecast for PSPS Impact Reduction Initiatives in the 2023 GRC is lower than what was presented for that mitigation in its 2020 RAMP Report.¹³ The primary reason for this is that costs for certain activities—such as for the provision of temporary generation at substations and for transmission work—are not included in the GRC because they are recovered in other proceedings. Also, while in the 2020 RAMP Report PG&E categorized Ground Grid and Substation Circuit Replacement activities to be part of the PSPS Reduction Initiatives mitigation, PG&E now considers those activities to be controls that address the Failure of Electric Distribution Substation Assets risk. Those activities are discussed in Chapter 15 of this exhibit.

b. Cost Tables

Tables 4.2-4 and 4.2-5 below show the forecast costs for mitigations.¹⁴ Tables showing the GRC forecast costs compared to the costs estimated in the 2020 RAMP Report by initiative are provided in workpapers.¹⁵

¹³ See Exhibit (PG&E-4), WP 3-20, lines 25 and 33.

¹⁴ See Exhibit (PG&E-4), WP 3-5, line 32 (WLD FR mitigations, capital), and WP 3-7, line 32 (WLD FR mitigations, expense).

¹⁵ See Exhibit (PG&E-4), WP 3-20.

**TABLE 4.2-4
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 –EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Total	RSE ^(b)
1	WLDFFR-M005	Public Safety Power Shutoff – PSPS Event (Distribution)	AB6	\$80,706	\$82,741	\$70,782	\$72,998	\$307,227	–
2	WLDFFR-M006	EP&R Field Operations ^(a)	AB6	3,691	9,974	6,903	–	20,568	–
3	WLDFFR-M006	EP&R Field Ops Tech Expense	AB6	92	206	212	–	510	–
4	WLDFFR-M006	PSPS – EP&R Field Ops Tech Expense	AB6	18	103	106	–	227	–
5	WLDFFR-M006	CRC Preparedness Program	AB6	15,423	14,774	15,226	15,703	61,126	–
6	WLDFFR-M006	PSPS Collateral/Segment Creations	AB6	249	103	106	109	568	–
7	WLDFFR-M006	PSPS EP&R Field Ops Misc. ^(a)	AB6	108	257	265	–	605	–
8	WLDFFR-M006	PSPS Field Exercise Dist.	AB6	1,073	2,470	2,546	2,625	8,714	–
9	WLDFFR-M006	PSPS Increased Helicopter Exclusive Use ^(c)	AB6	28,668	7,976	14,944	15,411	66,999	–
10	WLDFFR-M006	PSPS Program Team	AB6	2,180	5,533	4,502	4,643	16,857	–
11	WLDFFR-M006	PSPS Projects	AB6	6,898	1,544	1,591	1,641	11,674	–
12	WLDFFR-M006	PSPS Pre-flights	AB6	1,775	1,081	1,114	1,149	5,118	–
13	WLDFFR-M006	Wildfire Public Engagement Team	AB6	298	1,158	957	987	3,399	–
14		Total		\$141,178	\$127,920	\$119,254	\$115,266	\$503,618	–

(a) 2023 forecast is in Ch. 5 as the work shifts to an all-hazards approach.

(b) To comply with guidance from the Safety Policy Division (SPD), PG&E will not be calculating an RSE for the benefits of PSPS on Wildfire mitigation, per Resolution (Res.) WSD-002 (June 11, 2020), Appendix A, p. A-1. See Exhibit (PG&E-4), Ch. 3 for more information.

(c) 2020 recorded costs did not include post-close adjustments due to timing of GRC preparation. There were post-close adjustments that allocated helicopter daily exclusive use (EU) fees to various non-PSPS programs/projects that used the helicopters. The final 2020 recorded costs that remain in the PSPS program is \$14.3 million.

**TABLE 4.2-5
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2026 – CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	Total	RSE ^(a)
1	WLDFFR-M006	PSPS Field Ops Tech Capital ^(b)	21A	–	\$1,028	\$994	–	–	–	–	\$2,022	–
2	WLDFFR-M006	CRC Preparedness Program	21A	\$1,021	–	255	262	269	277	284	2,368	–
3	WLDFFR-M006	PSPS Capital Equipment ^(b)	21A	1,376	2,056	1,987	–	–	–	–	5,419	–
4		Total		\$2,397	\$3,084	\$3,237	\$262	\$269	\$277	\$284	\$9,809	–

(a) To comply with guidance from the SPD, PG&E will not be calculating an RSE for the benefits of PSPS on Wildfire Mitigation, per Res. WSD-002 (June 11, 2020), Appendix A, p. A-1. See Exhibit (PG&E-4), Ch. 3 for more information.

(b) 2023 forecast is in Ch. 5 as the work shifts to an all-hazards approach.

1 C. Activities, Costs, and Forecast Drivers by Risk Mitigation

2 PSPS is a Wildfire risk mitigation with both expense and capital forecasts.
3 The PSPS program's expenses are recorded in MWC AB, MAT AB6; its capital
4 expenditures are recorded in MWC 21, MAT 21A.

5 1. PSPS Event (WLDFR-M005)

6 PG&E's expense forecast for PSPS Events is \$82.7 million in 2021,
7 \$70.8 million in 2022, and \$73.0 million in 2023.¹⁶ PG&E's 2023 forecast is
8 \$7.7 million lower than 2020 recorded cost of \$80.7 million. This program is
9 a Wildfire mitigation referred to as PSPS – Event (Distribution)
10 (WLDFR-M005).

11 PG&E has recently modified its 2021 WMP¹⁷ to reflect five PSPS
12 events per year. The forecast in this GRC is based on three events plus
13 one additional borderline event.

14 PG&E's PSPS Event expense forecast assumes three annual PSPS
15 events with an additional potential/borderline event over the course of the
16 GRC rate case period. The forecasted cost per PSPS event is based upon
17 the average cost per PSPS event recorded during 2019 and 2020. As
18 explained below, PG&E has recently modified its 2021 WMP to reflect five
19 PSPS events per year, as compared to three events in the original 2021
20 WMP filing. However, due to timing of when the GRC is prepared, the
21 PSPS Event expense forecast still reflects three annual PSPS events with
22 an additional potential/borderline event.

23 a. Number of Events

24 PG&E's assumption of annual PSPS events is based on a 10-year
25 historical weather analysis. The analysis evaluates prior weather events
26 from the past decade, modeling the PSPS events that would have
27 occurred had the PSPS program been in place during that time frame,
28 including associated transmission and distribution system impacts. The
29 analysis identified approximately 30 weather events across the past

16 See Exhibit (PG&E-4), WP 4-8, line 2.

17 Revised 2021 WMP.

1 decade that would have triggered a PSPS event under PG&E's 2020
2 PSPS decision-making protocols.

3 PG&E is in the process of incorporating conditions not currently
4 included in the scoping of PSPS events that may drive an expansion in
5 PSPS scope in the future. PG&E is reviewing its criteria for what
6 conditions warrant initiating a PSPS event to prevent catastrophic
7 wildfires, in alignment with external feedback on this issue. Specifically,
8 we are assessing how to incorporate asset health as well as the
9 presence of known, high-risk vegetation conditions adjacent to
10 powerlines into PSPS decision making. This assessment will result in
11 PG&E executing PSPS in 2021 and beyond for powerlines where high
12 priority vegetation tags have been identified, including on lines that may
13 not have met the 2020 PSPS event criteria.

14 Based on PG&E's initial update of studies of 10 years of weather
15 data from 2011-2020, and incorporating some of the potential impact of
16 the proposed vegetation criteria, PG&E has increased the number of
17 PSPS events per year from three events to five events in its 2021 WMP,
18 with an increased customer impact and increased event duration.
19 However, due to timing of GRC preparation, the PSPS event forecast
20 still reflects three annual PSPS events with an additional
21 potential/borderline event.

22 Further, given what appears to be a trend of more extreme weather
23 in the last few years, PG&E's use of a ten-year average to arrive at its
24 2021-2023 forecast of number of events per year may be conservative.
25 PG&E experienced nine PSPS events in 2019, six more in 2020 and,
26 with no significant rainfall in 2020 and 2021, it is possible that PG&E
27 could be under-estimating the amount of PSPS events for 2021.

28 **b. Cost per Event**

29 The cost per PSPS event utilized in PG&E's PSPS cost forecast is
30 based upon the average cost per PSPS event recorded during 2019 and
31 2020. PSPS event costs are broken down into the following
32 categories:¹⁸

¹⁸ Exhibit (PG&E-4), WP 4-64 to WP 4-66.

- 1 • EOC Support – The EOC is comprised of a multi-disciplinary team
2 of PG&E employees who assume emergency response positions
3 consistent with the Incident Command System;
- 4 • IT – Coordinates the response of PG&E's IT resources and systems
5 in support of all stages of PSPS;
- 6 • Aviation Services – These include the flight costs associated with
7 aerial patrols of de-energized Transmission and Distribution lines,
8 prior to re-energization, to ensure it is safe to do so;
- 9 • Ground Patrols – These include the costs of internal and contract
10 crews that are utilized to patrol and inspect the de-energized lines,
11 to ensure that it is safe to re-energize the lines and restore power to
12 customers;
- 13 • Customer Outreach – During PSPS events, PG&E's Customer
14 teams provide key support to customers and partner agencies;
- 15 • Electric Distribution Operations – The Electric Distribution
16 Operations Branch coordinates with the Electric Distribution
17 Emergency Center in connection with the de-energization, recovery,
18 and restoration of PG&E's electric distribution system. The branch
19 also provides information on customer outages and field operational
20 challenges to the EOC;
- 21 • Mutual Assistance – Re-energizing electrical lines after a major
22 PSPS event may require a significant number of line workers to
23 patrol and inspect the lines and specialized equipment, have
24 technical gas service recovery expertise, and other related
25 capabilities. Electric utilities implementing a PSPS may turn to the
26 industry's mutual assistance network for additional help in
27 restoration;
- 28 • CRCs – To minimize public safety impacts during a PSPS event,
29 PG&E opens CRCs in potentially impacted counties and tribal
30 communities. CRCs provide customers and residents a safe
31 location to meet their basic power needs, such as charging medical
32 equipment and electronic devices;
- 33 • In-Event Vegetation Management – Beginning in 2020, PG&E
34 began investigating whether vegetation mitigation work can occur to

1 prevent de-energization of a line during a PSPS event. This cost is
2 for expedited vegetation work that could potentially avoid
3 de-energizing a line; and

- 4 • Other – Includes various categories with small dollars to support
5 PSPS events such as, Hydro Support to provide EOC leads with a
6 list of potentially impacted PG&E Power Generation managed
7 facilities and business continuity plans as a result of a PSPS event;
8 and staging and mobilizing response resources as necessary.

9 **2. PSPS Program (WLDFR-M006)**

10 Wildfire mitigation M006 includes a number of programs that are
11 described below.

12 **a. Field Training and Exercise**

13 This program is part of the Wildfire PSPS Program mitigation and is
14 referred to as PSPS Field Exercise Dist. Exp. (WLDFR-M006).

15 PG&E's expense forecast for Field Training and Exercise related to
16 PSPS is \$2.5 million in 2021, \$2.5 million in 2022, and \$2.6 million in
17 2023.¹⁹ PG&E's 2023 forecast is \$1.6 million higher than 2020
18 recorded costs. PG&E expects to incur similar costs on an annual
19 basis.

20 PG&E invests resources in training our crews to efficiently restore
21 power following a PSPS event while maintaining public and employee
22 safety. Our crews conduct restoration drills in HFTD areas across
23 northern and central California to practice coordinating emergency
24 response teams, inspecting lines for damage, and efficiently restoring
25 power while maintaining public and employee safety. These full-scale
26 drills are part of PG&E's expanded Community Wildfire Safety Program
27 and help PG&E personnel and contractors prepare for the challenges
28 posed by actual PSPS events. This program will allow resources to be
29 trained prior to the beginning of PSPS peak season, which typically
30 begins in September.

¹⁹ See Exhibit (PG&E-4), WP 4-8, line 16.

1 **b. CRC Preparedness Program**

2 The CRC Preparedness Program is part of the Wildfire PSPS
3 Program mitigation referred to as the CRC Preparedness Program
4 (WLDFR-M006).

5 PG&E's expense forecast for the CRC Preparedness Program is
6 \$14.8 million in 2021, \$15.2 million in 2022, and \$15.7 million in 2023.²⁰
7 PG&E's 2023 forecast is \$0.3 million higher than 2020 recorded costs.

8 PG&E's capital forecast for the CRC Preparedness Program is
9 \$0.3 million for 2022, \$0.3 million for 2023, \$0.3 million for 2024,
10 \$0.3 million for 2025, and \$0.3 million for 2026²¹.

11 As discussed above, during PSPS events PG&E opens CRCs to
12 provide a safe, energized space for impacted customers and residents
13 experiencing a PSPS related outage.

14 This project ensures that CRCs are ready to be activated during
15 PSPS events. It includes a small project management team,
16 construction to make all indoor sites Americans with Disabilities Act
17 (ADA) compliant and perform electrical upgrades where needed for
18 placement of temporary generating units, CRC material procurement,
19 and key third party vendor contracts (including contracts with emergency
20 service providers and external customer staffing for the sites).

21 To prepare indoor sites in advance of PSPS season, all indoor CRC
22 sites are made ADA compliant and undergo electrical upgrades. Any
23 building improvements required to make the facility compliant, such as
24 repairing cracks in the path of travel or restriping ADA parking is
25 included. Indoor CRC sites are also equipped with an automatic
26 transfer switch so that the PG&E-provided or site-owned generator will
27 automatically activate during an outage. By the end of 2020, PG&E had
28 98 event-ready indoor sites where all of the aforementioned work was
29 complete. In the forecast, PG&E includes site turnover and additional
30 site requests from counties and tribal governments of approximately
31 20 percent per year.

²⁰ See Exhibit (PG&E-4), WP 4-8, line 19.

²¹ See Exhibit (PG&E-4), WP 4-19, line 7.

1 The CRC Preparedness Program includes budget for two key third
2 party providers to prepare in advance for PSPS events. This includes
3 work by a professional staffing agency to recruit and train Customer
4 Service Leads (CSL) and Customer Service Support (CSS) staff in how
5 to operate CRCs. This firm hires and trains 850-1,000 CSLs and CSSs
6 in advance so they are ready to deploy during PSPS season. The
7 forecast also includes the retainer for emergency service providers who
8 set up the CRC sites during activations. The actual costs of staff time
9 during events are not included in this forecast but are included in the
10 PSPS Event forecast. If a PSPS is initiated, the costs of the emergency
11 service providers are charged to PSPS events.

12 The CRC forecast also includes logistics support which is primarily
13 the acquisition of supplies provided to visitors including, but not limited
14 to batteries and blankets. The logistics support also includes expenses
15 associated with updating signage and replenishing other supplies.

16 The CRC Preparedness Program forecast also includes the internal
17 project management work conducted by a dedicated team of four people
18 and time from supporting departments such as land, logistics, IT and
19 materials.

20 **c. Aviation Cost**

21 The work described in this section includes two Wildfire PSPS
22 Program mitigations referred to as PSPS Pre-Flights Expense
23 (WLDFR-M006) and PSPS Increased Helicopter EU (Dist.)
24 (WLDFR-M006).

25 PG&E's 2020 expenses for aviation costs totaled \$30.5 million,
26 which is made up of exclusive use helicopter contracts of \$28.7 million
27 and helicopter pre-flights of \$1.8 million.²² However, after post-close
28 adjustments allocating some helicopter fees to non-PSPS programs,
29 actual exclusive use helicopter cost for 2020 associated with PSPS was
30 \$14.4 million. PG&E's expense forecast for exclusive use helicopters

²² See Exhibit (PG&E-4), WP 4-8, lines 20 and 21.

1 contracts and helicopter pre-flights to support PSPS is \$9.1 million in
2 2021, \$16.1 million in 2022, and \$16.6 million in 2023.²³

3 PG&E's forecast for PSPS-related aviation resources includes costs
4 for exclusive use helicopter contracts for helicopters that may be used
5 during PSPS and helicopter "pre-flights" to assist PSPS planning.

6 PG&E's exclusive use helicopter contracts ensure access of up to
7 65 helicopters during the peak PSPS season. Access to these
8 helicopters allows PG&E to significantly shorten the patrol time for
9 circuits following an all-clear, thereby reducing the duration of a PSPS
10 event. While all 65 helicopters may not be deployed for smaller events,
11 utilization of all 65 helicopters during larger events facilitated faster
12 restoration times in 2020.

13 Additionally, forecast here also includes cost for helicopter
14 "pre-flights", which are part of preparation and planning for potential
15 PSPS events. Since 2019 PG&E has been flying helicopters on
16 distribution circuits with assets located in HFRA. The purpose of these
17 patrols was to:

- 18 • Provide critical information used to develop effective plans for air
19 and ground resource needs during PSPS events. This included
20 noting circuits that require ground or air patrols only and ensuring
21 the resources are appropriately staged during events;
- 22 • Improve planning capabilities to ensure more accurate estimated
23 times of restoration forecasting (by gathering patrol time data);
- 24 • Identify potential hazards on circuits and take appropriate action;
25 and
- 26 • Enhance patrollers training and expand the patrollers resource pool.

27 **d. PSPS Project Cost**

28 The work described in this section is part of the PSPS Program
29 Wildfire mitigation referred to as PSPS Projects (WLDFR-M006).

²³ See Exhibit (PG&E-4), WP 4-8, lines 20 and 21.

1 PG&E's expense forecast for PSPS Projects is \$1.5 million in 2021,
2 \$1.6 million in 2022, and \$1.6 million in 2023.²⁴ PG&E's 2023 forecast
3 is \$5.2 million lower than 2020 recorded costs.

4 PG&E's expense forecast include costs for PSPS Projects. This
5 program builds out and improves tools that are critical to PSPS
6 execution. Examples of such tools include:

- 7 1) PSPS Viewer – provides the ability to orchestrate the scoping of a
8 PSPS event from planning until the point of de-energization. It
9 translates geographic areas of meteorological fire risk to the
10 Distribution and Transmission assets potentially compromised by
11 those conditions;
- 12 2) PSPS Portal – online platform to share key event and sensitive
13 customer information with Public Safety Partners;
- 14 3) PSPS Situational Intelligence Platform – provides the primary
15 interface to support PSPS events, connecting PSPS data together
16 across multiple systems for real-time intelligence and post-event
17 reporting; it is a central repository of event data for decision making
18 during events; and
- 19 4) PSPS FORCE Tool – estimates field resources needed to patrol
20 de-energized lines and restore customers during PSPS events.

21 In addition, the PSPS Operations team, develops processes for
22 PSPS scoping working with meteorology and asset strategy, improves
23 overall PSPS event scoping process by minimizing manual process
24 steps, ensures accuracy and timeliness of reporting data, and manages
25 PSPS Process Documentation.

26 **e. WSPE Team**

27 The WSPE Team is part of the Wildfire PSPS Program mitigation
28 (WLDLFR-M006).

29 PG&E's expense forecast for the WSPE team is \$1.2 million in
30 2021, \$1.0 million in 2022, and \$1.0 million in 2023.²⁵ PG&E's 2023
31 forecast is \$0.7 million higher than 2020 recorded costs.

²⁴ See Exhibit (PG&E-4), WP 4-8, line 18.

²⁵ See Exhibit (PG&E-4), WP 4-8, line 22.

1 This portion of the PSPS forecast includes the cost of a WSPE team
2 that is focused on increasing the transparency of PG&E's wildfire safety
3 and PSPS programs with external stakeholders—in particular, local and
4 tribal government and public agencies—to increase mutual trust and
5 cooperation. The team is made up of five FTEs who concentrate on
6 three key workstreams:

- 7 • Outreach to county and tribal government and public agencies to
8 provide detailed local insight into PG&E wildfire and PSPS
9 mitigation work, and to gather continuous feedback on improvement
10 efforts;
- 11 • Evolve the Liaison Officer and supporting roles during PSPS events,
12 in particular PG&E's support and coordination with local emergency
13 management during events; and
- 14 • Identify, prioritize, and advocate for local projects based on
15 community feedback as part of wildfire and PSPS mitigation work in
16 EO (e.g., hardening, sectionalizing, vegetation management).

17 **f. PSPS Program Team**

18 The PSPS Program Team is part of the PSPS Program Wildfire
19 mitigation (WLDFR-M006).

20 PG&E's expense forecast for the PSPS Program team is
21 \$5.5 million in 2021, \$4.5 million in 2022, and \$4.6 million in 2023.²⁶
22 PG&E's 2023 forecast is \$2.5 million higher than 2020 recorded costs.

23 This portion of the forecast includes costs for the PSPS Operations
24 and PSPS PMO. The PSPS Program Team is a Wildfire mitigation
25 (WLDFR-M006). Primary functions of the PSPS Program team include:

- 26 • Building a cross-functional process by collaborating with various
27 line-of-business teams to build and continuously improve the
28 end-to-end PSPS execution process, including gathering and
29 prioritizing requirements, establishing process handoffs, and
30 conducting tabletops;
- 31 • Establishing and evolving the PSPS decision-making process by
32 working closely with Meteorology and Electric Asset Management to

²⁶ See Exhibit (PG&E-4), WP 4-8, line 17.

1 develop and operationalize PSPS thresholds and Officer in Charge
2 (OIC) decisions to support successful execution;

- 3 • Leading the development of the HFRA effort by determining
4 program scope by identifying areas at risk of catastrophic fire risk
5 during high-wind events;
- 6 • Driving and tracking execution against PSPS regulatory
7 requirements;
- 8 • Managing PSPS event data including design control, system, and
9 reporting for key PSPS data;
- 10 • Developing and leading PSPS training; and
- 11 • Supporting every PSPS event, including preparation and submission
12 of CPUC post-de-energization reports.

13 **g. PSPS Collateral/Segment Creations**

14 This program is part of the PSPS Program Wildfire mitigation and is
15 referred to as PSPS Collateral/Segment Creations (WLDFR-M006).

16 PG&E’s expense forecast for PSPS Collateral and Segmentation
17 Creations is \$0.1 million in 2021, \$0.1 million in 2022, and \$0.1 million in
18 2023.²⁷

19 PSPS Collateral and Segmentation Creations support the
20 enhancement of PG&E’s Segment Guides for distribution circuits
21 (Segment Guides). These guides are the primary reference documents
22 that Distribution Control Centers and field patrol personnel utilize for
23 alignment in executing “step restoration” efforts during PSPS
24 restoration. “Step restoration” is the breaking up of a given distribution
25 circuit into incremental “segments” that, once patrolled, are energized
26 individually rather than waiting to patrol the entire circuit (and then
27 energizing all customers at once). Step restoration provides for safer
28 and more efficient customer restoration.

29 **h. EP&R Field Operations**

30 This work is part of the Wildfire PSPS Program mitigation
31 (WLDFR-M005) through 2022. Beginning in 2023, this program
32 becomes a control in Chapter 5, EP&R (EPNDR-C005).

²⁷ See Exhibit (PG&E-4), WP 4-8, line 15.

1 PG&E's expense forecast for Field Operations is \$10.5 million in
 2 2021, \$7.5 million in 2022.²⁸ Beginning in 2023 this program shifts to
 3 the all hazards approach in Chapter 5 (EP&R).

4 The PSPS forecast includes costs for EP&R Field
 5 Operations-related costs which include headcount, team specific
 6 training, support expenditures, and other miscellaneous costs. EP&R
 7 related costs will remain in Chapter 4.2 (PSPS Operations) through
 8 2022. By the end of 2022, EP&R Field Operations is expected to
 9 complete its shift to an all hazards approach. Because program will no
 10 longer exclusively support wildfire risk, capital and expense dollars will
 11 then shift to Chapter 5 (EP&R) to better reflect the nature of Field
 12 Operations starting in 2023.

13 **3. PSPS IT Equipment**

14 This work is part of the PSPS Program Wildfire mitigation and includes
 15 two parts: PSPS Field Ops Tech. Capital (WLDFR-M006); and, PSPS
 16 Reduction Initiatives – PSPS Capital Equipment (WLDFR-M006).

17 PG&E's capital forecast for PSPS IT Equipment is \$3.1 million in 2021
 18 and \$3.0 million in 2022.²⁹ Beginning in 2023, these costs will shift to an all
 19 hazards approach and be in Chapter 5 (EP&R).

20 This program provides radio communications hardware and solutions to
 21 support essential roles activated in support of PSPS restoration and patrols.

22 **D. Cost Tables**

23 The expense and capital forecasts in this chapter are summarized in the
 24 following tables:

- 25 • Table 4.2-6 shows 2016 through 2020 recorded adjusted expenses and
 26 2021 through 2023 forecast expenses; and
- 27 • Table 4.2-7 shows 2016 through 2020 recorded capital adjusted
 28 expenditures and 2021 through 2026 forecast expenditures.

²⁸ See Exhibit (PG&E-4), WP 4-8, totals of lines 12, 13, and 14.

²⁹ See Exhibit (PG&E-4), WP 4-19, line 6.

**TABLE 4.2-6
EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted			Forecast			WP Reference		
			2016	2017	2018	2019	2020	2021		2022	2023
1	AB	Misc Expense	-	-	\$4,981	\$182,233	\$141,178	\$127,920	\$119,254	\$115,266	WP 4-8, line 23
2		Total	-	-	\$4,981	\$182,233	\$141,178	\$127,920	\$119,254	\$115,266	

**TABLE 4.2-7
CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted			Forecast			WP Reference				
			2016	2017	2018	2019	2020	2021		2022	2023	2024	2025
1	21	Misc Capital	-	-	\$757	\$2,397	\$3,084	\$3,237	\$262	\$269	\$277	\$284	WP 4-19, lines 6 and 7
2		Total	-	-	\$757	\$2,397	\$3,084	\$3,237	\$262	\$269	\$277	\$284	

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.3
SYSTEM HARDENING, ENHANCED AUTOMATION, AND
PSPS IMPACT MITIGATIONS

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.3
SYSTEM HARDENING, ENHANCED AUTOMATION, AND
PSPS IMPACT MITIGATIONS

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.3
SYSTEM HARDENING, ENHANCED AUTOMATION, AND
PSPS IMPACT MITIGATIONS

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 4.3**
3 **SYSTEM HARDENING, ENHANCED AUTOMATION, AND**
4 **PSPS IMPACT MITIGATIONS**

5 **A. Introduction**

6 **1. Scope, Purpose, and Support for this Request**

7 This chapter presents Pacific Gas and Electric Company's (PG&E or the
8 Company) expense and capital forecast for its Electric Distribution System
9 Hardening Program, expulsion fuse replacement, enhanced automation for
10 wildfire mitigation, and Public Safety Power Shutoff (PSPS) impact reduction
11 initiatives. This chapter demonstrates that the forecast for these activities is
12 reasonable and should be adopted by the California Public Utilities
13 Commission (CPUC or Commission). The programs described in this
14 chapter are critical elements of PG&E's wildfire mitigation program.

15 PG&E's expense and capital forecasts in this chapter are reasonable
16 and necessary to mitigate wildfire risk:

- 17 • PG&E's System Hardening Program is an important initiative that
18 reduces the risk of wildfire ignitions caused by distribution facilities. The
19 System Hardening Program targets three risk areas in PG&E's service
20 territory: (1) the top 20 percent of highest wildfire risk miles as identified
21 by PG&E's 2021 Wildfire Distribution Risk Model for system hardening;
22 (2) overhead structures previously impacted directly by wildfires; and
23 (3) those areas most impacted by PSPS.
- 24 • The underground construction of electric distribution assets in the
25 Community Rebuild Program includes undergrounding the majority of
26 the electric distribution assets in the Town of Paradise and parts of Butte
27 County. The undergrounding will help reduce wildfire risk from power
28 lines in the area and help ensure access to safe egress routes in the
29 event there is a wildfire.
- 30 • Removal of non-exempt expulsion fuses enables PG&E to reduce the
31 potential for vegetation ignitions due to normal operation of a fuse.
- 32 • Installing enhanced automation technologies will continue to reduce the
33 possibility of ignitions caused by PG&E assets. These technologies

1 include the following: single phase reclosers with the capability to trip all
 2 phases (i.e., open all phases), eliminating the risk associated with wire
 3 down events; distribution grid sensors that detect non-equipment failure
 4 types that cannot be detected by existing detection methods or patrol
 5 techniques; technology that can decrease overall wildfire ignition risk by
 6 detecting early-stage equipment failure, enabling PG&E to conduct
 7 repairs before infrastructure fails; technology that mitigates ignitions
 8 from line-to-ground faults such as wire down or tree contacts; and
 9 technologies that detect an object approaching an energized power line
 10 and respond quickly to shut off power before the object impacts the line.

- 11 • Programs for mitigating the impacts of PSPS on customers include the
 12 installation of sectionalizing devices and support for Temporary
 13 Generation (TG) programs that support temporary microgrids.

14 **2. Summary of Request**

15 PG&E requests that the Commission adopt its 2023 expense forecast of
 16 \$11.6 million¹ for four initiatives addressed in this chapter: (1) Sensor IQ™
 17 (SIQ) software used to enable predictive maintenance data analytics; (2) the
 18 Generation Enablement and Development organization that procures and
 19 deploys TG to support PSPS mitigation; (3) costs for the Asset Performance
 20 Center (APC) Distribution Engineering team that supports the wildfire risk
 21 mitigation technologies and activities described in this chapter; and
 22 (4) expense forecasts for the Remote Grid program. PG&E's 2023 expense
 23 forecast is \$3.7 million higher (47 percent) than 2020 recorded costs of
 24 \$7.9 million.

25 PG&E further requests that the Commission adopt its capital
 26 expenditure forecasts for System Hardening, expulsion fuse replacement,
 27 enhanced automation for wildfire mitigation, and PSPS impact reduction
 28 initiatives. PG&E forecasts \$520.0 million for 2021, \$1,020.5 million for
 29 2022, \$990.1 million for 2023, \$951.1 million for 2024, \$938.0 million for
 30 2025, and \$894.0 million for 2026. PG&E's 2023 forecast is \$405.1 million
 31 more than 2020 recorded expenditures of \$584.4 million.²

¹ See Exhibit (PG&E-4), WP 4-5, lines 4-7, 12, 15, 23, 26 and 29.

² See Exhibit (PG&E-4), WP 4-22, line 23.

1 PG&E also requests authorization to recover 2020 costs recorded in the
 2 Wildfire Mitigation Plan Memorandum Account and Fire Risk Mitigation
 3 Memorandum Account, as described in Attachment A of this chapter.

4 Forecasts in this chapter are shown with escalation at the MWC level
 5 and escalation is included in all expense and capital totals. For more
 6 information on escalation, please refer to Chapter 2 of this exhibit.

7 **3. Overview of Recorded and Forecast Costs**

8 Expenditures for the activities described herein are divided into two
 9 expense and three capital MWCs, listed in Table 4.3-1 below. The following
 10 sections describe each of the MWCs and explain how the cost forecasts for
 11 each were derived. Tables 4.3-8 and 4.3-9 at the end of this chapter show
 12 the 2020 recorded amounts, the 2021-2023 expense forecast, and the
 13 2021-2026 capital forecast by MWC.

**TABLE 4.3-1
 SYSTEM HARDENING, ENHANCED AUTOMATION, AND PSPS IMPACT MITIGATIONS MWCs**

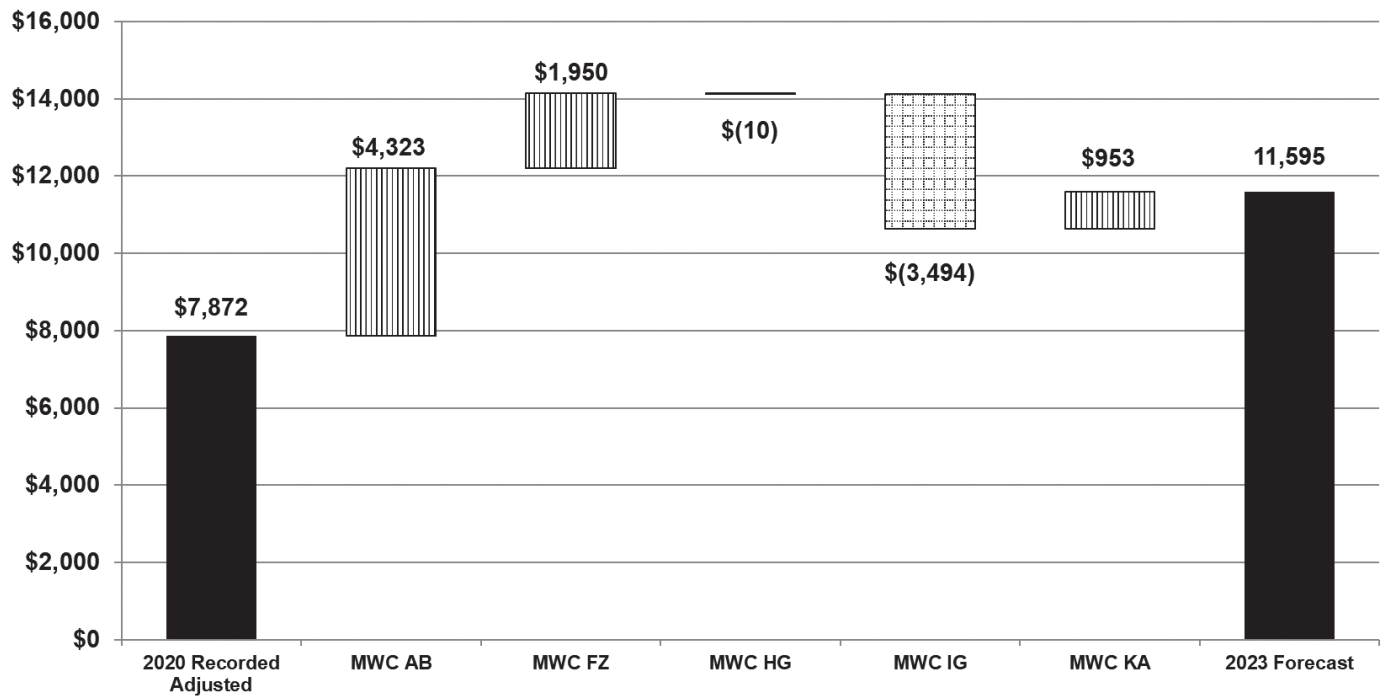
Line No.	MWCs	Description
1	<u>Expense</u>	
2	AB	Miscellaneous Expense
3	FZ	Electric Distribution Planning and Operations Engineering
4	HG	Distribution Operations Technology
5	IG	Manage Various Balancing Account Processes
6	KA	Electric Distribution Maintenance Overhead
7	<u>Capital</u>	
8	08	Electric Distribution Replace Overhead Assets
9	21	Miscellaneous Capital
10	49	Distribution Circuit/Zone Reliability
11	2A	Electric Distribution Install/Replace Overhead Asset

14 Work in these MWCs is further broken down into MAT codes, as
 15 described in Section C. Forecasts in this chapter are shown with escalation
 16 at the MWC level and escalation is included in all expense and capital totals.
 17 For more information on escalation, please refer to Chapter 2 of this exhibit.

1 **a. Expense**

2 Expense activities in this chapter³ are recorded in MWCs AB, FZ,
3 HG, IG, and KA. As shown in Figure 4.3-1 below, forecast costs for
4 expense activities are expected to increase by approximately
5 \$3.7 million, or 32 percent, between 2020 and 2023.

**FIGURE 4.3-1
EXPENSE WALK BY MWC 2020-2023
(THOUSANDS OF NOMINAL DOLLARS)**



6 The activities driving this increase are: \$1.9 million for SIQ in MWC AB
7 that began as a pilot program in 2020, but is now forecast as a wildfire risk
8 mitigation; \$1.5 million for Remote Grid in MWCs AB and KA; \$1.9 million for
9 the Generation Enablement and Deployment PMO in MWC AB; and
10 \$3.4 million in MWC FZ for monitoring, maintenance and support of new
11 wildfire mitigation technologies that PG&E is forecasting in this General Rate

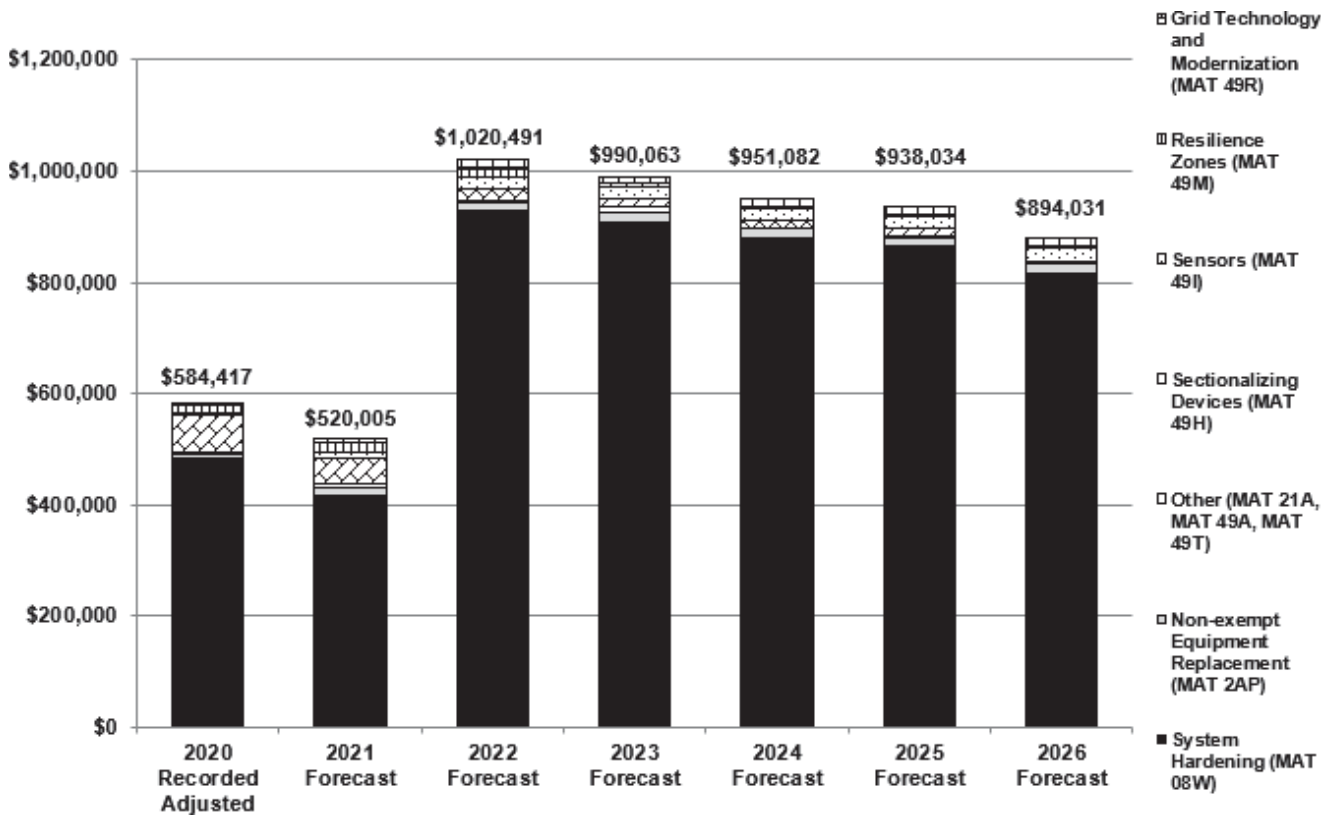
³ Values vary from the values in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

1 Case (GRC). These increases are offset by a decrease of \$3.5 million in
2 MWC IG for costs related to developing generation.

3 **b. Capital**

4 Capital activities in this chapter are recorded in MWCs 08, 2A, 21,
5 and 49. As shown in Figure 4.3-2 below, forecast costs for capital
6 activities are expected to increase by approximately \$405.1 million, or
7 70 percent, between 2020 and 2023.

**FIGURE 4.3-2
CAPITAL RECORDED AND FORECAST BY MWC 2020-2026
(THOUSANDS OF NOMINAL DOLLARS)**



- 8 The activities driving this increase include:
- 9 • An increase of approximately \$424 million for the System Hardening
 - 10 program (08W) due to an increase in the forecast number of system
 - 11 hardening overhead and underground miles in 2023;
 - 12 • A change in the scope and pace of expulsion fuse replacements
 - 13 resulting in an increase of approximately \$7.9 million;
 - 14 • An increase of \$10.5 million for the SIQ Program (21A); and

- 1 • Increases in line sensor activities (49I), and Rapid Earth Fault
2 Current Limiter (REFCL) deployments (49R).
3 The increase is offset by:
 - 4 • A decrease of approximately \$35 million consisting of a decrease in
5 PSPS sectionalizing projects (49H) and a decrease in temporary
6 distribution microgrids (49M).

7 **B. Program and Risk Overview**

8 **1. Program Overview**

9 The work described in this chapter includes the following components of
10 PG&E's wildfire risk mitigation program: system hardening, expulsion fuse
11 replacement, enhanced automation, and PSPS impact mitigation.

12 This work is designed to reduce the risk of wildfire and failure of
13 overhead distribution through both traditional asset replacement programs
14 and the addition of new technologies to the electric distribution grid that will
15 enable PG&E to better predict and detect failures. Programs in this chapter
16 are also designed to reduce the impact of PSPS events on PG&E's
17 customers.

18 **2. Risk Integration**

19 Chapter 3 of this exhibit describes how Electric Operations (EO) uses
20 the Enterprise and Operational Risk Management Program to manage
21 electric system risks. Table 4.3-2 below shows the EO risks associated with
22 the forecasts discussed in this chapter.

23 In Chapter 3 of this exhibit, we describe how management of the risk
24 has changed since the filing of the 2020 RAMP Report; provide updated
25 Risk Spend Efficiency (RSE) scores; list each mitigation and control; and
26 indicate if it has changed since the 2020 RAMP Report filing.

**TABLE 4.3-2
RISKS DISCUSSED IN THIS CHAPTER**

Line No.	Risk Name	Risk ID	Type of Risk	MAT
1	Failure of Electric Distribution Overhead Assets	DOVHD	Risk Assessment and Mitigation Phase (RAMP)	08W, 2AP, 49A, AB#, KAT
2	Wildfire	WLDFR	RAMP	AB#, FZA, 08W, 2AP, 21A, 49A, 49H, 49I, 49M, 49R, 49T

1 Some mitigations and/or controls may overlap across risks
2 (i.e., one mitigation or control offsets more than one risk). For example, a
3 mitigation can reduce both the Failure of Electric Distribution Overhead
4 Assets risk and the Wildfire risk. Where mitigations and/or controls overlap
5 across risks, the forecasts are included for only one risk.

6 **a. RAMP Risk – Failure of Electric Distribution Overhead Assets**

7 **1) Risk Overview**

8 The Failure of Electric Distribution Overhead Assets risk is
9 defined as the failure of distribution overhead assets or lack of
10 remote operation functionality may result in public or employee
11 safety issues, property damage, environmental damage or inability
12 to deliver energy. The Failure of Electric Distribution Overhead
13 Assets risk was one of PG&E's 2020 RAMP risks.⁴

14 **2) GRC Risk Mitigations and Controls**

15 As shown in the tables below, PG&E is forecasting two
16 mitigations. These programs were determined to reduce the
17 frequency or consequence of risk of failure of distribution overhead
18 assets. A brief description of the mitigations is provided in the table
19 below. More detail is included in the 2020 RAMP Report.⁵

4 PG&E's 2020 RAMP Report, A.20-06-012 (June 30, 2020), Ch. 11.

5 PG&E's 2020 RAMP Report, A.20-06-012 (June 30, 2020), Ch. 11, starting at p. 11-14.

**TABLE 4.3-3
FAILURE OF ELECTRIC DISTRIBUTION OVERHEAD ASSETS
FORECAST MITIGATIONS**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	DOVHD-M002	System Hardening	The Distribution System Hardening Program is an ongoing, long-term capital investment program to rebuild portions of PG&E's overhead electric distribution system to reduce fire risk.	D-Line Equipment Failure, Animal, Natural Hazard, Other PG&E Assets or Processes, Vegetation	See Section C.1 for more information	08W
2	DOVHD-M011	Remote Grid	Remote Grid is a new concept for utility service using standalone, decentralized energy sources and utility infrastructure for continuous, permanent energy delivery in lieu of traditional wires to small loads in remote locations at the edges of the distribution system. In many circumstances, the feeders serving these remote locations traverse through High Fire Threat District (HFTD) areas.	Equipment Failure, Third-Party, Animal, Vegetation, Unknown, or Other	See Section C.1.c for more information	08W, AB#, KAT

1 System Hardening, DOVHD-M002, is described below in the
2 Wildfire risk section.

3) Changes to Mitigations

4 The Remote Grid Program described in the GRC has not
5 changed since PG&E filed its 2020 RAMP Report (i.e., the number
6 of line miles that will be removed as a result of deploying Remote
7 Grid projects remains the same). However, instead of completing
8 these projects by the end of 2020, PG&E now plans to complete the
9 first project, the Briceburg project, by the end of 2021. PG&E is
10 proceeding with scoping new remote grid locations as part of the
11 2021-2023 workplan and, if the initial projects prove successful, may
12 proceed with additional sites. PG&E describes its remote grid
13 activities in Section C.1.c below.

b. RAMP Risk – Wildfire

1) Risk Overview

15 The Wildfire risk is defined as PG&E assets or activities that
16 may initiate a fire that is not easily contained, endangers the public,
17 private property, sensitive lands or environment. Wildfire was one of
18 PG&E's 2020 RAMP risks.⁶

2) GRC Risk Mitigations and Controls

21 As shown in the tables below, PG&E is forecasting eight
22 mitigations (including mitigations that are divided into subparts).
23 These programs were determined to reduce the frequency or
24 consequence of risk of wildfire. A brief description of the mitigations
25 and controls are provided in the tables below. More detail is
26 included in the 2020 RAMP Report.⁷

⁶ PG&E's 2020 RAMP Report, A.20-06-012 (June 30, 2020), Ch. 10.

⁷ PG&E's 2020 RAMP Report, A.20-06-012 (June 30, 2020), Ch. 10, starting at p. 10-22.

**TABLE 4.3-4
WILDFIRE
FORECAST MITIGATIONS**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	WLDFR-M002	System Hardening	The Distribution System Hardening Program is an ongoing, long-term capital investment program to rebuild portions of PG&E's overhead electric distribution system to reduce fire risk.	D-Line Equipment Failure, Animal, Natural Hazard, Other PG&E Assets or Processes, Vegetation	See Sections C.1.a and C.1.b for more information	08W
2	WLDFR-M004	Expulsion Fuse Replacement	This program is a targeted replacement program for non-exempt distribution line equipment, including non-exempt fuses. Such equipment has the potential to expel hot or molten material upon normal operation leading to an increased risk of wildfire.	Equipment Failure	See Section C.2 for more information	2AP
3	WLDFR-M006	PSPS Impact Reduction Initiatives – Sectionalizer Device Install/Replace	The installation of remote operated Supervisory Control and Data Acquisition (SCADA) sectionalizing devices on PG&E's distribution system can support PG&E's ability to segment the distribution circuits near HFTD boundaries to reduce the impact and scope of PSPS events.	Consequence only	See Section C.4.b for more information	49H
4	WLDFR-M006	PSPS Impact Reduction Initiatives – Temporary Distribution Microgrids	PG&E's temporary distribution microgrids are designed to reduce the number of customers impacted by PSPS events and support community resilience by powering a cluster of shared resources (e.g., commercial corridors and critical facilities within the energized zones) so that those resources can continue serving surrounding residents during PSPS events.	Consequence only	See Section C.4.a.2 for more information	49M

**TABLE 4.3-4
WILDFIRE
FORECAST MITIGATIONS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
5	WLDLFR-M006	PSPS Impact Reduction Initiatives – Generation Enablement and Deployment Project Management Office (PMO)	In Q1 of 2021, PG&E established a new Generation Enablement and Development organization, whose goal is to procure and deploy TG system wide across the four generation initiatives supporting PSPS mitigation.	Consequence only	See Section C.4.a.1 for more information	AB#
6	WLDLFR-M07A	Situational Awareness and Forecasting Initiatives – Line Sensors	Installation, maintenance, and monitoring of sensors and sensorized equipment used to monitor the condition of electric lines and equipment.	Equipment Failure, Vegetation	See Section C.3.c.1 and C.3.c.2 for more information	49I, FZA
7	WLDLFR-M07F	Situational Awareness and Forecasting Initiatives – SIQ	The SIQ software works with existing SmartMeter™(a) to capture and store high resolution, real-time, and granular: load, voltage, and outage data to enable predictive maintenance data analytics.	Foundational	See Section C.3.d for more information	AB#, 21A
8	WLDLFR-M10A	Additional System Automation and Protection	This includes the Distribution Automation Initiative, installing new Remote Terminal Units to improve visibility, reliability, and operations, and continuing to upgrade and replace obsolete, deficient, and failed automation and protection equipment.	Consequence only	See Section C.3.a for more information; This mitigation ends in 2021	49A
9	WLDLFR-M10B	Additional System Automation and Protection – FuseSaver	A FuseSaver is a cost-effective intelligent device which can replace fuses and act as a single phase recloser with the capability to trip all phases (i.e., open all phases) eliminating the risk associated with wire down events where a downed wire remains energized by a back-feed condition.	Equipment Failure	See Section C.3.b for more information	49T

**TABLE 4.3-4
WILDFIRE
FORECAST MITIGATIONS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
10	WLDFR-M10C	Additional System Automation and Protection – REFCL	This program is targeted at 12 kilovolt (kV) and 17 kV overhead distribution lines in Tier 2 and Tier 3 HFTD areas. REFCL technology has potential benefits of significantly lowering the energy for single line to ground faults, reducing the potential for arc-flash.	Equipment Failure	See Section C.3.e for more information	49R
11	WLDFR-M10D	Additional System Automation and Protection – DTS FAST	DTS-FAST is a technology developed internally at PG&E. It is currently in a pilot phase. The technology pilot uses fraction-of-a-second technologies to detect objects approaching an energized power line and respond quickly to shut off power before the object impacts the line.	Equipment Failure, Vegetation	See Section C.3.f for more information	PG&E is not forecasting any expenditures for this program
12	WLDFR-M011	Situational Awareness and Forecasting Initiatives – EFD	Radio Frequency (RF) sensors are sophisticated technology that listens for the RF signal that is generated by partial discharge arcing on alternating current (AC) circuits and uses precision time measurement of events to locate the source along the conductors. Early Fault Detection is the product name.	Equipment Failure, Vegetation	See Section C.3.c.3 for more information	49I
13	WLDFR-M012	Situational Awareness and Forecasting Initiatives – Distribution Fault Anticipation (DFA)	Event Classification Through Current and Voltage Monitoring Sensors (ECCVM) (also called Distribution Fault Anticipation) are substation Current Transformers (CT)/Potential Transformer (PT)-based devices measuring volts, amps, and arcing conditions. The sensors monitor magnitude, phase, harmonics, real and reactive power, and cycle-to-cycle deltas in these values.	Equipment Failure, Vegetation	See Section C.3.c.4 for more information	49I

**TABLE 4.3-4
WILDFIRE
FORECAST MITIGATIONS
(CONTINUED)**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
14	WLDFR-M017	Alternative Mitigation: System Hardening – Remote Grid	The Remote Grid Program will remove long feeders and serve customers from a local and decentralized energy source (i.e., a “Remote Grid”).	D-Line Equipment Failure, Animal, Natural Hazard, Other PG&E Assets or Processes, Vegetation	See Section C.1.c for more information	08W, KAT, AB#

(a) SmartMeter is a PG&E registered trademark. All further references to SmartMeters in PG&E’s testimony in this proceeding should be assumed to refer to the trademarked name, without continually using the ™ symbol, consistent with legally-acceptable practice.

3) Changes to Mitigations

PG&E modified its portfolio of mitigations since filing the 2020 RAMP Report. The work forecast in some of the mitigations proposed in the 2020 RAMP Report has also changed as described below.

System Hardening (WLDFR-M002)

PG&E is forecasting approximately 260 fewer miles between 2023-2026 as compared to the miles set forth in the 2020 RAMP Report.⁸ PG&E will continue to refine its strategy and improve the scope of the System Hardening Program. The exact scope of PG&E's System Hardening Program will continue to evolve as PG&E enhances its Wildfire Risk Model as well as performs more detailed scoping and inspections, estimating, and engineering review. Because PG&E's System Hardening Program is a first of its kind program, some level of uncertainty as to the exact number of miles of undergrounding versus overhead system hardening is to be expected.

PG&E continues to evaluate other technologies such as REFCL as described in Section C.3 below. PG&E will seek closer alignment of our system hardening efforts with PSPS mitigation opportunities.

Expulsion Fuse Replacement (WLDFR-M004)

The program has not changed since the 2020 RAMP Report was filed. However, in this GRC, PG&E proposes to install approximately 2,800 more units in 2021-2026 as compared to the units set forth in the 2020 RAMP Report.⁹ The increased units drive an increase in costs as compared to the 2020 RAMP Report. See Section C.2 for additional information about the GRC forecast.

⁸ PG&E estimated 2,118 miles for System Hardening in its 2020 RAMP Report, A.20-06-012 (June 30, 2020), p. 10-59, Table 10-11, line 2) compared to an estimated 1,859 miles of System Hardening in this GRC (Exhibit (PG&E-4), WP 4-28, line 26).

⁹ PG&E estimated 4,375 units for Expulsion Fuse Replacement in its 2020 RAMP Report, A.20-06-012 (June 30, 2020), p. 10-55, Table 10-8, line 4, and p. 10-59, Table 10-11, line 3), compared to an estimated 7,170 units in this GRC (Exhibit (PG&E-4), WP 4-29, line 16).

PSPS Impact Reduction Initiatives (WLDFR-M006)

In the 2020 RAMP Report, PG&E proposed a single PSPS Impact Reduction Initiatives mitigation (M6). Since PG&E filed its 2020 RAMP Report, PG&E has broken its GRC forecast for the PSPS Impact Reduction Initiatives into the individual activities that make up PSPS Impact Reduction Initiatives to enable more granular evaluation of risk reduction by activity. In this chapter, there are two individual activities related to PSPS Impact Reduction Initiatives: PSPS Impact Reduction Initiatives – Sectionalizer Device Install/Replace and PSPS Impact Reduction Initiatives – Temporary Distribution Microgrids (which were referred to as Resilience Zones in the 2020 GRC).

In the 2020 RAMP Report, PG&E estimated installing sectionalizing 592 devices in 2020 and 130 devices in 2021 and then assessing the number of devices to be installed after 2021.¹⁰ The units of work have changed since PG&E filed its 2020 RAMP Report. In 2020, PG&E actually installed 603 sectionalizing devices and plans to install at least 250 more distribution sectionalizing devices in 2021.

In the 2020 RAMP, PG&E described pursuing resiliency and reliability improvements to mitigate the customer impacts of PSPS using temporary front of the meter microgrid solutions. This is the work referred to as PSPS Reduction Initiatives – Temporary Distribution Microgrids. In the GRC, PG&E proposes to develop additional microgrids/TG sites.

Situational Awareness and Forecasting Initiatives

In the 2020 RAMP Report, PG&E proposed a single Situational Awareness and Forecasting Initiatives mitigation (M7). Since filing the 2020 RAMP Report, PG&E is forecasting individual activities that make up Situational Awareness and Forecasting Initiatives to enable more granular evaluation of risk reduction by activity.

¹⁰ PG&E's 2020 RAMP Report, A.20-06-012 (June 30, 2020), p. 10-51, lines 7-10.

1 The Line Sensor initiative includes two mitigations that were
2 included in PG&E's 2020 RAMP Report: WLDFR-M07A (Line
3 Sensors) and WLDFR-M011 (EFD/RF Sensors). These mitigations
4 are described in Section C.3.b below. PG&E is also including a new
5 initiative, SIQ (WLDFR-M07F), which is described Section C.3.c
6 below.

7 In the 2020 RAMP Report, PG&E identified a pilot of several
8 types of technologies to detect system anomalies such as overhead
9 line sensors, early fault detection, and DFA; PG&E noted that it
10 might deploy these sensors more broadly in the future, depending
11 on the outcome of the pilots. After filing the 2020 RAMP Report,
12 PG&E completed pilot projects and is forecasting to complete
13 installation of sensors on 160 circuits between 2020-2022 and on
14 464 circuits between 2023-2026 in this GRC.

15 Additional Automation and System Protection

16 In the 2020 RAMP Report, PG&E proposed a single Additional
17 Automation and System Protection mitigation (M10) made up of
18 several activities. In this GRC, PG&E is forecasting individual
19 activities that make up Additional Automation and System Protection
20 separately to enable more granular evaluation of risk reduction by
21 activity. As part of this mitigation in the 2020 RAMP Report, PG&E
22 stated that it would evaluate new system protection technologies
23 that may reduce wildfire risk. As part of this GRC, PG&E plans to
24 evaluate two new technologies, REFCL (WLDFR-M10C) and
25 DTS-FAST (WLDFR-M10D). Other projects include FuseSavers,
26 meter-based sensors, and distribution grid sensors.

27 **c. Cost Tables**

28 Tables 4.3-5 and 4.3-6 below show the forecast costs for
29 mitigations.¹¹ Tables showing the GRC forecast costs compared to the
30 costs estimated in the RAMP Report are provided in workpapers.¹²

¹¹ See Exhibit (PG&E-4), WP 3-4, line 29 (WLDFR mitigations, capital); WP 3-7, line 34 (WLDFR mitigations, expense); WP 3-10, line 12 (DOVHD mitigations, capital); and, WP 3-10, line 32 (DOVHD mitigations, expense).

¹² See Exhibit (PG&E-4), WP 3-20 and 3-21.

**TABLE 4.3-5
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 –EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020 Recorded Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Total	RSE ^(a)
1	WLDFFR-M006	Generation Enablement and Deployment PMO	AB#	–	–	\$2,063	\$1,957	\$4,020	(b)
2	WLDFFR-M006	Generation Enablement and Deployment PMO	IG#	\$3,494	\$3,031	–	–	–	(b)
3	WLDFFR-M07A	Situational Awareness and Forecasting Initiatives – Line Sensors	FZA	1,487	2,344	\$2,576	3,437	9,843	(c)
4	WLDFFR-M07A	Situational Awareness and Forecasting Initiatives – Line Sensors	HG#	10	–	–	–	–	(d)
5	WLDFFR-M07F	Situational Awareness and Forecasting Initiatives – SIQ	AB#	1,871	145	–	3,783	5,799	(c)
6	WLDFFR-M017	System Hardening - Remote Grid	AB#	1,010	1,382	\$1,423	1,464	4,269	30.1
7	WLDFFR-M017	System Hardening - Remote Grid	KAT	–	–	\$617	953	1,571	30.1
8		Total		\$7,872	\$6,903	\$6,679	\$11,595	\$25,502	

4.3-17

- (a) RSE values include all the MATs associated with a mitigation or control, not for individual MATs. While the RSEs may be shown for an individual MATs, the RSE value is assumed to incorporate the combined costs and risk reduction for all the assigned MATs.
- (b) To comply with guidance from the Safety Policy Division PG&E will not be calculating an RSE for the benefits of PSPS on Wildfire mitigation per Resolution (Res.) WSD-002 (June 11, 2020).
- (c) PG&E considers this a foundational mitigation and does not calculate RSEs for foundational programs.
- (d) The work tracked in MAT FZA and HG# supports risk reduction work in mitigation WLDFFR-M07A but it does not reduce risk itself. Therefore, the forecast costs for FZA are not included in the RSE calculation.

**TABLE 4.3-6
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2026 – CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020 Recorded Adj.	2021		2022		2023		2024		2025		2026		Total(a)	RSE
					Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast			
1	WLDFFR-M002	System Hardening – Overhead	08W	\$484,915	\$328,094	\$666,212	\$641,644	\$623,527	\$624,733	\$625,947	\$3,995,072	5.6						
2	WLDFFR-M002	System Hardening – Underground	08W	–	87,560	261,737	267,303	256,444	239,721	191,262	1,304,027	4.5						
3	WLDFFR-M004	Expulsion Fuse Replacement	2AP	7,847	15,125	15,388	15,752	16,257	16,777	17,314	104,460	1.2						
4	WLDFFR-M006	PSPS Reduction Initiatives – Sectionalizer Device Install/Replace	49H	69,441	42,890	20,919	11,933	12,255	12,586	12,926	182,949	(b)						
5	WLDFFR-M006	PSPS Reduction Initiatives – Temporary Distribution Microgrids	49M	3,746	16,448	13,559	–	–	–	–	33,753	(b)						
6	WLDFFR-M07A	Situational Awareness and Forecasting Initiatives – Line Sensors	49I	2,272	12,369	8,037	8,254	6,474	5,964	6,125	49,496	16.9						
7	WLDFFR-M07F	Situational Awareness and Forecasting Initiatives – SIQ	21A	–	–	–	10,507	–	–	–	10,507	(c)						
8	WLDFFR-M10A	Additional System Automation and Protection	49A	1,456	6,990	–	–	–	–	–	8,446	(d)						
9	WLDFFR-M10B	Additional System Automation and Protection – FuseSaver	49T	–	2,305	2,764	2,940	3,087	3,241	3,403	17,740	20.0						
10	WLDFFR-M10C	Additional System Automation and Protection – REFCL	49R	4,798	8,224	16,876	17,331	17,800	18,280	18,774	102,083	23.0						
11	WLDFFR-M011	Situational Awareness and Forecasting Initiatives – EFD	49I	–	–	4,647	5,434	6,234	7,486	8,786	32,588	60.7						
12	WLDFFR-M012	Situational Awareness and Forecasting Initiatives – DFA	49I	–	–	10,351	8,965	9,002	9,245	9,495	47,058	(e)						
13		Total		\$574,476	\$520,005	\$1,020,491	\$990,063	\$951,082	\$938,034	\$894,031	\$5,888,180							

(a) The enterprise risk models use the expense and capital forecast by risk to calculate the RSEs. In certain cases, forecast costs for the same program are included in more than one risk model. Even through the same costs are used to calculate the RSEs, PG&E is only requesting recovery for these costs once.

(b) To comply with guidance from the Safety Policy Division PG&E will not be calculating an RSE for the benefits of PSPS on Wildfire mitigation per Res. WSD-002 (June 11, 2020).

(c) PG&E considers this a foundational mitigation and, as such, is not calculating an RSE for it.

(d) PG&E calculated RSEs for programs with forecast spend from 2023-2026.

(e) A single RSE is calculated for WLDFFR-M012 and WLDFFR-M07A since Line Sensors and DFA work in tandem to detect faults.

1 C. Activities, Costs, and Forecast Drivers by Risk Mitigation

2 1. System Hardening

3 a. System Hardening (MAT 08W, WLDFR-M002, DOVHD-M002)

4 PG&E's System Hardening Program focuses on mitigating wildfire
5 risk posed by distribution overhead assets in Tier 2 and 3 HFTD areas in
6 PG&E's service territory. This program targets the highest wildfire risk
7 miles and includes various mitigation activities, including: (1) Line
8 Removal and Remote Grid, (2) Relocation of Overhead to Underground,
9 and (3) Overhead Hardening. The forecast miles and unit costs for
10 System Hardening is summarized in Section C.1.d. in Table 4.3-7.

11 Distribution overhead assets represent a high ignition risk due to a
12 combination of high exposure (i.e., many overhead assets located in or
13 crossing through HFTD areas) and proximity to risk factors such as
14 vegetation. Estimated ignitions associated with utility distribution
15 equipment are 1.6 times more frequent per circuit mile than
16 transmission-related ignitions. When vegetation drivers are also
17 considered, the estimated distribution ignitions per mile are up to
18 six times more frequent than for transmission circuits.

19 PG&E's System Hardening Program is a continuously evolving
20 initiative that reduces the risk of wildfire ignitions caused by distribution
21 facilities. The System Hardening Program targets three risk areas in
22 PG&E's service territory: (1) the top 20 percent of highest wildfire risk
23 miles as identified by PG&E's 2021 Wildfire Distribution Risk Model for
24 system hardening; (2) overhead structures previously impacted directly
25 by wildfires, and (3) those areas most impacted by PSPS.

26 The System Hardening Program incorporates several key initiatives
27 into a single program for comparison of alternatives, as well as work
28 efficiency. The work performed within this program includes line
29 removal, remote grid, underground conversion from overhead,
30 relocation of overhead facilities, and hardening overhead in place.
31 Hardening overhead in place includes the installation of covered
32 conductor, intumescent wrapped wood poles or composite poles,
33 replacement of non-exempt equipment, replacement of transformers

1 that do not have the now standard FR3 insulating fluid, composite
2 crossarm, framing, and other animal/bird protections.

3 PG&E prioritizes projects at the circuit segment level, as opposed to
4 the regional or full circuit level. Subsections (1) through (3) below
5 describe three mitigation options PG&E considers for each circuit
6 segment when developing a System Hardening Program project: Line
7 Removal and Remote Grid; Relocation of Overhead to Underground;
8 and Overhead Hardening.

9 System Hardening is a Wildfire risk mitigation (WLDFR-M002) and
10 also mitigates the Failure of Electric Distribution Overhead Assets risk
11 (DOVHD-M002).

12 **1) Line Removal and Remote Grid**

13 Complete removal of an existing overhead distribution line fully
14 eliminates the fire risk associated with that line and is therefore
15 explored for every identified system hardening project. For
16 example, known or suspected idle facilities that are not currently,
17 actively serving customer load can be removed.¹³ Although idle,
18 the lines can become energized through various means, including
19 magnetic induction and/or electric induction. Another line removal
20 alternative is the rearrangement or re-alignment of the existing
21 circuit path. PG&E reviews the targeted circuit segment for
22 redundant distribution ties through high risk areas. It may be
23 possible that removal of certain circuit segments would have little
24 impact on operational flexibility and provide the most cost-effective
25 measure to reduce wildfire risk. Finally, lines may be removed as
26 part of the installation of a Remote Grid, as discussed in
27 Section C.1.c below.

28 **2) Relocation of Overhead to Underground**

29 A second mitigation alternative is to relocate existing high-risk
30 overhead distribution lines to underground. The underground

¹³ In addition to the idle line removal work that is part of the System Hardening Program described here, PG&E's Idle Facilities Removal Program is described in Ch. 11 under MAT 2AF. (Exhibit (PG&E-4), Ch. 11, Section C.1.d.)

1 alternative is considered as the preferred mitigation when
2 addressing PSPS impacts, ingress and egress concerns, and tree
3 fall-in risk. When considering undergrounding as an alternative, all
4 execution risks are considered to provide an accurate cost
5 projection for the installation and lifetime of the asset. The cost risks
6 to installing underground assets include but are not limited to the
7 following: accessibility, rights-of-way, public utility easements,
8 private property crossings, the number of services, space for
9 necessary subsurface and pad-mounted equipment, environmental
10 restrictions—such as naturally-occurring asbestos or endangered
11 species—archeology and historic preservation, soil remediation, and
12 soil conditions. These risks are considered against the benefits of
13 undergrounding. An economic analysis is performed to compare the
14 underground alternative against the traditional overhead hardening
15 alternative; specifically weighing the additional risk reduction
16 expected against the full life of the assets.

17 **3) Overhead Hardening**

18 The most frequently used method for system hardening is
19 overhead hardening in place. Overhead system hardening can
20 often be done more quickly than line relocation or undergrounding
21 by taking advantage of existing rights and easements. After
22 analyzing projected performance of overhead hardened facilities on
23 more than 4,600 outage types, PG&E projects that overhead system
24 hardening will reduce 62 percent of the distribution overhead asset
25 ignitions caused by equipment failures or external contact/strikes
26 with energized lines, such as vegetation tree strikes. This
27 alternative generally has a higher RSE when compared to the
28 undergrounding alternative in many scenarios, due to the
29 significantly higher cost of undergrounding. Overhead system
30 hardening achieves risk reduction through these foundational
31 elements:

- 32 • Primary and Secondary Covered Conductor Replacement:
33 Replacement of bare overhead primary (high voltage) conductor
34 and associated framing with conductor insulated with

1 abrasion-resistant polyethylene coatings (sometimes referred to
2 as covered conductor or tree wire) can be an effective mitigation
3 against wildfire ignitions caused by distribution lines. Installing
4 covered conductor can help reduce the likelihood of faults due
5 to line-to-line contacts, tree-branch contacts, and faults caused
6 by animals. Installing covered conductor on secondary lines
7 has similar benefits to installing it on primary lines.

- 8 • Pole Replacements: PG&E evaluates all existing poles where a
9 hardening project is planned to determine whether those poles
10 meet the strength requirements to withstand the new, heavier
11 covered conductor and associated conductor. Often the
12 majority or all poles on a circuit segment will need to be
13 replaced. The new composite poles and intumescent wrapped
14 poles that replace the old poles have increased fire damage
15 resiliency to reduce the risk of a pole failure during a wildfire.
16 Intumescent wrapped wood poles are now the standard new
17 pole PG&E uses in Tier 2 and 3 HFTD areas. Composite poles
18 may be considered where the life expectancy of a new
19 intumescent wrapped wood pole is expected to be less than
20 20 years (often due to a high decay rate, in the water/wetlands)
21 or where the largest class wood poles would be required to
22 support the facilities.
- 23 • Replacement of Non-Exempt Equipment: Replacement of
24 existing primary line equipment such as fuses/cutouts and
25 switches with equipment that has been certified by the California
26 Department of Forestry and Fire Protection (CAL FIRE) as low
27 fire risk is another component of PG&E's System Hardening
28 Program. This replacement work eliminates overhead line
29 equipment and devices that may generate exposed electrical
30 arcs, sparks, or hot material during their operation.
- 31 • Replacement of Overhead Distribution Line Transformers:
32 Upgrading transformers with newer transformers that contain
33 fire resistant "FR3" insulating fluid, consistent with PG&E's
34 current equipment standards (PG&E implemented the transition

1 from mineral oil to FR3 in 2014). “FR3” insulating fluid, a natural
2 ester derived from renewable vegetable oils, provides improved
3 fire safety, transformer life, increased load capability, and
4 environmental benefits. In addition, new transformers are
5 manufactured to achieve higher Department of Energy electrical
6 efficiency standards.

- 7 • Framing and Animal Protection Upgrades: Replacing
8 crossarms with composite arms, wrapping jumpers, and
9 installing animal protection upgrades reduces animal contacts
10 and pole related ignition risks.
- 11 • Vegetation Clearing: Vegetation clearing is a critical component
12 required and funded by the System Hardening Program.
13 Accessing our facilities to execute a project often requires
14 significant undergrowth clearing, which removes dense
15 vegetation on the ground directly beneath the lines. In addition,
16 some of the previously mentioned components of a system
17 hardening project require additional clearance space to execute.
18 Regulatory requirements mandate 4 feet of clearance all year
19 long, so that if there is a change to a line’s profile, including
20 using taller poles or wider cross-arms, the vegetation must be
21 cleared to be consistent with any profile changes and provide
22 the required clearing for new overhead lines.

23 In addition to targeting the highest risk miles and frequently
24 impacted PSPS areas, PG&E’s System Hardening Program also
25 includes work needed to rebuild overhead or underground assets
26 damaged by wildfire. PG&E considers several alternatives when
27 restoring services to customers. These include line removal, remote
28 grid, underground, overhead harden in a different location, overhead
29 harden in place, and restore in place. These solutions are tailored
30 to the needs of the area and often used in conjunction with each
31 other. In 2020, PG&E rebuilt approximately 342 miles of distribution
32 facilities to PG&E’s system hardening standards including some that
33 were damaged by the 2020 wildfires.

1 In addition to work performed in HFTD areas, PG&E may also
2 perform system hardening in buffer zones, the areas immediately
3 adjacent to HFTD areas. Because a specific distribution line may
4 continue from an HFTD area into a buffer zone, hardening the line
5 may include both hardening both the HFTD and buffer zone areas of
6 the line.

7 PG&E's system hardening forecast, excluding the Community
8 Rebuild work, is based on 1,140 miles of overhead and underground
9 mile from 2021-2023. Additional goals for the 3-year period from
10 2021-2023 are that 80 percent of the miles PG&E hardens should
11 be on circuit segments that have the highest risk and that 10 percent
12 of the miles PG&E hardens should be accomplished through
13 undergrounding or asset removal. While the 2021 mileage target is
14 less than the previous year's 2020 mileage target, this is as a result
15 of an improvement in risk modeling that led to a significant pivot in
16 location targeting. Even though the target is lower, hardening
17 PG&E's 2021 targeted miles will result in a greater reduction of
18 projected wildfire risk than the 2020 mileage target.¹⁴

19 PG&E will also use 2021 to generate a 2021-2023 portfolio of
20 system hardening projects more in alignment with its improved 2021
21 Wildfire Distribution Risk Model. These efforts will include
22 identifying, vetting, designing, and permitting projects for future
23 construction. As result of this activity, PG&E anticipates that the
24 pace of system hardening will increase substantially in 2022, to
25 470 miles, then stabilize between 450 and 500 miles per year
26 between 2023 and 2026. Even with the shift in the risk model,
27 PG&E anticipates generally aligning with the system hardening
28 goals for 2020-2022 outlined in the Revised 2021 Wildfire Mitigation
29 Plan (WMP). The Revised 2021 WMP's 3-year target of 992 miles

14 Please see PG&E's Revised 2021 WMP, Section 7.3.3.17.1 for discussion on risk reduction value comparison between 180 miles and the previously planned work. (PG&E's Revised 2021 Wildfire Mitigation Plan (WMP) Report, R.18-10-007 (June 3, 2021)).

1 is within 3 percent of the 2020 GRC's target of 1,021 miles of
2 system hardening for this same period.

3 In addition to increasing the pace of system hardening work in
4 upcoming years, PG&E will continue to improve and improve its risk
5 models by incorporating more data sets, and make further
6 programmatic refinements, all of which should result in better
7 scoping and targeting of locations of highest risk for PG&E's System
8 Hardening Program. Furthermore, PG&E will analyze its hardened
9 facilities' performance with regard to actual outages, incidents, and
10 ignitions so that it can continue to refine its strategy and improve the
11 scope and design of the System Hardening Program. PG&E will
12 also analyze the performance of any hardened facilities that
13 experience a wildfire in order to validate assumptions about the life
14 expectancy and effectiveness of hardened facilities in various
15 conditions. In addition, technology innovations, including
16 improvements in protection schemes such as REFCLs, may allow
17 PG&E to achieve greater wildfire risk reductions or reduce the
18 amount of work required to mitigate risk on lines in high fire risk
19 areas. Finally, we will seek closer alignment of our system
20 hardening efforts with PSPS mitigation opportunities.

21 In addition to the work that is part of the System Hardening
22 Program in MAT 08W, PG&E also hardens its system for wildfire
23 resilience through other activities that target high-risk components.
24 These include the replacement of non-exempt equipment that may
25 generate electrical arcs, sparks, or hot material during its normal
26 operation. The Fuse Replacement Program is described below
27 under MAT 2AP and the Replacement of Non-Exempt Surge
28 Arresters is described in Chapter 11 under MAT 2AR. Also, in
29 addition to the line removal work that is performed as part of the
30 System Hardening Program, PG&E has an Idle Facilities Removal
31 Program described in Chapter 11 under MAT 2AF.

32 PG&E's forecasts annual expenditures of \$374.1 million in
33 2021, \$869.8 million in 2022, \$837.7 million in 2023, \$814.0 million
34 in 2024, \$815.6 million in 2025, and \$817.2 million in 2026 in

1 MAT 08W for its System Hardening Program.¹⁵ These forecasts do
2 not include the additional expenditures expected within MAT 08W in
3 support of the Butte Rebuild Undergrounding Program described in
4 the next section.

5 The exact scope of PG&E's System Hardening Program will
6 continue to evolve as PG&E enhances its Wildfire Risk Model as
7 well as performs more detailed scoping and inspections, estimating,
8 and engineering review. Because PG&E's System Hardening
9 Program is a first of its kind program, some level of uncertainty as to
10 the exact number of miles of undergrounding versus overhead
11 system hardening is to be expected. This is one of the primary
12 reasons why PG&E proposed the Wildfire Mitigation Balancing
13 Account (WMBA) so that customers only pay for the actual work
14 performed and if our forecast is higher than the actual costs, the
15 difference is returned to customers.

16 **b. Community Rebuild Undergrounding (MAT 08W, WLDFR-M002,**
17 **DOVHD-M002)**

18 The Community Rebuild Program was established to rebuild
19 PG&E's infrastructure following the 2018 Camp Fire, which devastated
20 the Town of Paradise and surrounding areas in Butte County. PG&E
21 describes the Community Rebuild Program in Chapter 23 of this exhibit,
22 but PG&E seeks approval for costs related to the underground
23 construction of electric distribution assets that is part of the Community
24 Rebuild Program in this chapter because that activity is part of the
25 broader System Hardening Program in MAT 08W. The forecast for the
26 Community Rebuild undergrounding is included in the overall System
27 Hardening Program forecast. Assets in this category were previously
28 overhead and transitioned to underground for the fire rebuild.

29 PG&E plans to underground 39.2 miles that were previously
30 overhead as part of the Community Rebuild under the MAT 08W
31 category of work. The forecast is for annual expenditures of
32 \$71.2 million in 2023 (16.2 miles), \$65.9 million in 2024 (13.9 miles),

¹⁵ See Exhibit (PG&E-4), WP 4-22, line 3.

1 and \$48.8 million in 2025 (9.1 miles).¹⁶ At this time, PG&E does not
 2 anticipate expenditures in 2026 because the majority of the Community
 3 Rebuild underground mainline construction is expected to conclude by
 4 the end of 2025. Total expenditures in 2020 were \$24.7 million and
 5 corresponding forecasts for 2021 and 2022 are \$41.5 million and
 6 \$58.1 million, respectively.¹⁷

7 **c. Remote Grid (MATs 08W, AB# and KAT, Alternative Mitigation**
 8 **WLDFR-M017, DOVHD-M011)**

9 Throughout PG&E's service territory, pockets of isolated small
 10 customer loads are currently served via long electric distribution feeders,
 11 some which traverse HFTD areas and require significant annual
 12 maintenance and vegetation management. The Remote Grid Program
 13 will remove these long feeders and serve customers from a local and
 14 decentralized energy source (i.e., a "Remote Grid"). This reduction in
 15 overhead lines can reduce fire ignition risk as an alternative to or in
 16 conjunction with system hardening and other risk mitigation efforts.

17 The Remote Grid facilities include a Standalone Power System
 18 (SPS) made up of local sources of electricity supply, such as solar
 19 photovoltaic generation, battery energy storage, and other distributed
 20 generation, as well as distribution and service facilities to connect
 21 customers to the SPS.

22 PG&E has six Remote Grid project in the advanced stages of
 23 development, which when completed will eliminate a total of 11.6 miles
 24 of overhead line.¹⁸ PG&E plans to begin operations of the first Remote
 25 Grid project to serve customer load by the end of 2021.

26 In 2021, PG&E will continue to mature the Remote Grid concept
 27 toward an eventual standard configuration. Experience gained through

¹⁶ See Exhibit (PG&E-4), WP 4-27, lines 8-10.

¹⁷ See Exhibit (PG&E-4), Ch. 23, Community Rebuild Program, Section D. for more details on how the costs are estimated.

¹⁸ One Remote Grid project will mitigate the need for 1.4 miles of overhead line in Tier 2/3 HFTD and is part of the 08W Hardening Program in 2021. The Remote Grid Program has five additional sites slated to come online in 2022 that will mitigate the need to harden an additional 10.2 miles of line in Tier 2/3 HFTD. Remote Grid projects included in the 08W capital forecast from 2023-2026 are restricted to HFTD areas.

1 the deployment and initial operation of the initial Remote Grid projects
 2 will contribute to refinements in the deployment processes, design and
 3 performance standards, customer agreements, and operational and
 4 maintenance protocols for future Remote Grid solutions. PG&E is
 5 identifying and evaluating Remote Grid projects based on prioritization
 6 of high-risk locations as identified by the 2021 Wildfire Distribution Risk
 7 Model assessment of Circuit Protection Zones. PG&E is selecting
 8 projects that have an RSE based on the 2021 Wildfire Distribution Risk
 9 Model that exceeds the RSE of hardening electric lines to serve the
 10 same customers.

11 The capital forecast for Remote Grid projects is included in the
 12 overall MAT 08W System Hardening forecast.¹⁹ PG&E is forecasting
 13 expense amounts related to the initial Remote Grid projects. The
 14 expense amounts cover costs for the Remote Grid team and operations
 15 and maintenance. PG&E is forecasting \$1.5 million in 2023 in MAT AB#
 16 for the Remote Grid team members and \$0.95 million in 2023 in
 17 MAT KAT for operations and maintenance.²⁰

18 PG&E plans to scale its Remote Grid program in the GRC forecast
 19 time frame from approximately 20 projects and 26 line miles in 2023 to
 20 69 projects and 90-line miles per year by 2026 if the initial projects are
 21 successful.

22 **d. System Hardening Forecast Summary**

23 The forecast annual costs, number of miles and cost per mile for
 24 System Hardening Overhead, System Hardening Underground and
 25 Butte County Rebuild, 2021 through 2026, are shown in Table 4.3-7
 26 below.²¹

¹⁹ For the purposes of risk modeling PG&E is assigning estimated capital costs for initial remote grid projects for each year 2020-2026. To the extent a remote grid project is conducted the capital funding will come from MAT 08W.

²⁰ See Exhibit (PG&E-4), WP 4-5, lines 4 and 23.

²¹ See Exhibit (PG&E-4), WP 4-28.

TABLE 4.3-7
FORECAST UNIT COSTS AND MILES FOR SYSTEM HARDENING
(THOUSANDS OF NOMINAL DOLLARS - ESCALATED)

Line No.		2021	2022	2023	2024	2025	2026
1	Overhead	\$288,000	\$667,113	\$642,960	\$625,949	\$627,523	\$629,109
2	Miles	180	423	423	405	405	405
3	Forecast Cost/Mile	\$1,600	\$1,577	\$1,520	\$1,546	\$1,549	\$1,553
4	Underground	\$86,120	\$202,664	\$194,742	\$188,100	\$188,100	\$188,100
5	Miles	20	47	47	45	45	45
6	Forecast Cost/Mile	\$4,306	\$4,312	\$4,143	\$4,180	\$4,180	\$4,180
7	Butte Rebuild	\$41,534	\$58,172	\$71,245	\$65,922	\$48,830	\$0
8	Miles ^(a)	10	14	16	14	9	-
9	Forecast Cost/Mile	\$4,282	\$4,126	\$4,398	\$4,743	\$5,366	\$0
10	Total Forecast Cost	\$415,654	\$927,949	\$908,947	\$879,971	\$864,454	\$817,209
11	Total Forecast Miles	210	484	486	464	459	450

(a) The number of forecast miles for Butte Rebuild shown in this table is rounded.

2. Expulsion Fuse Replacement (MAT 2AP, WLDFR-M004)

The Expulsion Fuse Replacement program only targets non-exempt expulsion fuses. Non-exempt²² equipment is equipment that may generate electrical arcs, sparks, or hot material during its normal operation. If a non-exempt expulsion fuse operates, it has the potential to spread hot molten metal material that could cause an ignition. By contrast, exempt fuses are designed to internalize any molten material resulting from a fuse operation. By using exempt fuses instead of expulsion fuses, PG&E can reduce the potential for vegetation ignitions due to molten material spread. This program is a wildfire mitigation (WLDFR-M004).

HFTD Tier 2 and 3 areas are the focal point for the Expulsion Fuse Replacement Program. The Expulsion Fuse Replacement Program was initiated in 2019, and as the program has matured the prioritization of expulsion fuses has evolved. In 2019, expulsion fuse locations were spread across the territory. In 2020, PG&E targeted expulsion fuse replacement

²² “Exempt” and “Non-Exempt” refer to the fact that California Pub. Resources Code, § 4292 requires utilities to maintain a 10-foot radial clearance around poles that have asset types that pose a fire risk [non-exempt equipment], but also provides that CAL FIRE can issue exemptions for particular models of those asset types that have been shown to have a low fire risk [exempt equipment].

1 exclusively in the Sierra Division, which had the highest count of expulsion
2 fuses, and therefore, the largest amount of risk reduction of any division.

3 PG&E is pivoting its Expulsion Fuse Replacement Program to use the
4 2021 Wildfire Distribution Risk Model, which became available for circuit
5 prioritization in January 2021. Going forward, the Expulsion Fuse
6 Replacement Program will target the circuits the model ranks as having the
7 highest risk. PG&E will attempt replacement of all expulsion fuses on a
8 circuit; previously, mostly end-of-line fuses were selected for replacement.
9 PG&E's prioritization strategy will continue to evolve as refinements are
10 made to the model and lessons continue to be learned from the execution
11 program. This program is a complimentary wildfire risk reduction program,
12 which will be coordinated with other programs that include expulsion
13 fuse replacement, such as system hardening, which is targeting the
14 highest wildfire risk distribution miles, and pole replacement, to avoid
15 duplicating work.

16 PG&E has identified 13,305 expulsion fuses at known operating
17 locations in HFTD areas. System hardening and other programs are
18 forecast to replace between 3,000 and 4,000 units as part of the scope of
19 their rebuild efforts. The remaining approximately 10,000 fuses will be
20 addressed as part of the Expulsion Fuse Program. PG&E replaced
21 707 fuses in 2019 and 643 fuses in 2020, but is accelerating this activity
22 beginning in 2021. PG&E forecasts replacing approximately 1,200 fuses per
23 year at \$15 million per year (with escalation) starting in 2021 until all of the
24 non-exempt fuses are replaced in 2027.²³ As efficiency gains are realized
25 or if more funds become available, the program is scalable to ramp to
26 expedite the program.

27 In addition to non-exempt fuses identified with known operating
28 numbers, PG&E also has population of 25,000-32,000 non-exempt fuses
29 connected to transformers in HFTD areas. Most of these are transformer
30 bushing mounted cut-outs. Replacement of bushing mounted cut-outs may
31 require addition of a cross-arm or even replacement of the pole. PG&E
32 initiated a pilot in 2021 to investigate the use of retrofit kits that could avoid

²³ See Exhibit (PG&E-4), WP 4-29, lines 15 and 16.

1 the need for cross-arm installation at these locations. Based on the results
2 of this pilot and finalization on the count of non-exempt transformer fuses, a
3 formal program for replacement of non-exempt transformer fuses is planned
4 for 2022.

5 PG&E's forecasts annual expenditures of \$15.1 million in 2021,
6 \$15.4 million in 2022, \$15.7 million in 2023, \$16.3 million in 2024,
7 \$16.8 million in 2025, and \$17.3 million in 2026 in MAT 2AP for its Expulsion
8 Fuse Replacement Program.²⁴

9 **3. Enhanced Automation for Wildfire Mitigation**

10 **a. Reclosers (MAT 49A, WLDFR-M10A)**

11 The Distribution Line Automation program (MAT 49A) includes
12 forecasts for the replacement of outdated line recloser controllers in both
13 HFTD areas (in 2021) and non-HFTD areas (in 2022-2026).²⁵ The
14 wildfire mitigation work performed in 2021 is discussed below and the
15 work in non-HFTD areas is discussed in Chapter 13. This program is a
16 Wildfire mitigation referred to as "Additional Automation and System
17 Protection" (WLDFR-M10A).

18 High impedance faults are conditions where line-to-ground faults do
19 not draw a full fault current that a protective device can reliably sense
20 and trip, creating a potential ignition source. The replacement of the
21 legacy SCADA recloser controls protecting Tier 2 and 3 HFTD areas
22 with new recloser controllers will enable the use of protective features
23 designed to address high impedance fault conditions as well as
24 integrating with current communication protocols. Under this distribution
25 system automation initiative, the existing oil-filled reclosers and
26 controllers will be replaced with a solid dielectric recloser and new
27 micro-processor controller with protection elements like Downed
28 Conductor Detection, Sensitive Ground Fault, and platforms that will
29 allow for future protection elements that are under development to
30 reliably detect high impedance faults.

²⁴ See Exhibit (PG&E-4), WP 4-22, line 8.

²⁵ This work was forecast in MAT 09A in the 2020 GRC. (A.18-12-009, HE-16: Exhibit (PG&E-4), p. 10-18, line 26 to p. 10-20, line 8.)

1 In 2021, PG&E will replace approximately 80 remaining legacy
2 controllers that are located throughout PG&E’s service territory in Tier 2
3 and 3 HFTD areas. Due to a change in recloser standards driven by
4 unreliability in the product provided by the original vendor, PG&E will be
5 replacing the entire recloser assembly, including both the control and
6 the tank for most installations.

7 PG&E forecasts expenditures of \$7.0 million in 2021 in 49A for the
8 work in HFTD areas described above.²⁶

9 **b. Single Phase Reclosers (MAT 49T, WLDFR-M10B)**

10 A single phase recloser is a cost-effective, intelligent device
11 mounted on cross-arms that can replace fuses. The model of single
12 phase recloser that PG&E is installing in HFTD areas—known as a
13 FuseSaver—has gang trip capability (i.e., the capability to open all
14 phases, rather than just one).²⁷ This capability makes FuseSavers
15 ideal for areas with high wildfire risk. FuseSavers are also equipped
16 with SCADA, which allows them to be used as PSPS sectionalizing
17 devices. This program is a Wildfire risk mitigation referred to as
18 “Additional System Automation and Protection – FuseSaver”
19 (WLDFR-M10B).

20 Single phase reclosers with gang trip capability eliminate the risk
21 associated with wire down events where a downed wire remains
22 energized by a back-feed condition. This is a condition that traditional
23 overcurrent protection devices like fuses are not able to sense and trip.
24 PG&E will install single phase reclosers with gang trip capability on
25 distribution laterals that have a history of energized wire down
26 conditions. The single phase recloser with gang tripping will open all
27 phases for the initial line to ground fault and eliminate the risk of ignition
28 from a back-feed condition.

²⁶ See Exhibit (PG&E-4), WP 4-22, line 16.

²⁷ PG&E is also installing single-phase reclosers in non-HFTD areas. This work, which is also recorded in MAT 49T, is discussed in Ch. 13 of this exhibit.

1 For purposes of wildfire risk mitigation, PG&E currently forecasts
2 ramping from 66 FuseSaver installations in Tier 2 and 3 HFTD areas in
3 2021 to approximately 80 per year starting in 2023.

4 PG&E identified locations for 2021 FuseSaver installations based on
5 the following criteria: (1) Tier 2 or Tier 3 HFTD areas; (2) one or more
6 wire down outages in the last 10 years; (3) fused cutout locations within
7 Fire Index Areas²⁸ with elevated fire risk potential days; (4) and load on
8 all phases greater than 1 ampere. Site selection for FuseSaver
9 installations in 2022 through 2026 will utilize similar risk modeling and
10 will evolve as refinements are made to the model and lessons continue
11 to be learned from the execution program.

12 PG&E forecasts annual expenditures of \$2.3 million in 2021,
13 \$2.8 million in 2022, \$2.9 million in 2023, \$3.1 million in 2024,
14 \$3.2 million in 2025, and \$3.4 million in 2026 in MAT 49T for the wildfire
15 mitigation portion of its Single Phase Recloser Program.²⁹ PG&E's
16 forecasts for this work is as of March 2021. PG&E will aim to install
17 additional units of FuseSavers, above this forecast, during the 2020
18 GRC rate case period.

19 **c. Distribution Grid Sensors**

20 The three types of distribution grid sensors described below detect
21 non-equipment failure types that cannot be detected by existing
22 detection methods or patrol techniques. In some cases, non-equipment
23 failure-type outages (no problem found) are indicators of latent
24 conditions that could cause more significant issues or fire risks if left
25 unresolved. These sensor technologies also detect other power flow
26 anomalies/disruptions that may be indicative of incipient faults. By
27 proactively detecting failing conditions before they continue to degrade,
28 these sensors enable PG&E to address latent or incipient issues in their
29 early stages before they cause an ignition that leads to a wildfire.

²⁸ Fire Index Area is a PG&E term for segmenting the HFTD areas into geographic operational zones.

²⁹ See Exhibit (PG&E-4), WP 4-22, line 21.

1 The sensors described below, based on monitoring different signals,
2 act in conjunction as a system to detect a wide variety of conditions that
3 could not be effectively detected or located with just a single technology.

- 4 • Line Sensors and Communicating Faulted Circuit Indicators (cFCI)
5 are able to detect larger overcurrent conditions (faults) and can
6 moderately categorize and localize the location of the condition.
7 Line sensors are commercially available and can be immediately
8 deployed. cFCIs will be available in 2021.
- 9 • Event Classification Through Current and Voltage Monitoring
10 (ECCVM) sensors also measure current and high resolution, but
11 add voltage reads for a comprehensive and synchronized power
12 measurement of each phase from the substation outlet. This
13 high-resolution data matched with a 20-year distribution event
14 waveform library can accurately categorize the type of event, but
15 due to its single measurement location cannot determine location on
16 the circuit.
- 17 • Radio Frequency (RF) sensors are an emerging technology
18 designed to detect incipient conditions as subtle as a broken wire
19 strand or vegetation proximity, as well as larger fault conditions
20 based on the RF energy created by partial discharge, with sub-span
21 locational accuracy. PG&E envisions that Line Sensors/cFCIs and
22 ECCVM would be used initially to cover most circuits in HFTD area,
23 with RF sensors gradually replacing most of the Line Sensor/cFCI
24 functionality over time.

25 Standing alone, each of these three sensor types would have a
26 limited impact on the detection of equipment issues; however, when
27 combined, they are a powerful tool that can provide the location (Line
28 Sensors/cFCIs and RF sensors) and the cause of the event (ECCVM
29 sensors) for quick action and remedy. This technology combination
30 requires using an analytical platform to merge and analyze the data.

31 PG&E provides specific forecasts and deployment plans for each of
32 type of sensor below. These plans could change depending on
33 continued evaluation of each technology's capabilities, as well as
34 integration with other enhanced automation and wildfire mitigation

1 efforts. In coordination with deployments of other technologies, future
2 sensor deployments will utilize PG&E's risk modeling tools in
3 combination with feasibility screens to help prioritize the highest-risk
4 locations for installations. Deployment costs should also factor in IT
5 costs for data integration and grid sensing analytics to support grid
6 operations.

7 PG&E forecasts annual expenditures of \$12.4 million in 2021,
8 \$23.0 million in 2022, \$22.7 million in 2023, \$21.7 million in 2024,
9 \$22.7 million in 2025, and \$24.4 million in 2026 in MAT 49I for its
10 Distribution Grid Sensor Program.³⁰

11 **1) Line Sensors and cFCIs (MAT 49I, WLDFR-M07A)**

12 Line sensors and cFCIs are single phase, conductor mounted
13 devices that continuously monitor electric lines to capture various
14 disturbances, such as overcurrent events. Line sensors harvest
15 power from the conductor and continuously measure current in
16 real-time and report events as they occur, while cFCIs operate on
17 batteries and are placed on low-current sections of circuit, and
18 usually communicate regular data once a day and fault event alerts
19 (excluding waveforms) as they occur. This program is a Wildfire
20 mitigation referred to as Situational Awareness and Forecasting
21 Initiatives – Line Sensors (WLDFR-M07A).

22 When fault events are detected, line sensors and cFCIs
23 generate alerts through to OSISoft PI™ and display in the
24 Distribution Management System. Line sensors provide waveforms
25 of the fault event. Root Mean Square current values can be used in
26 fault locator models like CYME Power Engineering software to
27 estimate the location of the disturbance. Deployment costs should
28 also factor in IT costs for data integration and analytics.

29 Building from its Smart Grid Pilot Program, in 2019 and 2020
30 PG&E deployed 801 line sensing devices on 60 circuits in Tier 2 and

³⁰ See Exhibit (PG&E-4), WP 4-22, line 18.

1 Tier 3 HFTD areas.³¹ Efforts were focused on reducing wildfire risk
 2 and improving public safety by monitoring the grid continuously;
 3 performing analytics on captured line disturbance data; identifying
 4 potential hazards; and, when necessary, dispatching field operations
 5 to proactively patrol/maintain/repair failing field conditions or assets.

6 PG&E plans to expand coverage of the technology first to the
 7 highest fire-risk areas, with full coverage to over 600 circuits in
 8 HFTD areas over the next 10 years. PG&E currently forecasts
 9 installing line sensors/cFCIs on approximately 50 circuits each year.

10 PG&E's forecast in MAT 49I for its Line Sensor/cFCI Program is
 11 \$7.4 million in 2021, \$8.0 million in 2022, \$8.3 million in 2023,
 12 \$6.5 million in 2024, \$6.0 million in 2025, and \$6.1 million in 2026.³²

13 **2) Radio Frequency Sensors (MAT 49I, WLDFR-M011)**

14 RF sensors (also called Early Fault Detection or EFD) are a
 15 sophisticated technology that listens for the RF signal that is
 16 generated by partial discharge arcing on AC circuits and uses
 17 precision time measurement of events to locate the source along the
 18 conductors. This program is a wildfire mitigation referred to as
 19 Situational Awareness and Forecasting Initiatives – EFD
 20 (WLDFR-M011).

21 PG&E conducted a pilot in 2019-2020 of 20 RF Sensors in an
 22 HFTD Tier 2/Tier 3 area.³³ In PG&E's pilot of RF sensors, line risks
 23 that were detected included a broken conductor strand, a bullet
 24 lodged in conductor, a deteriorated cross arm conductor insulator
 25 attachment, vegetation contact, failing fuses, failing transformers, a
 26 candling fuse, and loose clamps. Since these issues were detected,
 27 PG&E was able to repair them with normal maintenance tags before

31 In 2019, line sensor deployment work was redirected from reliability improvement efforts to support of wildfire mitigation efforts under the CWSP.

32 See Exhibit (PG&E-4), WP 4-31, line 16.

33 The recorded costs for the RF and ECCVM sensors are funded through the Electric Program Investment Charge (EPIC) Program, but are shown in this GRC chapter, together with their future cost forecasts, to show the evolution of these sensor programs.

1 complete failure occurred. The recommendation from the pilot was
2 to continue deployment of this emerging technology.

3 RF Sensors show great promise in identifying and locating line
4 risks, but still require additional product development and a lower
5 total installed cost before they are ready for full-scale deployment.
6 PG&E's efforts to date have also relied on a single vendor and
7 PG&E plans to explore additional vendors going forward.

8 PG&E deployed RF Sensors on one additional circuit in 2020
9 and currently plans to expand RF Sensors to cover an additional
10 circuits in aggregate between 2021-2022 with a forecast of
11 \$1.4 million in 2021 and \$4.6 million in 2022.³⁴

12 PG&E's proposes to install an RF Sensors on an additional
13 65 circuits total in 2023-2026 with an annual forecast in MAT 49I for
14 its RF Sensor Program of \$5.4 million in 2023, \$6.2 million in 2024,
15 7.5 million in 2025, and \$8.8 million in 2026.³⁵

16 **3) Event Classification Through Current and Voltage Monitoring** 17 **Sensors (MAT 49I, WLDFR-M012)**

18 ECCVM Sensors (also called Distribution Fault Anticipation or
19 DFA) are substation-based devices measuring volts, amps, and
20 arcing conditions. The sensors monitor magnitude, phase,
21 harmonics, real and reactive power, and cycle-to-cycle deltas in
22 these values. They also cluster and categorize events and generate
23 waveforms; these alerts are usable in fault locator models like
24 CYME to estimate disturbance location. The leading vendor of
25 ECCVM Sensors uses more than 20 years of utility data of event
26 signatures to categorize events. The categorizations of events
27 assist with focusing investigations on specific equipment or
28 construction types. This program is a Wildfire mitigation referred to
29 as Situational Awareness and Forecasting Initiatives – DFA
30 (WLDFR-M012).

34 See Exhibit (PG&E-4), WP 4-31, line 19.

35 See Exhibit (PG&E-4), WP 4-31, line 19.

1 Examples of line conditions identified by ECCVM Sensors
 2 include the following: candled fuses, arcing switches, line slap, and
 3 failing transformer/secondary issues.

4 PG&E conducted a pilot of ECCVM Sensors from 2019 to 2020
 5 on six circuits.³⁶ The pilot was in one of PG&E's HFTD Tier 2 and 3
 6 areas and was deemed successful. The recommendation from the
 7 pilot was to continue deployment of this emerging technology.

8 PG&E is planning to expand installations of ECCVM Sensors to
 9 cover an additional 160 total circuits between 2021-2022 with
 10 annual expenditures of \$3.6 million in 2021 and \$10.4 million in
 11 2022.³⁷

12 PG&E's proposes to install additional ECCVM Sensors on
 13 116 circuits annually from year 2023-2026 (464 circuits total) with a
 14 forecast of \$9.0 million in 2023, \$9.0 million in 2024, \$9.2 million in
 15 2025, and \$9.5 million in 2026.³⁸

16 **4) Asset Health and Performance Center (MAT FZA,** 17 **WLDFR-M07A)**

18 The PG&E Asset Health and Performance Center deploys and
 19 operates technologies and applications that provide data for real
 20 time grid monitoring and analytics of asset health & performance.³⁹
 21 These technologies and application predict developing problems on
 22 the electric system so PG&E can implement proactive maintenance,
 23 reducing wildfire risk and improving public safety. These efforts will
 24 be achieved by utilizing a portfolio of new & commercially available
 25 monitoring and sensing technologies, in combination with advanced
 26 analytical and machine learning tools to monitor in real-time
 27 distribution grid disturbances; Identify, locate, and predict

³⁶ See Exhibit (PG&E-4), WP 4-113.

³⁷ See Exhibit (PG&E-4), WP 4-31, line 22.

³⁸ See Exhibit (PG&E-4), WP 4-31, lines 22 and 23.

³⁹ Maintenance Activity Type (MAT) FZA includes forecast costs for the APC; MAT FZA costs are divided between this chapter and Ch. 17, Electric Distribution Capacity and Engineering. In Ch. 17, PG&E describes the General Engineering work included in MAT FZA.

1 developing hazards; and investigate and repair assets prior to
2 failure.

3 Work conducted by the Asset Health and Performance Center
4 enables grid sensor technologies and, as such, is part of the
5 Situational Awareness and Forecasting Initiatives – Line Sensors
6 mitigation (WLDFR-M07A).

7 PG&E’s forecast for MAT FZA in this chapter for the Asset
8 Health and Performance Center is \$3.3 million in 2021, \$2.6 million
9 in 2022, and \$3.4 million in 2023.⁴⁰

10 Expense costs include contract costs for software licenses and
11 communications, and labor cost for monitoring, maintenance, and
12 support of new technologies. Increasing costs can be attributed to
13 the additional maintenance and support costs that will be incurred to
14 maintain the new technologies that have been forecasted to be
15 deployed in this GRC

16 **d. Meter-Based Sensors: Sensor IQ™ (MATs 21A and AB#,**
17 **WLDFR-M07F)**

18 The SIQ software works with existing SmartMeter devices to capture
19 and store high-resolution, real time, and granular data on load, voltage,
20 and outages to enable predictive maintenance data analytics. This
21 program is a Wildfire risk mitigation (WLDFR-M07F).

22 SIQ can decrease overall wildfire ignition risk by detecting
23 early-stage equipment failure, enabling PG&E to conduct repairs before
24 infrastructure fails. PG&E anticipates the additional data source
25 provided by SIQ may provide an analytical methodology to detect:
26 (1) early-stage equipment failure resulting in voltage and other
27 meter-detectable conditions including loose conductor splices and failing
28 or overloaded transformers; and (2) momentary, secondary, and primary
29 vegetation contact.

30 In addition to providing early awareness of degraded conditions on
31 equipment, the data collected and analyzed by SIQ also supports other
32 wildfire related objectives. For example, the interval voltage and load

⁴⁰ See Exhibit (PG&E-4), WP 4-80.

1 data collected through SIQ can be used to determine (through machine
2 learning methods) the phase assignment of meters, which is critical for
3 REFCL, which requires feeder phasing to determine the line-earth
4 capacitive imbalance. Another example of a wildfire-related use case
5 for SIQ data is improving PG&E's wires down algorithms to find faults.

6 In 2020, PG&E deployed SIQ capability to 500,000 SmartMeter
7 devices in Tier 2 and 3 HFTD areas. PG&E expects to have SIQ
8 capability deployed on all planned meters by October 2021⁴¹ and to
9 complete a full evaluation of potential uses in 2022. If the SIQ
10 technology proves to be effective in the early detection of wildfire risks,
11 PG&E plans to extend the deployment of the SIQ technology to
12 additional meters, including possibly all 5.5 million electric SmartMeter
13 devices across PG&E's service territory.

14 PG&E's 2023 capital forecast for its SIQ program (in MAT 21A) is
15 \$10.5 million.⁴² PG&E's expense forecast for its SIQ program (in
16 MAT AB#) is \$3.8 million in 2023.⁴³

17 **e. Rapid Earth Fault Current Limiter (MAT 49R, WLDFR-M10C)**

18 REFCL technology mitigates ignitions from line-to-ground faults
19 such as wire down or tree contacts. High-impedance, line-to-ground
20 faults on distribution circuits are difficult to detect with traditional
21 overcurrent protection and can become an ignition source. This
22 program is a Wildfire risk mitigation referred to as Additional System
23 Automation and Protection – REFCL (WLDFR-M10C).

24 REFCLs are intended to address these risks. REFCL is installed on
25 a substation transformer and provides line-to-ground protection for all
26 circuits served from the substation transformer. REFCL technology
27 uses a component called a Ground Fault Neutralizer that detects

⁴¹ This date differs from the original anticipated completion date of December 31, 2020. The SIQ pilot was delayed due to several issues identified to date and the uncertainty related to further challenges with this new technology. These issues and challenges are described in more detail in PG&E's Revised 2021 WMP Report, R.18-10-007 (June 3, 2021), Section 7.3.2.2.4, and in PG&E's Change Order Report (Sept. 11, 2020).

⁴² See Exhibit (PG&E-4), WP 4-22, line 12.

⁴³ See Exhibit (PG&E-4), WP 4-5, line 5.

1 high-impedance, line-to-ground faults and limits the fault current below
2 ignition thresholds.

3 Core REFCL technology has been around for decades and is being
4 used by some European utilities to limit current on their distribution
5 systems to prevent equipment damage. However, the use of REFCLs
6 to mitigate wildfire risk, which has much tighter performance standards
7 than the European use case, has only been implemented in the past few
8 years, primarily in Australia.

9 In 2018, PG&E initiated a pilot project under EPIC 3.15 for REFCL
10 technology at PG&E's Calistoga Substation based on wildfire risk in that
11 area and historical line-to-ground outage events.

12 Based on our initial testing and the successful implementation in
13 Australia, PG&E has developed a short-term strategy to install REFCLs
14 in HFTD areas. PG&E forecasts deploying REFCLs at an additional
15 two substations each year, but these plans could change pending pilot
16 results and integration with other enhanced automation and wildfire
17 mitigation efforts described in this chapter. In coordination with
18 deployments of other technologies, future REFCL deployments will
19 utilize PG&E's 2021 Wildfire Distribution Risk Model in combination with
20 feasibility screens to help prioritize highest-risk locations for installations.

21 PG&E's MAT 49R REFCL Program forecasts annual expenditures
22 of \$8.2 million in 2021, \$16.9 million in 2022, \$17.3 million in 2023,
23 \$17.8 million in 2024, \$18.3 million in 2025, and \$18.8 million in 2026.⁴⁴

24 **f. Distribution, Transmission, and Substation: Fire Action Schemes**
25 **and Technology (DTS-FAST) (WLDFR-M10D)**

26 DTS-FAST is a technology developed internally at PG&E. It is
27 currently in a pilot phase. The technology pilot uses
28 fraction-of-a-second technologies to detect an object (such as a falling
29 branch) approaching an energized power line and respond quickly to
30 shut off power before the object impacts the line. This program is
31 considered a wildfire mitigation (WLDFR-M10D), but PG&E is not
32 forecasting any costs for this work.

⁴⁴ See Exhibit (PG&E-4), WP 4-22, line 20.

1 In 2020, PG&E completed a proof of concept in San Ramon,
2 California. The proof-of-concept model confirmed the technology would
3 meet the detection, speed, and signal confirmation requirements for
4 subsequent testing through a pilot.

5 PG&E is currently implementing a pilot program evaluating
6 DTS-FAST on a 115 kV transmission circuit and on a 12 kV distribution
7 feeder in locations in HFTD areas. The pilot will assess the
8 technology's efficacy at mitigating PG&E's wildfire and safety risks.
9 Next steps and potential operationalization of this technology is
10 dependent on an assessment of pilot findings.

11 While PG&E is optimistic about this technology, we are currently not
12 able to provide a forecast in the GRC because DTS-FAST technology is
13 still early in its pilot phases and, unlike REFCL, has not been
14 successfully demonstrated elsewhere. A longer-term DTS-FAST
15 deployment plan will be dependent on findings of pilot. PG&E will
16 include costs for this program in the WMBA.

17 **4. PSPS Impact Reduction Initiatives**

18 PG&E's most important responsibility is protecting the health, welfare,
19 and safety of our customers and the communities we serve. When severe
20 weather or other circumstances threaten the ability to provide electricity
21 safely, PG&E must take the appropriate steps necessary to protect the
22 public. PG&E's PSPS program proactively de-energizes a portion of the
23 Company's electric system, in the interest of public safety, as the wildfire
24 prevention measure of last resort when there is a potential for a catastrophic
25 wildfire should the lines be left energized. PG&E understands that
26 de-energizing customers causes significant disruption and is actively
27 working to reduce the impact on our customers.

28 Below, PG&E describes its programs for mitigating the impacts of PSPS
29 on our customers. The two programs described below comprise only a
30 subset of PG&E's PSPS mitigation activities. Other activities described in
31 this chapter (e.g., System Hardening), as well as activities and technologies
32 described in other GRC chapters (e.g., improved weather forecasting tools)
33 also currently contribute to or have the potential to contribute directly or
34 indirectly to PSPS mitigation. In Exhibit (PG&E-6), Chapter 2 of PG&E's

1 opening testimony, PG&E describes customer programs to directly support
 2 customers before, during, and after PSPS events. For a more complete
 3 overview of PG&E’s PSPS mitigation activities, including activities on
 4 transmission lines, please see PG&E’s Revised 2021 WMP.⁴⁵

5 Finally, PG&E continues to explore and evaluate new alternatives to
 6 continue to mitigate the impact of PSPS. These include new grid
 7 technologies such as DTS-FAST and REFCL as well as options such as
 8 transmission rebuild or locally sited permanent generation. PG&E will also
 9 continue to explore additional continuous power solutions to support back up
 10 power needs for the most vulnerable and impacted customers.
 11 Behind-the-meter battery storage and generation solutions we are currently
 12 researching may also comprise part of future PSPS mitigation strategy.

13 **a. Generation for PSPS Mitigation**

14 PG&E has four initiatives designed to support customers with TG
 15 during PSPS:

- 16 1) Temporary substation microgrids focused on keeping
 17 safe-to-energize customers online when a substation serving them
 18 is impacted by an upstream de-energization;
- 19 2) Temporary distribution microgrids focused on energizing “main
 20 street corridors” with shared services and critical facilities;
- 21 3) Back-up power for individual critical customer facilities, such as
 22 hospitals; and
- 23 4) CRCs focused on providing essential services to customers affected
 24 by PSPS events.

25 Each of these initiatives is described in more detail in
 26 Section 7.3.3.11.1 of PG&E’s Revised 2021 WMP filing. Cost recovery
 27 for these initiatives is addressed primarily through the Microgrid Order
 28 Instituting Rulemaking proceeding.⁴⁶ Below, PG&E describes the
 29 two areas within “Generation for PSPS Mitigation” included in the
 30 2023 GRC.

⁴⁵ PG&E’s Revised 2021 WMP Report, R.18-10-007 (June 3, 2021), Section 7.3.3.11.

⁴⁶ *Order Instituting Rulemaking (OIR) Regarding Microgrids Pursuant to Senate Bill 1339*, R.19-09-009 (Sept. 12, 2019).

1 **1) Generation Enablement and Deployment (MATs AB# and IG#,**
2 **WLDFR-M006)**

3 PG&E established a new Generation Enablement and
4 Development organization whose goal is to procure and deploy TG
5 systemwide across the four generation initiatives supporting PSPS
6 mitigation. The organization will drive improvement and efficiencies
7 by implementing and documenting the actions taken to support
8 reduction of customer impacts during PSPS events. Once scaled,
9 this organization will be comprised of 14 Full-Time Equivalents
10 (FTE). This program is a Wildfire risk mitigation referred to as PSPS
11 Impact Reduction Initiatives – Generation Enablement and
12 Deployment PMO (WLDFR-M006).

13 In addition to carrying out traditional TG procurement and
14 execution activities, the Generation Enablement and Development
15 organization will work closely with stakeholders, vendors, and
16 regulators to lead an incremental transition toward a cleaner TG
17 portfolio. This team will also examine the operational feasibility of
18 piloting alternative-to-diesel projects for testing and demonstration in
19 future years, and deploy projects if bids meet established
20 cost-effectiveness criteria.

21 Within the Generation Enablement and Development
22 organization, the TG PMO will provide a single source of reporting to
23 senior leadership on the operational readiness of the four TG
24 initiatives described above. It will also staff, coordinate, and train
25 Emergency Operations Center TG members for PSPS event
26 response and for other major emergency events. Finally, a key
27 function the TG PMO will be to better integrate planning for TG with
28 other system planning activities that might reduce the need of TG for
29 PSPS events.

30 PG&E forecasts annual expenditures of \$2.1 million in 2022,
31 and \$2.0 million in 2023 in MAT AB# for its Generation Enablement
32 and Deployment Program.⁴⁷

⁴⁷ See Exhibit (PG&E-4), WP 4-125.

2) Temporary Distribution Microgrids (MAT 49M, WLDFR-M006)

PG&E’s temporary distribution microgrids are designed to reduce the number of customers impacted by PSPS events and support community resilience by powering a cluster of shared resources (e.g., commercial corridors and critical facilities within the energized zones) so that those resources can continue serving surrounding residents during PSPS events. Though each distribution microgrid varies in scale and scope, the following design features are likely for each:

- Devices used to disconnect the distribution microgrid from the larger electrical grid;
- A pre-determined space for backup generation and equipment to allow for rapid connections (e.g., pre-installed interconnection hub (PIH)); and
- The use of temporary generators allowing PG&E to shorten the design and construction time typically required to ready a permanent microgrid for operation.

This program is a Wildfire risk mitigation referred to as PSPS Impact Reduction Initiatives – Temporary Distribution Microgrids (WLDFR-M006).

To determine the appropriate locations for distribution microgrids, PG&E identifies the distribution circuits most likely to be impacted by PSPS events in the future, based on foundational data analysis of 10 years of historical weather events. This “historical lookback” takes historical weather events and models the associated PSPS events that would have occurred, including both transmission and distribution impacts. PG&E reviews these circuits to identify communities with clusters of shared services (i.e., those involving food, fuel, healthcare, and shelter) and critical facilities served by electrical infrastructure that would likely be safe to energize during PSPS events. To determine whether distribution microgrids could be a viable, effective near-term mitigation measure for a particular location, PG&E also reviews implementation

1 feasibility (i.e., land availability and construction complexity) and the
2 site's potential to be served by alternative grid solutions.

3 In 2020, PG&E developed seven distribution microgrids, four of
4 which were operated during actual PSPS events. For 2021, PG&E
5 is planning to develop at least five additional distribution microgrid
6 PIHs by the end of the calendar year. PG&E will continue to follow
7 the methodology described above to select locations for these sites,
8 collaborating with county and local governments to ensure local
9 priorities help shape site selection and design where technically
10 feasible. PG&E is forecasting \$16.4 million in 2021 and
11 \$13.6 million in 2022.⁴⁸ For 2022, PG&E is planning to apply all
12 remaining 2020 GRC MAT 49M (CWSP – Resilience Zones) funds
13 to develop additional temporary distribution microgrids following the
14 targeting methodology described above.

15 PG&E currently is not forecasting any costs for the construction
16 of new temporary distribution microgrids for 2023-2026. Operating
17 and procuring TG for the completed temporary distribution
18 microgrids will be carried out by the Generation Enablement and
19 Deployment organization described above (Section C.4.1). As
20 PG&E continues to evolve its understanding of the PSPS risk and
21 matures its PSPS Mitigation Program, we will continue to evaluate
22 the need for additional temporary distribution microgrids, as well as
23 permanent generation.

24 **b. Sectionalizing Devices (MAT 49H, WLDFR-M006)**

25 The installation of remote operated SCADA sectionalizing devices
26 on PG&E's distribution system can support our ability to segment the
27 distribution circuits near HFTD boundaries to reduce the impact and
28 scope of PSPS events. PG&E plans to continue enhancing our
29 distribution segmentation strategy to minimize the number of customers
30 impacted during future PSPS events by refining what areas of a circuit
31 to de-energize. This program is a wildfire mitigation referred to as PSPS

⁴⁸ See Exhibit (PG&E-4), WP 4-22, line 19.

1 Impact Reduction Initiatives – Sectionalizer Device Install/Replace
2 (WLDLFR-M006).

3 Distribution sectionalizing device installations have been focused on
4 all circuits that traverse HFTD areas. When wildfire season concludes
5 each year, PG&E integrates lessons learned from actual PSPS events
6 and feedback from county leaders and customers so that we can
7 become more precise on what circuits to de-energize during a PSPS
8 event to minimize customer impact and outage duration. With this data
9 and feedback, PG&E can continue to install new SCADA automated
10 sectionalizing devices closer to the refined meteorological shutoff
11 boundaries and learn what areas of the community to analyze for even
12 further granular sectionalizing.

13 PG&E installed 232 SCADA sectionalizing devices in 2019 and
14 added 603 more SCADA sectionalizing devices in 2020. In 2021, PG&E
15 plans to install at least 250 more SCADA sectionalizing devices,
16 integrating learnings from 2020 PSPS events and focusing efforts
17 primarily on counties and specific areas that are frequently impacted by
18 PSPS or predicted to be frequently impacted based on the 10-year
19 historical lookback described in Section C.4.a.2 (Temporary Distribution
20 Microgrids) above.

21 PG&E is also in the process of addressing the ignition risk created
22 by some of the Motorized Switch Operators (MSO) switches that were
23 initially installed on PG&E’s distribution system in 2019 as sectionalizing
24 devices. Despite these switches being understood to meet CAL FIRE’s
25 exempt criteria for not posing an ignition risk during normal operation,
26 PG&E crews noted that some MSO switches exhibited an arc flash
27 during the opening (de-energizing) operation. Based on this feedback
28 and subsequent testing, PG&E plans to replace or retrofit MSO switches
29 to address this potential risk.⁴⁹

⁴⁹ Until all installed MSOs can be replaced or retrofitted, PG&E has issued guidance document “Limited Use of Inertia SCADA MSO” (Utility Bulletin, TD-076253-B004, Rev. 0 (May 15, 2020)) which puts controls in place to mitigate the wildfire risk associated with MSOs.

1 During 2021, PG&E will be assessing various alternatives to
2 address the identified risk with MSOs. Specifically, PG&E will explore
3 corrective actions to prevent any potential arc flash including retrofitting
4 the MSO with new vacuum-break technology or replacement with either
5 new automated Line Reclosers or new automated SCADAMATE-SD
6 switches. Based on the results of these studies, PG&E will develop a
7 strategy to retrofit or replace all MSO switches used to reduce the scope
8 of PSPS events by 2022.

9 PG&E plans to install 190 remote operated SCADA sectionalizing
10 devices in 2022 and then 100 sectionalizing devices each year between
11 2023 and 2026, but these plans could change pending results and
12 integration with other enhanced automation and wildfire mitigation
13 efforts described in this chapter and elsewhere in the GRC. In
14 coordination with deployments of other technologies, future
15 sectionalizing device deployments will utilize historical weather lookback
16 studies in combination with feasibility screens to help prioritize the
17 highest-risk locations for installations.

18 PG&E's forecast for distribution SCADA sectionalizing devices is
19 \$42.9 million in 2021, \$20.9 million in 2022, \$11.9 million in 2023,
20 \$12.6 million in 2024, \$12.6 million in 2025, and \$12.9 million in 2026.⁵⁰

21 **D. Estimating Methods**

22 PG&E used both a unit cost forecast methodology and program cost
23 estimating methodology to forecast the costs for the work described herein.
24 PG&E describes its basic method for developing unit and program cost
25 estimates in Chapter 2 of this exhibit. PG&E describes below how those
26 methods were used to forecast each of the work types described in this chapter.

27 **1. System Hardening**

28 Costs for system hardening work are based on the number of overhead
29 and underground miles forecast each year and forecast unit costs. Unit
30 costs for overhead and underground system hardening work are based on
31 historic costs for similar work and consider any known differences between
32 completed and planned work.

50 See Exhibit (PG&E-4), WP 4-22, line 17.

2. Expulsion Fuse Replacement

Costs for expulsion fuse replacement were developed based on the plan to replace approximately 1,200 fuses per year from 2022 through 2026. The unit cost for fuse replacement is based on recorded costs for similar work in previous years. Unit costs for the program using the circuit prioritization approach based on the 2021 Wildfire Distribution Risk Model may be slightly higher. This approach targets replacing all the fuses on a specific circuit instead of just focusing on end-of-line fuses. In executing the work in this way, more complicated switching is required, which increases clearance times and manpower.

3. Enhanced Automation for Wildfire Mitigation

The enhanced automation work described in Section B.3 includes different types of work estimated using different methods.

- Costs for single Phase Reclosers (MAT 49T) are based on the unit cost to install FuseSavers and TripSavers. Costs are based on the planned estimated number of units and forecast unit costs.
- Distribution Grid Sensors (MAT 49I) includes three types of sensors: (1) Line Sensors and cFCIs, (2) ECCVM/Early Fault Detection Sensors, and (3) RF Sensors/Distribution Fault Anticipation technology. The unit cost for each type of sensor was informed by historic actual costs plus estimated cost adjustments based on the planned volume of work.
- SIQ (MAT 21A and AB#) is a new technology. Costs are based on the estimated amounts to purchase and install the software.
- DTS-FAST: PG&E is not forecasting costs for this program.

4. PSPS Impact Reduction Initiatives

- Forecast costs for Temporary Distribution Microgrids are based on estimated costs for individual projects including amounts for labor, materials, and contracts. Project costs are informed by recently completed, similar work. Costs are adjusted based on project size and location, plus any factors that are unique to a particular project.
- Costs for the Generation Enablement and Deployment organization are based on the estimated number of FTEs in the organization, multiplied by the fully-loaded cost for each one.

- 1 • Costs for Sectionalizing Devices (49H) were developed based on the
2 plan to install approximately 190 devices in 2022 and 100 devices per
3 year from 2023 through 2026.⁵¹ The unit costs for each device are
4 based on recorded costs for similar work in previous years.

5 **E. Cost Tables**

6 Expense and capital forecasts are summarized in the following tables:

- 7 • Table 4.3-8 lists expense MWCs showing 2016 through 2020 recorded
8 adjusted expenses and 2021 through 2023 forecast expenses.
9 • Table 4.3-9 lists capital MWCs showing 2016 through 2020 recorded capital
10 adjusted expenditures and 2021 through 2026 forecast expenditures.

⁵¹ Exhibit (PG&E-4), WP 4-30, line 15.

**TABLE 4.3-8
EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Workpaper Reference
			2016	2017	2018	2019	2020	2021	2022	2023	
1	AB	Miscellaneous Expense	-	-	\$7	\$431	\$2,881	\$1,528	\$3,486	\$7,204	WP 4-5 lines 4-7
2	BA	E Dist. Operate System	-	-	-	1	-	-	-	-	WP 4-5 line 26
3	FZ	E Dist. Planning & Ops Engineer	-	705	775	455	1,487	3,256	2,576	3,437	WP 4-5 line 12
4	HG	Dist. Ops Tech ^(e)	-	-	17	201	10	134	-	-	WP 4-5 line 29
5	IG	Manage Var Bal Acct Processes	-	-	-	22	3,494	3,031	-	-	WP 4-5 line 15
6	KA	E Dist. Maint. OH General	-	-	-	-	-	-	617	953	WP 4-5, line 23
7		Total	-	\$705	\$799	\$1,110	\$7,872	\$7,949	\$6,679	\$11,595	

(a) Costs recorded and forecast in MWC HG reflect cellular and satellite costs for SCADA reclosers in Tier 2 and Tier 3 HFTD areas.

**TABLE 4.3-9
CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Workpaper Reference			
			2016	2017	2018	2019	2020	2021	2022	2023		2024	2025	2026
1	08	E Dist. Replace OH Asset	-	\$70	\$23,670	\$297,884	\$484,915	\$415,654	\$927,949	\$908,947	\$879,971	\$864,454	\$817,209	WP 4-22 line 5
2	21	Misc Capital	-	-	-	29	(30)	-	-	10,507	-	-	-	WP 4-22 line 13
3	2A	E Dist. Inst/Repl OH General	-	-	0	9,130	7,847	15,125	15,388	15,752	16,257	16,777	17,314	WP 4-22 line 9
4	49	E Dist. Reliability Ckt/Zone	-	-	8,360	63,986	91,685	89,226	77,153	54,857	54,853	56,803	59,508	WP 4-22 line 22
5		Total	-	\$70	\$32,030	\$371,030	\$584,417	\$520,005	\$1,020,491	\$990,063	\$951,082	\$938,034	\$894,031	

(PG&E-4)

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.3
ATTACHMENT A
RECOVERY OF SYSTEM HARDENING, ENHANCED
AUTOMATION, AND PSPS IMPACT MITIGATIONS COSTS
RECORDED IN THE WILDFIRE MITIGATION PLAN
MEMORANDUM ACCOUNT

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.3
ATTACHMENT A
RECOVERY OF SYSTEM HARDENING, ENHANCED AUTOMATION, AND PSPS
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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.3
ATTACHMENT A

**RECOVERY OF SYSTEM HARDENING, ENHANCED AUTOMATION,
AND PSPS IMPACT MITIGATIONS COSTS RECORDED IN THE
WILDFIRE MITIGATION PLAN MEMORANDUM ACCOUNT**

A. Introduction

The purpose of this testimony is to demonstrate the reasonableness of costs incurred and recorded in 2020 for the Wildfire Mitigation Plan Memorandum Account (WMPMA) for Pacific Gas and Electric Company’s (PG&E): (1) Line Sensor program (Maintenance Activity Type (MAT) Code 49I); (2) Rapid Earth Fault Current Limiter (REFCL) pilot project (MAT Code 49R); (3) Remote Grid program (MAT Code AB#); (4) Sensor IQ™ (SIQ) project (MAT Code AB#); and (5) Distributed Generation-Enabled Microgrid Services (DGEMS) program (MAT Code IG#). The 2020 incremental recorded costs for this work are \$7.1 million in capital expenditures and \$1.3 million in expense costs in the WMPMA.¹ PG&E seeks a determination that these costs were reasonably incurred and approval to recover them through customer rates.

B. Project Overview

This section summarizes the work performed for the Line Sensor program, REFCL pilot project, Remote Grid program, SIQ project, and DGEMS program.

1. Line Sensor Program (MAT Code 49I)

Line sensors are primary conductor-mounted devices that continuously measure current in real time and report events as they occur, and in some cases, the current waveform of grid disturbances. The line sensors utilized in this program are next-generation fault indicators, with additional functionality and communication capabilities. The line sensor deployment program was included in PG&E’s 2020 Wildfire Mitigation Plan (WMP).

¹ Please see Exhibit (PG&E-4), Ch. 2, Attachment A for a summary of the 2020 WMPMA and Fire Risk Mitigation Memorandum Account (FRMMA) costs.

1 **2. REFCL Pilot Project (MAT Code 49R)**

2 The REFCL pilot project is primarily a fire safety project. The project
3 has the potential of reducing the risk of electrical ignition events and
4 improving reliability through the automatic, proactive de-energizing of
5 circuits during high fire risk events.

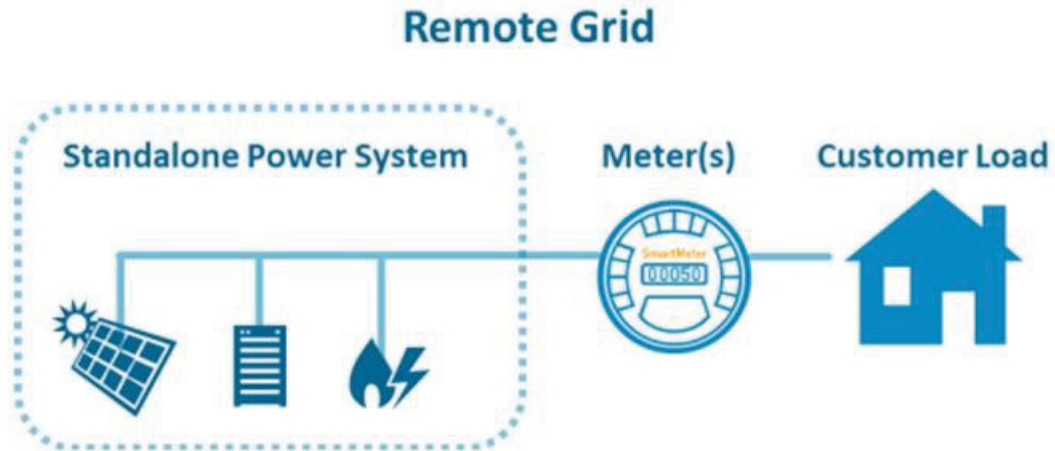
6 The REFCL system can protect hundreds of miles and be deployed at a
7 faster rate than system hardening. The system does not eliminate the need
8 for system hardening but instead greatly reduces ignition risk for
9 line-to-ground contacts. This project is the first deployment of a resonant
10 grounded system in the United States.

11 **3. Remote Grid Program (MAT Code AB#)**

12 Throughout PG&E's service territory, pockets of isolated small customer
13 loads are currently served via long electric distribution feeders, some which
14 traverse Tier 2 and Tier 3 High Fire Threat District (HFTD) areas and require
15 significant annual maintenance and vegetation management to mitigate
16 wildfire risk. The remote grid program will remove these long feeders and
17 serve customers from a local and decentralized energy source (i.e., a
18 "remote grid"). The reduction in overhead lines traversing in Tier 2 and
19 Tier 3 HFTD areas can reduce fire ignition risk as an alternative to or in
20 conjunction with system hardening and other risk mitigation efforts. The
21 objective of the remote grid program is to develop and validate the concept
22 of local and decentralized energy sources as an alternative to other service
23 arrangements and/or wildfire risk mitigation activities such as system
24 hardening.

25 The remote grid facilities include a Standalone Power System (SPS)
26 consisting of local sources of electricity supply, such as solar photovoltaic
27 generation, battery energy storage, and other distributed generation, as well
28 as distribution and service facilities to connect customers to the SPS.

**FIGURE 4.3-1
REMOTE GRID CONCEPT**



1 **4. Sensor IQ Project (MAT Code AB#)**

2 The Sensor IQ or SIQ software works with existing SmartMeters™ to
 3 capture and store high resolution, Real-Time, and granular load, voltage and
 4 outage data to enable predictive maintenance data analytics. PG&E
 5 anticipates the additional data sources from SIQ will provide data that can
 6 be used to detect early-stage equipment failure resulting in voltage and
 7 other meter-detectable conditions including loose conductor splices,
 8 failing/overloaded transformers, momentary secondary and primary
 9 vegetation contact. The goal is to decrease overall wildfire ignition risk by
 10 detecting early-stage equipment failure and conducting repairs before
 11 infrastructure fails.

12 PG&E believes useful and valuable wildfire-risk data can be obtained
 13 from SmartMeters. The current SmartMeters are only able to capture limited
 14 lower frequency and less comprehensive real time data. PG&E has worked
 15 to harness as much intelligence from the meters as possible in the current
 16 configuration. The SIQ software is expected to provide higher resolution
 17 data and additional data fields that can be set to report in real time, allowing
 18 for a more insightful view of undesirable changes that could negatively
 19 impact PG&E equipment. Early awareness of degrading conditions can
 20 allow for a prompt response and help reduce the risk of potential wildfire
 21 ignition sources.

5. DGEMS Program (MAT Code IG#)

In December 2019, PG&E launched its DGEMS solicitation to power safe-to-energize distribution substations using permanent generation at or near the substation, as a key component of its 2020 PSPS mitigation strategy. In 2020, as further discussed below, PG&E evaluated the feasibility of program components: (1) permanent generation at substations; (2) Make-Ready program to upgrade substations for permanent generation; and (3) temporary generation at substations. At this time, based on evaluations completed to date, PG&E is pursuing temporary generation as a viable PSPS mitigation alternative.

C. Reasonableness Analysis

This section addresses the reasonableness analysis of the Line Sensor program, REFCL pilot project, Remote Grid program, SIQ project, and DGEMS program, and includes the following sections:

- Summary of Costs
- Project/Program Work Need

1. Summary of Costs

This section summarizes the cost incurred and recorded in the WMPMA for these programs. All of the programs discussed in this reasonableness review attachment are new activities that were not forecast in PG&E's 2020 GRC. These activities were included in PG&E's 2020 WMP and PG&E is requesting their recovery through the WMPMA.

Table 4.3-1 shows the 2020 imputed adopted and recorded costs, 2020 WMP target spend amounts, any disallowance amount under the Wildfire Order Instituting Investigation (OII) decision, and the capital expenditure amount being requested for cost recovery in the WMPMA. Table 4.3-2 shows the same information for expense costs.

**TABLE 4.3-1
WMPMA SUMMARY OF PROGRAM CAPITAL EXPENDITURES
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Program/ MAT Code	Imputed Adopted	WMP Target Spend	Recorded Adjusted	WMPMA Recorded	Wildfire OII Disallowance	WMPMA Request
1	Line Sensors /49I	\$0	\$3,918	\$2,272	\$2,272	\$0	\$2,272
2	REFCL/49R	0	5,023 ^(a)	4,798	4,798	0	4,798
3	Total	\$0	\$8,941	\$7,071	\$7,071	\$0	\$7,071

(a) The REFCL amount was forecast as expense rather than capital.

**TABLE 4.3-2
WMPMA SUMMARY OF PROGRAM EXPENSE COSTS
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Program/ MAT Code	Imputed Adopted	WMP Target Spend	Recorded Adjusted	WMPMA Recorded	Wildfire OII Disallowance	WMPMA Request
1	Remote Grid /AB#	\$0	\$943	\$755	\$755	\$(597)	\$158
2	DGEMS/IG#	0	0	1,115	1,115	0	1,115
3	SIQ/AB#	0	1,819	1,871	1,871	(1,806)	65
4	Total	\$0	\$2,762	\$3,741	\$3,741	\$(2,403)	\$1,338

1 As shown in the tables above, PG&E is requesting recovery of \$7 million
2 in capital expenditures and \$1.3 million in expense costs recorded to the
3 WMPMA.

4 **2. Project/Program Work Need**

5 **a. Line Sensor Program (MAT Code 49I)**

6 In 2020, PG&E incurred \$2.3 million in capital expenditures for line
7 sensor program, recorded in the WMPMA. As explained in additional
8 detail below, the activities support PG&E's WMPs as outlined in the
9 2020 WMP and should be approved as reasonable.

10 The goal of the line sensor program is to address proactively many
11 of the conditions that could cause a wildfire by identifying latent or
12 incipient issues in their early stages. By proactively detecting and
13 resolving failing conditions quickly before they further degrade, we can
14 increase safety and reduce wildfire risks for the protection of our
15 customers. Existing detection methods and patrol techniques often miss

1 certain failure types (i.e., line slap caused by sagging conductors,
2 conductor contact with swaying vegetation etc.) since they lack visibility
3 and sensitivity. These failure-types indicate, in some cases, latent
4 conditions that could result in more significant issues or fire risks if left
5 unresolved. There are also other power flow anomalies/disruptions that
6 may indicate incipient faults. Advanced monitoring methods that
7 measure different electrical parameters over the distribution circuits can
8 utilize advanced sensors to find conditions early in their degradation
9 mode. PG&E's line sensor program provides these beneficial advanced
10 monitoring methods.

11 PG&E's 2020 Line Sensor program was included in Section 4.7.3 of
12 PG&E's 2019 WMP and in Section 5.3.2.2.7 of PG&E's 2020 WMP,
13 which was approved by the California Public Utilities Commission
14 (CPUC or Commission) on June 11, 2020.² The 2020 WMP indicated
15 that PG&E would deploy line sensing devices on circuits within Tier 2
16 and Tier 3 HFTD areas with a focus on reducing wildfire risk and
17 improving public safety.

18 In 2020, consistent with the approved WMP, PG&E deployed
19 approximately 600 line sensors on 46 circuits (4,131 line-circuit miles) in
20 Tier 2 and Tier 3 HFTD areas. As noted above, the line sensors reduce
21 wildfire risk and improve public safety by allowing PG&E operators to:
22 (1) monitor the grid continuously; (2) perform analytics on captured line
23 disturbance data; and (3) identify potential hazards and, when
24 necessary, dispatch field operations to proactively patrol, maintain, and
25 repair degraded assets.

26 **b. REFCL Pilot Project (MAT Code 49R)**

27 In 2020, PG&E incurred \$4.8 million in capital expenditures for
28 REFCL pilot project, recorded in the WMPMA. Of this amount, the
29 expenditures included the replacement of a 3,600 kilovolt-ampere (kVA)
30 autotransformer with a 7,500 kVA unit for \$0.900 million; installation of
31 the 13 Capacitive Balancing Units (CBU) for \$0.600 million; and the
32 replacement of fuses with FuseSavers for \$1.3 million. As explained in

² Resolution (Res.) WSD-003 (June 11, 2020).

1 additional detail below, the activities support PG&E's WMPs and should
2 be approved as reasonable. PG&E's REFCL pilot project was included
3 in Section 4.7.1 of PG&E's 2019 WMP and in Section 5.1.D.3.6 of
4 PG&E's 2020 WMP, which was approved by the CPUC on June 11,
5 2020.³

6 To reduce potential of wildfires, PG&E is deploying REFCL
7 technology on Calistoga – 3 wire 12 kilovolt (kV) distribution circuits in
8 North Bay Division. The goal of this pilot is to demonstrate methods of
9 automatically and rapidly reducing the flow of fault current and
10 significantly reducing risk of fire ignition in the event of a phase
11 conductor contact to ground.

12 In 2020, the project scope of work includes the following:

13 Phase 1:

- 14 • Engineering and Construction;
- 15 • Project design;
- 16 • Equipment Order;
- 17 • Test in Proof of Concept RTDS Lab; and
- 18 • Train and educate all departments affected by this technology.

19 Major accomplishments in 2020 include the project design
20 completion of 71 job estimates, the completion of the Calistoga
21 Substation clearance work by replacing a 3,600 kVA autotransformer
22 with a 7,500 kVA unit, and building a “shoo-fly” (e.g., temporary line
23 used during construction projects) to facilitate substation clearance
24 work. By December 2020, job estimates were developed that included
25 installations of FuseSavers, line reclosers, switches, isolation
26 transformers and CBU installations.

27 **c. Remote Grid Program (MAT Code AB#)**

28 In 2020, PG&E incurred \$0.75 million in expense for the remote grid
29 program, recorded in the WMPMA. Based upon disallowances set forth
30 in the Wildfire OII decision, PG&E is excluding \$0.6 million from its
31 cost-recovery request and is seeking only \$0.16 million in this GRC. As
32 explained in additional detail below, PG&E's remote grid programs

3 Res.WSD-003 (June 11, 2020).

1 support PG&E's WMPs as outlined in the 2020 WMP and should be
2 approved as reasonable.

3 The primary goal of the remote grid program is to reduce wildfire
4 ignition risk by reducing the need for overhead distribution lines in
5 HFTDs that serve a small number of remote customers. The elimination
6 of these lines will serve two key objectives: (1) reducing the likelihood of
7 fire ignition due to damage or failure of such lines; and (2) eliminating or
8 reducing the cost to harden the lines and/or complete enhanced VM to
9 mitigate wildfire risks. In addition, remote grids also provide a rebuild
10 solution for remote areas of the electric grid infrastructure already
11 damaged or destroyed by recent wildfires.

12 PG&E's remote grid program was included in Section 4.7.3 of
13 PG&E's 2019 WMP and in Section 5.1.D.3.8 PG&E's 2020 WMP, which
14 was approved by the Commission on June 11, 2020.⁴ The 2020 WMP
15 approved PG&E to deploy initial sites to validate use cases, design
16 standards, deployment processes and commercial arrangements.
17 Based on the results of the initial projects, PG&E will deliver
18 recommendations for scale up and/or further development for
19 consideration in 2021 and beyond. PG&E's accomplishments and
20 progress in implementing this program are described below.

21 Initial remote grid project locations were selected to validate a range
22 of remote grid configurations while simultaneously providing immediate
23 risk mitigation value at a reduced cost when compared to alternative risk
24 mitigations. In 2020, PG&E continued its extensive review of all
25 distribution feeders in Tier 2 and Tier 3 HFTD areas and developed a
26 preliminary screening protocol to identify potential remote grid projects
27 where this alternative distribution method could deliver superior
28 risk-spend efficiency and overall distribution cost reduction (including
29 reduced capital costs). PG&E prioritized sites for detailed evaluation
30 based on a combination of factors and threshold criteria including:

- 31 • Located at the end of a radial distribution line;
- 32 • Consisting of a small number and size of customer loads;

4 Res. WSD-003 (June 11, 2020).

- 1 • Historically served by a long section of line;
- 2 • Preliminary feasibility assessment based on initial customer
- 3 outreach and desktop screening for technical viability and
- 4 constructability of a SPS;
- 5 • Potential cost savings: remote grid costs versus costs of alternative
- 6 risk mitigation strategy (e.g., hardened overhead distribution or
- 7 underground conversation), and
- 8 • Risk ranking of line segment(s) to be eliminated or hardened.

9 From this list of preliminary screening results, PG&E has applied
10 criteria including customer receptivity, solar access (i.e., whether there
11 is sufficient sunshine), civil constructability, and site accessibility to
12 identify initial remote grid projects that are likely feasible for remote grid
13 deployments.

14 PG&E has one remote grid project in advanced stages of
15 development which when completed will eliminate a total of 1.4 miles in
16 HFTDs by deploying SPSs at five locations to serve ten customer
17 meters. This project is located in Mariposa County. PG&E plans to
18 begin operations of the first remote grid project to serve customer load
19 by the end of 2021.

20 In 2020, key accomplishments toward validation and standardization
21 of remote grids include:

- 22 • A detailed protocol was developed to identify and evaluate potential
- 23 remote grid projects;
- 24 • Technical specifications have been iteratively refined through
- 25 detailed design of the in-flight projects;
- 26 • Commercial availability of specialist vendor equipment and services
- 27 has been verified at the preliminary level through a successful
- 28 competitive solicitation for design and construction of a SPS;
- 29 • Assumptions of upfront capital costs and ongoing maintenance and
- 30 operations expenses have been validated and further refined
- 31 through a successful negotiation of a turnkey Purchase and Sale
- 32 Agreement and a 10-year full-wrap Maintenance Agreement,
- 33 forming a reusable template for future SPS procurements;

- 1 • The majority of customers engaged to date have voiced positive
2 initial interest in pursuit of service conversion from overhead line to
3 a remote grid;
- 4 • Terms of service have been drafted into a form of Supplemental
5 Provisions to the Electric Rules, as a tariffed, form agreement; the
6 proposed form of Supplemental Provisions Agreement was adopted
7 by the CPUC in Res.E-5132 on March 18, 2021; and
- 8 • Benchmarking with other utilities shows a point of validation in the
9 advanced program now operational under Horizon Power in western
10 Australia.

11 The \$0.16 million of costs sought in this GRC that are associated
12 with these efforts are reasonable because they will allow PG&E to
13 reduce the wildfire risk associated with serving remote PG&E customers
14 in HFTD areas. The costs are limited and will avoid system hardening
15 costs for lines serving these customers.

16 **d. Sensor IQ Project (MAT Code AB#)**

17 In 2020, PG&E incurred \$1.9 million in expense for SIQ program,
18 recorded in the WMPMA. Based upon disallowances set forth in the
19 Wildfire OII decision, PG&E is excluding \$1.8 million from its
20 cost-recovery request and is seeking only \$0.065 million in this GRC.
21 As explained in additional detail below, PG&E's SIQ project supports
22 PG&E's WMPs as outlined in the 2020 WMP and should be approved
23 as reasonable

24 The goal of the SIQ program is to decrease overall wildfire ignition
25 risk by detecting early-stage equipment failure and conducting repairs
26 before infrastructure fails and potentially causes an ignition. As noted
27 above, we anticipate the additional data source will provide information
28 that can be utilized an analytical methodology to detect early-stage
29 equipment failure resulting in voltage and other meter-detectable
30 conditions including, loose conductor splices, failing/overloaded
31 transformers, momentary secondary and primary vegetation contact.

32 PG&E's 2020 SIQ program was included in Section 4.7.3 of PG&E's
33 2019 WMP and in Section 5.1.D.3.17 of PG&E's 2020 WMP, which was

1 approved by the Commission on June 11, 2020.⁵ The 2020 WMP
2 approved PG&E to implement the SIQ pilot project and, based on the
3 results of the initial projects, to deliver recommendations for scale up
4 and/or further development for consideration in 2021 and beyond.
5 PG&E's progress in implementing this program is described below.

6 PG&E began developing and implementing this new technology pilot
7 in 2020. In 2020, recorded costs included costs relating to securing a
8 contract with the vendor, integrating our customized Advanced Metering
9 Infrastructure platform with the SIQ platform, coordinating vendor
10 activities, and completing iterative testing cycles to ensure valid sensor
11 measurements. Through these efforts, PG&E anticipates having SIQ
12 capability deployed on all planned SmartMeters by December 31, 2021
13 (within 6 months of project completion forecasted in the 2020 WMP) and
14 to complete the full evaluation for how to use this technology by
15 Quarter 1 2022.

16 **e. DGEMS Program (MAT Code IG#)**

17 In 2020, PG&E incurred \$1.115 million in expense for DGEMS,
18 recorded in the WMPMA. PG&E's DGEMS program was included in
19 Section 4.7.3 of PG&E's 2019 WMP and in Section 5.3.3.11 of PG&E's
20 2020 WMP, which was approved by the Commission on June 11,
21 2020.⁶ As explained in additional detail below, the program activities
22 support PG&E's WMPs and should be approved as reasonable.

23 During the October 26, 2019 PSPS event, the largest in 2019,
24 234,000 customer meters in PG&E's service territory were de-energized
25 due to transmission line outages where some or all of the distribution
26 load being served by a distribution substation was safe to energize
27 because it was outside of the PSPS de-energization footprint. Similar
28 outages of otherwise safe-to-energize customer meters occurred in
29 other 2019 PSPS events. While these PSPS events likely may have
30 prevented catastrophic wildfires, PG&E received a clear message from

5 Res. WSD-003 (June 11, 2020).

6 Res. WSD-003 (June 11, 2020).

1 political leaders and the public: the frequency, scope, and impact of
2 these events must be reduced.

3 On January 21, 2020 PG&E submitted testimony in the Microgrid
4 OIR describing a proposed DGEMS program along with other temporary
5 generation-related PSPS mitigation activities that PG&E proposed to
6 undertake in 2020. As set forth in the January 2020 filing, the DGEMS
7 program contained the following components, subject to further
8 feasibility evaluations:

- 9 • Permanent Generation – Potential construction of permanent
10 generation at various substations that were impacted by PSPS
11 events in October 2019 because the transmission lines feeding each
12 of the substations were not safe to energize due to wildfire risk, but
13 otherwise would have been safe-to-energize. The program’s
14 feasibility-study activities included Request for Offers (RFO) for
15 permanent generation at 20 candidate substations.
- 16 • Make-Ready Program – A Make-Ready Program involving various
17 upgrades to the twenty candidate substations for permanent
18 generation. The Make-Ready Program represented the first tranche
19 of a multi-year program that would include providing DGEMS at up
20 to an additional 28 substations.
- 21 • Temporary Generation – A program to provide up to 300 megawatts
22 (MW) of mobile temporary generation to support four PSPS
23 mitigation workstreams, including substation temporary generation
24 at locations beyond the 20 being considered for permanent
25 generation. This built upon PG&E’s successful deployment of
26 temporary generation during 2019 PSPS events.

27 Following its feasibility evaluations, PG&E ultimately decided to
28 defer efforts to develop new permanent generation at substations with
29 an online date of 2020. Since all 20 of the identified substations were
30 expected to remain vulnerable to PSPS de-energization for at least
31 2020, PG&E pivoted to include these 20 substations in its 2020
32 substation temporary generation program, reserving ~350 MWs of
33 temporary generation for use at 62 substations.

1 PG&E made the decision to defer efforts to develop new permanent
2 generation at substations after evaluating the data collected by internal
3 teams on the feasibility for building generation in 2020. Only 5 of the
4 20 substations were determined to be feasible for building permanent
5 generation with an online date of 2020 due to a variety of obstacles
6 (i.e., sufficient land available within the substation footprint and gas
7 supplies in close proximity). PG&E concluded that one of these
8 five feasible substations (Tyler) should not be pursued for new
9 permanent generation in 2020 due to the potential for other solutions in
10 the area. The other four substations⁷ were de-energized due to indirect
11 impacts on the transmission grid.⁸ For these four indirectly-impacted
12 substations, PG&E concluded that further studies were needed to
13 determine the best solution to remove the likelihood of future indirect
14 impacts. Building permanent generation immediately would have
15 precluded the opportunity to evaluate alternative solutions, including
16 placement of energy supplies in the area interconnected at the
17 transmission level or new transmission capacity in the area. However,
18 this analysis would take more time to complete, so no new permanent
19 DGEMS generation solutions were developed with a 2020 online date.

20 Much of the information gathered and analytics evaluated by PG&E
21 are continuing to be used by PG&E as it evaluates the long-term role of
22 permanent generation (including diesel-alternative technologies) in
23 mitigating the impacts of future PSPS events. Some of this information,
24 including the availability of PG&E-owned land within and adjacent to the
25 substation has been included in subsequent filings at the CPUC in which
26 PG&E details its 2021 temporary generation plans, consideration of a
27 2021 diesel-alternative pilot, and long-term investment framework for
28 substation-level PSPS mitigations. Much of the information gathered
29 has also been useful in dialogue with external stakeholders, like CCAs,

7 These four substations were: Ignacio, Carquinez, Highway, and Windsor.

8 In these cases, while PSPS weather conditions did not directly drive the de-energization of the transmission lines and related substations, but these lines and substations still required de-energization to mitigate overall grid stability in the area caused by transmission lines being de-energized in other areas.

1 interested in developing their own resiliency solutions. It was also useful
2 in providing specific substation examples during the CPUC's August
3 2020 Diesel-alternatives Workshop.

4 The \$1.115 million in expense was incurred by the following teams
5 and workstreams:

- 6 • Creation of the DGEMS Program Management Office which
7 coordinated all DGEMS workstreams including regulatory, project
8 development, finance, site selection, construction, permitting, etc.
- 9 • Project development efforts, including hiring a consultant
10 responsible for coordinating with key internal teams to gather site
11 data (e.g., available land, proximity to gas infrastructure,
12 interconnection requirements) conduct site visits, prepare for
13 potential permitting efforts, and respond to site-specific questions
14 from vendors who bid in to the 2019 permanent generation DGEMS
15 RFO. This team supported the selection of the Tier 1 DGEMS
16 Substations and the eventual decision not to pursue permanent
17 generation with an online date of 2020.
- 18 • Legal support in preparation for permitting of permanent generation,
19 including air permits and review of materials and negotiations for the
20 permanent and temporary generation procurement efforts.
- 21 • Hiring a consultant whose efforts focused on the design and
22 operation of the 2019 permanent generation DGEMS RFO as well
23 as evaluation of bids. This consultant also supported the design
24 and operation of the 2020 Temporary Generation RFO and
25 subsequent bid evaluation, negotiations, and contracting.
- 26 • Work by various internal organizations including land,
27 environmental, gas operations, and the interconnection team.
28 These teams gathered data on each of the 20 substations
29 considered for permanent generation (and are now considered for
30 temporary generation); conducted site-specific analytics to inform
31 land acquisition; generation procurement activities; and preparations
32 for permitting. They also informed project development timelines by
33 outlining key steps and time required to complete activities in their
34 workstream, including for example, potential interconnection

1 timelines at each location and time required for each step.
2 Information gathered included a substation's proximity to gas
3 infrastructure, available capacity of that infrastructure, and
4 associated costs and timelines associated with connecting to nearby
5 gas infrastructure and/or expanding capacity on the existing gas
6 system.

7 All of these efforts are critical to PG&E's development of generation
8 alternatives that could substantially reduce the impact of PSPS events
9 on customers, and therefore should be approved as reasonable.

10 **D. Conclusion**

11 The wildfire mitigation costs we present in this attachment are for activities
12 that are necessary to mitigate wildfire risks and improve the safety and reliability
13 of our system, consistent with the policies underlying the establishment of the
14 WMPMA. For the reasons described above, the Commission should approve all
15 costs PG&E incurred for this work as reasonable.

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.4
COMMUNITY WILDFIRE SAFETY PROGRAM PMO

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.4
COMMUNITY WILDFIRE SAFETY PROGRAM PMO

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 4.4**
3 **COMMUNITY WILDFIRE SAFETY PROGRAM PMO**

4 **A. Introduction**

5 This chapter demonstrates that Pacific Gas and Electric Company’s (PG&E
6 or the Utility) expenditures for the Community Wildfire Safety Program (CWSP)
7 Program Management Office (PMO) are reasonable and should be adopted.

8 Senate Bill (SB) 901 required each California electric corporation to submit
9 an annual Wildfire Mitigation Plan (WMP) to establish the Utility’s approach to
10 mitigating wildfire risk caused by its electric equipment, beginning in 2019.¹
11 Assembly Bill (AB) 1054 and subsequent regulatory activities have further
12 expanded the WMP process.² The CWSP delivers on the key facets of PG&E’s
13 WMP. The CWSP PMO, in turn, provides the foundational coordination,
14 support, tracking, and governance needed to effectively execute our WMP, and
15 manage the CWSP across multiple functions, internal teams, and work streams.

16 **1. Scope, Purpose, and Support for this Request**

17 Wildfire safety work is complex and multi-faceted. It requires a wide
18 range of internal teams and subject matter experts — including experts in
19 planning, operations, emergency response, external engagement, and
20 communications. Collectively these teams assist with developing and
21 implementing comprehensive solutions and supporting our customers,
22 communities, and other partners. The CWSP PMO aims to:

- 23 • Coordinate with the various planning and operational teams to develop
24 cohesive operational plans that maximize wildfire risk reduction and
25 minimize community and customer impacts;
- 26 • Monitor, govern, and support wildfire risk mitigation workstreams in
27 delivering the activities to meet our WMP goals and align with plans to
28 aggressively reduce wildfire risk;

1 Senate Bill (Sen. Bill) No. 901 (2017-2018 Reg. Sess.) § 12.

2 Assembly Bill (Assem. Bill) No. 1054 (2019-2020 Reg. Sess.).

- 1 • Coordinate with various outreach teams on communications plans for
2 engaging with customers, agencies, tribes, critical facilities, first
3 responders, and other key stakeholders;
- 4 • Maintain accurate and timely data regarding our progress to inform
5 internal tracking, governance, and management and to be shared with
6 external stakeholders;
- 7 • Lead and facilitate regulatory reporting and filings on wildfire programs,
8 including the WMP process; and
- 9 • Gather and provide feedback from customers and external stakeholders
10 to PG&E planning and operational teams.

11 Given the increases in the volume of work in our WMP and in regulatory
12 reporting requirements, PG&E has seen growth in the management,
13 oversight, and support needed for the CWSP. This management support
14 spans various functions in Electric Operations (EO), providing leadership
15 and oversight to the various wildfire mitigation activities PG&E is
16 undertaking.

17 The CWSP PMO supports the continued implementation of CWSP
18 workstreams, which have ramped up to unprecedented levels of activity.
19 The CWSP PMO provides programmatic support and flexible resources
20 across multiple workstreams. Other overall benefits of the CWSP PMO
21 include:

- 22 • Improved oversight via a centralized entity that oversees strategy and
23 execution of wildfire risk mitigation activities;
- 24 • Alignment of work tracking, quality management, documentation, and
25 other processes through a centralized team;
- 26 • Improved accountability through dedicated resources focused solely on
27 the CWSP;
- 28 • Improved reporting, communication, external outreach, coordination,
29 and engagement of stakeholders and customers on the full suite of
30 PG&E's wildfire risk mitigation activities; and
- 31 • Improved change management and coordination due to the
32 cross-functional nature of the CWSP, which incorporates many lines of
33 business (LOB) across PG&E and multiple functional groups within EO.

1 The activities of the CWSP PMO and related support functions are
2 applicable across all regions of PG&E’s service territory, particularly focused
3 on High Fire Threat District (HFTD) areas.

4 **2. Summary of Request**

5 PG&E requests that the California Public Utilities Commission adopt
6 PG&E’s 2023 expense forecast of \$13.5 million for the CWSP PMO, which
7 is \$20.8 million (or 61 percent) lower than 2020 recorded costs of
8 \$34.3 million.³

9 PG&E also requests authorization to recover 2020 CWSP-related costs
10 recorded in the Fire Risk Mitigation Memorandum Account (FRMMA), as
11 described in Attachment A of this chapter.

12 Forecasts in this chapter are shown with escalation at the Major Work
13 Category (MWC) level and escalation is included in all expense totals.
14 For more information on escalation, please refer to Chapter 2 of this exhibit.

15 **3. Overview of Recorded and Forecast Costs**

16 CWSP PMO forecasts expense costs in MWC AB, as shown in
17 Table 4.4-1.

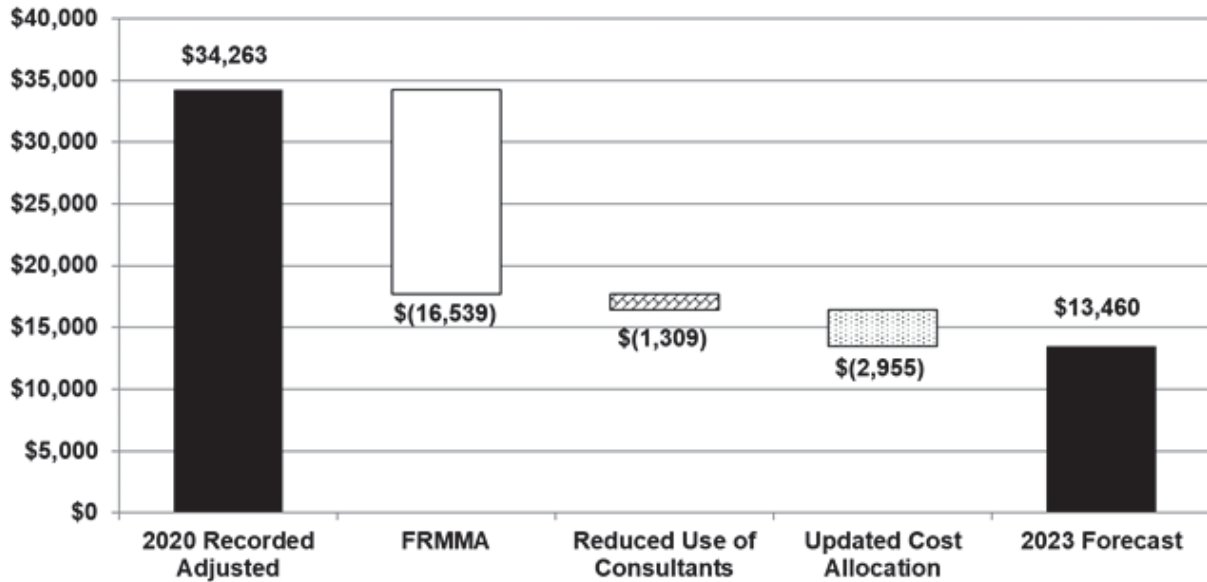
**TABLE 4.4-1
CWSP PMO MWC**

Line No.	MWCs	Description
1	AB	Miscellaneous Expense

18 Figure 4.1-1 shows the walk from 2020 recorded adjusted expense
19 amounts to the 2023 forecast for the CWSP PMO. This figure includes
20 costs that are subject to recovery on a recorded basis through the FRMMA.

³ See Exhibit (PG&E-4), WP 4-9, line 4.

**FIGURE 4.4-1
EXPENSE WALK 2020-2023
(THOUSANDS OF NOMINAL DOLLARS)**



As shown in the figure above, there are three main drivers for the decrease between 2020 recorded adjusted amounts for the CWSP PMO and the 2023 forecast:

- 1) Fire Risk Mitigation Memorandum Account (FRMMA): CWSP-related costs incurred in 2020 and recorded in the FRMMA are not included in the 2023 General Rate Case (GRC) forecast. Attachment A of Chapter 2 in Exhibit (PG&E-4) summarizes the amounts recorded in the FRMMA in 2020, which includes \$16.4 million in expense costs in MWC AB and \$119 thousand of expense costs in MWC IG. The need to record and recover these costs in the FRMMA was unique to the 2020 GRC. These costs have either been incorporated into the 2023 GRC forecast where appropriate, like in PG&E's 2023 forecast for Operational Management & Operational Support as provided in Chapter 22 of Exhibit (PG&E-4), or are no longer continuing into the 2023 GRC period.
- 2) Reduced use of consultants: PG&E engaged consultants to assist with the ramp-up of the CWSP PMO from its inception in 2018 into 2019 and 2020, as well as to prepare and assist with the regulatory process for the 2019 and 2020 WMPs. As these processes have stabilized, PG&E

1 has increased its internal staff and reduced the volume and cost of
2 contractors needed to support the CWSP PMO.

- 3 3) Updated Cost Allocation: As described below in Section D of this
4 chapter, in the section entitled “Estimating Method”, PG&E has updated
5 the allocation of the CWSP PMO cost forecast starting in 2023.

6 **B. Program and Risk Overview**

7 **1. Program Overview**

8 As described above, the PMO leads and facilitates the overall CWSP,
9 including developing and optimizing mitigation programs in conjunction with
10 numerous other teams, facilitating the development of PG&E’s annual WMP
11 filings, and coordinating implementation of wildfire risk mitigation activities
12 across multiple LOBs.

13 The PMO’s responsibilities also include monitoring progress, handling
14 resourcing needs, and directing workstreams as issues arise. This includes
15 managing and enhancing quality monitoring programs, tracking performance
16 data and metrics, documenting program activities, and coordinating external
17 engagement and communication activities.

18 To address the significant impact of the CWSP and its new mitigation
19 programs on our customers and the communities we serve, the PMO also
20 supports internal and external engagement efforts, including public affairs
21 and government relations support, local customer outreach support, and
22 program communications. In 2019 and 2020, PG&E’s external outreach for
23 the CWSP program included open houses, webinars and meetings with
24 local agencies to educate communities and customers about wildfire risks,
25 PG&E’s wildfire risk mitigation activities, and PSPS events.

26 Given the recent occurrence of wildfires associated with utility
27 infrastructure, there is considerable external oversight and interest in
28 PG&E’s wildfire mitigation activities. The CWSP PMO facilitates and leads
29 the reporting, updates, and engagement with regulators, customers, and
30 other outside parties. The PMO leads these external reporting and
31 engagement activities to allow the operational leaders of the CWSP
32 workstreams to focus on executing the wildfire risk mitigation activities they
33 lead.

2. Risk Integration

Chapter 3 of this exhibit describes how EO uses the Enterprise and Operational Risk Management program to manage electric system risks. Table 4.4-2 below shows the EO risk associated with the forecasts discussed in this chapter.

**TABLE 4.4-2
RISKS DISCUSSED IN THIS CHAPTER**

Line No.	Risk Name	Risk ID	Type of Risk	MAT
1	Wildfire	WLDFR	RAMP	AB#

a. Risk Assessment Mitigation Phase (RAMP) Risk – Wildfire

1) Risk Overview

The Wildfire risk is defined as the potential that PG&E assets or activities may initiate a fire that is not easily contained and endangers the public, private property, sensitive lands, or environment. Wildfire was one of PG&E's 2020 RAMP risks.⁴

In Chapter 3, PG&E describes how management of this risk has changed since it filed the 2020 RAMP Report; provides updated Risk Spend Efficiency (RSE) scores; lists each mitigation and control; and indicates if those mitigations and controls have changed since the 2020 RAMP Report. In this chapter, PG&E provides more information about the mitigation associated with the CWSP PMO and the work needed to implement it.

2) GRC Risk Mitigations and Controls

As shown in the table below, PG&E is forecasting one wildfire risk mitigation associated with the CWSP PMO. A brief description of the mitigation is provided in the table below. More detail is included in the 2020 RAMP Report.⁵

⁴ PG&E's RAMP Report, Application (A.) 20-06-012 (June 30, 2020), p. 10-5, lines 14-15.

⁵ PG&E's RAMP Report, A.20-06-012 (June 30, 2020), p. 10-43, lines 16-27.

**TABLE 4.4-3
WILDFIRE FORECAST MITIGATIONS**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	WLDFR-M009	CWSP PMO	The CWSP PMO was established in 2018 to oversee and coordinate multiple LOB's implementation of PG&E's wildfire risk mitigation activities. The CWSP PMO is focused on project and program development and management for wildfire mitigation efforts.	Foundational	See Section C.1 for more information	AB#

3) Changes to Mitigations

PG&E did not modify its CWSP PMO mitigation since filing the 2020 RAMP Report. While the work remains the same, the forecast costs for the work have changed. PG&E has reduced its forecast for the CWSP PMO for 2021 to 2026 after submitting the 2020 RAMP Report. The decrease is primarily due to the reduction in consultant/contractor spend discussed in section A.3 above. The GRC portion of these costs has also decreased based on the application of the cost allocation methodology mentioned in section A.3 above and discussed in Section D below.

4) Cost Tables

Table 4.4-4 below shows the forecast costs for the mitigation presented in this chapter.⁶ Tables showing the GRC forecast costs compared to the costs estimated in the 2020 RAMP Report are provided in workpapers.⁷ There are no controls associated with work in this chapter.

⁶ See Exhibit (PG&E-4), WP 3-7, line 34.

⁷ See Exhibit (PG&E-4), WP 3-20, lines 64-66.

**TABLE 4.4-4
WILDFIRE
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 – EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Total	RSE
1	WLDFR-M009	CWSP PMO	\$17,724	\$15,438	\$14,994	\$13,460	\$61,617	(a)
2		Total	\$17,724	\$15,438	\$14,994	\$13,460	\$61,617	

(a) PG&E considers this a foundational mitigation and, as such, does not calculate an RSE for it.

1 C. Activities, Costs, and Forecast Drivers by Risk Mitigation

2 1. Expense (MWC AB) (WLDFR-M009)

3 The forecasted costs for the CWSP PMO (aligned with mitigation
4 WLDFR-M009) consist primarily of third-party consultants to support internal
5 and external engagement, including public affairs and government relations,
6 local customer outreach, and marketing and communications for the CWSP
7 program overall and also to provide supplemental support for coordinating
8 the development of the annual WMP filings. As discussed above, Wildfire
9 safety work is complex and multi-faceted and has ramped up substantially
10 since the program inception in 2018. The CWSP PMO organizes and
11 coordinates this work by performing activities including:

- 12 • Coordination with the various planning and operational teams to develop
13 cohesive operational plans that maximize wildfire risk reduction and
14 minimize community and customer impacts;
- 15 • Monitoring, governing, and supporting wildfire risk mitigation
16 workstreams to meet our WMP goals and align with plans to
17 aggressively reduce wildfire risk;
- 18 • Coordinating with numerous outreach teams on communications plans
19 for engaging with customers, agencies, tribes, critical facilities, first
20 responders, and other key stakeholders and supporting the delivery of
21 those communications and engagement;
- 22 • Maintaining accurate and timely data regarding our progress to inform
23 internal tracking, governance, and management and to be shared with
24 external stakeholders;

- 1 • Leading and supporting the expanding wildfire-related regulatory
- 2 reporting and filings, including the WMP process; and
- 3 • Gathering and providing feedback from customers and external
- 4 stakeholders to PG&E planning and operational teams.

5 The CWSP PMO supports the continued implementation of CWSP
6 workstreams, which have ramped up to unprecedented levels of activity and
7 are forecasted to grow as PG&E continues to aggressively reduce wildfire
8 risk to protect the customers and communities we serve.

9 **D. Estimating Method**

10 Forecasted costs in 2021 through 2023 for the CWSP PMO are based on
11 2020 recorded costs. As noted in the forecast walk in section A.3 above, there
12 are three primary modifications from the 2020 recorded costs to our future year
13 forecasts.

- 14 1) Costs recorded to the Fire Risk Mitigation Memorandum Account (FRMMA)
15 in 2020: The primary costs associate with this chapter and recorded to the
16 FRMMA in 2020 were for incremental wildfire work support activities
17 (management support and quality support, as discussed in Attachment A of
18 this chapter) that were not forecasted in the 2020 GRC. In 2021 those costs
19 have been forecasted again in this chapter but for 2022 and beyond, the
20 forecast for the cost of internal headcount to support wildfire work has been
21 primarily captured in the Operational Management and Operational Support
22 forecasts presented in Chapter 22.
- 23 2) Reduced use of consultants: PG&E engaged consultants to assist with the
24 ramp up of the CWSP PMO from its inception in 2018 into 2019 and 2020,
25 as well as to prepare and assist with the regulatory process for the 2019 and
26 2020 WMPs. As these processes have stabilized, PG&E has increased its
27 internal staff and reduced the volume and cost of contractors needed to
28 support the CWSP PMO.
- 29 3) Updated Cost Allocation: After the above two adjustments, the total CWSP
30 PMO forecast for 2023 is \$16.4 million.⁸ In the 2020 GRC PG&E allocated
31 the full CWSP PMO costs to “common” assets such that the cost of the
32 CWSP PMO was split among different asset groups (including Electric

8 See Exhibit (PG&E-4), WP 4-9, line 1.

1 Transmission and Electric Distribution) through ratemaking calculations.
2 With more experience in operating the CWSP PMO and the underlying
3 wildfire risk mitigation activities, for the 2023 GRC PG&E is updating that
4 allocation based on the asset classes supported by the CWSP, which are
5 Electric Distribution and Electric Transmission Assets. This reallocation of
6 the overall CWSP PMO costs resulted in 18 percent of the cost (\$2.9 million)
7 being allocated to Electric Transmission assets. That \$2.9 million has been
8 excluded from the GRC request included in this chapter.

9 The proposed allocation of the CWSP PMO costs to electric distribution and
10 electric transmission is based on the ratio of overhead circuit miles in HFTD
11 areas for each asset group to total overhead circuit miles in HFTD areas. As of
12 the end of 2020, the allocation percentage is 18 percent electric transmission
13 and 82 percent electric distribution.⁹ These mile amounts are also discussed in
14 the 2021 WMP.¹⁰ Because the CWSP PMO supports wildfire work activities on
15 both distribution and transmission assets, this allocation was used to split the
16 overall CWSP PMO cost forecast between distribution, which is presented here
17 in the GRC, and transmission costs, which will be recorded and recovered
18 directly through PG&E's Transmission Owner rate case process for 2023 and
19 beyond.

20 If this allocation methodology to directly associate 82 percent of the CWSP
21 PMO forecast to Electric Distribution assets through the GRC is not adopted and
22 the CWSP PMO costs are instead allocated as a "common" cost allocation (as
23 was the case with the 2020 GRC forecast) then then CWSP PMO forecast here
24 would need to be revised back to the total CWSP PMO forecast of \$16.4 million.

25 E. Cost Tables

26 The expense recorded and forecast amounts and the capital recorded
27 amounts for CWSP PMO related activities are summarized in the following
28 tables:

- 29 • Table 4.4-5 shows 2016 through 2020 recorded adjusted expenses and
30 2021 through 2023 forecast expenses.

⁹ Exhibit (PG&E-4), WP 4-9.

¹⁰ PG&E's 2021 Wildfire Mitigation Plan – Revised Report, R.18-10-007 (June 3, 2021), Attachment 1, Table 8, lines 16, 18, 32, 34, 48 and 50.

- 1 • Table 4.4-6 shows 2016 through 2020 recorded capital adjusted
- 2 expenditures as there are no forecast expenditures for 2021 through 2026.
- 3

**TABLE 4.4-5
EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Workpaper Reference
			2016	2017	2018	2019	2020	2021	2022	2023	
1	AB	Misc. Expense	-	-	\$4,530	\$30,635	\$34,144	\$27,802	\$14,994	\$13,460	WP 4-5, line 8
2	IG	Manage Var Bal Acct Processes	-	-	-	-	119	-	-	-	WP 4-5, line 16
3		Total	-	-	\$4,530	\$30,635	\$34,263	\$27,802	\$14,994	\$13,460	

**TABLE 4.4-6
CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded / Adjusted					Forecast					Workpaper Reference		
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		2026	
1	21	Misc Capital	-	-	\$(1)	\$10	\$0	-	-	-	-	-	-	-	WP 4-19, line 9
2		Total	-	-	\$(1)	\$10	\$0	-	-	-	-	-	-	-	

(PG&E-4)

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.4
ATTACHMENT A
RECOVERY OF COMMUNITY WILDFIRE SAFETY PROGRAM
PMO COSTS RECORDED IN THE
FIRE RISK MITIGATION MEMORANDUM ACCOUNT

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.4
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RECOVERY OF COMMUNITY WILDFIRE SAFETY PROGRAM PMO COSTS
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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 4.4**
3 **ATTACHMENT A**
4 **RECOVERY OF COMMUNITY WILDFIRE SAFETY PROGRAM PMO**
5 **COSTS RECORDED IN THE**
6 **FIRE RISK MITIGATION MEMORANDUM ACCOUNT**

7 **A. Introduction**

8 The purpose of this testimony is to demonstrate the reasonableness of costs
9 incurred and recorded in the Fire Risk Mitigation Memorandum Account
10 (FRMMA) for the year 2020 for costs recorded in Maintenance Activity Type
11 (MAT) AB6 (Management Support); MAT AB# (Quality Support); MAT AB6
12 (International Wildfire Risk Mitigation Consortium (IWRMC)); and MAT IG#
13 (Local Resiliency Support). The 2020 incremental recorded costs for these
14 programs are \$5.3 million in expense in the FRMMA.¹ Pacific Gas and Electric
15 Company (PG&E or the Company) seeks a determination that these costs were
16 reasonably incurred and that recovery of these costs in rates is appropriate.

17 **B. Reasonableness Analysis**

18 This section addresses the reasonableness analysis of the general
19 Community Wildfire Safety Program (CWSP) work performed and includes the
20 following sections:

- 21 • Summary of Program Costs; and
- 22 • Program Work Need and Details of Activities.

23 **1. Summary of Program Costs**

24 This section summarizes the cost incurred and recorded in the FRMMA
25 for CWSP management support, quality support, benchmarking through the
26 IWRMC and local resiliency project support. All of these costs support
27 PG&E's wildfire mitigation activities. Table 4.4A-1 shows the 2020 imputed
28 adopted and recorded costs, disallowance amounts applied in accordance
29 with the Wildfire Order Instituting Investigation (OII), and the amount being

¹ Please see Exhibit (PG&E-4), Ch. 2, Attachment A, p. 2-AtchA-16, Table 2A-2, and p. 2-AtchA-17, Table 2A-3, for a summary of the 2020 Wildfire Mitigation Plan Memorandum Account and FRMMA costs.

1 requested for cost recovery. Attachment A of Ch. 2 in Exhibit (PG&E-4)
 2 describes the Wildfire OII disallowances and how they were applied to 2020
 3 expense costs recorded to the FRMMA. The other items are discussed in
 4 greater detail below.

**TABLE 4.4A-1
 SUMMARY OF PROGRAM EXPENSE COSTS
 (THOUSANDS OF DOLLARS)**

Line No.	Program/MAT Code	Imputed Adopted	Recorded Adjusted	FRMMA Recorded	Wildfire OII Disallowance	FRMMA Request
1	Mgmt Support/ AB6	\$0	\$14,896	\$14,896	\$(10,392)	\$4,504
2	Quality Support/AB#		1,388	1,388	(859)	529
3	IWRMC/AB6		135	135	–	135
4	Local Resiliency/IG#		119	119	–	119
5	Total	\$0	\$16,539	\$16,539	\$(11,251)	\$5,288

5 **2. Program Work Need and Details of Activities**

6 As the devastating 2020 fire season demonstrated, California's climate
 7 driven wildfire risks are significant and must be addressed through focused
 8 and sustained mitigation efforts. PG&E's annually-filed Wildfire Mitigation
 9 Plan (WMP) sets forth our proposed activities to mitigate wildfire risk in our
 10 service territory for the safety of our customers. PG&E's wildfire risk
 11 mitigation activities require cross-functional effort, incorporating many lines
 12 of business (LOB) across PG&E and multiple functional groups within
 13 Electric Operations. These efforts are critical to the effective implementation
 14 of PG&E's WMP, and include management support, quality support,
 15 benchmarking activities, and community resiliency support, as discussed in
 16 further detail below.

17 **a. Management Support (MAT Code AB6)**

18 PG&E's 2019 and 2020 WMPs represented unprecedented
 19 increases in work scope as PG&E implemented new programs or
 20 expanded existing programs to reduce wildfire risk. These programs—
 21 including Enhanced Vegetation Management; asset inspections of all
 22 assets in High Fire Threat Districts (HFTD) in a single year; and system
 23 hardening—required significant deployment of internal and contract
 24 resources, materials, and customer and community outreach. This

1 increase in activities and resources required additional management
2 direction and support, leadership and safety oversight, and coordination
3 of cross-functional support for the work. Examples of these activities
4 include:

- 5 • Increases in work volumes to reduce wildfire risk required the
6 deployment of additional support staff to plan and coordinate the
7 work;
- 8 • Additional leadership (Supervisors, Managers, Directors, etc.) were
9 deployed to oversee and direct the work, much of which was
10 performed by contractors who were incremental to PG&E's previous
11 workforce; and
- 12 • Increased spending, contracting and material purchases required
13 oversight and management by Program Managers, financial support
14 staff, and other resources.

15 The costs recorded in the FRMMA for Management Support of the
16 CWSP reflect the incremental cost for leadership and management
17 oversight attributable to the increased wildfire risk mitigation work
18 completed in 2020. The methodology for allocating Operational
19 Management & Operational Support (OM & OS) costs is described in
20 more detail in Chapter 22,² including the methodology used to record
21 the \$14.9 million of 2020 OM & OS costs to this CWSP account within
22 the FRMMA. As shown above in Table 4.4A-1, PG&E is only seeking
23 recovery of \$4.5 million of these costs, due to the Wildfire OII
24 disallowance amount.

25 **b. Quality Support (MAT Code AB#)**

26 Similar to the Management Support activity described above, where
27 incremental internal management and leadership support costs were
28 incurred due to PG&E's expansive wildfire risk mitigation activities,
29 PG&E's Electric Compliance and Quality Assurance (QA) Department
30 supported these new Wildfire Risk Mitigation workstreams with
31 incremental staffing and as part of the CWSP. As shown in
32 Table 4.4A-1 these incremental costs in support of wildfire risk mitigation

² Exhibit (PG&E-4), Ch. 22, WP 22-14, line 46.

1 activities in 2020 totaled \$1.4 million. However, PG&E is only seeking
2 recovery of \$529 thousand of these costs, due to the Wildfire OII
3 disallowance amount.

4 The Electric Operations QA Department is responsible for reviewing
5 completed work activities. The QA team required substantial additional
6 headcount to support two wildfire-driven workstreams: (1) providing
7 quality support and oversight of PG&E's Wildfire Risk Mitigation
8 activities including asset inspections and repairs in HFTDs; and
9 (2) supporting the California Public Utilities Commission (CPUC or
10 Commission) Wildfire Safety Division's compliance activities including
11 inspections of wildfire mitigation work, issuance of potential defects and
12 the documentation and closeout of those findings, which was a new
13 process that began in 2020. The QA team's activities help confirm that
14 PG&E's wildfire mitigation activities are properly completed and will be
15 effective at reducing wildfire risk. QA reviews are a foundational utility
16 practice that assure safety and reliability for the benefit of customers.
17 For this reason, the costs recorded in the FRMMA for QA activities
18 should be approved as reasonable.

19 In addition, the Electric Compliance department, which includes the
20 Electric Data Request Unit (EDRU) is responsible for ensuring
21 compliance with various regulatory requirements. These regulatory
22 requirements include responding to data requests and other requests for
23 information from the Commission, other state regulatory agencies, and
24 intervenors. When PG&E receives electric operations-related data
25 requests, the EDRU assists in the preparation of the response and
26 ensures accuracy through quality control checks and coordination with
27 other LOBs. The EDRU saw a significant uptick in wildfire related data
28 requests requiring additional headcount to support internal coordination
29 and oversee the accuracy of the responses. It is imperative that PG&E
30 timely provide accurate responses to the Commission, other state
31 agencies, and intervenors. Accordingly, the costs recorded for PG&E's
32 complying with data requests and other data submissions should be
33 approved as reasonable.

1 **c. IWRMC (MAT Code AB6)**

2 PG&E, like other utilities, finds significant value in benchmarking
3 with industry peers on a wide range of topics. Long-established industry
4 forums exist with a focus on electric system reliability and other topics.
5 Additionally, PG&E's benchmarking partners historically have been
6 other utility companies in the United States and Canada. However, the
7 substantially increased risk of wildfire, as well as the unique combination
8 of meteorological and ecological factors that make the wildfire risk so
9 acute in California, and PG&E's service territory in particular, required
10 PG&E to pursue additional benchmarking and best-utility-practice
11 sharing opportunities with utilities in other parts of the world facing
12 similar conditions and wildfire risks. In particular, PG&E is pursuing
13 connections with other, international utilities who have faced similar,
14 substantial wildfire risk and changing climates. To this end, in 2020
15 PG&E was a founding member, along with other large California
16 Investor-Owned Utilities and several utilities from Australia, in a new
17 benchmarking group referred to as the "International Wildfire Risk
18 Mitigation Consortium (IWRMC)." PG&E's dues as a founding member
19 for the first year of participation in this new consortium totaled the
20 \$135 thousand reflected in Table 4.4A-1. The consortium is exclusively
21 focused on wildfire risk mitigation and will provide valuable insight into
22 how other utilities are addressing wildfire risks and how those practices
23 could be incorporated in California. This insight includes understanding
24 their experience with various ignition prevention technologies and
25 different wildfire risk mitigation approaches not previously considered or
26 incorporated in California. Given the substantial cost of wildfire
27 mitigation activities and the immense safety risk that wildfire poses to
28 PG&E's customers and communities, leveraging the experience and
29 best practices of other utilities facing similar cost pressures and risks, is
30 a prudent investment for PG&E and our customers.

31 **d. Local Resiliency Support (MAT Code IG#)**

32 In 2020, PG&E began efforts to support local communities in
33 reviewing and considering electric grid resiliency projects to potentially
34 improve overall grid reliability and mitigate Public Safety Power Shutoff

1 (PSPS) events. The 2020 efforts for local support were designed to
2 build PG&E's capacity to be responsive to communities as we learn
3 more about their PSPS mitigation needs through proactive outreach and
4 responses to community inquiries, consistent with PG&E's efforts to put
5 customers at the center of PG&E's operations. Ultimately, this
6 workstream will provide feasibility planning support for PG&E's
7 identification of potential grid solutions (incremental to PG&E's existing
8 workplan) and ability to implement such projects in future years. In
9 2020, PG&E received and addressed numerous community and/or
10 stakeholder requests to evaluate and identify potential grid solutions to
11 mitigate PSPS events. Ultimately this work supported the community
12 resiliency toolset³ and Community Microgrid Enablement Program.⁴
13 This important and new customer-focused work to support and partner
14 with the communities we serve on local grid resiliency and potential
15 PSPS mitigation activities should be approved as reasonable.

16 C. Conclusion

17 The wildfire mitigation costs presented in this attachment are for
18 fundamental activities that are necessary to improve the safety and resiliency of
19 our system, support our customers and are consistent with the policies
20 underlying the establishment of the FRMMA. As described above, all costs the
21 Company incurred for this work are incremental and reasonable, and PG&E
22 requests that the Commission approve full cost recovery.

3 PG&E, Community Resilience Guide, at: <www.pge.com/resilience> (as of May 27, 2021).

4 PG&E, Community Microgrid Enablement Program, at: <https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/community-microgrid-enablement-program.page> (as of May 27, 2021).

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.5
INFORMATION TECHNOLOGY FOR WILDFIRE MITIGATIONS

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.5
INFORMATION TECHNOLOGY FOR WILDFIRE MITIGATIONS

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 4.5**
3 **INFORMATION TECHNOLOGY FOR WILDFIRE MITIGATIONS**

4 **A. Introduction**

5 **1. Scope, Purpose, and Support for This Request**

6 The purpose of this chapter is to demonstrate that Pacific Gas and
7 Electric Company’s (PG&E or the Company) expense and capital forecasts
8 for administering its Community Wildfire Safety Program (CWSP)
9 Information Technology (IT) initiatives and programs are reasonable and
10 should be approved. This chapter describes the CWSP IT programs,
11 initiatives, key metrics, mitigations, and controls to support PG&E’s Wildfire
12 mitigation efforts.

13 IT for Wildfire Mitigations enables and supports wildfire response and
14 mitigation efforts as described in the Company’s 2021 Wildfire Mitigation
15 Plan (WMP).¹ The request in this chapter is necessary to improve and
16 maintain the IT systems and applications that support those critical efforts.
17 The benefits associated with these efforts include:

- 18 • Improved data quality through the enablement of foundational data
19 management practices and programs, such as Public Safety Power
20 Shutoff (PSPS) Data Quality and Grid Data Analytics Tool, that will
21 support other programs to reduce wildfire risk;
- 22 • Risk reduction through continued investments in key technology
23 programs and the development of new and enhanced risk based data
24 models, such as Remote Sensing Data Platform, Risk Assessment &
25 Mapping and Asset Management & Inspections, that will drive more
26 informed decision making related to asset management;
- 27 • More agile PSPS event scoping that increases scoping speed and
28 minimizes event scope through the integration and continued
29 enhancement of tools and better coordination and sharing of

1 PG&E’s 2021 Wildfire Mitigation Plan – Revised Report, R.18-10-007 (June 3, 2021)
 (Revised 2021 WMP).

1 information, such as PSPS Viewer, PSPS Situational Intelligence
2 Platform and PSPS External Portal;

- 3 • Improved customer experiences through enhanced customer
4 notifications and self-service tools to better support customer needs
5 during wildfire and PSPS events;
- 6 • Increased efficiency and higher quality execution of field work through
7 the implementation of integrated cross-functional technology solutions;
8 and
- 9 • More stable and reliable technology platforms to support critical wildfire
10 and PSPS operations.

11 **2. Summary of Request**

12 Below is a summary of the expense and capital requests for information
13 technology for wildfire mitigations.

14 **a. Expense**

15 PG&E's expense forecast for IT for Wildfire Mitigations is
16 \$35.7 million in 2023, which is \$8.8 million more than 2020 recorded
17 adjusted expense of \$26.9 million.² The increase is primarily driven by
18 additional technology program investments, namely in the Data
19 Enablement and Asset Management and Risk Analysis value streams,³
20 and the establishment of key Baseline Operations and Maintenance
21 (O&M) activities, resulting from the implementation of continued
22 technology program investments needed to support PG&E's wildfire
23 response and mitigation efforts.

24 **b. Capital**

25 PG&E's forecast of capital expenditures for IT for Wildfire
26 Mitigations is \$25.3 million in 2021,⁴ \$25.3 million in 2022, \$25.3 million
27 in 2023, \$25.3 million in 2024, \$25.3 million in 2025, and \$25.3 million in

2 Exhibit (PG&E-4), WP 4-10, line 13.

3 A value stream represents an ongoing program of technology investments. This concept is further discussed in Section B.1.

4 Values vary from the values listed in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

1 2026. Recorded adjusted capital expenditures were \$22.7 million in
2 2020.⁵ PG&E's capital request in 2023 is \$2.6 million more than 2020
3 recorded costs, and stays flat each year through 2026. The increase is
4 due primarily to technology program investments, particularly around the
5 Data Enablement, and Asset Management and Risk Analysis, and Event
6 Management value streams that are critical in continuing to improve
7 wildfire response and mitigation efforts.

8 **3. Overview of Recorded and Forecast Costs**

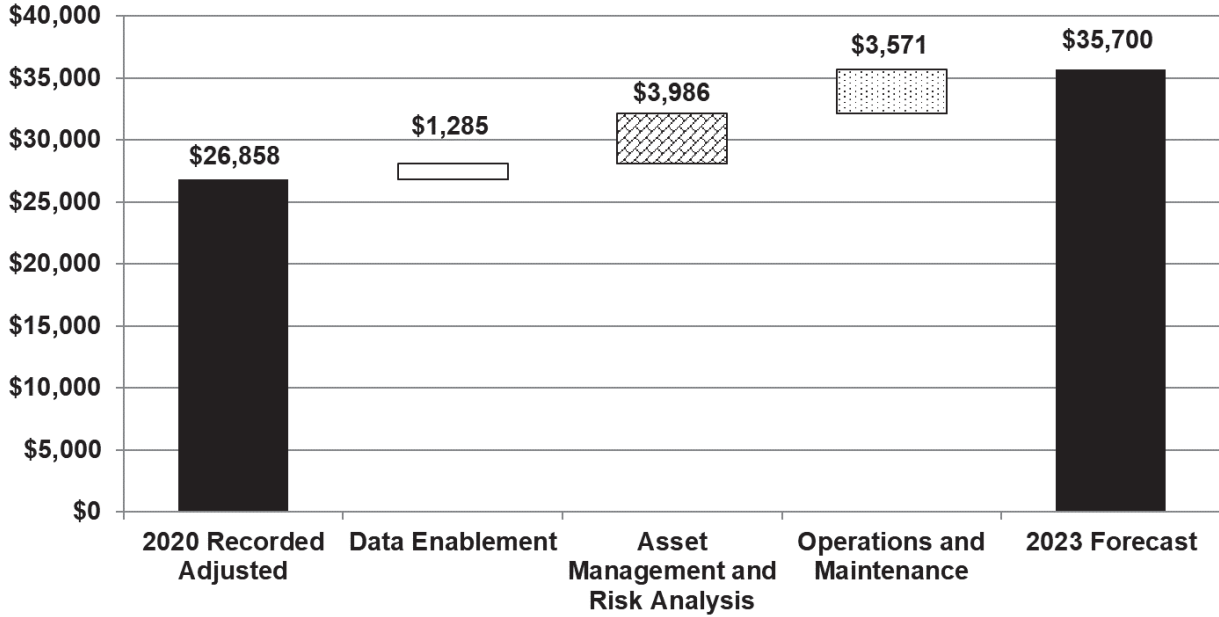
9 PG&E organizes forecasts and recorded costs for the IT for Wildfire
10 Mitigations chapter into two main categories of work: (1) Technology Project
11 Investments, which are further categorized into value streams, and
12 (2) Baseline O&M activities. The forecasts and recorded costs are as
13 follows:

- 14 • Figure 4.5-1 shows the expense walk from 2020 recorded to the 2023
15 forecast; and
- 16 • Figure 4.5-2 shows the capital 2020 recorded expenditures and 2021 to
17 2026 forecast.

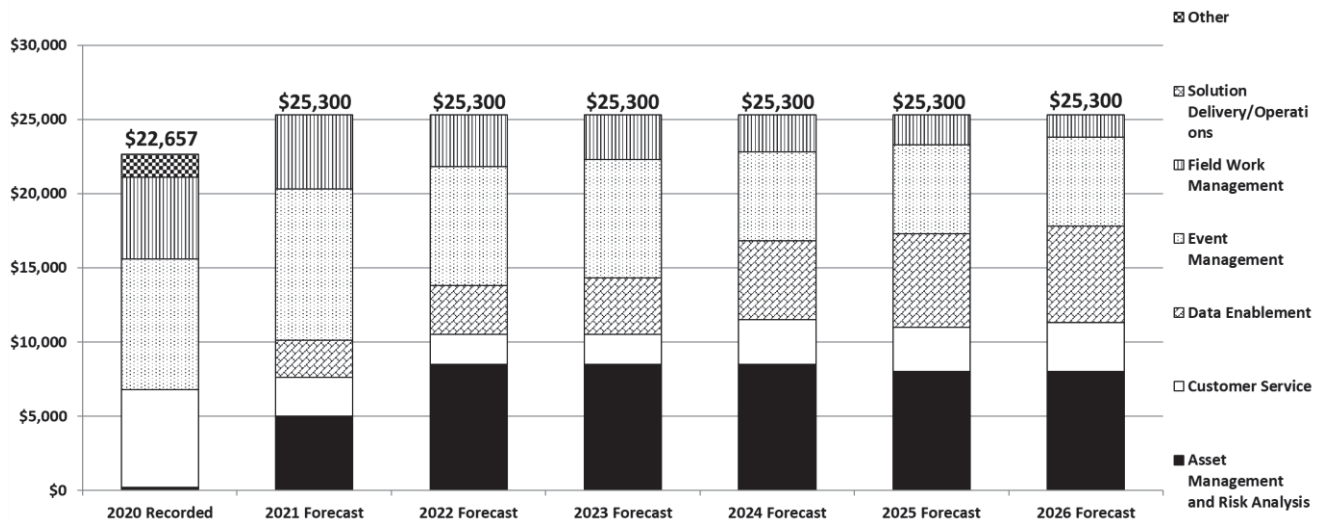
18 These figures include costs that are subject to recovery on a recorded
19 basis through the Wildfire Mitigation Plan Memorandum Account (WMPMA),
20 and these amounts are included for trending purposes because the activity
21 will become GRC funded beginning in 2023.

⁵ Exhibit (PG&E-4), WP 4-33, line 7.

**FIGURE 4.5-1
IT FOR WILDFIRE MITIGATIONS
EXPENSE WALK (2020-2023)
(THOUSANDS OF NOMINAL DOLLARS)**



**FIGURE 4.5-2
IT FOR WILDFIRE MITIGATIONS
CAPITAL EXPENDITURES (2020-2026)
(THOUSANDS OF NOMINAL DOLLARS)**



1 **B. Program and Risk Overview**

2 **1. Program Overview**

3 PG&E's IT for Wildfire Mitigations encompasses both Technology
4 Project Investments and a Baseline O&M workstream that supports O&M
5 activities after those technology programs have been put into service and
6 transitioned to operations.

7 PG&E's IT organization has begun to adopt an IT industry framework for
8 delivering technology investments using agile and Lean principles. Within
9 this framework, called the Scaled Agile Framework (SAFe), technology
10 investments are planned, organized, and managed through logical
11 constructs called "value streams." A value stream, in essence, represents
12 an ongoing program of technology investments that support aspects of
13 Company operations where technology solutions are of long-term strategic
14 importance. Within a value stream, PG&E will continually plan, prioritize,
15 and sequence specific investments based on the value they provide to the
16 associated aspect of Company operations at a given time. Not only does
17 this help ensure consistent investment in critical business and technology
18 capabilities, this also enables specialized, cross-functional delivery teams to
19 adapt more nimbly to emergent customer and business needs, changes in
20 priority or value propositions, and innovation in the technology environment.

21 The value stream construct provides structure for the Electric
22 Operations (EO) Line of Business (LOB) to deliver Technology Programs
23 that enable the LOB to best meet the needs of its customers. The solutions
24 from these value streams will enable the LOB to identify and implement
25 opportunities to support wildfire mitigation and response efforts, including:
26 more effective risk analysis, enhanced field work enablement capabilities,
27 and improved customer service capabilities.

28 The IT programs in this chapter form part of value streams supporting
29 Asset Management & Risk Analysis, Event Management, Data Enablement,
30 Field Work Management, and Customer Service.

31 **2. Risk Integration**

32 Risk controls and mitigations are aligned to various Major Work
33 Categories (MWC) and Maintenance Activity Types (MAT) in Electric

1 Distribution. The work presented in this chapter enables other mitigations
2 and controls though none of the MWCs presented in this chapter
3 corresponds to an individual risk mitigation or risk control.⁶

4 C. Activities, Costs, and Forecast Drivers by MWC

5 1. Expense

6 The primary MWC for all IT for Wildfire Mitigations forecast expense
7 work is MWC IG. PG&E defines this MWC and other expense MWCs that
8 contribute to the CWSP IT forecast as follows:

- 9 • MWC IG – (Manage Various Balancing and Memorandum Accounts) is
10 used for work tracked in the WMPMA and Wildfire Mitigation Balancing
11 Account (WMBA) and includes costs for ongoing maintenance,
12 operations and repair for PG&E applications, systems, and
13 infrastructure.

14 PG&E's IT for Wildfire Mitigations expense forecast is \$35.7 million in
15 2021, \$35.7 million in 2022, and \$35.7 million in 2023.⁷

16 PG&E's IT for Wildfire Mitigations expense forecast spans both
17 Technology Project Investments and Baseline O&M. Significant expense
18 cost drivers within these categories are listed below:

19 a. Technology Project Investments

- 20 • Expense activities and costs (such as planning, data
21 migration/conversion, and certain third-party service agreements)
22 associated with capital investments, described in Section C.2, that are
23 necessary to deliver cross-functional technology solutions that support
24 wildfire mitigation efforts as defined in PG&E's WMP.

25 b. Baseline O&M

- 26 • Recurring O&M – Ongoing labor and non-labor costs necessary to
27 manage operate and maintain CWSP-related technology solutions and
28 meet contractual agreements for the support of third-party software and
29 IT Services. Labor costs encompass application support activities,

6 See Exhibit (PG&E-4), Ch. 3 for more information about risk mitigations and controls, in PG&E's Electric Distribution Risk Management testimony.

7 Exhibit (PG&E-4), WP 4-10, line 13.

1 including system operations, bug fixes, incident management as well as
 2 asset calibration. Non-labor costs include software maintenance
 3 renewals and other vendor contract costs, including Amazon Web
 4 Services, Environmental Systems Research Institute Managed Services,
 5 and various other software maintenance contracts that are needed to
 6 provide the level of service to support the systems its stakeholder teams
 7 rely on to perform wildfire response and mitigation activities.

- 8 • Incremental O&M – Increases in O&M costs—including: vendor
 9 contracts, licensing, and cloud service provider agreements—required to
 10 support and maintain the technology solutions deployed in support of
 11 wildfire response and mitigation efforts over the base year. PG&E
 12 assumes an annual increase in O&M costs resulting from the technology
 13 solutions delivered as part of the Technology Project Investments. This
 14 increase is assumed to be 10 percent of the Technology Project
 15 Investments per year.
- 16 • Operational Efficiencies – Savings from a variety of sources that partially
 17 offset forecast increases. PG&E assumes a 10 percent year-over-year
 18 reduction in Baseline O&M and the Company expects to realize these
 19 efficiencies largely through renegotiating contracts and leveraging
 20 seasonal resources where appropriate.

21 **2. Capital**

22 The primary MWC for all IT for Wildfire Mitigations forecast capital work
 23 is MWC 2F. PG&E defines this MWC as follows:

- 24 • MWC 2F – (Build Applications and Infrastructure) includes costs to
 25 design, develop, and enhance applications, systems, and infrastructure
 26 technology solutions.

27 PG&E's IT for Wildfire Mitigations capital forecast is \$25.3 million
 28 annually from 2021-2026.⁸

29 PG&E's IT for Wildfire Mitigations capital forecast falls entirely within the
 30 Technology Project Investments category, focused on the value stream
 31 concept, and are listed in Table 4.5-1 and described below:

⁸ Exhibit (PG&E-4), WP 4-33, line 7.

TABLE 4.5-1
CAPITAL RECORDED AND FORECAST BY VALUE STREAM (2020-2026)
(MILLIONS OF DOLLARS)

Line No.	Value Stream	2020	2021	2022	2023	2024	2025	2026	2020-2026
1	Asset Management & Risk Analysis	\$0.2	\$5.0	\$8.5	\$8.5	\$8.5	\$8.0	\$8.0	\$46.7
2	Event Management	9.7	10.2	8.0	8.0	6.0	6.0	6.0	53.9
3	Data Enablement	0.0	2.5	3.3	3.8	5.3	6.3	6.5	27.7
4	Field Work Management	4.6	5.0	3.5	3.0	2.5	2.0	1.5	22.1
5	Customer Service	6.6	2.6	2.0	2.0	3.0	3.0	3.3	22.5
6	Other	1.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6
7	Total	\$22.7	\$25.3	\$25.3	\$25.3	\$25.3	\$25.3	\$25.3	\$174.5

1 **a. Asset Management and Risk Analysis**

2 The Asset Management and Risk Analysis value stream in this
3 chapter is focused on investments in cross-functional technology
4 solutions that capture, manage, and provide access to EO asset-related
5 data in order to understand asset condition and related risks that are
6 fundamental in supporting specific areas of PG&E's 2021 WMP,
7 including:

- 8 • Risk Assessment and Mapping;
- 9 • Situational Awareness and Forecasting;
- 10 • Grid Design and System Hardening; and
- 11 • Asset Management and Inspections.

12 It is important to note that these investments only address IT developed
13 data-related capabilities that are geared to support business
14 requirements identified in the WMP.

15 The overall technology vision and objective of this value stream is to
16 optimize the use of all asset related data, including SAP, Geographic
17 Information System (GIS), operational data, environmental data
18 (e.g., weather, fuel moisture, wildfire cameras, satellite feeds),
19 three-dimensional data and imagery, for integration into a
20 comprehensive engineering infrastructure model (also referred to as a
21 “digital twin”). The digital twin is a representation of asset structures,
22 framing, attached conductors, and equipment. Three-dimensional data
23 from light detection and ranging (LiDAR) and imagery will also provide
24 information on asset location, proximity and risk of vegetation and

1 non-PG&E structures. The estimating, design, and construction
2 departments will use the infrastructure model—the evolving digital
3 twin—as the initial basis for asset knowledge and grid design. This
4 model will also be used to optimize asset maintenance and vegetation
5 management using predictive models. Data from the digital twin will
6 also be integrated for real-time operational use cases. This foundational
7 data and the analytical tools will provide capabilities to mitigate risk and
8 manage safety factors. Building the digital twin requires ongoing
9 technology and resources investments to develop and keep the model
10 up to date for reliability, data accessibility and ease of use.

11 The following provides further details by WMP Plan Area, with the
12 capabilities PG&E expects to enable, as well as the business outcomes
13 it intends to achieve. While objectives span Transmission and
14 Distribution systems and processes, the focus here is on Distribution.

- 15 • Risk Assessment and Mapping – This involves the development and
16 use of tools and processes to develop and update risk maps and
17 simulations and to estimate the risk reduction potential of initiatives for a
18 given portion of the grid (at various levels of granularity, e.g., circuit,
19 span, or asset). Note the investments discussed below only address the
20 IT developed data-related capabilities that are geared to support
21 business requirements identified in the WMP.

22 As it relates to this value stream, PG&E’s long-term technology plan
23 for developing and using risk modeling and mapping to estimate the risk
24 reduction potential of initiatives centers around refining data inputs,
25 creating more integrated models, and improving granularity in model
26 outputs. Steady improvement in these areas will serve to better localize
27 areas and more effectively target mitigations that reduce the risk of grid
28 related ignitions. With more data being captured internally as well as by
29 outside parties, PG&E will continue to evaluate the vast amounts of
30 available data to increase the granularity and performance of its models.
31 Modeling capabilities are improving from relative risk models at the
32 circuit level with system level risk reduction and risk spend efficiencies
33 (RSE), to more automated and quantitative risk models that include risk
34 reduction and RSE evaluations at the asset level. These improvements

1 over the next several years will position PG&E to focus on continually
2 improving the data and granularity of its risk models to enable better
3 decision making.

- 4 • Situational Awareness and Forecasting – This involves the collection,
5 recording and analysis of data from weather stations and other sources.
6 Note the investments discussed below only address the IT developed
7 data-related capabilities that are geared to support business
8 requirements identified in the WMP.

9 As it relates to this value stream, PG&E's long-term technology plan is
10 to continue investment in integrating additional data sources, including
11 data from Electric Operations assets, and developing and optimizing
12 associated models in support of overall asset risk modeling. Specific
13 examples of this technology work are embedded in the projects listed
14 below.⁹ It is important to note that the scope described within each of
15 the projects cited in this section only represents the technology
16 investment required to enable PG&E's long-term plan to integrate the
17 data associated with this program into centralized asset data
18 management systems in support of multi-dimensional model
19 development and optimization that will prioritize inspections and
20 maintenance work based on risk. These include:

- 21 – Numerical Weather Prediction: Meteorological models are
22 expected to improve in the future, and PG&E plans to evaluate
23 and incorporate the latest weather model improvements that
24 can increase forecast accuracy. This includes upgrading to
25 newer version of the Weather Research and Forecasting Model
26 in the future and producing more granular forecasts to
27 determine if greater accuracy can be achieved. Ensemble
28 weather prediction is also being evaluated and can be
29 expanded to provide a wider range of outcomes and
30 probabilistic forecasts.
- 31 – Fuel Moisture Sampling and Modeling: PG&E plans to continue
32 working with external experts to evaluate and operationalize

⁹ See Exhibit (PG&E-4), Chapters 4.1 and 4.3 for more information about these projects.

- 1 new methodologies and models that may contribute to the
 2 overall model fidelity and accuracy.
- 3 – Wildfire Cameras: PG&E continues to look for opportunities to
 4 pilot emergent technologies such as enhanced Artificial
 5 Intelligence (AI) camera software for ignition detection. If the
 6 pilots are successful, PG&E expects to invest in these
 7 technologies.
 - 8 – Continuous Monitoring Sensors (Sensor IQ): If the technology
 9 proves to be effective in early detection of fire risks, the
 10 deployment of this tool may be extended to continue coverage
 11 beyond the currently deployed pilot of 500 thousand meters,
 12 including possibly deploying to all 5.5 million electric
 13 SmartMeter™ devices across PG&E's service territory.
 - 14 – Continuous Monitoring Sensors (Line Sensors): As PG&E
 15 continues to evaluate this technology, it is simultaneously
 16 building a strategy to deploy the technology on 600-800 High
 17 Fire Threat District (HFTD) circuits over the next 8-10 years
 18 covering multiple rate case planning cycles. This technology
 19 will be increasingly incorporated into wildfire detection and
 20 prevention operational applications as they mature and are
 21 available.
 - 22 • Grid Design and System Hardening - This is a broad category of
 23 programs that target remediation, adjustments, or installations of new
 24 equipment to reduce potential distribution ignition risks, including
 25 undergrounding of conductors, installation of insulated conductors,
 26 Distribution Line Sectionalizing, and installation of island-able
 27 microgrids. Note the investments discussed below only address the IT
 28 developed data-related capabilities that are geared to support business
 29 requirements identified in the WMP.
- 30 As it relates to this value stream, PG&E's long-term technology plan is
 31 to continue investment in integrating additional data sources and
 32 developing models that will help identify the highest priority targets for
 33 system hardening and update associated asset models in support of
 34 overall asset risk modeling. It is important to note that the scope

1 described within each of the projects cited in this section only represents
2 the technology investment required to enable PG&E's long-term plan to
3 integrate the data associated with this program into centralized asset
4 data management systems in support of multi-dimensional model
5 development and optimization that will prioritize inspections and
6 maintenance work based on risk.

7 One specific area of relevant focus is the Pole Replacement Program.¹⁰
8 PG&E is strengthening pole loading model parameters and variables by
9 considering historical data with various meteorological factors (e.g., wind
10 speed). These enhancements include evaluation of advanced wire
11 strength, clearance, and pole loading using acquired imagery; and
12 LiDAR from inspections, drones, and helicopters. In addition, PG&E is
13 working with its pole loading calculation software vendor to enable
14 analysis of multiple pole models together, enabling span linking to
15 structural connectivity.

- 16 • Asset Management and Inspections – This is a broad category of
17 programs targeted at improving the effectiveness of asset inspections
18 and asset management work and processes, including preventive and
19 predictive maintenance. Through a combination of ground inspection,
20 intrusive wood pole testing, aerial inspections, infrared assessments,
21 patrols, and advanced predictive modeling capabilities that leverage
22 sensor and operational data, PG&E seeks to identify conditions that
23 require repair or replacement of assets prior to failing. PG&E has
24 undertaken efforts to develop risk-informed models that prioritize
25 preventive asset patrol and inspection activity cycles aligned with the
26 risk of wildfire ignition, including increasing the frequency of such
27 preventive tasks in HFTD Tiers 2 and 3. Note the investments
28 discussed below only address the IT developed data-related capabilities
29 that are geared to support business requirements identified in the WMP.
30 As it relates to this value stream, PG&E's long-term technology plan is
31 to continue investment in asset management systems and model
32 development and optimization that will prioritize inspections and

¹⁰ See Exhibit (PG&E-4), Ch. 4.3, for more information about Pole Replacement Program.

1 maintenance work based on risk. It is important to note that the scope
2 described within the projects cited in this section only represents the
3 technology investment required to enable PG&E's long-term plan to
4 integrate the data associated with this program into centralized asset
5 data management systems in support of multi-dimensional model
6 development and optimization that will prioritize inspections and
7 maintenance work based on risk.

8 One such example is the Pole Loading Assessment Program to
9 Determine Safety Factor.¹¹ This is a 10-year program that continues
10 the work started in 2020 that focuses on structural desktop review
11 assessments of all poles. Due to the higher risk of potential fire ignition
12 exposure in the HFTD Tier 2 and 3 areas, PG&E's goal for these poles
13 is full implementation of assessments (100 percent poles analyzed) in
14 these areas by 2024. Poles located in PG&E's non-HFTD areas would
15 then follow, with the goal to be fully implemented (100 percent poles
16 analyzed) by 2030.

17 One key focus of the Asset Management and Risk Analysis value
18 stream is in streamlining the overall data collection, governance, and
19 access for asset related data, ensuring it is fit for use. To this end, there
20 is a tight connection between this value stream and the Data
21 Enablement value stream. PG&E will continue its investment in the
22 Palantir Foundry platform to support data management and access,
23 including providing support for implementing and managing advanced
24 analytics models in support of the digital twin.

25 Also planned within the Asset Management and Risk Analysis value
26 stream is the development of an enterprise wide remote sensing data
27 platform that will allow for the ingestion, storage, tracking, and access of
28 all imagery (raster, LiDAR, infrared, multispectral, 360-degree spherical,
29 and videos) currently being stored and utilized by various LOBs
30 throughout the Company. By storing and making remote sensing data
31 centrally available, the organization will utilize remote sensing images

¹¹ See Exhibit (PG&E-4), Ch. 12, for more information about Pole Loading Program.

1 and derived data to achieve various improvements covered in PG&E's
2 WMP. These improvements include:

- 3 • Utilizing data for improved data analytics, vegetation insights, and
4 asset and vegetation inspection;
- 5 • Development of asset failure and wildfire ignition risk models,
6 including fire spread models;
- 7 • Determining asset conditions through change detection and sharing
8 data with other internal and external systems.

9 Additionally, the remote sensing platform will be able to provide
10 search and visualization capabilities and ensure organizational
11 alignment with regards to data acquisition, standards, quality assurance,
12 and data access.

13 **b. Event Management**

14 The Event Management value stream focuses on investment in
15 cross-functional technology solutions in support of wildfire response and
16 mitigation efforts. This includes enabling PSPS business processes,
17 and consists of risk identification, event scoping, data sharing with
18 external agencies, field patrol and restoration, and real-time intelligence
19 and reporting. It also covers areas of direct wildfire mitigation and
20 response, including enablement of the Wildfire Safety Operations Center
21 with solutions to monitor PG&E's service territory for wildfire risk and
22 mobilize the organization appropriately in the event of a wildfire through
23 the sharing of intelligence.

24 The forecast of work is driven by regulatory requirements and
25 evolving commitments defined in separate proceedings—such as the
26 PSPS Order Instituting Rulemaking and WMP—identified post-event
27 improvement opportunities, and feedback from Public Safety Partners.

28 The Event Management value stream consists of two key areas of
29 technology investment, PSPS Event Management and Wildfire Event
30 Management. Each of these is described below, with the capabilities
31 PG&E expects to enable as well as the business outcomes it intends to
32 achieve.

33 PSPS is evolving continuously through feedback from customers, its
34 partners, regulators, and stakeholders within PG&E and these learnings

1 result in new and emerging requirements for execution. PSPS Event
2 Management will enable the following business capabilities:

- 3 • Enable PSPS event scoping to include unmitigated Priority 1/
4 Priority 2 trees and select distribution electric compliance tags and
5 to provide intelligence to prioritize immediate mitigation of these
6 items to minimize scope;
- 7 • Enable PSPS event scoping to incorporate PSPS mitigations—such
8 as system hardening—so that areas can be removed from scope if
9 conditions are safe to do so;
- 10 • Increase PSPS event scoping agility, through direct integration
11 between systems, including PSPS Viewer, the PSPS Situational
12 Intelligence Platform and meteorology systems;
- 13 • Increase PSPS event scoping coordination through inclusion of
14 PSPS meteorology polygons into the Distribution Management
15 System (DMS) map, improving validation of switching scope and the
16 identification of opportunities to reduce customer impact through
17 switching;
- 18 • Expand the scope and improve usability of the PSPS Situation
19 Report and the PSPS Portal to support Public Safety Partners;
- 20 • Expand PSPS maps for Public Safety Partners with the addition of
21 PDF maps for Tribal entities
- 22 • Continue automation and incorporation of additional data sources to
23 improve post-PSPS event reporting required by the California Public
24 Utilities Commission and which supports improvement actions;
- 25 • Provide tools that allow for improved restoration speed by enabling
26 forecast and automation of Weather All-Clear status from spatial
27 meteorological forecast to the electric system;
- 28 • Partner with cybersecurity to enable mutual aid and contractors to
29 utilize PSPS patrol technology solutions, currently limited to
30 employees, to increase efficiency, and improve consistency of
31 patrols occurring during PSPS restoration;
- 32 • Enable the electronic assignment of PSPS patrol scope and capture
33 of PSPS patrol results to improve execution efficiency and record
34 accuracy;

- 1 • Begin integration of the PSPS tools and processes with the new
2 Advanced Distribution Management System platform, allowing for
3 the utilization of capabilities such as automated switching plan
4 generation that can save operator time in comparison to the manual
5 switching log process in place today;
- 6 • Improve tools used during PSPS events to support situations where
7 other concurrent major hazards may also occur; and
- 8 • Deploy public PSPS risk map that provides data for customers and
9 public safety partners to understand future PSPS risk through views
10 of historic PSPS impact and forecasted future PSPS risk.

11 The second key area of technology investment within the Event
12 Management Value stream is Wildfire Event Management. Wildfire
13 Event Management will enable the following business capabilities:

- 14 • Improve the stability and scalability of the Wildfire Incident Viewer
15 (WIV) and Safety and Infrastructure Protection Teams (SIPT)
16 Viewer to support an expanding user base and increasing data
17 streams;
- 18 • Expand the Wildfire Active Incidents Dashboard to additional users
19 to increase wildfire situational awareness across PG&E;
- 20 • Incorporate new data sources into the WIV, SIPT Viewer, and Active
21 Incident Dashboard to improve situational awareness and response;
- 22 • Mature intelligence and situational awareness for large active
23 wildfire response with real-time common operating picture and
24 internal and external Situation Report; and
- 25 • Enable integration of wildfire situational awareness data sources
26 into other operations tools—such as the DMS and Maps+—to
27 increase response capability.

28 **c. Data Enablement**

29 Data Enablement is defined as designing, maintaining, hosting, and
30 upgrading a technology platform that supports storage, processing, and
31 utilization of all utility proprietary data and data compiled by the utility
32 from other sources.

33 The Data Enablement value stream focuses on investments in
34 foundational technology solutions in support of wildfire mitigation efforts

1 by focusing on foundational data management activities that will help
2 drive risk reduction and directly supports the 2021 WMP.¹²

3 PG&E is in the process of implementing and operationalizing a data
4 analytics environment that integrates asset-related information from
5 disparate data sources into a single platform, enabling data-driven
6 approaches to wildfire risk mitigation. To enable and sustain value from
7 this environment, PG&E is also implementing enterprise data
8 management practices. To do this effectively, it is necessary to adopt a
9 practical data integration approach that utilizes data pipelines from
10 source data systems into an integrated data platform. This approach,
11 combined with an effective data management practice, enables access
12 to timely, trusted, and consistent information that can be used for
13 advanced data analytics, thereby enabling the Company to make more
14 effective, data-driven decisions.

15 Data streams from new technologies, such as remote sensing and
16 LiDAR, introduce emerging data needs for high capacity storage and
17 processing, while advanced analytics—including AI and Machine
18 Learning (ML)—offer the potential to leverage data to better manage risk
19 and predict events before they happen. PG&E is responding to these
20 challenges by developing and implementing strategies for more effective
21 data management, integration, and access.

22 EO is working with Enterprise Data Management to develop
23 long-term plan milestones that will guide PG&E's efforts to continue
24 building its central data platform, data products and data management
25 capabilities to improve asset and wildfire risk management capabilities
26 through efficient and effective data-driven decision making. Below are
27 several data enablement initiatives PG&E is evaluating for 2021 and
28 beyond.

- 29 • Data Schema – In 2021, PG&E will evaluate and decide whether to
30 develop and implement a central data schema for EO to be built on
31 the Common Information Model, developed by the International

¹² See PG&E's Revised 2021 WMP, pp. 774 to 786 (Section 7.3.7, Data Governance, and subsection 7.3.7.1, Centralized Repository for Data).

1 Electrotechnical Commission, in alignment with the Wildfire Safety
2 Division GIS data schema. Conceptually, this model would align
3 asset, operational, maintenance and other data to PG&E's assets
4 and operations, creating a "digital twin" of the utility that would
5 directly support wildfire mitigation efforts. If PG&E determines that
6 this work should be undertaken, implementation would be a
7 multi-year effort.

- 8 • Data Management – PG&E has embarked on an effort to mature its
9 data management capabilities, which will ultimately enhance the
10 Company's abilities to make effective data-driven decisions around
11 wildfire mitigation. Consistent with the Data Management
12 Framework, PG&E will continue to advance its data management
13 maturity using a phased approach, with the focus for the next
14 2-3 years on Data Architecture, Data Governance, Data Quality and
15 Data Security in direct support of wildfire mitigation efforts. This will
16 entail the development and implementation of new standards,
17 processes, and tools to support the maturation of data management
18 and advanced analytics practices.

19 **d. Field Work Management**

20 This value stream focuses on investments in cross-functional
21 software products that are necessary to increase the efficiency and
22 quality of field activities (such as asset inspections) and enable
23 alignment of work management processes and tools in support of
24 Wildfire mitigation efforts.

25 The Field Work Management value stream focuses on technology
26 solutions used to plan and execute field work safely and efficiently, to
27 document performed work completely and accurately, and to manage
28 the flow of information between field crews and the back-office. Planned
29 technology project investments in this value stream will build and
30 support technology capability needs shared across LOBs in support of
31 Wildfire Operations. The area of focus is work management technology
32 capabilities for field and back-office personnel to better perform wildfire
33 operational activities. This effort includes:

- 1 • Improving technology for SIPTs by enhancing work management
2 systems to assign, execute, and approve work through technology.
3 This will improve the efficiency of system hardening efforts to protect
4 assets against changing conditions;
- 5 • Creating an electronic process to facilitate “door-knock”
6 communication with customers during PSPS events to improve
7 customer relations;
- 8 • Providing features in which field crews can electronically report fire
9 damage to assets to increase visibility and analysis of assets after
10 fires;
- 11 • Enhancing the aerial inspection process (drone and helicopter) for
12 greater visibility into asset health;
- 13 • Creating a solution for the capture of electric substation infrared
14 inspections to find unseen issues within electric substations;
- 15 • Modernizing the current technology platform to allow legacy systems
16 to be replaced and/or enhanced in order to meet growing demands
17 for technology that will improve efficiencies of field personnel and
18 reduce risk of asset failure;
- 19 • Migrating the current IT infrastructure to the Cloud to provide
20 improved system scaling in order to support additional business
21 capabilities and data streams that are enabled;
- 22 • Implementing necessary security controls to ensure compliance with
23 cybersecurity requirements;
- 24 • Support of regulatory reporting requirements, as well as those from
25 external agencies;
- 26 • Investing in system logging and monitoring to ensure a secure,
27 healthy, and efficient IT work process by providing automated and
28 manual system checkpoints for service quality assurance;
- 29 • Data clean-up and archival to allow for more data points to be
30 analyzed consistently to form high-fidelity risk models with improved
31 accuracy;
- 32 • AI and ML to be used to generate risk scores based on information
33 gathered by preventative maintenance personnel. These models
34 will drive future maintenance plans/schedules; and

- Computer vision models that will enable operations personnel to detect components, leading indicators for potential asset failure, and asset failures in images to may not easily been seen without aid.

e. Customer Service

The Customer Service value stream focuses on investments that provide customer management and self-service tools in support of Wildfire mitigation efforts. Ensuring that website, self-service and notifications continue to meet customer needs is critical to improving the customer experience as it relates to wildfire and PSPS.

In order to keep up with changing conditions and increasing customer expectations, continuous improvement is standard in modern website design. Through feedback and learning, PG&E has been enabling new or improved functionality to address customer pain points.

The PG&E Safety and Alert Center website, also known as Emergency Web, currently used for PSPS events is one such an example. In 2020, substantial improvements were made to PG&E's web experience for wildfire and PSPS, including the development of a new standalone site in the cloud that can scale to handle high traffic, rebuilt maps, and address search tools to improve functionality and making available tools and information to customers speaking languages other than English. The site was also designed with accessibility in mind to ensure those with vision impairments and other needs could get essential safety information.

Since the launch of the new site in 2020, feedback has been positive, but customers have also identified opportunities for improvement. PG&E collects customer feedback through a variety of channels, including the web, contact centers and surveys, and analyzes customer comments for improvement opportunities. For example, customers provided feedback that the zoom level on the maps was too close by default, so PG&E tested an improved zoom level with customers and is working to implement updates based on that finding. PG&E will also be working to improve map functionality, such as the ability to search by city or county in addition to customer address, as well as improving the layout for mobile phone users on smaller screens.

1 Additionally, in response to feedback that customers wanted greater
2 advance notice of PSPS shutoffs and that the information on
3 pge.com/weather was sometimes different than what was on the primary
4 outage map, PG&E will be moving the 7-day forecast out of
5 pge.com/weather and into the primary outage map. This will help
6 enable more customers see the 7-day forecast, ensure the information
7 is consolidated in one location, and translate the 7-day forecast to the
8 address search functionality customers use most often.

9 In addition to making improvements to the website, PG&E will also
10 focus on improving its internal operations. This includes optimization
11 efforts to make it easier to publish content to the PSPS website in
12 16 different languages and to load data simultaneously. These
13 improvements will help shorten execution times, allowing the Company
14 to get critical information to its customers more quickly once
15 de-energization or energization decisions have been made.

16 PG&E also intends to enable a capability to provide customers with
17 a way to obtain PSPS-related outage updates by sending an SMS text
18 to PG&E. This capability would benefit lower bandwidth customers who
19 may not have sufficient cell coverage to make calls during a
20 PSPS-related event. Another capability includes developing a PSPS
21 chatbot on the PG&E Safety and Alert Center website to be used during
22 PSPS events to help answer the top questions being asked by
23 customers. PG&E is also exploring the appeal of a mobile app for
24 PSPS events to help improve the customer experience.

25 PG&E maintains a queue of potential improvements that has been
26 developed based on customer feedback and is continuously prioritizing
27 that queue based on additional customer feedback to ensure it is
28 delivering on those items that customers find most valuable.

29 **D. Estimating Method**

30 PG&E discusses its standard estimating methods for technology project
31 investments in Exhibit (PG&E-7), Chapter 8. Historical spend patterns, subject
32 matter expertise, and standard cost factors serve as primary inputs to the IT
33 estimating tools used in this chapter to calculate labor and non-labor costs and
34 document associated assumptions. Forecasts are sequenced to fit within

1 high-level annual planning targets set by IT and Company leadership to align
2 with strategic priorities. Refer to Project and Program Summary workpapers
3 supporting this chapter for more information on the specific estimating methods
4 used in this chapter.

5 **E. Cost Tables**

6 The expense and capital forecasts for this chapter are summarized in the
7 following tables:

- 8 • Table 4.5-2 lists expense MWCs showing 2016 through 2020 recorded
9 adjusted expenses and 2021 through 2023 forecast expenses.
- 10 • Table 4.5-3 lists the capital MWC 2F showing 2016 through 2020 recorded
11 capital adjusted expenditures and 2021 through 2026 forecast expenditures.

**TABLE 4.5-2
EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Worksheet Reference	
			2016	2017	2018	2019	2020	2021 ^(a)	2022	2023		
1	AB	Misc Expense	-	-	-	-	\$5,500	-	-	-	-	WP 4-5, line 9
2	IG	Manage Var Bal Acct Processes	-	-	\$1,102	\$5,955	21,358	\$35,700	\$35,700	\$35,700	\$35,700	WP 4-5, line 17
3	JV	Maintain IT Apps & Infra	-	-	(34)	-	-	-	-	-	-	WP 4-5, line 20
4		Total	-	-	\$1,069	\$5,955	\$26,858	\$35,700	\$35,700	\$35,700	\$35,700	

(a) Values vary from the values listed in the Results of Operations (RO) Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

**TABLE 4.5-3
CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Worksheet Reference			
			2016	2017	2018	2019	2020	2021 ^(a)	2022	2023		2024	2025	2026
1	2F	Build IT Apps & Infra	-	-	\$6,125	\$18,349	\$22,658	25,300	\$25,300	\$25,300	\$25,300	\$25,300	\$25,300	WP 4-33, line 7
2		Total	-	-	\$6,125	\$18,349	\$22,658	\$25,300	\$25,300	\$25,300	\$25,300	\$25,300	\$25,300	

(a) Values vary from the values listed in the RO Model due to errata. These amounts do not align to the RO Model provided to the Public Advocates Office at the time of filing. The RO will be updated to incorporate these errata with the Joint Comparison Exhibit submittal.

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.5
ATTACHMENT A
RECOVERY OF INFORMATION TECHNOLOGY COSTS
RECORDED IN THE WILDFIRE MITIGATION PLAN
MEMORANDUM ACCOUNT

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4.5
ATTACHMENT A
RECOVERY OF INFORMATION TECHNOLOGY COSTS RECORDED IN THE
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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 4.5**
3 **ATTACHMENT A**
4 **RECOVERY OF INFORMATION TECHNOLOGY COSTS RECORDED**
5 **IN THE WILDFIRE MITIGATION PLAN MEMORANDUM ACCOUNT**

6 **A. Introduction**

7 The purpose of this testimony is to demonstrate the reasonableness of costs
8 incurred and recorded in the Wildfire Mitigation Plan Memorandum Account
9 (WMPMA) for the year 2020 for Information Technology (IT) initiatives Pacific
10 Gas and Electric Company (PG&E or the Company) has undertaken in support
11 of our 2020 Wildfire Mitigation Plan (WMP). The 2020 incremental recorded
12 costs for this program are \$22.7 million in capital expenditures for IT (Major
13 Work Category (MWC) 2F) and \$21.4 million in expense costs for IT (MWC IG).¹
14 PG&E seeks a determination that these costs were reasonably incurred and
15 approval to recover them through customer rates.

16 **B. Project/Work Scope Overview**

17 This section describes the IT initiatives PG&E has undertaken in support of
18 our 2020 WMP. The initiatives include the development and implementation of
19 tools and technologies that enabled various Electric Distribution wildfire risk
20 mitigations and controls outlined in the 2020 WMP. For this reasonableness
21 review, PG&E has grouped the initiatives based upon the primary Electric
22 Distribution mitigation program area they support:

- 23 1) The IT Public Safety Power Shutoff (PSPS) Program;
- 24 2) The IT Asset and System Inspection Program;
- 25 3) The IT Asset Risk Program;
- 26 4) Cybersecurity project activities; and
- 27 5) IT operations and maintenance (O&M) activities.

28 The IT PSPS Program consisted of technology projects focused on enabling
29 technology solutions in support of Electric Distribution's PSPS, Situational
30 Awareness, and Safety and Infrastructure Protection Team (SIPT) mitigation
31 strategies. These projects supported the implementation of interdependent

¹ Please see Exhibit (PG&E-4), Ch. 2, Attachment A for a summary of the 2020 WMPMA and Fire Risk Mitigation Memorandum Account (FRMMA) costs.

1 applications that enabled PSPS processes, including risk identification, event
 2 scoping, customer notification, data sharing with external agencies, post-event
 3 field inspection and real-time intelligence and reporting.

4 The IT Asset and System Inspection Program consisted of technology
 5 projects that enabled the asset inspection process. These projects supported
 6 more enhanced asset inspection and increased application integration.

7 The IT Asset Risk Program consisted of technology projects that will allow
 8 PG&E to leverage data and analytic methods to improve PG&E's identification of
 9 highest risk assets for inspection.

10 The Cybersecurity project focused on ensuring projects were being
 11 developed with the proper security controls. The IT O&M activities consisted of
 12 post-production stabilization support consistent with the transition to system
 13 operations.

14 C. Reasonableness Analysis

15 PG&E's 2020 WMP IT work was introduced in Section 5.3.7 of PG&E's 2020
 16 WMP, which was approved by the California Public Utilities Commission (CPUC
 17 or Commission) on June 11, 2020.² This work is a new activity that was not
 18 included in the 2020 GRC. Since these costs were included in PG&E's 2020
 19 WMP, PG&E is requesting their recovery through the WMPMA. Table 4.5A-1
 20 shows the 2020 amount being requested for cost recovery.

TABLE 4.5A-1
SUMMARY OF 2020 WMP IT COSTS
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Cost Type	MWC	Imputed Adopted	2020 WMP Target Spend	Recorded	Wildfire OII Disallowance	WMPMA Request
1	Capital	2F	N/A	\$41,832	\$22,658	0	\$22,658
2	Expense	IG	N/A	\$46,399	\$21,358	0	\$21,358

Note: The imputed adopted values do not apply to IT as these forecasts were not included in the 2020 GRC. In addition, IT was not specifically called out in the 2020 WMP but technology support was mentioned in Electric Operations program descriptions. Finally, IT did not bear any of the adjustments for the Wildfire OII disallowance.

² Resolution (Res.) WSD-003 (June 11, 2020).

1 As shown in Table 4.5A-1 above, PG&E requests authorization to recover
 2 the following amounts in IT costs: \$22.7 million in capital and \$21.4 million in
 3 expense for wildfire mitigation costs recorded to the WMPMA in 2020. These
 4 costs are recorded in IT's organizational accounting under MWC 2F for capital
 5 expenditures and MWC IG for expense. The sections that follow further
 6 describe the reasonableness of IT activities support PG&E's wildfire mitigation
 7 activities in 2020. In compliance with the terms of the WMPMA, this
 8 reasonableness review only seeks recovery of IT costs incurred in the 2020
 9 fiscal year. Descriptions of work performed in 2019 and 2021 are provided only
 10 for context.

TABLE 4.5A-2
2020 BREAKDOWN OF IT COSTS
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Program Area	Capital	Expense
1	IT PSPS Program	\$17,150	\$15,010
2	IT Asset and System Inspection	3,749	489
3	IT Asset Risk Program	193	14
4	Cybersecurity	1,566	213
5	IT Operations and Maintenance	-	5,632
6	Total	\$22,658	\$21,358

11 As illustrated in Table 4.5A-2, IT has organized the remainder of this
 12 attachment into five main program areas. Although the costs relevant to this
 13 attachment were recorded to the WMPMA in 2020, the programs are iterative by
 14 design and allow for further development of enhanced technology solutions
 15 based upon Electric Distribution field crew experiences and other user feedback.
 16 This flexibility allows the implemented mitigations to provide value over time and
 17 stay current with user requirements. These programs and activities are
 18 discussed further in the subsections below.

19 **1. IT PSPS Program**

20 This program category includes nine major initiatives, as identified in
 21 Table 4.5A-3 below.

**TABLE 4.5A-3
IT PSPS PROGRAM
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Major Initiative	Capital	Expense
1	Emergency Web	\$6,581	\$7,137
2	PSPS Viewer	4,852	1,035
3	PSPS Situational Intelligence Platform	12	4,337
4	PSPS External Portal	2,167	357
5	Wildfire Incident Viewer	1,567	175
6	PSPS Field Inspection Application	1,476	227
7	PSPS Data Quality	-	1,341
8	Safety and Infrastructure Protection Team (SIPT) Scheduling	885	(25)
9	Miscellaneous Small Technology Solutions	(389)	426
10	Total	\$17,151	\$15,010

1 **a. Emergency Web**

2 During the October 8, 2019 PSPS event, PGE.com experienced
3 significant performance issues which caused some customers to
4 experience longer wait times or to see a “site not found” error message.
5 A stop-gap mitigation was implemented shortly thereafter by partnering
6 with a third-party vendor to implement a content distribution network in
7 order to support the PSPS events in 2019.

8 To prevent the capacity issue and improve customer experience in
9 preparation for the 2020 PSPS events, PG&E created a new
10 cloud-based Emergency Web. This website was created in consultation
11 and review with the CPUC and the California Department of
12 Technology.

13 The Emergency Web was created with multiple redundancies to
14 support high availability. The website is hosted in multi-region Amazon
15 Web Services (AWS) environment. The Economic and Social Research
16 Institute (ESRI) map was also created with high availability
17 configuration. The Emergency Web was successfully tested to support
18 240 million hits per hour. A backup application was enhanced to
19 support the same capacity in case the primary site fails. For the website
20 to support the volume and high availability, PG&E leveraged hosting
21 services from AWS and ESRI, utilized a SaaS tool (i.e., StormRunner)
22 for performance testing, and introduced F5 Silverline for security and
23 increased subscription volume for tools such as Adobe Analytics.

1 The following are some of the functionalities implemented in
2 Emergency Web in 2020.

- 3 • Content publishing for the website;
- 4 • Content pages for wildfire and PSPS emergencies, including a
5 PSPS Event page, and various pages to support safety partners and
6 provide additional PSPS detail on certain topics;
- 7 • Customer Resource Center Information with Search by County;
- 8 • Single Address Lookup;
- 9 • Multiple Address Lookup;
- 10 • Maps for current and planned outages with improved display using
11 parcels vs. polygons;
- 12 • Integration of the Customer Resource Centers in the maps;
- 13 • Ability to click on shapes for outage details on Forecast map;
- 14 • Microgrid details on Forecast Map and in address search;
- 15 • Priority and Partner Early Access Map & File Downloads;
- 16 • Help text added throughout website and is authorable on the fly by
17 PG&E publishers without a developer;
- 18 • Website is available in 16 languages including languages that are
19 displayed Right to Left; and
- 20 • Website is compliant with American with Disabilities Act regulations
21 (WCAG 2.0) as tested by Level Access.

22 The Emergency Web was first used during the PSPS event of
23 September 7, 2020 and subsequently supported the other PSPS events
24 in 2020. The website fulfilled its intended functions and did not have
25 any capacity and availability issues during these events.

26 Emergency Web releases were completed with partnership with
27 several third-party vendors, including AWS, ESRI and Nexient. PG&E
28 expects to continue to partner with these key vendors for the releases
29 planned in 2021.

30 **b. PSPS Viewer**

31 In 2020, IT continued to enhance the PSPS Viewer Product that was
32 initially developed in 2018 as part of the Wildfire Situational Awareness
33 initiative and will continue into 2021 and future years. The product
34 enables PG&E to assess a PSPS event's impact on customers. PG&E

1 will be able to use the assessments to better notify customers, create
2 maps to drive the Emergency Web, create maps and customer lists to
3 share with Public Safety Partners via the PSPS Portal, provide internal
4 situational awareness via reports and the PSPS Situational Intelligence
5 Platform (PSIP).

6 In 2020, the following major changes and capabilities were
7 incorporated into PSPS Viewer Product:

- 8 • Migrate the product from an on-site computer platform to the public
9 cloud to improve the scalability and stability of the product;
- 10 • Update the product to have the ability to review
11 meteorologically-defined risk-area inputs and reduce the time to
12 create initial forecast PSPS event scope by approximately
13 three hours;
- 14 • Update the product to have the ability to model temporary
15 generation to allow for more granular targeting of customer
16 messaging and maps and improve customer experience; and
- 17 • Create maps with parcel-based granularity, as opposed to
18 circuit-based buffers, that allow for more accurate depiction of the
19 area to be de-energized and improve customer experience.

20 Much of the work identified above was implemented to meet
21 Phase 1 and Phase 2 requirements under the PSPS OIR and
22 commitments PG&E made in its Wildfire Mitigation Plan.

23 The work was completed through an active partnership between IT
24 and business teams. IT resources included PG&E employees, IT staff
25 augmentation resources, AWS Professional Services and services from
26 IT Managed Services partners. The resources worked at PG&E
27 facilities, at our offshore managed service partner locations, and
28 remotely, as required by coronavirus (COVID-19) safety requirements.
29 Work was completed to allow for releases (updates) throughout the year
30 to enable incremental capabilities to be realized.

31 **c. PSPS Situational Intelligence Platform**

32 The PSIP was a new product built in 2020, with development
33 expected to continue in 2021 and into future years. PSIP is the central
34 platform to inform PSPS decision-making, reporting, and

1 communications. Among several features, PSIP features include
2 PG&E's situational intelligence reporting, customer notification
3 management, event scoping, re-energization management, and
4 regulatory reporting. The platform is also used to generate information
5 shared with external parties such as California Department of Forestry
6 and Fire Protection, California Governor's Office of Emergency Services,
7 and local emergency management agencies.

8 In 2020, PG&E used this platform to develop and manage
9 situational intelligence for all of its PSPS events, which provided timely
10 information to internal and external stakeholders. This product resulted
11 in significant operational efficiencies and improved accuracy of PSPS
12 customer notification (accuracy of customer contacts for PSPS events
13 was increased to over 99 percent, a significant improvement over 2019).

14 The work was completed through an active partnership between IT
15 and business teams. IT resources included PG&E employees,
16 engineers from Palantir Foundry, IT Staff Augmentation resources and
17 services from IT Managed Services partners. The resources worked at
18 PG&E facilities, at our offshore managed service partner locations, and
19 remotely, as required by COVID-19 safety requirements. Work was
20 completed to allow for releases (updates) throughout the year to enable
21 incremental capabilities to be realized.

22 **d. PSPS External Portal**

23 The PSPS External Portal was a new product built in 2020, with
24 development expected to continue in 2021 and in future years. The
25 product was the successor to the External Data Sharing on Enterprise
26 Secure File Transfer product, which was part of the Wildfire Situational
27 Awareness initiative and used during the 2019 PSPS season. The
28 PSPS Portal allowed PG&E to increase capabilities to partner with
29 Public Safety Partners, as required in Phase 2 of the PSPS OIR and
30 committed to in PG&E's Wildfire Mitigation Plan. The platform provides
31 secure access for Public Safety Partners to PSPS planning and event
32 resources, including:

- 33 • PSPS Planning Resources:
 - 34 – Maps of areas more likely to be affected by PSPS events;

- 1 – Summary lists of aggregate customer impacts in areas more
- 2 likely to be affected by PSPS events;
- 3 – List of critical facilities within a particular jurisdiction;
- 4 – List of medical baseline customers more likely to be affected by
- 5 PSPS events within a particular jurisdiction; and
- 6 – List of critical infrastructure provider facilities in areas more
- 7 likely to be affected by PSPS events.
- 8 • PPS Event Resources:
- 9 – Situation Reports;
- 10 – Lists of customers projected to be impacted during the event
- 11 including medical baseline customers, critical facilities, and all
- 12 impacted customers;
- 13 – Lists of critical infrastructure provider facilities projected to be
- 14 impacted during the event; and
- 15 – Maps of planned and actual de-energization areas.

16 The work was completed through an active partnership between IT

17 and business teams. IT resources included, PG&E employees, IT staff

18 augmentation resources, The ESRI Professional Services and services

19 from IT Managed Services partners. The resources worked at PG&E

20 facilities, at our offshore managed service partner locations, and

21 remotely, as required by COVID-19 safety requirements. Work was

22 completed to allow for releases (updates) throughout the year to enable

23 incremental capabilities to be realized.

24 **e. Wildfire Incident Viewer**

25 In 2020, PG&E continued development of the Wildfire Safety

26 Operations Center’s (WSOC) Wildfire Incident Viewer (WIV) and SIPT

27 Viewer. The development of the product suite started in 2018 as part of

28 the as part of the Wildfire Situational Awareness initiative. The WIV and

29 SIPT Viewer product suite are an integrated toolset to allow for the

30 tracking and management of active wildfires that impact or may impact

31 PG&E’s infrastructure and to facilitate the PPS field observation

32 process. Development on the product suite is expected to continue in

33 2021 and in future years.

1 In 2020, the following major capabilities were put in place:

- 2 • Addition of new and updated PG&E infrastructure layers
3 (e.g., PG&E IT infrastructure) and situational awareness layers
4 (e.g., Integrated Reporting of Wildland Fire Information or IRWIN
5 data) to improve the core capability and functionality of the suite;
- 6 • Enhancements to PSPS field observation components to improve
7 ease of identification of field observation locations, tracking
8 observations and reporting on observations for PSPS decision
9 making;
- 10 • Enhancements to the data model and user interface to improve
11 completeness of data required for reporting and improve usability of
12 the solution for users; and
- 13 • Integration of the solution with Microsoft Power BI to enable
14 reporting needs.

15 At the end of 2020, the product team began migrating the platform
16 from PG&E's on-site systems to the public cloud to increase stability and
17 scalability of the solution.

18 The work was completed through an active partnership between IT
19 and business teams. IT resources included, PG&E employees, IT staff
20 augmentation resources, and services from IT Managed Services
21 partners. The resources worked at PG&E facilities, at our offshore
22 managed service partner locations, and remotely, as required by
23 COVID-19 safety requirements. Work was completed to allow for
24 releases throughout the year to enable incremental capabilities to be
25 realized.

26 **f. PPS Field Inspection Application**

27 In 2020, the PPS Patrol application, formerly known as PPS Field
28 Inspection application, continued development that started in 2019 and
29 will continue into 2021 and future years. The focus of the PPS Patrol
30 application is to enable field patrol resources to capture damage, hazard
31 and near-hit incidents during the patrol and re-energization phase of
32 PPS.

33 In 2020, the team focused on enhancing the PPS Damage/Hazard
34 Form to include additional fields required for reporting and to enable

1 download and export capabilities of captured data to facilitate a more
2 efficient validation and reporting process. In future years, the intention
3 will be to further build the application's toolset to provide for: (1) the
4 electronic assignment and closeout of PSPS patrol activities; and
5 (2) identification technology that will allow the application to be used by
6 temporary emergency workers (e.g., mutual aid and contractors) who do
7 not otherwise have PG&E identification to allow access to PG&E's
8 systems.

9 The work was completed through an active partnership between IT
10 and business teams. IT resources included PG&E employees, IT Staff
11 Augmentation, Nexient, and services from IT Managed Services
12 partners. The resources worked at PG&E facilities, at our offshore
13 managed service partner locations, and remotely, as required by
14 COVID-19 safety requirements. Work was completed to allow for
15 releases (updates) throughout the year to enable incremental
16 capabilities to be realized.

17 **g. PSPS Data Quality**

18 The PSPS Data Quality team's main objective was to improve
19 PG&E's PSPS customer contact rate for the 2020 wildfire season.

20 In 2019, roughly 2.6 percent (over 50,000 out of 2 million) customers
21 impacted by a PSPS event did not receive shutoff notices. Over half of
22 these missed customer notifications were caused by data quality related
23 issues, which increased public safety risks and damaged customer
24 satisfaction with their electric service.

25 The PSPS Data Quality project focused on making sure that PG&E
26 possessed valid customer contact information, including phone numbers
27 and email, so that PG&E could reliably notify customers about PSPS
28 events. To this end, the PSPS Data Quality project focused on ensuring
29 customer contact information within PG&E's systems conformed to
30 consistent format and input rules so as to reduce bad data. For
31 example, the project reviewed customer phone numbers and emails to
32 verify they were complete and valid (e.g., phone numbers may have
33 been missing area codes and emails may need to be corrected for case
34 sensitivity and other errors).

1 The PSPS Data Quality project provided recommendations for
2 missing customer contact information that the Electric Operations team
3 could leverage in order to cleanse the data in the appropriate source
4 systems.

5 **h. Safety and Infrastructure Protection Team (SIPT) Scheduling**

6 The SIPT Scheduling product is a new product built in 2020, with
7 development expected to continue in 2021. The SIPT scheduling effort
8 is intended to allow for the intake, scheduling, dispatch and work
9 completion of work intended for the SIPT crews.

10 In 2020, the product included the following major capabilities:

- 11 • Allow for a PG&E field user or WSOC analyst to create/request,
12 reschedule and cancel a work order for SIPT resources;
- 13 • Allow for a WSOC Analyst to assign a work order to a SIPT crew via
14 the dispatch application; and
- 15 • Allow for a SIPT crew to receive and enter completion information
16 for a work order via the Field Worker application.

17 The work was completed through an active partnership between IT
18 and business teams. IT resources included PG&E employees, IT Staff
19 Augmentation, Nexient, and services from IT Managed Services
20 partners. The resources worked at PG&E facilities, at our offshore
21 managed service partner locations, and remotely, as required by
22 COVID-19 safety requirements. Work was completed to allow for
23 releases (updates) throughout the year to enable incremental
24 capabilities to be realized.

25 **i. Miscellaneous Small Technology Solutions**

26 This initiative included smaller improvements for various PSPS
27 processes. These include enhancements made to the Outage
28 Management Tool (OMT) and Distribution Management System (DMS)
29 to better manage PSPS outages, the implementation of the PSPS
30 Community Outreach Tracker, and the Ontrack database upgrade to
31 more effectively support PSPS events.

32 In 2020, PG&E continued investment in enhancements to the
33 distribution control center technology, including PG&E's DMS, OMT, and

1 Integrated Logging and Information System. This work started in 2019
2 as a part of the Situational Awareness initiative. These systems support
3 the de-energization and re-energization process of PSPS, including
4 functions such as tracking and logging the outages and supporting
5 notifications to customers.

6 In 2020, the following major capabilities were put in place:

- 7 • Automation of weather all-clear, Estimated Time of Restoration
8 (ETOR) update, and restoration notification generation to improve
9 customer experience with more timely and regular updates on PSPS
10 outages;
- 11 • Simplification in management of outage cause codes, ETORs and
12 patrol progress to increase accuracy of information provided to
13 customers;
- 14 • Enabling the capture of weather all-clear times and reasons for
15 outage duration exceeding 24-hour threshold to improve efficiency
16 of reporting required in the PSPS Post Event Report; and
- 17 • Improvements in capturing associated hazards with outages
18 (i.e., wire down) to increase visibility and internal coordination during
19 the restoration process.

20 The work was completed through an active partnership between IT
21 and business teams. IT resources included PG&E employees and
22 services from IT Managed Services partners. The resources worked at
23 PG&E facilities, at our offshore managed service partner locations, and
24 remotely, as required by COVID-19 safety requirements. Work was
25 completed to allow for releases throughout the year to enable
26 incremental capabilities to be realized.

27 At the end of 2020, work also commenced on the integration of
28 PSPS meteorology scope areas as a spatial layer into the PG&E DMS.
29 This will allow for increased efficiency in validation of PSPS planned
30 switching and an improved ability to identify switching based
31 opportunities to mitigate customer impact. This work was initiated with
32 the DMS Vendor ABB/Hitachi, as an enhancement to their current
33 software product. This work will continue into 2021.

1 Another improvement in 2020 was the development and
2 implementation of the PSPS Community Outreach Tracker to support
3 PG&E's Local Public Affairs, External Affairs and Public Safety
4 Specialists in tracking PSPS community outreach. The application was
5 used for managing relationships and outreach interactions with public
6 safety partners, allowing for the logging and tracking of outreach
7 meetings and engagement activities conducted by PG&E. The outreach
8 tracking tool was built on the Salesforce platform and was in partnership
9 between business and IT stakeholders. IT resources included PG&E
10 employees and IT Managed Services partners. The resources worked
11 at PG&E facilities, at our offshore managed service partner locations,
12 and remotely, as required by COVID-19 safety requirements.

13 An additional improvement to better support the PSPS process was
14 the Ontrack database upgrade. Ontrack is an application that supports
15 the PSPS notification process, validating notification files before
16 delivering to a third-party vendor for execution. Ontrack also manages
17 the truck roll process and the live outcall process for Medical Baseline
18 customers, Critical Customers, Telco and Transmission customers. The
19 initial design of the system was to have the application share an existing
20 database server for the notification process.

21 In 2020, PG&E built a new backend database server with high
22 availability architecture on PG&E OneCloud infrastructure to better
23 support the Ontrack notification process. This work improved the
24 notification process by enabling the validations to be completed faster
25 and allowed quicker turnaround times for customer outcalls during a
26 PSPS event. The work was completed by PG&E personnel.

27 **2. IT Asset and System Inspection Program**

28 This program category includes two types of major initiatives, as
29 represented in Table 4.5A-4 below.

TABLE 4.5A-4
IT ASSET AND SYSTEM INSPECTION PROGRAM
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Major Initiative	Capital	Expense
1	Sherlock Tool	\$2,490	\$374
2	Electric Distribution Compliance	1,249	90
3	Miscellaneous Small Technology Solutions	10	25
4	Total	\$3,749	\$489

a. Sherlock Tool

Following the catastrophic California wildfires in November 2018, PG&E captured more than two million images of its field equipment in high fire-risk areas. Using cutting-edge software and Artificial Intelligence techniques, PG&E's IT team developed a technology solution that uses these images to automate some of the time-consuming steps in an inspection. This solution, known as the Sherlock tool, provided PG&E with in-depth knowledge of the state of its equipment.

In 2020, PG&E continued to enhance the Sherlock tool to support the aerial inspection review process. These enhancements included the development of six different web applications (called "profiles") for different roles across the aerial inspection team as well as a number of computer vision models of which five are deployed for inspectors.

Below is a description of the six different profiles:

- 1) Imagery Quality Assurance (IQA): This profile allows the IQA team to review the latest images flown by the drone and helicopter vendors, to ensure they are ready for inspection. Further, it allows them to correct any data issues with regard to multi-pole structures, flag a set of photos for reflight, or flag an asset for a map correction.
- 2) Data Quality Assurance (DQA): This profile allows the DQA team to review the results of IQA, and use this to create the inspection queue.
- 3) Inspector: This profile enables remote aerial inspectors to review QA'd images, mark them up with issues, view associated data, and

1 fill out the appropriate inspection checklist. All inspection related
2 data (e.g., who inspected what, when) is stored for traceability.

- 3 4) Post Inspection Quality Check (SME Profile): This profile enables
4 SMEs to review completed inspections and make changes as
5 needed. For example, an SME may upgrade or downgrade an
6 issue created by an inspector. Further, an SME may add a new
7 issue as well. This is not the final “gatekeeping” function, but rather
8 an internal quality check to ensure high quality inspection records.
9 Data on changes between SMEs and Inspectors can be used for
10 internal training purposes.
- 11 5) Supervisor: This profile enables supervisors to view what is going
12 on in the inspection process. Supervisors are able to see what
13 stage a particular structure is in and can prioritize particular lines for
14 inspection.
- 15 6) Search: This profile is open to anyone in the Company. It enables
16 a user to search for images of any asset that was a part of the aerial
17 inspections in 2019, 2020, or 2021. Users can currently search by
18 line name or equipment ID.

19 In addition to the profiles, the Sherlock initiative developed and
20 deployed several computer vision models into the Inspector profile for
21 the following “classes”:

- 22 1) Overview Image: An image that shows the entire asset;
23 2) Asset Tag: An image that clearly shows the asset ID tag on the
24 structure;
25 3) Right of Way: An image that clearly shows the right of way (i.e., the
26 next few structures should be in view);
27 4) Access Path: An image that shows an access path to the asset;
28 and
29 5) Bird Nests: An image that shows a bird nest on the asset (this is a
30 potential ignition risk if the nest is above the conductor).

31 The model suggests to the inspector the image with the highest
32 confidence for each of these classes, visually flagging it so that the
33 inspector can make the final call. The inspectors’ interactions with these
34 suggestions are then used to improve the models over time. Additional

1 models are currently in development. They are continuously being
2 deployed into the inspector profile with small beta groups, where the
3 performance is closely monitored before being released to the wider
4 group of remote inspectors.

5 Major cost drivers in 2020 included labor costs, including software
6 engineers, data scientists, product leads and machine learning
7 engineers, cloud storage and computing costs (AWS), and contract
8 costs for labelling imagery so as to train computer vision models.

9 **b. Electric Distribution Compliance**

10 In August 2016, PG&E deployed a custom-developed, native iOS
11 mobile application (referred to as Asset Inspection) to the Electric
12 Compliance organization. The application was used in conjunction with
13 a paper process to document minor work or corrective issues found
14 during a detailed inspection process. The initiative was a multi-year
15 effort to create an enterprise mobile application and align the
16 preventative maintenance process between Gas and Electric
17 Operations. Prior to developing the application, the electric patrol and
18 inspection process during this timeframe only required documentation
19 and photos if an issue was identified and follow-on work was required.
20 Over the next several years (2018-2019), IT continued to improve the
21 application (rebranded as Inspect) and issued updates to:
22 (1) incorporate a new, more robust mapping interface with improved
23 functionality in connection with PG&E's inspections of Gas Distribution,
24 Gas Transmission, Electric Distribution and Electric Transmission
25 assets; (2) provide an inspection checklist for every detailed inspection
26 as directed by the WSIP; and (3) provide a mobile digital method for
27 field inspectors to capture inspection data from electric transmission
28 structure.

29 In 2020, IT continued to update the application by integrating
30 ProntoForms questions into the Inspect mobile application. IT also
31 worked in close collaboration with the Electric Operations System
32 Inspections Program, the GIS Asset Data Management & Improvement,
33 Inspection Planning & Work Management, and the Electric Asset
34 Strategy and Regulatory Compliance Organizations to incorporate WSIP

1 questions into the Inspect integrated suite of applications, which
 2 included the Engage Web application to facilitate work assignment to
 3 mobile, Inspect Mobile to provide Electric Distribution GIS integration,
 4 SAP and Business Warehouse for compliance reporting documentation
 5 in order to create a fully integrated end-to-end solution that would
 6 ensure data accuracy and reporting. These updates will remove the
 7 reliance on two mobile apps for the field inspectors, ensure accurate
 8 documentation of detailed inspection work and traceability of any
 9 corrective work identified against an asset during an inspection.

10 c. Miscellaneous Small Technology Solutions

11 The costs outlined here represent project closing costs.

12 3. IT Asset Risk Program

13 This program category includes two initiatives, as represented in
 14 Table 4.5A-5 below.

**TABLE 4.5A-5
 IT ASSET RISK PROGRAM
 (THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Major Initiative	Capital	Expense
1	Vegetation Management (VM) Next Priority Insights	\$172	\$12
2	Miscellaneous Small Technology Solutions	22	2
3	Total	\$193	\$14

15 a. Vegetation Management Next Priority Insights

16 The VM Next Priority Insights initiative was an effort to: (1) deepen
 17 PG&E's knowledge and understanding of remote sensing data collected
 18 by external vendors; (2) develop methodologies and automated tools to
 19 ensure that the quality of data produced by those vendors meets
 20 pre-determined thresholds; and (3) create data libraries in support of
 21 various related downstream PG&E efforts. As a result of this effort,
 22 PG&E's Electric Distribution VM teams had access to accurate
 23 information about trees posing a risk to distribution assets in High Fire
 24 Threat Districts (HFTD). In addition, Map Correction teams had access

1 to reliable Light Detection and Ranging data sets that informed efforts to
2 improve the quality of asset location data.

3 The VM Next Priority Insights initiative was coordinated, facilitated,
4 and implemented by PG&E's IT organization in collaboration with
5 Electric Distribution's VM Department and external remote sensing
6 third-party vendors. IT commenced the initiative late in 2018 and
7 completed it in early 2020, with the delivery of the last of the data
8 collected in late 2019. In 2019, data was collected for 25,000 miles of
9 Electric Distribution assets in Tier 2 and Tier 3 HFTDs. The 2020 work
10 covered in this request constitutes the completion of the project and
11 hand-over of the resulting data to VM users.

12 The VM Next Priority Insights initiative was coordinated, facilitated,
13 and implemented by PG&E's IT organization and staff augmentation
14 resources in collaboration with PG&E's VM Department. All costs
15 incurred in 2020 were staff cost.

16 **b. Miscellaneous Small Technology Solutions**

17 The costs outlined here represent project closing costs.

18 **4. Cybersecurity**

19 The Cybersecurity program category costs are represented in
20 Table 4.5A-6 below.

**TABLE 4.5A-6
CYBERSECURITY
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Major Initiative	Capital	Expense
1	WF – SAF 2.0	\$1,566	\$213

21 As more and more Wildfire projects moved from PG&E's on-site
22 systems to the public cloud, Cybersecurity was challenged to create a
23 security model to assure that PG&E data and assets (including customer
24 information) were safe in the cloud.

25 Cybersecurity began an accelerated implementation of its Service
26 Adoption Framework (SAF), which was in its second iteration undergoing a
27 transformation from a purely directive set of controls to the next level of

1 maturity where the controls were not just defined but verified continuously.
 2 In addition to measuring the controls, SAF 2.0 creates a feedback loop and
 3 a process by which application teams are assigned tickets for the risky
 4 configurations or vulnerabilities found on their cloud assets. At a high level,
 5 SAF 2.0 enabled the business to adopt cloud in the following ways:

- 6 • Provided the definitions of what secure looked like for the services used
 7 by PSPS and Wildfire;
- 8 • Created a risk model to help prioritize the highest risk findings and
 9 reduce the most risk as quickly as possible;
- 10 • Instilled confidence in cloud adoption and knowing that the infrastructure
 11 in the cloud had been hardened with a framework mapped directly to an
 12 industry standard (National Institute of Standards and Technology
 13 Cybersecurity Framework or NIST CSF); and
- 14 • Integration of cloud risks into PG&E’s risk management system to
 15 assign vulnerabilities to the application owners and provide leadership
 16 with risk metrics across the portfolio.

17 The SAF 2.0 detect process will continue to mature over the coming
 18 years as the threats in the cloud are constantly evolving and as new
 19 services are integrated, the set of risks and the threat model changes.
 20 PG&E has never had such rich data and visibility into the security of the
 21 cloud and across servers, containers, serverless functions and cloud native
 22 AWS services.

23 5. IT Operations and Maintenance

24 The IT Operations and Maintenance program category costs are
 25 represented in Table 4.5A-7 below.

**TABLE 4.5A-7
 IT OPERATIONS AND MAINTENANCE
 (THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Major Activities	Expense
1	Labor	\$1,425
2	Non-Labor	4,207
3	Total	\$5,632

1 The IT O&M work consisted of post-production activities consistent with
2 the transition to system operations, as well as software maintenance, vendor
3 contracts and cloud service provider agreements, required to support the
4 technology solutions deployed over the course of 2020.

5 **D. Conclusion**

6 The IT wildfire mitigation costs we present in this attachment are for
7 activities that are necessary to improve the safety and reliability of our system
8 and are consistent with the policies underlying the establishment of the
9 WMPMA. As described above, all costs PG&E incurred for this work are
10 reasonable and PG&E requests that the Commission approve full cost recovery.

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 5
EMERGENCY PREPAREDNESS AND RESPONSE

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 5
EMERGENCY PREPAREDNESS AND RESPONSE

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 5**
3 **EMERGENCY PREPAREDNESS AND RESPONSE**

4 **A. Introduction**

5 **1. Scope and Purpose**

6 The purpose of this chapter is to demonstrate that Pacific Gas and
7 Electric Company's (PG&E or the Company) expense and capital forecasts
8 for the enterprise Emergency Preparedness and Response (EP&R)
9 organization are reasonable and should be approved.¹

10 This chapter forecasts expenditures for preparing PG&E to respond to
11 catastrophic events by having integrated plans, and the appropriate
12 facilities, logistics, technology, and processes in place prior to the event
13 occurring. EP&R advances the Company's response to emergencies by
14 improving governance, strengthening coordination among PG&E's lines of
15 business (LOB), and improving collaboration with external partners such as
16 the Federal Emergency Management Agency and California Governor's
17 Office of Emergency Services. The EP&R department is mainly responsible
18 for emergency preparedness, prevention, response, mitigation, and recovery
19 to respond to all emergency incidents safely, transparently and with a strong
20 sense of urgency. EP&R's strategy focuses on initiatives to ensure the
21 Company remains prepared to respond to these events for the benefit of
22 customers.

23 **2. Summary of Request**

24 PG&E requests that the California Public Utilities Commission (CPUC or
25 Commission) adopt its 2023 expense forecast for EP&R of \$26.5 million.
26 PG&E's 2023 forecast is \$19.0 million more than 2020 recorded costs of
27 \$7.6 million.² The increase is primarily due to multiple programs moving

1 The forecasts described in this chapter do not duplicate the forecasts described in Chapters (Ch.) 4 and 6 of this exhibit. The forecasts in Ch. 4 are for implementing Wildfire Risk Mitigations. The expenditure forecasts in Ch. 6 are for responding to incidents and outages during Routine and Major Emergencies

2 See Exhibit (PG&E-4), WP 5-1, line 3.

1 from the Wildfire Mitigation Balancing Account (WMBA) to base EP&R work
2 beginning in 2023 and the initiatives described below.

3 PG&E further requests that the Commission adopt the following capital
4 expenditure forecasts for EP&R: \$2.0 million in 2021, \$2.0 million in 2022,
5 \$5.5 million in 2023, \$5.4 million in 2024, \$5.5 million in 2025, and
6 \$5.6 million in 2026.³ PG&E's 2023 forecast is \$5.0 million more than 2020
7 recorded capital expenditures of \$0.5 million. Similar to expense, the
8 increase is primary due to multiple programs moving from the WMBA to
9 base EP&R work beginning in 2023.

10 Forecasts in this chapter are shown with escalation at the Major Work
11 Category (MWC) level and included in all expense and capital totals. For
12 more information on escalation, please refer to Chapter 2 "Electric
13 Distribution Forecast and Investment Planning" of this exhibit.

14 3. Overview of Recorded and Forecast Costs

15 PG&E uses MWCs to record expenditures for capital and expense for
16 EP&R. EP&R expense costs are recorded in MWC AB, and EP&R capital
17 expenditures are recorded in MWC 21, as shown in Table 5-1 below.

TABLE 5-1
EP&R MWCS

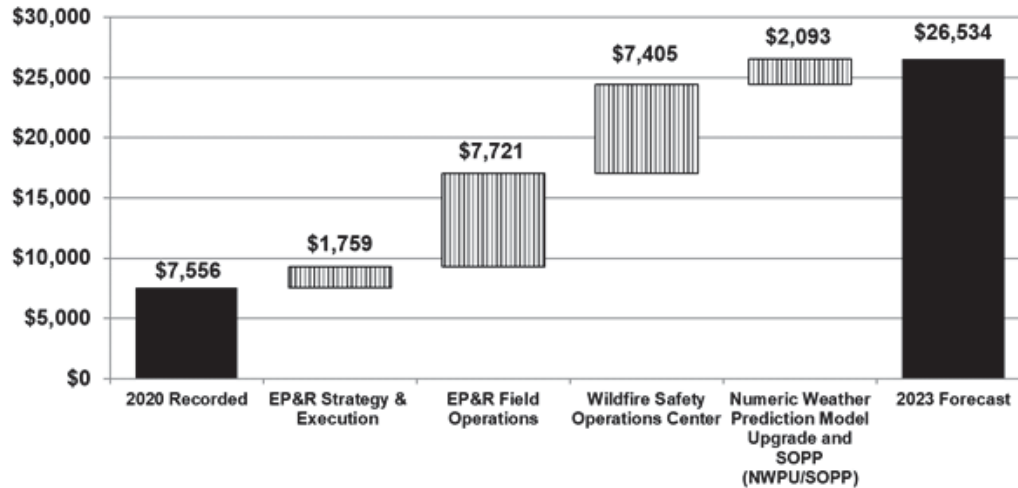
Line No.	MWCs	Description
1	AB	EP&R – Expense
2	21	EP&R – Capital

18 a. Expense

19 Figure 5-1 below shows the walk from 2020 recorded adjusted
20 expense amounts to the 2023 forecast.

³ See Exhibit (PG&E-4), WP 5-6, line 2.

**FIGURE 5-1
EXPENSE WALK 2020-2023
(THOUSANDS OF NOMINAL DOLLARS)**

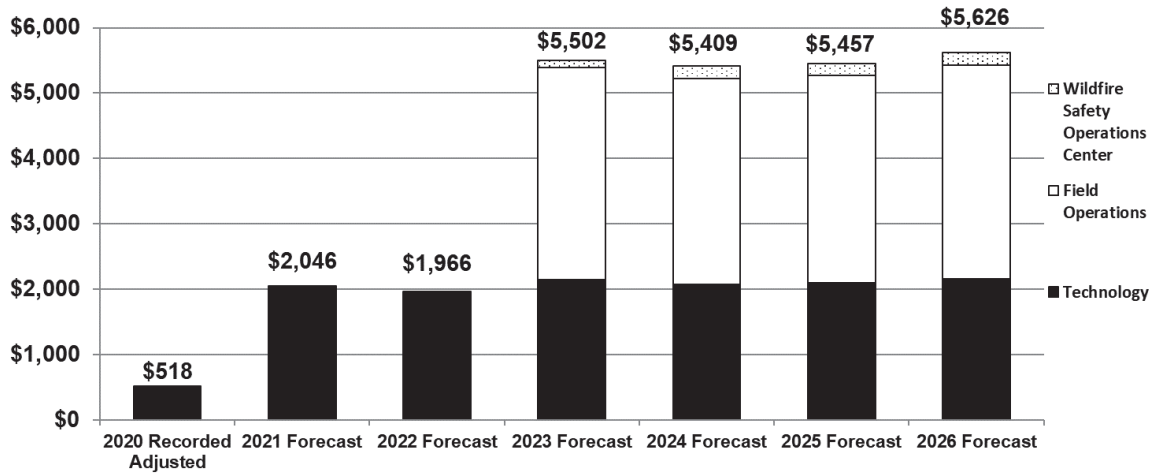


1 The increase from 2020 recorded to the 2023 forecast is primarily
 2 driven by three activities which will no longer be considered wildfire
 3 mitigations starting in 2023, and will be moving to wildfire controls.
 4 These activities are (1) EP&R Field Operations, which is moving from
 5 supporting PSPS events through 2022 as described Chapter 4.2; (2) the
 6 Wildfire Safety Operations Center (WSOC), which is expanding from
 7 solely monitoring wildfire events as described in Chapter 4.1 to an
 8 all-hazards approach; and (3) weather and storm outage prediction
 9 models, as described in Chapter 4.1, which will be applicable to all
 10 emergencies in addition to wildfires going forward.

11 **b. Capital**

12 Figure 5-2 shows the 2020 recorded adjusted capital expenditures
 13 and 2021 to 2026 forecast capital expenditures. Similar to expense, the
 14 increase from 2020 recorded to the 2023 forecast is primarily driven by
 15 the capital forecast for activities which will no longer be considered
 16 wildfire mitigations starting in 2023, and will be moving to wildfire
 17 controls: EP&R Field Operations and the WSOC.

**FIGURE 5-2
CAPITAL RECORDED AND FORECAST 2020-2026
(THOUSANDS OF NOMINAL DOLLARS)**



1 **4. Support for Request**

2 Numerous threats from various sources challenge PG&E’s ability to
3 provide safe and reliable energy to our customers. Natural hazards
4 affecting our service territory consist of earthquakes, high wind events,
5 wildfires, and various other catastrophic incidents; and can seriously impact
6 PG&E’s infrastructure and operations. Other hazards unrelated to nature,
7 such as a physical attack on critical PG&E facilities, cyber-attacks on our
8 digital assets, and unintentional dig-ins on our gas pipelines, also cause
9 significant impacts.

10 The EP&R organization is PG&E’s primary defense against emergent
11 hazards that exceed our extensive resiliency efforts. EP&R has been
12 working with PG&E’s LOBs to provide distinct core capabilities that are
13 essential for responding to a catastrophic emergency, including:

- 14 • A clearly defined organizational structure for emergency response, with
15 associated secondary roles, staffing plans, operational boundaries, and
16 executive involvement;
- 17 • Scalable restoration plans and systems that assist responders with
18 situational awareness;

- 1 • Working closely with our Supply Chain and Corporate Real Estate
2 departments to strengthen our logistics and facilities for
3 emergency response;
- 4 • Implementation of critical technologies, such as resilient servers and
5 enhanced basecamp communication systems, that enhance our ability
6 to respond and coordinate with our customers and community partners;
- 7 • Partnering with our communications groups to develop and disseminate
8 planned proactive communications to our stakeholders;
- 9 • Working closely with Human Resources and other groups to train our
10 employees to respond to emergencies and to ensure that appropriate
11 mechanisms are in place to assist employees who are affected by a
12 major disaster; and
- 13 • Leading enterprise-wide business continuity efforts, including business
14 impact analysis and the maintenance of business continuity plans. This
15 chapter outlines the need for appropriate maintenance and improvement
16 of these capabilities.

17 Overall, PG&E's expense and capital forecasts for EP&R are
18 reasonable because they are needed:

- 19 • To address any top enterprise risk—a catastrophic emergency incident
20 such as a major earthquake or fire that could affect one or more areas of
21 PG&E's service territory;
- 22 • To provide additional fire mitigation actions as precautionary measures
23 to reduce the risk of future wildfire ignitions, including timely detection of
24 wildfires;
- 25 • To respond in the event of a global pandemic to coordinate at the
26 highest levels of the company to reduce safety risk and protect critical
27 resources to continue operations;
- 28 • To continue developing corporate emergency strategy, preparedness,
29 response, and business continuity policies and procedures for gas,
30 electric, and generation;
- 31 • To support compliance with regulation including, General Order (GO)
32 166; Standards for Operation, Reliability, and Safety During
33 Emergencies and Disasters, GO 112F; State of California Rules

1 Governing Design, Construction, Testing, Operation, and Maintenance
2 of Gas Gathering, Transmission, and Distribution Piping Systems and

- 3 • To undertake key technology projects that support PG&E’s emergency
4 preparedness to improve public and system safety, employee safety,
5 reliability, and work efficiency.

6 **5. Organization of the Remainder of This Chapter**

7 The remainder of this chapter is organized as follows:

- 8 • Section B – Program and Risk Overview
- 9 • Section C – Activities, Costs, and Forecast Drivers by MWC
- 10 • Section D – Estimating Methods
- 11 • Section E – Compliance with Section 5.2 of the 2020 General Rate
12 Case (GRC) Settlement Agreement (“Deferred Work Principles”)
- 13 • Section F – Cost Tables

14 **B. Program and Risk Overview**

15 **1. Program Description**

16 **a. Program Overview**

17 The EP&R department is responsible for PG&E’s emergency
18 preparedness, prevention, response, mitigation, and recovery activities
19 for addressing all emergent hazard events. Since the 2020 GRC, the
20 expanded EP&R department consists of five organizations, each
21 responsible for a unique EP&R scope of work.

22 The five organizations are as follows:

- 23 • Wildfire Safety Operations Center (WSOC)
- 24 • Meteorology and Fire Science
- 25 • Field Operations
- 26 • Public Safety Power Shutoff Management (PSPS)
- 27 • Strategy and Execution

28 EP&R activities can be categorized as wildfire- or
29 non-wildfire-related work. Activities performed by the WSOC,
30 Meteorology and Fire Science, Field Operations, and PSPS generally
31 are wildfire-related and are discussed extensively in Chapter 4.

32 Activities completed by the Strategy and Execution organization are All

1 Hazards, include both wildfire and non-wildfire and are discussed in the
2 remainder of this chapter.

3 Beginning in 2023, certain wildfire mitigations will transition away
4 from the organizations responsible for managing PG&E's wildfire
5 mitigations and move to EP&R. These activities will be converted from
6 wildfire-specific mitigations tracked in the WMBA and will become all
7 hazards controls. Mitigations that are moving out of the WMBA are
8 shown in Chapters 4.1 and 4.2 of this exhibit through 2022 and are then
9 listed as controls in Chapter 5 starting in 2023. For example, the WSOC
10 will transition to become the Hazard Awareness and Warning Center
11 (HAWC)⁴ that will serve as a centralized hub for emergency and hazard
12 communications and intelligence to internal stakeholders for all types of
13 emergencies, not just wildfires. Because the center will no longer
14 exclusively support wildfire risk, capital and expense dollars will then
15 shift to this chapter, consistent with the all hazards nature of the center.
16 The wildfire mitigations that will become all hazard controls in 2023 are:

- 17 • WSOC – HAWC (transitions from WLDFR-M07C to EPNDR-C002);
- 18 • Meteorology: Numerical Weather Prediction/ Storm Outage
19 Prediction Project (SOPP) (transitions from WLDFR-M07H to
20 EPNDR-C001);
- 21 • Field Operations Technology (transitions from WLDFR-M006 to
22 EPNDR-C003 and EPNDR-C004);
- 23 • Field Operations – All Hazards (transitions from WLDFR-M006 to
24 EPNDR-C005 and EPNDR-C006).

25 The non-wildfire programs described in the EP&R chapter of the
26 2020 GRC are performed by the EP&R Strategy and Execution team.
27 This organization is committed to assisting the Company prepare for,
28 respond to, and recover from emergency catastrophic events that could
29 affect one or more areas of PG&E's service territory, including
30 employees, customers, and infrastructure. These types of events are
31 typically rated as severe or catastrophic on the Company's incident level

4 The control name associated with the WSOC as well as its future state (HAWC) will remain "WSOC" across Ch. 4.1 and Ch. 5.

1 scale and require significant coordination across all LOBs. Strategy and
 2 Execution works to enhance preparedness by continuing to develop
 3 best practices, improve response processes, and institutionalize EP&R
 4 principles and practices throughout PG&E. The department has evolved
 5 and has been restructured into the following subgroups:

- 6 • Emergency Planning and Process Improvement;
- 7 • Training;
- 8 • Exercise;
- 9 • Prevention;
- 10 • Response; and
- 11 • Recovery.

12 **b. Management Structure**

13 EP&R is a department within Electric Operations (EO) and is
 14 responsible for company-wide emergency preparedness for all LOBs
 15 including Electric, Gas, and Power Generation. The EP&R Department
 16 is led by the Senior Director, Grid and Emergency Response, who
 17 reports to the Senior Director of Electric Transmission Operations, who
 18 in turn reports to the Senior Vice President of Electric Operations.

19 **2. Risk Integration**

20 Chapter 3 of this exhibit describes how EO uses the Enterprise and
 21 Operational Risk Management program to manage electric system risks.
 22 Table 5-2 below shows the EO risks associated with the forecasts discussed
 23 in this chapter.

**TABLE 5-2
 RISKS DISCUSSED IN THIS CHAPTER**

Line No.	Risk Name	Risk ID	Type of Risk	Maintenance Activity Type (MAT)
1	Emergency Preparedness and Response	EPNDR	Cross-Cutting Factor	AB6, 21A

1 **a. Risk Assessment Mitigation Phase (RAMP) Cross-Cutting Factor –**
 2 **EP&R**

3 **1) Risk Overview**

4 The EP&R Cross-Cutting Factor is defined as the impact of
 5 EP&R controls that affect PG&E’s risk drivers and consequences.⁵
 6 EP&R influences 19 risk events on PG&E’s Corporate Risk
 7 Register.⁶

8 In Chapter 3 PG&E: described how management of the risk has
 9 changed since the filing of the 2020 RAMP Report; provided the
 10 updated Risk Spending Efficiency; listed each mitigation and control
 11 and indicated if it has changed since the 2020 RAMP Report filing.
 12 In this chapter PG&E provides more information about the
 13 mitigations and controls and the work needed to implement them.

14 **2) GRC Risk Mitigations and Controls**

15 As shown in the tables below, PG&E is forecasting one
 16 mitigation and seven controls. These programs were determined to
 17 reduce the consequence of various risk events. EP&R is a
 18 cross-cutting factor for the following risk events:

- 19 • Aviation;
- 20 • Hazardous Materials Release;
- 21 • Failure of Distribution Underground Network Assets;
- 22 • Failure of Distribution Overhead Assets;
- 23 • Failure of Distribution Underground Assets;
- 24 • Failure of Distribution Substation Assets;
- 25 • Information Technology Asset Failure
- 26 • Insufficient Capacity to Meet High Demand
- 27 • Large Uncontrolled Water Release (Dam Failure)
- 28 • Loss of Containment (LOC) on Gas Distribution Main or Service;
- 29 • LOC on Gas Transmission Pipeline;

5 PG&E’s RAMP Report, Application (A.) 20-06-012 (June 30, 2020), Ch. 20, p. 20-2,
 lines 11-15, and 20.

6 Exhibit (PG&E-2), Chapter 1, Attachment B is a table that maps the cross-cutting
 factors to the risk events.

- 1 • Large Overpressure Event Downstream of Gas Measurement
2 and Control Facility;
3 • LOC on Gas Customer Connected Equipment;
4 • LOC at Natural Gas Storage Well or Reservoir;
5 • LOC at Gas Measurement and Control or Compression and
6 Processing Facility;
7 • LOC on Compressed Natural Gas (CNG) Station Equipment;
8 • LOC on Liquefied Natural Gas/CNG Portable Equipment;
9 • Real Estate and Facilities Failure; and
10 • Wildfire.

11 A brief description of each mitigation provided in Tables 5-3 and
12 5-4 below. More detail is included in the 2020 RAMP Report.⁷

**TABLE 5-3
EP&R
FORECAST MITIGATIONS**

Line No.	Mitigation Number	Mitigation Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	EPNDR-M000	EP&R Mitigations	A suite of mitigations that includes: <ul style="list-style-type: none"> • EOC Enhancements • Base Camp Project • Check-in/Check-out with Salesforce • Secondary Emergency Roles Enterprise-wide • Mutual Aid Enhancements 	Consequences Only	See section C.1.a.2 for more information	AB6

⁷ PG&E's RAMP Report, A.20-06-012 (June 30, 2020), Ch. 20, starting at p. 20-12.

**TABLE 5-4
EP&R
FORECAST CONTROLS**

Line No.	Control Number	Control Name	Description	Risk Drivers Addressed	Additional Information	MAT Code
1	EPNDR-C000	EP&R Controls	A suite of controls that includes: <ul style="list-style-type: none"> • Emergency Planning and Process Improvement • Training • Exercise • Prevention • Response • Recovery 	Consequences Only	See section C.1.a.1 for more information	AB6
2	EPNDR-C001	Situational Awareness and Forecasting Initiatives – SOPP Improvements	Develop methodology for forecast of weather conditions relevant to utility operations., forecasting weather conditions and conducting analysis to incorporate into utility making, learning and updates to reduce false positives and false negatives of forecast PSPS conditions.	Consequence only	See section C.1.d for more information Moving from Wildfire in 2023	AB6
3	EPNDR-C002	Situational Awareness and Forecasting Initiatives – WSOC	The WSOC is a physical facility which serves as PG&E's central information hub for all wildfire-related data. The WSOC team monitors, analyzes and initiates wildfire mitigation and response efforts throughout the service area.	Foundational	See section C.1.c for more information Moving from Wildfire in 2023	AB6
4	EPNDR-C003	All Hazard – EP&R Field Ops Tech Expense	The EP&R Field Ops Tech expense allows the Public Safety Specialist (PSS) team to utilize the Salesforce database platform to capture activity and regulatory compliance engagement.	Foundational	See section C.1.b for more information Moving from Wildfire in 2023	AB6

- 1 • Emergency Operations Center (EOC)/ICS Training Program
- 2 Enhancements –Not included in the GRC mitigation. EP&R
- 3 continues to provide other types of EP&R training as
- 4 described in this chapter.
- 5 • Mutual Assistance Tools and Equipment – Not included in
- 6 the GRC mitigation.
- 7 • Mutual Assistance Improvement – Is part of the GRC
- 8 mitigation
- 9 • New Incident Specific Annexes – Becomes a control in the
- 10 GRC (EPNDR-C000)
- 11 • Early Earthquake Warning (EEW) Enhancements –
- 12 Becomes a control in the GRC (EPNDR-C000)

13 **b) Changes to Controls**

14 PG&E modified its portfolio of controls since filing the RAMP
 15 Report by consolidating twelve controls presented in its RAMP
 16 Report into a single control. The EP&R control referred to as
 17 EPNDR-C000 consists of six parts: Emergency Planning and
 18 Process Improvement; Training; Exercise; Prevention;
 19 Response; and, Recovery. Below PG&E identifies which
 20 controls included in the 2020 RAMP Report are aligned to the
 21 GRC EP&R control. .

- 22 • Company Emergency Operations Plans and Standards for
- 23 Response – Included in EPNDR-C000 in the Response
- 24 area;
- 25 • Emergency Response Technology – Included in
- 26 EPNDR-C000 in the Response area;
- 27 • EOC/ICS training program – Included in EPNDR-C000 in
- 28 the Training area;
- 29 • EOC Response – Included in EPNDR-C000 in the
- 30 Response area;
- 31 • EOC Exercises – Included in EPNDR-C000 in the Exercises
- 32 area;
- 33 • Weekly Situational Awareness Call – No longer a control;
- 34 • EEW – Included in EPNDR-C000 in the Response area;

- 1 • Debris Flow Modeling – Included in EPNDR-C000 in the
- 2 Response area;
- 3 • Gas System Operations Temperature Forecasting – No
- 4 longer a control;
- 5 • Power Gen Hydro Management Forecast – No longer a
- 6 control;
- 7 • Short-Term Electric Supply Forecasting – No longer a
- 8 control; and
- 9 • Diablo Canyon Power Plant Emergency Response
- 10 Organization Support – No longer a control.
- 11 Along with the controls listed above PG&E also identified
- 12 three new activities that are part of control EPNDR-C000:
- 13 • Emergency Planning and Process Improvement;
- 14 • Portable Rain Gauge; and
- 15 • Dynamic Automated Seismic Hazard (DASH).

16 **b. Cost Tables**

17 Tables 5-5 and 5-6 below show the forecast costs for mitigations.⁸

18 Tables showing the GRC forecast costs compared to the costs

19 estimated in the RAMP Report are provided in workpapers.⁹ Forecast

20 costs for controls are shown in supporting workpapers.¹⁰

⁸ Exhibit (PG&E-4), WP 3-18.

⁹ Exhibit (PG&E-4), WP 3-24.

¹⁰ Exhibit (PG&E-4), WP 3-18.

**TABLE 5-5
EMERGENCY PREPAREDNESS AND RESPONSE
RECORDED AND FORECAST MITIGATION COSTS 2020-2023 – EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020		2021 Forecast	2022 Forecast	2023 Forecast	Total	RSE
				Rec. Adj.	AB6, AB#					
1	EPNDR-M000	EP&R Mitigations		\$2,782		\$976	\$1,897	\$4,192	\$9,874	
2		Total		\$2,782		\$976	\$1,897	\$4,192	\$9,874	

**TABLE 5-6
EMERGENCY PREPAREDNESS AND RESPONSE
RECORDED AND FORECAST MITIGATION COSTS 2020-2026 – CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Mitigation No. (2023 GRC)	Mitigation Name (2023 GRC)	MAT	2020 Rec. Adj.	2021 Forecast	2022 Forecast	2023 Forecast	20235 Forecast	2024 Forecast	2026 Forecast	Total	RSE
1	EPNDR-M000	EP&R Mitigations	21A	\$518	\$2,046	\$1,966	\$2,143	\$2,093	\$2,075	\$2,160	\$13,001	
2		Total		\$518	\$2,046	\$1,966	\$2,143	\$2,093	\$2,075	\$2,160	\$13,001	

(a) PG&E calculated two RSEs for EPNDR-M000: EOC Enhancements has an RSE of 360; and, Mutual Aid Enhancements has an RSE of 21,219.

1 C. Activities, Costs, and Forecast Drivers by MWC

2 The individual mitigations and controls described in the risk integration
3 section above (Section B.2) account for virtually all the work PG&E is forecasting
4 for its EP&R organization. In total, PG&E's 2023 expense forecast and
5 2021-2026 capital forecast is associated with a risk mitigation or risk control
6 activity. The close alignment between the overall EP&R forecast and the
7 forecast for mitigations and controls demonstrates that the primary driver behind
8 the work EP&R is forecasting is to mitigate or control PG&E's risk. In this
9 section PG&E describes individual groups and activities responsible for
10 implementing this risk control and mitigation work.

11 1. Expense (MWC AB)

12 PG&E's 2023 expense forecast for EP&R activities in MWC AB is
13 \$26.5 million, which is \$19.0 million higher than 2020 recorded costs of
14 \$7.6 million.¹¹ Some items discussed below are programs that move to this
15 chapter beginning in 2023 and will cause an increase in expense forecast
16 compared to 2020 actual recorded costs. The drivers for the increase are
17 described below.

18 a. EP&R Strategy and Execution

19 PG&E's 2023 forecast for Strategy and Execution is \$9.3 million,
20 \$1.8 million more than 2020 recorded costs of \$7.6 million.¹² In
21 developing its GRC portfolio, EO was constrained by the targets
22 established in the Plan of Reorganization (POR) when PG&E emerged
23 from bankruptcy on July 1, 2020.¹³ Due to the POR constraint, Strategy
24 and Execution's expense forecast in 2021-2022 is lower than normal at
25 \$4.2 million per year.

26 The EP&R Strategy and Execution activities described in this
27 section are associated with both the EP&R mitigations (EPNDR-M000)
28 and the EP&R controls (EPNDR-C000). In 2023, approximately

11 See Exhibit (PG&E-4), WP 5-1, line 1.

12 See Exhibit (PG&E-4), WP 5-5, line 2.

13 PG&E discusses the POR financial targets in Exhibit (PG&E-2), Ch. 3.

1 \$4.2 million is as with the EP&R mitigation and approximately
2 \$5.1 million is associated with controls.

3 **1) EP&R Risk Control (EPNDR-C000)**

4 PG&E is including one EP&R control that consists of six
5 different activities.

6 Emergency Planning and Process Improvement – The
7 Emergency Planning and Process Improvement team publishes the
8 annual Company Emergency Response Plan (CERP) that provides
9 guidance on managing emergencies and establish processes that
10 are scalable to any hazard. This team works with the LOBs to
11 develop CERP annexes and leads continuous improvement projects
12 that improve emergency response functions.

13 The development of new hazard specific annexes provides
14 guidance to the LOBs to plan and document their responses to
15 specific disruptions. Current annexes being developed are the
16 Tsunami Annex and the Infectious Disease/Pandemic annex. Other
17 annexes will be developed based on the Threat Hazard
18 Identification Risk Assessment (THIRA) results.

19 Training – The Training team develops the Company Training
20 Program for emergency preparedness in order to align with State of
21 California Standardized Emergency Management System and
22 National Incident Management System principles for EOC
23 operations and continuous process-improvement for all aspects of
24 the EOC. The activities of the training team also includes,
25 developing roles and responsibilities for the EOC, training
26 curriculum for EOC processes and positions, and supporting
27 curriculum development for line of business emergency
28 management teams. Training plays a crucial role by providing
29 PG&E with a means of attaining, practicing, validating, and
30 improving emergency preparedness capabilities.

31 EP&R is pursuing several certified¹⁴ training courses, including:

¹⁴ Certified courses provided by California Office of Emergency Services (CalOES) California Specialized Training Institute (CSTI).

- 1 • ICS 100 – Introduction to the Incident Command System
- 2 • ICS 200 – Basic Incident Command System for Initial Response
- 3 • IS 700 – An Introduction to the National Incident Management
- 4 System
- 5 • IS 800 – National Response Framework, An Introduction
- 6 • G606 – Standardized Emergency Management System
- 7 • ICS 300 – Intermediate ICS for Expanding Incidents;
- 8 • ICS 400 – Advanced ICS for Command and General Staff;
- 9 • G-775 – EOC Management and Operations;
- 10 • G-191 – ICS Field/EOC Interface;
- 11 • G-626 – EOC Action Planning;
- 12 • G-197 – Integrating Access and Functional needs into
- 13 Emergency Planning; and
- 14 • ICS Position-Specific Workshops.

15 The expense forecast supports the workload to conduct and
16 manage these trainings.

17 Exercise – The Exercise team plans, coordinates, and executes
18 emergency preparedness exercises that develop PG&E's
19 emergency response and recovery capabilities through a
20 progressive building-block approach. Using the Homeland Security
21 Exercise and Evaluation Program (HSEEP), the team develops
22 exercises designed to test the effectiveness of current enterprise
23 emergency response plans and procedures. The team leads
24 internal and external emergency preparedness events, including
25 annual company-wide exercises and functional/hazard specific
26 exercises. EP&R conducts, on average, two tabletop exercises and
27 two functional emergency response exercises per year, ranging
28 from Earthquake, PSPS¹⁵ or Cybersecurity exercises. In 2021,
29 PG&E is scheduled to conduct a Cybersecurity tabletop exercise, a
30 Wildfire tabletop exercise, two PSPS tabletop exercises, and two
31 PSPS full scale exercises. PG&E has also participated in external

15 The PSPS Exercises conducted by this team differ from the PSPS Field Exercises described in Chapter 4.

1 exercises like the Grid Security Exercise, a 2-day exercise held
2 every two years by the North American Electric Reliability
3 Corporation designed to test the electric sector's ability to respond
4 to grid security emergencies, improve communications among
5 partners, identify lessons learned, and engage senior leadership.

6 Prevention – The Prevention team leads PG&E's business
7 continuity efforts. In addition, the Prevention team researches and
8 conducts the Threat Hazard Identification Risk Assessment (THIRA) to
9 identify enterprise risks. These efforts will utilize the Fusion software
10 and services to conduct our 3-year Business Impact Analysis (BIA),
11 Business Continuity Planning and keeping the plans accessible. Based
12 on the results of the BIA, the Prevention team will work with the LOBs to
13 draft business continuity plans to ensure that during a catastrophic
14 disruption, PG&E can continue to reliably and safely deliver both gas
15 and electricity to its customers. This program develops the role and
16 responsibility guidelines for the Company's Corporate Incident
17 Management Council, Business Continuity Directors, and Coordinators.

18 Response – The Response programs range from maintaining the
19 EOC to managing and coordinating the technology platforms used for
20 key initiatives listed below:

- 21 • EOC¹⁶
- 22 • EEW
- 23 • Debris Flow Modeling
- 24 • Portable Rain Gauge
- 25 • Mobile Command Vehicle (MCV)
- 26 • Base Camp
- 27 • DASH Modeling System
- 28 • Mass Emergency Notification Systems
- 29 • Everbridge
- 30 • LiveSafe

16 The Vacaville Emergency Response Center (VERC) opened in 2019 as PG&E's Alternate EOC. Due to the Company's intention to sell the General Office complex in San Francisco (SFGO) where the EOC currently resides, the VERC will become PG&E's primary EOC facility in 2021.

1 Recovery – The Recovery program manages the After-Action
2 Reports (AAR) and process improvements to support the development
3 and creation of AARs for All Hazards EOC Incidents. Initiatives include
4 the development of Strategy & Execution’s Key Performance Indicators
5 (KPIs), as well as track KPIs for projects tied to safety, compliance, and
6 risk.

7 **2) EP&R Risk Mitigation (EPNDR-M000)**

8 PG&E is including one EP&R mitigation that consists of four
9 different activities.

10 Base Camp Project – Improve personnel accountability and
11 operations surrounding base camp activations, including check in
12 and check out of employees. Implement IT controls and processes
13 to account for personnel entering and exiting the base camp.

14 Check in/Check out with Salesforce – Develop and implement
15 processes and tools for the check in and check out function at the
16 EOC.

17 Secondary Emergency Roles Enterprise wide – Implement
18 secondary emergency role in the event of an activated incident.
19 PG&E will train personnel for multiple emergency response roles so
20 that if one area gets hit by an emergency, staff from other areas are
21 ready to assist.

22 Mutual Aid Enhancements – Develop guidance for acquiring
23 and training mutual assistance resources. Improve mutual
24 assistance program to onboard, process, track, demobilize and pay
25 mutual assistance resources.

26 **b. EP&R Field Operations (All Hazards, EPNDR-C005, EPNDR-C006)**

27 The Field Operations team consists of the Public Safety Specialist
28 (PSS) team that will serve as an All Hazards response group to maintain
29 established relationships with external agency partners and to support
30 emergency planning and information sharing during emergencies. In
31 this capacity, the PSS team serves as the PG&E Agency
32 Representative to coordinate and integrate PG&E’s response with the
33 Authority Having Jurisdiction (AHJ) during active incidents. The Field

1 Operations activities prior to 2023 are described in Chapter 4.2 (PSPS
2 Operations). Due to the nature of the work intended to support All
3 Hazards, the Expense forecast is detailed in this chapter beginning in
4 2023.

5 EP&R Field Operations activities described in this section are
6 associated with the EP&R Field Operations controls. PG&E's 2023
7 forecast for EP&R Field Operations is \$7.1 million,¹⁷ and is associated
8 with the two controls (EPNDR-C005 and EPNDR-C006).

9 The Field Operations related costs which includes headcount¹⁸,
10 team specific training, support expenditures, and other miscellaneous
11 cost are outlined below:

- 12 • Coordinating vegetation management activities between California
13 Department of Forestry and Fire Protection, United States Forest
14 Service, other authorities having jurisdiction, and PG&E;
- 15 • PG&E Utility Standard TD-1464S,¹⁹ Fire Prevention and Mitigation
16 training for PG&E personnel;
- 17 • Satellite information sharing with external partners;
- 18 • Weather station placement input;
- 19 • Public Partner Outreach;
- 20 • Community Wildfire Safety Program Open Houses;
- 21 • Public Safety Liaison Meetings;
- 22 • First Responder Workshops;
- 23 • Triennial Regulatory Workshops;
- 24 • Annual Contingency Plan Meeting;
- 25 • Live Fire and Gas Release Training; and
- 26 • Public Utility Code Section 768.6 biennial outreach

27 The PSS team also utilizes the Salesforce database platform to
28 capture activity and regulatory compliance engagement. Support of the

¹⁷ See Exhibit (PG&E-4), WP 5-5, line 5.

¹⁸ See Exhibit (PG&E-4), Project Summary – EP&R Strategy and Execution page WP 5-18 and Project Summary – EP&R Field Operations – Core Work pages WP 5-24 and WP 5-25 for additional information on this topic.

¹⁹ Standard TD-1464S is the ignition prevention utility standard the PSS team helped write and present on a regular basis to PGE personnel. (PG&E Utility Standard, TD-1464S, Rev. 4 (June 17, 2020).)

1 Salesforce platform is critical in ensuring regulatory compliance,
2 associated with Gas mandates,²⁰ Electric mandates,²¹ and Wildfire
3 Mitigation Planning outreach and engagement. Costs would support
4 Salesforce licensing fees, database maintenance costs, hosting fees,
5 and non-project application enhancement needs.²²

6 **c. WSOC/HAWC (EPNDR-C002)**

7 As previously stated, the WSOC will emerge as the HAWC in 2023
8 and will be recorded in this chapter resulting in a forecast increase.
9 Additional hazards monitored will include debris flow/landslide events,
10 company response to earthquakes, and severe weather events. The
11 center will remain staffed 24/7 with employees monitoring and reporting
12 on broader real-time emergency events. The center will serve as a
13 centralized hub for emergency and hazard communications and
14 intelligence to internal stakeholders. PG&E's HAWC will not replace
15 existing communication processes within the respective lines of
16 businesses, but rather will operate as a centralized resource for
17 real-time situational awareness & intelligence.

18 All the WSOC/HAWC work described in this section is associated
19 with a risk control (EPNDR-C002).

20 Core capabilities for the HAWC will include monitoring, assessment,
21 and communication of pertinent information for emergency events. The
22 center will monitor internal and external information sources for issues
23 and emerging risks as well as develop and maintain updates to real time
24 dashboards accessible to all key stakeholders. For communications,
25 the center will produce periodic situational awareness reports and
26 briefing documents, initiate two-way communication processes with key
27 LOB groups to share and receive intelligence information, and initiate
28 notifications per established protocols. Lastly, there will be

²⁰ Assem. Bill No. 56 (2011); 49 CFR §§ 192.615-192.616; D.11-07-004; and, CPUC GO 112F.

²¹ Pub. Util. Code, § 768.6.

²² See Exhibit (PG&E-4), Project Summary – EP&R Strategy and Execution; Project Summary – EP&R Field Operations – Core Work; Project Summary – EP&R Field Operations - Technology for additional information on this topic.

1 communications requirements with external entities. Based on criteria
2 established by EP&R, the HAWC will escalate issues for resolution as
3 appropriate by engaging with the EOC Duty Officer, Execution Director,
4 and other key points of contact.

5 PG&E's 2020 recorded expense for the WSOC was \$4.3 million,²³
6 which mainly represented staffing costs. The 2023 expense forecast for
7 the WSOC/HAWC is \$7.4 million in 2023.²⁴

8 **d. Numerical Weather Prediction and SOPP Model Automation**
9 **(EPNDR-C001)**

10 The SOPP Model is a storm damage prediction system developed,
11 maintained and operated by PG&E's Meteorology Department. The
12 SOPP Model is the primary tool utilized to forecast the magnitude and
13 timing of unplanned outage activity on the distribution and transmission
14 system that may occur due to weather events (wind, rain, snow, heat,
15 etc.). The SOPP program's state and details prior to 2023 can be found
16 in Chapter 4.1 listed under Meteorology Weather Forecasting, Fire
17 Potential Index and Fire Detection Projects (Section C.1.c.2). Due to
18 the nature of the work intended to support All Hazards, the Expense
19 forecast is in this chapter beginning in 2023.

20 In addition, this model provides input to PG&E's operational staffing
21 and logistical decisions to support PG&E's planning for upcoming
22 weather/storm emergency events. The primary goal of this program is
23 to be prepared for storms and reduce customer outage duration to the
24 extent possible. For example, the model informs PG&E's decisions
25 regarding whether to open the EOC, and if the storm is severe enough,
26 execute PG&E's mutual assistance agreements in advance of storms.
27 SOPP mitigates operational risk and reduces customer outage times
28 arising from weather events that create high unplanned outage volumes.

29 In 2023–2026, PG&E plans to continue the SOPP model program
30 and plans to upgrade modules of the SOPP forecast, such as the

²³ 2020 recorded and 2021-2022 expense forecasts are described in Chapter 4.1, Section C.1.a (Situational Awareness Forecasting).

²⁴ See Exhibit (PG&E-4), WP 5-5, line 7.

1 snow-outage model and heat-outage model. PG&E also plans to
 2 continue improving its analog forecasting techniques by exploring
 3 machine learning or other statistical techniques.

4 This overall initiative will improve PG&E's weather prediction
 5 capabilities, help PG&E make better risk informed decisions, and be
 6 better positioned and staffed to respond to any storm event. PG&E's
 7 2023 expense forecast for this work is \$2.1 million.^{25 26}

8 e. MWC AB Forecast Summary

9 Table 5-7 summarizes the expense forecast in MWC AB.

TABLE 5-7
MWC AB EXPENSE SUMMARY
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Description	2020 Recorded Adjusted	2021 Forecast	2022 Forecast	2023 Forecast	WP Reference
1	EP&R Strategy and Execution	\$7,556	\$4,209	\$4,215	\$9,315	WP 5-5, line 2
2	All Hazards	-	-	-	15,127	WP 5-5, lines 5-7
3	NWPU/SOPP	-	-	-	2,093	WP 5-5, line 8
4	Total	\$7,556	\$4,209	\$4,215	\$26,534	

10 2. Capital (MWC 21)

11 In 2020, EP&R recorded capital expenditures of \$0.5 million. EP&R is
 12 forecasting capital expenditures of \$2.0 million in 2021, \$2.0 million in 2022,
 13 \$5.5 million in 2023, \$5.4 million in 2024, \$5.5 million in 2025, and
 14 \$5.6 million in 2026.²⁷ The drivers for the higher capital expenditures
 15 relative to 2020 recorded are described below.

16 a. EP&R Strategy and Execution Capital Projects (EPNDR-M000)

17 The capital expenditures associated with Strategy and Execution –
 18 are split among the following programs. All the Strategy and Execution
 19 capital work is associated with EP&R mitigation (EPNDR-M000).

²⁵ See Exhibit (PG&E-4), WP 5-5, line 8.

²⁶ 2020 recorded and 2021-2022 Expense forecasts are under Chapter 4.1, Section C.1.c.2 (Situational Awareness Forecasting).

²⁷ See Exhibit (PG&E-4), WP 5-6, line 1.

1 **1) MCVs, Base Camp, Emergency Communications Equipment**

2 The Information Technology Emergency Communications
3 (ITEC) Program continues to support the EP&R organization,
4 ensuring that the Company is positioned to support all-hazards
5 emergencies and planned events. To effectively support this
6 strategy, the ITEC Program employs a vast array of technology to
7 ensure there are communications solutions for all responding
8 Incident Management teams, field personnel and aviation assets.

9 Future enhancements and improvements include a prescribed
10 lifecycle of the mobile command vehicle fleet, microwave tower
11 trailer enhancements and refinements to satellite network
12 connectivity, including a lifecycle of aging satellite assets. The
13 lifecycle of the MCV fleet will begin in 2023, lasting until 2026.

14 This work provides for the continuation of technology necessary
15 to permit communication under catastrophic conditions, including
16 PG&E's ability to provide voice, data, and printing capabilities to
17 temporary base camp locations throughout its service territory.

18 **2) Earthquake Early Warning**

19 The PG&E EEW Program, in cooperation with the United States
20 Geological Survey and the University of California (UC) Berkeley
21 Seismology Lab, has been beta testing EEW products, including
22 Shake Alert and the UC Berkeley Smartphone application MyShake,
23 for use throughout the PG&E service territory. Using sophisticated
24 computational algorithms with input from seismic sensor networks
25 along the West Coast, EEW technology can provide the user
26 anywhere from a few seconds to tens of seconds advance notice
27 before ground shaking occurs at their location.²⁸ PG&E has also
28 been pilot-testing an EEW based elevator recall system at the
29 SFGO, and is currently evaluating installation of EEW based Public
30 Address system notification and elevator recall at the 300 Lakeside
31 Drive headquarters in Oakland.

²⁸ There are instances (e.g., in the immediate earthquake area) where little or no notification is possible.

1 In addition to the implementation of the capability to issue EEW
2 alerts, PG&E also plans to develop and integrate EEW education
3 and response training into employee safety programs. This
4 encompasses the roll out of the EEW Program to other critical
5 locations throughout PG&E's service territory.

6 The EP&R Strategy and Execution Capital Projects forecast is
7 \$2.0 million in 2021, \$2.0 million in 2022, \$2.1 million in 2023,
8 \$2.1 million in 2024, \$2.1 million in 2025, and \$2.2 million in 2026.²⁹

9 **b. EP&R Field Operations (All Hazards, EPNDR-C004)**

10 The capital expenditures associated with the PSS team in EP&R
11 Field Operations includes the utilization of the Salesforce database
12 platform to capture activity and regulatory compliance engagement.
13 Additionally, the database is aligned with the Commissions' decision
14 related to safety phase protocols and procedures that requires PG&E to
15 provide first responders information about PG&E's systems, for external
16 public safety partners (first responders).³⁰ PG&E's forecast is
17 \$3.1 million in 2021, \$3.0 million in 2022, \$3.3 million in 2023,
18 \$3.1 million in 2024, \$3.2 million in 2025, and \$3.3 million in 2026.³¹
19 Capital forecasts for 2021-2022 are shown in Chapter 4.2, Section
20 C.2.h.

21 All the EP&R Field Operations capital work is associated with the
22 EP&R control (EPNDR-C004).

23 **c. WSOC/HAWC (EPNDR-C002)**

24 The capital expenditures associated with the WSOC/HAWC include
25 costs for establishing a physical monitoring site outside of
26 San Francisco to a new or upgraded facility, which is projected to take
27 place in 2021. Equipment costs (new laptops or other technical
28 upgrades) are also included in the forecast. PG&E's forecast is

²⁹ See Exhibit (PG&E-4), WP 5-12, line 2, for 2023 to 2026 forecast.

³⁰ D.11-07-004, Decision on the Safety Phase Protocols and Procedures Adopted for Pacific Gas and Electric Company, July 5, 2011, Ordering Paragraph 1.

³¹ See Exhibit (PG&E-4), WP 5-12, line 4, for 2023 to 2026 forecast; see Exhibit (PG&E-4), WP 4-17, line 14, for 2021 and 2022.

1 \$1.5 million in 2021, \$0.1 million in 2022, \$0.1 million in 2023,
 2 \$0.2 million in 2024, \$0.2 million in 2025, and \$0.2 million in 2026.^{32 33}

3 All the EP&R WSOC/HWAC capital work is associated the EP&R
 4 control (EPNDR-C002).

5 d. MWC 21 Forecast Summary

6 Table 5-8 summarizes the capital forecast in MWC 21.

TABLE 5-8
MWC 21 CAPITAL SUMMARY
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Work Description	2020 Recorded	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	WP Reference
1	EP&R Strategy and Execution Technology	\$518	\$2,046	\$1,966	\$2,143	\$2,075	\$2,093	\$2,160	WP 5-12, line 2
2	All Hazards – Field Operations and WSOC/HWAC	–	–	–	3,359	3,334	3,364	3,465	WP 5-12, lines 3-4
3	Total	\$518	\$2,046	\$1,966	\$5,502	\$5,409	\$5,457	\$5,626	

7 D. Estimating Methods

8 PG&E's Strategy and Execution expense 2023 forecast for EP&R was
 9 developed based on estimating staffing and work needs as described in this
 10 chapter. The costs associated with the WSOC/HWAC were derived based on
 11 the estimated staffing requirements to support the expansion and transition to
 12 serve as a centralized hub for emergency and hazard communications. The
 13 costs associated with the EP&R Field Operations were derived based on the
 14 estimated staffing requirements to continue to build out core capabilities
 15 including monitoring, assessment, and communication of pertinent information
 16 for all emergency events. These recorded expenses were adjusted for
 17 escalation, consistent with rates described in Chapter 2 of this exhibit.

18 PG&E's capital forecast for EP&R Strategy and Execution Technology from
 19 is based on estimates for each individual project. Field operations used 2020

³² See Exhibit (PG&E-4), WP 5-12, line 5, for 2023 to 2026 forecast; see Exhibit (PG&E-4), WP 4-18, line 2, for 2021 and 2022.

³³ Capital 2020 recorded and forecasts for 2021-2022 are shown Chapter 4.1, Section C.1.b.

1 recorded cost as the proxy for the annual forecast including escalation for
2 2023-2026. The capital for WSOC/All Hazards is estimated by any needed
3 equipment needs or costs that may still be outstanding related to relocation or
4 back-up facilities.

5 **E. Compliance With Section 5.2 of the 2020 GRC Settlement Agreement**
6 **(“Deferred Work Principles”)**

7 The 2020 GRC Settlement Agreement requires PG&E to include testimony
8 in this GRC on deferred work if the following criteria are met:

- 9 (a) The work was requested and authorized based on representations that it
10 was needed to provide safe and reliable service (Check 1);
11 (b) PG&E did not perform all of the authorized and funded work, as measured
12 by authorized (explicit or imputed) units of work (Check 2); and
13 (c) PG&E continues to represent that the curtailed work is necessary to provide
14 safe and reliable service (Check 3).

15 Work that was authorized in the 2020 GRC for MWCs in this chapter is
16 needed to provide safe and reliable service, however there was not work that
17 met the criteria for deferred work as described in the Settlement Agreement.
18 This analysis is presented in the workpapers supporting Chapter 2 of this
19 Exhibit.³⁴

20 **F. Cost Tables**

21 The capital and expense forecasts for EP&R related activities are
22 summarized in the following tables:

- 23 • Table 5-9 lists the expense MWCs, showing 2016 through 2020 recorded
24 expenses and 2021 through 2023 forecast expenses.

25 Table 5-10 lists the capital MWC, showing 2016 through 2020 recorded
26 expenses and 2021 through 2026 forecast expenditures.

³⁴ See Exhibit (PG&E-4), WP 2-13.

**TABLE 5-9
EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			WP Reference
			2016	2017	2018	2019	2020	2021	2022	2023	
1	AB	Misc Expense	\$6,296	\$4,740	\$5,574	\$6,045	\$7,556	\$4,209	\$4,215	\$26,534	WP 5-1, line 1
2	JV	IT	(73)	-	-	-	-	-	-	-	WP 5-1, line 2
3		Total	\$6,223	\$4,740	\$5,574	\$6,045	\$7,556	\$4,209	\$4,215	\$26,534	

**TABLE 5-10
CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			WP Reference			
			2016	2017	2018	2019	2020	2021	2022	2023		2024	2025	2026
1	21	EPR Capital	\$3,595	\$1,640	\$219	\$715	\$518	\$2,046	\$1,966	\$5,502	\$5,409	\$5,457	\$5,626	WP 5-6, line 1
2		Total	\$3,595	\$1,640	\$219	\$715	\$518	\$2,046	\$1,966	\$5,502	\$5,409	\$5,457	\$5,626	

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 6
ELECTRIC EMERGENCY RECOVERY

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 6
ELECTRIC EMERGENCY RECOVERY

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 6**
3 **ELECTRIC EMERGENCY RECOVERY**

4 **A. Introduction**

5 **1. Scope and Purpose**

6 This chapter demonstrates the reasonableness of Pacific Gas and
7 Electric Company's (PG&E) expense and capital forecasts for the Electric
8 Emergency Recovery (EER) Program and catastrophic event straight-time
9 (ST) labor previously recovered in the Catastrophic Event Memorandum
10 Account (CEMA). The EER forecast is for the following activities:
11 (1) responding to incidents and outages during Routine and Major
12 Emergencies; (2) performing equipment repairs and replacements related to
13 Routine and Major Emergencies; (3) staffing the Emergency Operations
14 Center (EOC), Regional Emergency Centers (REC) and Operations
15 Emergency Centers (OEC) during Major Emergencies; and (4) ST labor
16 expenses when responding to CEMA-eligible events.

17 The cost forecasts described in this chapter are unique and do not
18 duplicate the cost forecasts described in any other chapter in this exhibit.
19 Forecasts in this chapter are shown with escalation¹ at the Major Work
20 Category (MWC) level and include expense and capital.

21 In addition, this chapter demonstrates the reasonableness of 2020 EER
22 program costs recorded in the Wildfire Mitigation Plan Memorandum
23 Account (WMPMA). Attachment A to this chapter provides this showing.

24 **2. Summary of Request**

25 PG&E requests that the California Public Utilities Commission
26 (Commission) adopt PG&E's 2023 expense forecast of \$136.5 million for the
27 EER program.² The 2023 expense forecast is \$38.4 million more than the
28 2020 recorded adjusted expenses of \$98.0 million.

1 See Exhibit (PG&E-4), Ch. 2 for more information on escalation.

2 See Exhibit (PG&E-4), WP 6-1, line 3. The forecast amount includes Electric Operations' CEMA ST labor cost, which is also included in WP 6-28, CEMA ST workpaper.

1 PG&E further requests that the Commission adopt the following capital
2 expenditure forecasts for EER: \$269.6 million for 2021; \$311.4 million for
3 2022; \$319.2 million for 2023; \$328.4 million for 2024; \$337.9 million for
4 2025; and \$347.7 million for 2026.³ The 2023 capital forecast is \$7.4 million
5 more than 2020 recorded adjusted capital expenditures of \$311.8 million.

6 PG&E's also requests the Commission adopt total company expense
7 and capital forecast for ST labor costs associated with CEMA-eligible
8 events, and approve a new two-way balancing account, the Catastrophic
9 Event Straight-Time Labor Balancing Account (CESTLBA). For further
10 discussion on Catastrophic Event Straight-Time Labor, refer to Section F.2
11 below.

12 PG&E proposes continuing the Major Emergency Balancing Account
13 (MEBA)⁴ to account for the actual costs incurred from responding to major
14 emergencies events that are not eligible for recovery through the CEMA or
15 the proposed CESTLBA, if approved by the Commission in the 2023
16 General Rate Case (GRC).

17 Forecasts in this chapter are sub-divided into three programs, each with
18 corresponding expense and capital forecasts: (1) Routine Emergency,
19 (2) Major Emergency and (3) Catastrophic Event Straight-Time Labor for
20 Electric Operations.

21 **a. Routine Emergency**

22 PG&E requests that the Commission adopt PG&E's 2023 expense
23 forecast of \$73.7 million for Routine Emergency.⁵ The 2023 expense
24 forecast for Routine Emergency is \$6.6 million (or 10 percent) higher
25 than PG&E's 2020 recorded costs of \$67.1 million.

26 PG&E further requests that the Commission adopt the following
27 capital expenditure forecasts for Routine Emergency: \$193.2 million for

3 See Exhibit (PG&E-4), WP 6-9, line 3. The forecast amount includes Electric Operations' CEMA Straight time labor cost, which is also included in WP 6-28, CEMA Straight-time workpaper.

4 The purpose of MEBA is to account for and recover the actual expenses and capital revenue requirements resulting from responding to major and catastrophic emergencies, that are not eligible for recovery through the CEMA or the proposed CESTLBA.

5 See Exhibit (PG&E-4), WP 6-1, line 1.

1 2021; \$233.4 million for 2022; \$239.2 million for 2023; \$246.1 million for
2 2024; \$253.3 million for 2025; and \$260.6 million for 2026.⁶ The 2023
3 capital forecast for Routine Emergency is \$8.3 million (or 3 percent)
4 lower than PG&E's 2020 recorded costs of \$247.5 million.

5 **b. Major Emergency**

6 PG&E requests that the Commission adopt PG&E's 2023 expense
7 forecast of \$42.7 million for Major Emergency.⁷ The 2023 expense
8 forecast for Major Emergency is \$11.7 million (or 38 percent) higher
9 than the 2020 recorded costs of \$31.0 million.

10 PG&E further requests that the Commission adopt the following
11 capital expenditure forecasts for Major Emergency: \$60.8 million for
12 2021; \$62.1 million for 2022; \$63.6 million for 2023; \$65.5 million for
13 2024; \$67.4 million for 2025; and \$69.3 million for 2026.⁸ The 2023
14 capital forecast for Major Emergency is \$0.6 million (or 1 percent) less
15 than PG&E's 2020 recorded costs of \$64.3 million.

16 **c. Catastrophic Event Straight-Time Labor Costs**

17 PG&E proposes to recover ST labor costs associated with
18 CEMA-eligible events through a new two-way balancing account
19 referred to as the CESTLBA.⁹ PG&E's total company 2023 expense
20 forecast is \$23.2 million.^{10,11} PG&E's total company capital forecast is
21 \$18.6 million for 2023, \$19.1 million for 2024, \$19.6 million for 2025, and
22 \$20.1 million for 2026.^{12,13}

6 See Exhibit (PG&E-4), WP 6-9, line 1.

7 See Exhibit (PG&E-4), WP 6-8, line 10.

8 See Exhibit (PG&E-4), WP 6-18, line 9.

9 For a discussion on the CEMA ST labor costs, see Section F.2 below.

10 The total company ST labor cost forecast includes Electric Operations' portion, which is also captured as part of EER program's total forecast. See Table 6-1, lines 3 and 5 for the ST labor forecast breakdown of Electric and Other Lines of Business (LOB) respectively.

11 See Exhibit (PG&E-4), WP 6-28, line 11.

12 The total company ST labor cost forecast includes Electric Operations' portion, which is also captured as part of EER program's total forecast. See Table 6-2, lines 3 and 5 for the ST labor forecast breakdown of Electric and Other LOBs respectively.

13 See Exhibit (PG&E-4), WP 6-28, line 6.

1 Tables 6-1 and 6-2 summarize the expense and capital forecasts for
 2 EER by sub-program and the total company CESTLBA.¹⁴

TABLE 6-1
TOTAL EXPENSE FORECAST
(THOUSANDS OF NOMINAL DOLLARS)

Line No	Description	2020 Recorded	2021 Forecast	2022 Forecast	2023 Forecast
1	Routine Emergency – Expense	\$67,075	\$59,274	\$59,361	\$73,678
2	Major Emergency– Expense	30,973	41,465	41,501	42,708
3	EER CESTLBA Expense	–	18,737	19,397	20,079
4	EER Total Expense	\$98,049	\$119,477	\$120,259	\$136,466
5	Other LOB CESTLBA Expense	–	2,899	3,001	3,106
6	Total Expense	\$98,049	\$122,375	\$123,260	\$139,571

TABLE 6-2
TOTAL CAPITAL FORECAST
(THOUSANDS OF NOMINAL DOLLARS)

Line No	Description	2020	2021	2022	2023	2024	2025	2026
1	Routine Emergency – Capital	\$247,499	\$193,244	\$233,354	\$239,188	\$246,137	\$253,271	\$260,615
2	Major Emergency – Capital	64,253	60,810	62,069	63,621	65,470	67,367	69,321
3	EER CESTLBA- Capital	–	15,541	15,945	16,375	16,817	17,271	17,738
4	EER Total Capital	\$311,752	\$269,595	\$311,368	\$319,184	\$328,424	\$337,910	\$347,674
5	Other LOB CESTLBA Capital	–	2,133	2,170	2,220	2,275	2,327	2,380
6	Total	\$311,752	\$271,727	\$313,538	\$321,404	\$330,698	\$340,237	\$350,054

3. Overview of Recorded and Forecast Costs

4 As shown in Table 6-3, PG&E records EER Program expenditures in
 5 four MWCs – both Routine Emergency and Major Emergency each have an
 6 expense MWC and a capital MWC. Electric CEMA-eligible costs are also
 7 recorded in the Major Emergency MWCs and are separated from MEBA
 8 costs using planning orders assigned to the respective cost types. For the
 9 purpose of the PG&E's 2023 GRC, all CEMA-eligible costs, except for the

¹⁴ 2021 and 2022 expense and capital forecasts for CESTLBA shown in Table 6-1 and 6-2 are shown for trending purposes, and actual costs will be recorded in the CEMA.

1 CEMA ST labor costs, have been removed from the recorded and forecast
2 costs.

3 Routine Emergency work is recorded in MWC BH – Routine Emergency
4 Expense and MWC 17 – Routine Emergency Capital.

5 Major Emergency (MEBA) work is recorded in MWC IF – Major
6 Emergency Expense and MWC 95 – Major Emergency Capital.

7 Electric CEMA Straight-time work is recorded in MWC IF – CEMA
8 Straight-Time Expense and MWC 95 – CEMA Straight-Time Capital.

**TABLE 6-3
MAJOR WORK CATEGORIES**

Line No.	MWCs	Description
1	<u>Expense MWCs</u>	
2	BH	Routine Emergency – Expense
3	IF	Major Emergency – Expense Electric CEMA Straight-Time - Expense
4	<u>Capital MWCs</u>	
5	17	Routine Emergency – Capital
6	95	Major Emergency – Capital Electric CEMA Straight-Time – Capital

9 **a. Expense**

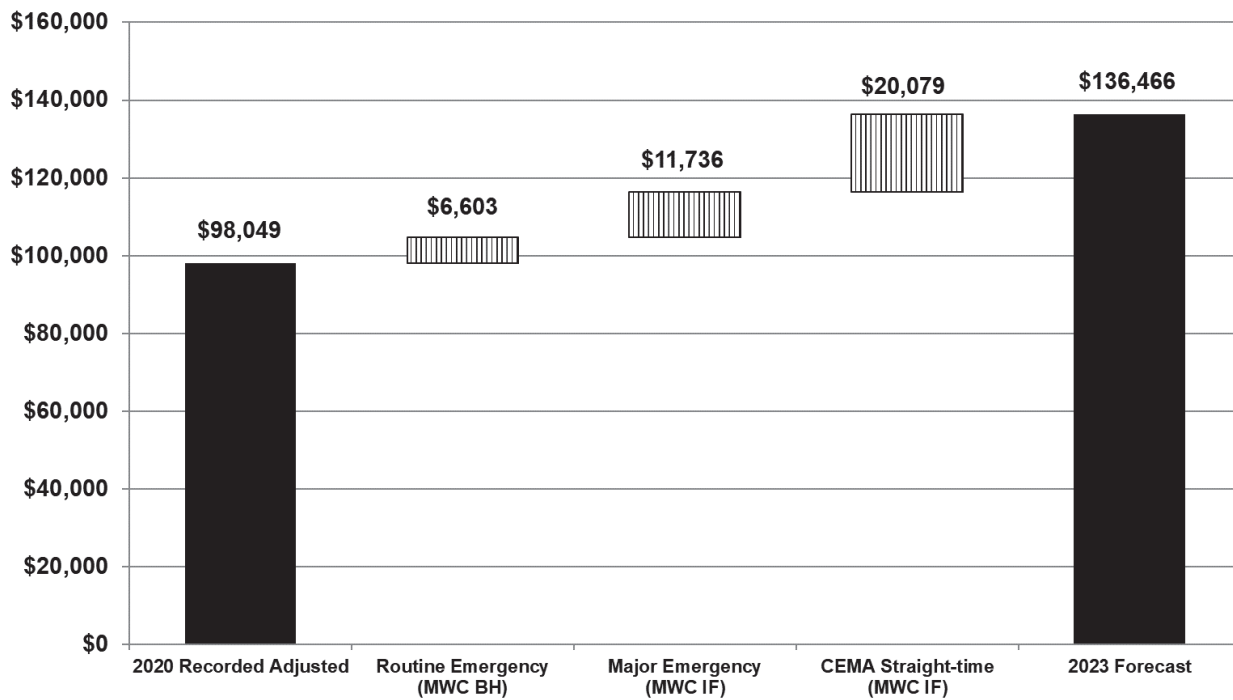
10 Figure 6-1¹⁵ shows the walk from 2020 recorded adjusted expense
11 amounts to the 2023 forecasts for Routine Emergency, Major
12 Emergency and Electric CEMA Straight-Time Labor. Because
13 emergency recovery work is primarily driven by weather events and
14 weather patterns that vary from year-to-year and are difficult to predict,
15 PG&E used averages of historical data to develop its forecast—
16 three years (2018-2020) for Routine Emergency and CEMA ST,¹⁶

¹⁵ This figure includes costs that are subject to recovery on a recorded basis through the CEMA memo account; these amounts are included for trending purposes because the activity will become GRC funded beginning in 2023.

¹⁶ Refer to Section F.2 for details on Catastrophic Event Straight-Time Labor forecast methodology.

1 five years (2016-2020) for Major Emergency (MEBA).¹⁷ The 2023
 2 forecasts for EER, as based on these historical averages, are higher
 3 than recorded expenditures in 2020. A forecast based on historical
 4 averages is appropriate given the year-to-year variability in EER costs.
 5 PG&E’s forecast methodology is discussed further in Section D of this
 6 chapter.

FIGURE 6-1
EER PROGRAM MWC EXPENSE WALK 2020-2023
(THOUSANDS OF NOMINAL DOLLARS)



7 **b. Capital**

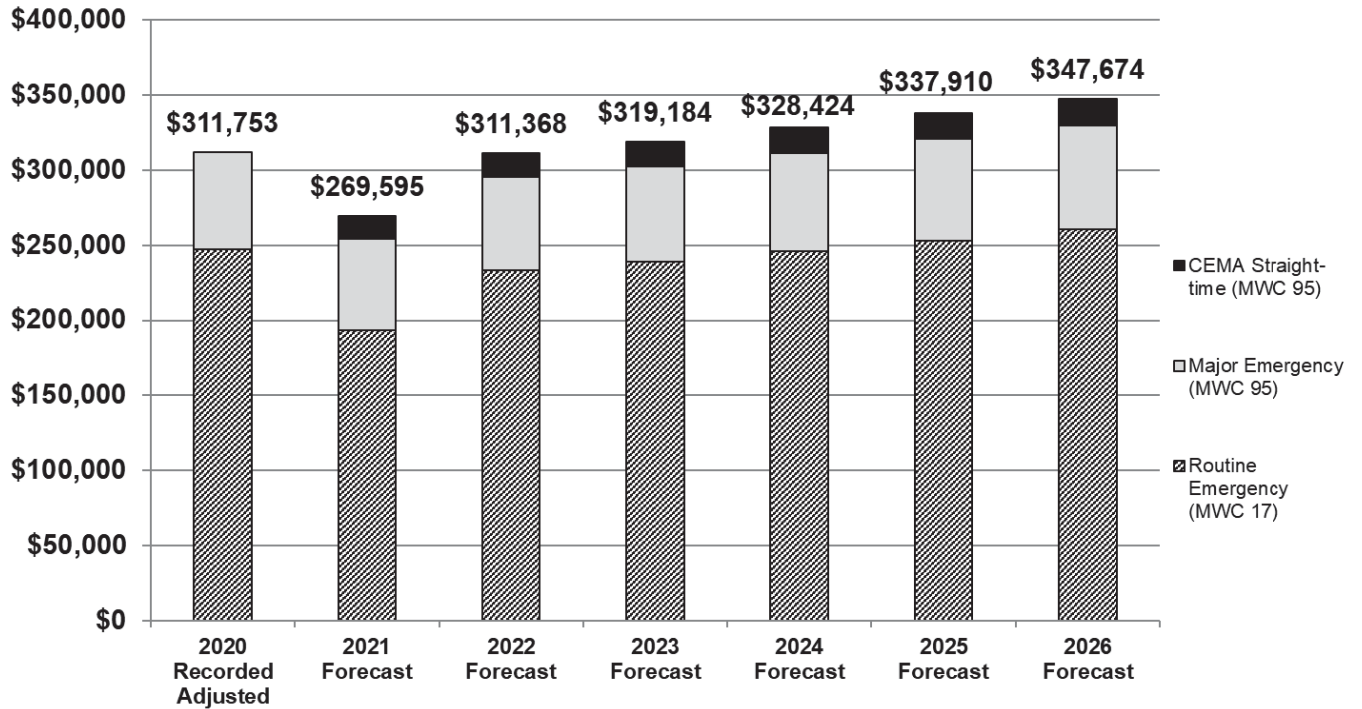
8 Figure 6-2 shows the 2020 recorded adjusted capital expenditures
 9 to 2026 forecast capital expenditures for Routine Emergency, Major
 10 Emergency and Electric CEMA Straight-Time Labor. Similar to the
 11 expense forecast, PG&E used an average of historical data to develop
 12 its capital forecast.¹⁸ The 2023 capital expenditure forecasts for EER,

¹⁷ All CEMA-eligible costs have been removed from the recorded costs used to develop the MEBA forecast.

¹⁸ *Ibid.*

1 as based on these historical averages, are higher than recorded
2 expenditures in 2020.

FIGURE 6-2
EER PROGRAM CAPITAL RECORDED AND FORECAST 2020-2026
(THOUSANDS OF NOMINAL DOLLARS)



3 **4. Support for Request**

4 PG&E's Routine and Major Emergency expense and capital expenditure
5 forecasts are reasonable and should be approved. The EER Program
6 allows PG&E to comply with General Order (GO) 166 – Standards for
7 Operation, Reliability, and Safety during Emergencies and Disasters – by
8 providing effective outage restoration efforts in response to Routine
9 Emergencies caused by equipment failures and Major Emergencies that are
10 mainly caused by major weather-related events. PG&E successfully
11 maintains the effectiveness of the EER Program while controlling overall
12 expenditures by:

- 13 • Maintaining an effective operational plan designed to support the safe
14 and reliable delivery of power to customers while striving to minimize
15 outage impacts;

- 1 • Maintaining a clear, well-defined electric emergency process to guide
2 incident assessment and response;
- 3 • Reviewing labor and material charges to correctly classify them as
4 Routine or Major Emergencies; and
- 5 • Maintaining key operational performance measures to assess EER’s
6 effectiveness and identify areas for further improvement.

7 **5. Organization of the Remainder of This Chapter**

8 The remainder of the chapter is organized as follows:

- 9 • Section B – Program and Risk Overview;
- 10 • Section C – Activities, Costs, and Forecast Drivers by MWC;
- 11 • Section D – Estimating Methods;
- 12 • Section E – Compliance with Section 5.2 of the 2020 GRC Settlement
13 Agreement (“Deferred Work Principles”);
- 14 • Section F – Balancing and Memorandum Accounts;
- 15 • Section G – WMPMA : Reasonableness Review of Electric Emergency
16 Costs;
- 17 • Section H – Cost Tables; and
- 18 • Attachment A – Recovery of Electric Emergency Recovery Costs
19 Recorded in the Wildfire Mitigation Plan Memorandum Account.

20 **B. Program and Risk Overview**

21 **1. Program Description**

22 Electric emergencies are created when outages occur and require
23 immediate response by PG&E to restore customer service and protect the
24 community from potential safety hazards. Emergency outages can range
25 from Routine Emergencies resulting from equipment failures to Major and
26 Catastrophic Emergencies arising from storms and other natural
27 disasters.¹⁹ PG&E’s response to electric emergencies is a fundamental
28 part of operating an electric distribution system and is subject to the
29 requirements of GO 166. PG&E has developed a proactive approach to
30 prepare for all emergencies and reduce response times to restore service to
31 customers. PG&E prepares an electric emergency response plan that

19 The distinction between Routine and Major Emergencies is discussed in greater detail below.

1 defines staffing levels, roles and responsibilities, emergency incident
2 assessment guidelines, and communication plans. The response plan
3 supports PG&E's activation of emergency centers and mobilization of crews
4 and other resources to respond to routine and major emergencies. PG&E's
5 top priority when responding to emergencies is the safety of the public and
6 its employees. PG&E's next priority is the timely restoration of service to its
7 customers experiencing any outages.

8 Weather-related emergencies are the leading driver of major and
9 catastrophic emergency response costs for PG&E. As shown by the list
10 below, from resources such as National Climate Data Center (NCDC),
11 Geographic Area Coordination Center, National Oceanic and Atmospheric
12 Administration, and North American Drought Monitor, in the past five years,
13 the weather impacting PG&E's service area has been extreme; this extreme
14 weather has resulted in an unusually high number of major emergency and
15 catastrophic declared emergency (CEMA) events.

- 16 • The five-year period from January 2016 through December 2020 was
17 the warmest five-year period on record for California (rank 1 of 126).
- 18 • Every year between 2016 through 2020 except 2019 was a top-3
19 warmest year on record for that time.
- 20 • The 2016-2017 water year was the wettest on record for the Northern 6
21 Sierra index (rank 1 of 100), and second wettest on record for the San
22 Joaquin index (rank 2 of 108).
- 23 • The 2018-2019 water year was also a wet year and featured a top 5
24 wettest and top 10 coldest February (NCDC) when many monthly
25 snowfall records were broken across the Sierra.
- 26 • The heavy rains in 2016-2017 and again in 2018-19 (NCDC) promoted
27 extensive vegetation growth that dried-up during the normally dry
28 summer and became fuel for numerous fires throughout PG&E's service
29 territory during the fall.
- 30 • October and November 2019 saw many Diablo wind events including a
31 very strong and damaging wind event for Central and Northern California
32 on October 26th.

1 During 2020, there were even more weather extremes:

- 2 • Calendar year 2020 was the third driest and third warmest on record.
3 (NCDC)
- 4 • February 2020 was the first time on record (back to 1921) that the
5 California Data Exchange Center weather stations comprising the
6 Northern Sierra 8-station precipitation Index measured 0.00” of rainfall.
- 7 • The three-month period August 2020 through October 2020 during the
8 peak of fire season was the driest and warmest on record (out of 126
9 years). (NCDC)
- 10 • By the middle of fall of 2020, approximately 65 percent of California was
11 experiencing drought conditions and approximately 35 percent was rated
12 as having severe or extreme drought conditions.
- 13 • 2020 also saw the largest number of acres burned across the state
14 including 5 of the 6 largest wildfires on record, with most ignited by a
15 lightning storm in mid-August when over 7,500 cloud-to-ground strikes
16 were observed.
- 17 • The weather in 2020 included three Level 4 events (see below for a
18 description of PG&E’s Incident Levels), during which 400-750 thousand
19 customers lost service. EER leveraged basecamps, staging areas,
20 communication plans, and incident command processes established by
21 PG&E’s Emergency Preparedness and Response (EP&R) organization
22 to deploy an effective response effort to these events.

23 **a. Electric Emergency Recovery Process Overview**

24 PG&E’s Distribution System Operations (DSO) monitors the
25 distribution grid to identify outages and direct the scheduling and
26 dispatching of field personnel to address identified abnormal conditions.
27 PG&E typically identifies outages through alarms from field devices such
28 as circuit breakers or reclosers, SmartMeter™ data, notifications from
29 police and fire departments, preventive maintenance patrols and
30 inspections, and calls from customers’ reporting an outage. Once
31 outages have been identified, personnel are deployed to address them.

32 PG&E also proactively attempts to anticipate potential outage
33 events by using the DSO Storm Outage Prediction Project (SOPP)
34 forecasting model. This model evaluates potential impacts to the

1 electric system from adverse weather forecasts, translates this data into
2 expected outage activity, and estimates the resources required to
3 respond effectively. The model is a key component of PG&E's EER
4 Program. Using the detailed information that the DSO SOPP model
5 provides, PG&E can mobilize resources several days in advance of an
6 anticipated major adverse weather event.

7 PG&E follows a defined process to ensure emergency priorities are
8 addressed by field personnel and system operators:

- 9 • Make Safe: Addressing hazardous conditions first to support public
10 and employee safety;
- 11 • Assess: Assessing the outage location to identify the cause
12 (if possible), determine the necessary resources to address the
13 situation (material, equipment, and personnel), and estimate the
14 time necessary to make repairs;
- 15 • Communicate: Coordinating various technologies to provide
16 customers and public agencies with outage information, such as the
17 cause of an outage and Estimated Time of Restoration; and
- 18 • Restore: Coordinating work activities to restore service. This is
19 completed by reconfiguring the distribution grid and repairing
20 damaged facilities, depending on the nature of the event.

21 **1) Distinguishing Between Routine Emergency and Major 22 Emergency**

23 PG&E has five incident levels, which are further described in the
24 next section. Level 1 incidents are classified as Routine
25 Emergencies. Level 3 through 5 incidents are classified as Major
26 Emergencies. A Level 2 emergency can be categorized as either a
27 Routine Emergency or Major Emergency, depending on whether an
28 OEC is fully activated. OECs are positioned within each region.
29 They provide oversight and support at the divisional level by
30 directing and coordinating the personnel necessary to assess
31 damages, secure hazardous situations, restore service, and
32 communicate status information internally and externally. OECs
33 report to their region's REC, which coordinates the activities of all
34 OECs.

1 An OEC may be activated if any one of the following criteria is
2 met:

3 Criteria 1: A division meets the outage trigger presented in
4 Table 6-4 below.²⁰ The outage triggers²¹ (and underlying outage
5 numbers) vary by division due to the differences in geographical
6 size, electric infrastructure design (i.e., overhead versus
7 underground, urban versus rural), outage history, and resource
8 availability.

20 A qualifying outage is one that continues for at least 30 minutes, at the transformer level or above.

21 The Outage Trigger is derived by taking the 6-hour period's stable outage average (i.e., outages that continue for at least 30 minutes) and multiplying it by 50 percent.

**TABLE 6-4
OEC ACTIVATION CRITERIA BY DIVISION**

Line No.	Division	Real Time Outage Management Tool Outage Trigger (Transformer and Above)
1	Central Coast	9
2	De Anza	5
3	Diablo	5
4	East Bay	5
5	Fresno	8
6	Humboldt	7
7	Kern	5
8	Los Padres	6
9	Mission	5
10	North Bay	5
11	North Valley	8
12	Peninsula	5
13	Sacramento	6
14	San Francisco	5
15	San Jose	5
16	Sierra	9
17	Sonoma	5
18	Stockton	6
19	Yosemite	8

- 1 Criteria 2: A predicted major emergency event in which either:
- 2 a) A PG&E division's DSO SOPP forecast is at Category 2²² or
- 3 above and PG&E predicts that the event will ultimately meet
- 4 the requirements of Criteria 1 above; or
- 5 b) There is a wildfire event that does not meet the
- 6 requirements of Criteria 1 above, but where:
- 7 i) PG&E de-energizes electric distribution facilities to
- 8 mitigate public safety risk and/or first responder risk,
- 9 including at the request of responding agencies, such
- 10 as the California Department of Forestry and Fire

22 DSO SOPP Category 2 indicates that adverse weather is possible, and that there should be a staffing plan in place for possible escalation.

1 Protection, U.S. Forest Service, and/or city or county
2 government; and

3 ii) PG&E mobilizes resources from outside the affected
4 district to address the wildfire event.

5 Once an OEC is activated, the incident is considered a Major
6 Emergency. If PG&E does not activate an OEC to respond to the
7 incident, it is considered a Routine Emergency.

8 When PG&E forecasts that a major weather event is likely to
9 occur, work orders are created under MWCs IF and 95 for crews to
10 record their restoration and recovery activities. All costs charged to
11 these work orders are reviewed monthly by a group consisting of the
12 EER Business Finance Lead, and the EER Manager. The group
13 determines whether the work was correctly charged to each order,
14 and whether the order covers an event that meets the criteria for a
15 Major Emergency. If the group determines that an event did not
16 meet the criteria of a Major Emergency, the costs are charged as
17 Routine Emergency costs to MWC BH for expense and MWC 17 for
18 capital.

19 **a) PG&E Incident Levels**

20 PG&E's Company Emergency Response Plan defines
21 incident levels that function as part of a decision support tool
22 which determines PG&E's actions to coordinate and deploy the
23 needed resources to respond to emergency incidents. The
24 five incident levels are described below:

- 25 • Level 1 – Routine: A Level 1 emergency is typically at the
26 local level, involving a limited number of customers with an
27 anticipated restoration response time of within 24 hours.
28 In a Level 1 emergency, PG&E can respond adequately
29 using standard operations and resources. The local
30 operating departments coordinate resource deployment in a
31 Level 1 emergency. This level does not require the
32 activation of an OEC.
- 33 • Level 2 – Elevated: Level 2 emergencies are defined as a
34 pending potential incident or a local emergency that may

1 require more than routine operations response. Resources
2 are mainly provided by the impacted division, but there is a
3 possibility that outside division resources may need to move
4 within the region. For Level 2 emergencies, an OEC may
5 be activated for communications only or fully activated to
6 provide oversight and support at a divisional level.

- 7 • Level 3 – Serious: Level 3 emergencies are serious
8 incidents involving large numbers of customers. Divisional
9 resources mainly move within the region, but may need to
10 move between regions. In Level 3 emergencies, OECs are
11 activated to direct and coordinate the personnel necessary
12 to assess damages, secure hazardous situations, restore
13 service, and communicate status information internally and
14 externally. REC and EOC activations are possible. The
15 REC provides oversight and support to the OEC(s) at a
16 regional level. As an event escalates, the REC becomes
17 the point of contact for assessing information and for
18 managing escalated OEC issues.
- 19 • Level 4 – Severe: Level 4 emergencies are very serious
20 incidents with company-wide impact or extended multiple
21 emergency incidents that impact large number of
22 customers. Resources move between regions, general
23 contractors are utilized, and mutual aid may be needed.
24 During a Level 4 emergency, the OEC, REC, and EOC are
25 activated. Additionally, the EP&R team assumes incident
26 command.
- 27 • Level 5 – Catastrophic: Level 5 emergencies involve a
28 catastrophic event that includes multiple emergency
29 incidents, impacts large number of customers, extensive
30 infrastructure risk and damage. This emergency level
31 affects the entire Company's ability to conduct normal
32 business operations. Full mobilization of Company
33 resources is needed to respond, and mutual aid resources
34 are needed. During a Level 5 event, all emergency centers

1 are fully activated, and the EP&R team assumes incident
2 command.

3 **b. Management Structure**

4 EER management personnel are located throughout the service
5 territory to assist with emergency preparedness, response, financial
6 support, and oversight. These personnel reside in the Emergency
7 Management Department. The Emergency/Restoration process within
8 PG&E's Electric Distribution Operations utilizes a centralized-process
9 ownership model that aims for end-to-end accountability for various
10 emergency work streams. The Emergency/Restoration process owner
11 oversees the Emergency Management Department, including centrally
12 managing the emergency response and restoration process, and
13 coordinate related activities. The process owner reports to the Senior
14 Director of Distribution Grid Operations, who reports to the Vice
15 President of Distribution Operations.

16 **c. Key Metrics and Other Performance Measures**

17 PG&E employs key measures and metrics to evaluate and
18 determine if its distribution restoration work processes are effective. For
19 instance, DSO is responsible for monitoring the distribution grid,
20 identifying issues and directing work that is ultimately executed by
21 Troublemens and crews in EER. By employing key metrics, PG&E
22 ensures that the organizations handling emergency response are
23 efficiently working together to meet the same goals to safely restore
24 power. For this reason, EER and DSO use the same metrics.

25 A primary performance metric used to evaluate PG&E's commitment
26 to public safety is PG&E's time to respond to 911 calls (or 911 standby
27 response) once they have been received. Since even short distances
28 can take considerable travel time, depending on traffic and/or
29 geography, the emergency-response-time metric focuses managers'
30 efforts to identify and distribute resources so that prompt response
31 occurs. There is a direct link between public safety and a utility's timely
32 response to emergency situations, which is why PG&E selected
33 emergency response time for this element of the performance metric.

1 PG&E began benchmarking its 911 standby response times against
2 other utilities in 2012. In the past several years, PG&E has significantly
3 improved its call response time from third quartile to first decile. PG&E
4 is a leading utility in 911 response and is often benchmarked by other
5 utilities. PG&E measures 911 standby performance every day without
6 exception. This includes both major and catastrophic event days and
7 routine day-to-day operations.

8 The emergency response time metric measures the percentage of
9 electric emergency calls to which PG&E personnel respond within
10 60 minutes of the time the call is received. Measurement begins with
11 the receipt of the call from a 911 public safety agency to PG&E's
12 dedicated 911 Agency phone number. Upon receiving the 911 call, a
13 911 standby tag is generated in the Outage Information System (OIS).
14 Electric Dispatch dispatches the 911 standby tag to the closest
15 Troubleman or 911 standby resource for response.²³ Once the
16 Troubleman or resource arrives on site, the OIS is updated either
17 directly by the employee via the Field Automation System or by phone to
18 Electric Dispatch, which then updates OIS. The metric measures the
19 time between the initiation of the 911 standby tag and the arrival of the
20 Troubleman or 911 standby resource arriving on site, and is captured
21 directly in OIS as the system of record.

22 911 Standby performance is reviewed daily by PG&E's Electric
23 Dispatch organization and audited quarterly by the Internal Auditing
24 team to validate the accuracy of the performance results.

25 Table 6-5 shows the percent of 911 electric emergency calls with
26 response times less than 60 minutes for the past five years.

23 A Troubleman is a qualified electrical worker used as the first responder to electric emergencies. A Standby Resource is a resource that has been trained to stand by energized electric equipment during an emergency to protect the public. These Standby Resource employees come from other departments and can include Gas Service Representatives, Meter Technicians, Estimators, and Meter Readers.

**TABLE 6-5
911 RESPONSE PERFORMANCE**

Line No.	Year	# 911 Request	# Within One Hour	% Compliant
1	2016	8,693	8,544	98.29%
2	2017	12,615	12,183	96.58%
3	2018	8,743	8,561	97.92%
4	2019	11,435	10,897	95.30%
5	2020	8,527	8,287	97.19%

2. Risk Controls and Mitigations

Risk controls and mitigations are aligned to various MWCs and MATs in Electric Distribution. None of the MWCs presented in this chapter correspond to a risk mitigation or risk control that address a risk on EO's Corporate Risk Register. Electric Emergency Recovery work is considered work performed post unplanned failure, and the costs associated with this work are included in the financial consequences of equipment failures. As such, the emergency recovery work is embedded in the quantification of the equipment failure risks, and not a risk control or mitigation. More information about risk mitigations and controls is in PG&E's Electric Distribution Risk Management testimony (Exhibit (PG&E-4), Chapter 3).

C. Activities, Costs and Forecast Drivers by MWC

This section describes the major expense and capital drivers to the Routine and Major Emergency forecasts provided in Figures 6-1 and 6-2. The CESTLBA forecast is discussed in Section F below.

1. Routine Emergency

The 2023 expense and capital forecasts for Routine Emergency are based on a three-year (2018-2020) average of recorded costs, adjusted for escalation. PG&E has also incorporated a cost-savings initiative into the expense forecast (MWC BH) for years 2021 and 2022, and in the capital

1 forecast (MWC 17) for 2021.²⁴ The 2023 expense forecast is higher and
2 the 2023 capital forecast is lower than PG&E's 2020 recorded costs.

3 **a. MWC BH – Routine Emergency Expense**

4 During routine conditions, overhead- or underground-related
5 outages occur for many reasons. In response to these outages,
6 Troublemens and crews make the situation safe, restore power to
7 customers, and isolate the trouble location so repairs can be made.
8 PG&E records costs for these activities in MWC BH.

9 **b. MWC 17 – Routine Emergency Capital**

10 The work in MWC 17 is similar to that of MWC BH and involves
11 routine emergency work that meets capital accounting criteria, such as
12 replacing equipment instead of repairing it.

13 **c. Routine Emergency Forecast Summary**

14 See Tables 6-6 and 6-7 for Routine Emergency expense and capital
15 expenditure forecasts.

**TABLE 6-6
SUMMARY OF RECORDED AND FORECAST FOR ROUTINE EMERGENCY EXPENSE WORK
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Description	2020 Recorded Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Workpaper Reference
1	BH – Routine Emergency	\$67,075	\$59,274	\$59,361	\$73,678	WP 6-1, line 1

²⁴ As explained in Exhibit (PG&E-2) Ch. 3, PG&E prepared its 2023 GRC forecast, starting first with the Plan of Reorganization forecast for the work included in the 2023 GRC and then adding updates to address company-wide work needs and priorities, risk mitigations, and cost-savings initiatives. Through the process of prioritizing the Electric Distribution portfolio and in accordance with the 2023 GRC forecast guidelines outlined in Exhibit (PG&E-2) Ch. 3, this forecast prioritizes funding for the most critical work and incorporates a cost-savings initiative which is identified as a reduction to the forecast. EO's work portfolio planning and prioritization process is discussed further in Exhibit (PG&E-4) Ch. 2.

TABLE 6-7
SUMMARY OF RECORDED AND FORECAST FOR ROUTINE EMERGENCY CAPITAL WORK
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	MWC	2020 Recorded Adj.	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	Workpaper Reference
1	17 – Routine Emergency	\$247,499	\$193,244	\$233,354	\$239,188	\$246,137	\$253,271	\$260,615	WP 6-9, line 1

1 **2. Major Emergency**

2 2020 was a significant year in terms of Major Emergencies. Major
3 Emergencies can be expected to occur on all Major Event days, and in 2020
4 PG&E experienced a higher than average number weather-related Major
5 Event Days (MED)²⁵ in its service territory. In 2020, PG&E recorded
6 14 Major Event days; the average number of MEDs per year for the
7 2000-2020 was 9.8, with a range of 3-31 days.

8 PG&E's 2023 MEBA expense forecast, and its annual capital
9 expenditures forecast for 2021-2026 are all based on five-year historical
10 averages (2016-2020).²⁶

11 **a. MWC IF – Major Emergency – Expense**

12 The work in MWC IF is identical to the work in MWC BH, except that
13 the work is performed in response to a Major or Catastrophic
14 Emergency.

15 **b. MWC 95 – Major Emergency – Capital**

16 The work in MWC 95 is the same as the work in MWC 17, except
17 that the work is performed in response to a Major or Catastrophic
18 Emergency.

25 MED is a day in which the daily System Average Interruption Duration Index (SAIDI) exceeds a MED threshold value. Statistically, days having a daily system SAIDI greater than T_{MED} are days on which the energy delivery system experienced stresses beyond that normally expected (such as during severe weather).

26 Major Emergency forecasts are developed after excluding costs that are eligible for CEMA, including CEMA ST Labor.

1 **c. Major Emergency Forecast Summary**

2 See Tables 6-8 and 6-9 for Major Emergency expense and capital
3 expenditure forecasts. The forecast summaries below exclude the
4 CESTLBA labor cost forecast.

**TABLE 6-8
SUMMARY OF RECORDED AND FORECAST FOR MAJOR EMERGENCY EXPENSE WORK
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Expense/Revenues by MWC	2020 Recorded Adj.	2021 Forecast	2022 Forecast	2023 Forecast	Workpaper Reference
1	IF – Major Emergency	\$30,973	\$41,465	\$41,501	\$42,708	WP 6-8, line 10

**TABLE 6-9
SUMMARY OF RECORDED AND FORECAST FOR MAJOR EMERGENCY CAPITAL WORK
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	2020 Recorded Adj.	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	Workpaper Reference
1	95 – Major Emergency	\$64,253	\$60,810	\$62,069	\$63,621	\$65,470	\$67,367	\$69,321	WP 6-18, line 9

5 **D. Estimating Methods**

6 **1. Routine Emergency**

7 Due to the variability of EER costs, PG&E used a three-year average
8 (2018-2020) to forecast both capital and expense for Routine Emergency
9 expenditures. Historic costs are escalated to accurately depict historical
10 costs in Base Year dollars in order to calculate test year costs. Base Year
11 costs are escalated using the escalation rates outlined in Chapter 2 of this
12 exhibit.²⁷

13 **2. Major Emergency**

14 Since the number and severity of Major Emergencies are unpredictable
15 from year-to-year, PG&E used a five-year average (2016-2020) of recorded
16 costs to forecast Major Emergency costs. A longer average period was

²⁷ See Exhibit (PG&E-4), WP 6-7 and WP 6-17, for details on forecast calculations for MWCs BH and 17.

1 used for Major Emergencies than for Routine Emergencies because Major
2 Emergencies are more variable from year-to-year. Recorded costs have
3 been adjusted to remove authorized CEMA-related recovery costs. In order
4 to present a forecast that properly reflects the current and future cost
5 structure view of MEBA, the average basis of using 2016-2019 costs to
6 develop the MEBA expense forecast was adjusted to remove certain
7 overhead costs that no longer reflect the current cost model structure, which
8 became effective in 2020. Furthermore, the historical costs are escalated to
9 Base Year dollars for averaging purpose to derive the test year forecast.²⁸

10 **E. Compliance With Section 5.2 of the 2020 GRC Settlement Agreement**
11 **(“Deferred Work Principles”)**

12 The 2020 GRC Settlement Agreement requires PG&E to include testimony
13 in this GRC on deferred work if the following criteria are met:

- 14 1) The work was requested and authorized based on representations that it
15 was needed to provide safe and reliable service (Check 1);
- 16 2) PG&E did not perform all of the authorized and funded work, as
17 measured by authorized (explicit or imputed) units of work (Check 2);
18 and
- 19 3) PG&E continues to represent that the curtailed work is necessary to
20 provide safe and reliable service (Check 3).

21 Work that was authorized in the 2020 GRC for MWCs in this chapter is
22 needed to provide safe and reliable service, however there was no work that met
23 the criteria for deferred work as described in the Settlement Agreement. This
24 analysis is presented in the workpapers supporting Chapter 2 of this Exhibit.²⁹
25 Emergency response work is conducted on an as-needed basis, and PG&E’s
26 forecast is based on historical averages. The actual amount of work completed
27 depends on the emergency work that is required during the rate case period.

²⁸ See Exhibit (PG&E-4), WP 6-8 and WP 6-18, for details on forecast calculations for MWCs IF and 95.

²⁹ See Exhibit (PG&E-4), WP 2-13.

1 F. Balancing and Memorandum Accounts

2 1. Major Emergency Balancing Account

3 PG&E's two-way MEBA was established in PG&E's 2014 GRC by
4 Decision 14-08-032. PG&E proposes to continue to book Major Emergency
5 costs to the MEBA. Most major emergencies are directly related to major
6 weather events. Recent years have shown the high degree of variability in
7 the number of major weather events from year to year. As described above,
8 between 2000 and 2020 there were on average approximately ten Major
9 Event Days per year (ranging from 3-31). In 2020, there were 14 Major
10 Event Days, 30 percent higher than the average of the previous 20 years.
11 This variation means that PG&E's response costs for weather-driven major
12 emergencies will also vary widely from year to year, due to factors beyond
13 PG&E's control that are difficult to forecast. All these factors reinforce the
14 need for continuing the MEBA. PG&E's electric emergency operations are
15 subject to GO 166 – Standards for Operation, Reliability, and Safety During
16 Emergencies and Disasters. The MEBA ensures that PG&E will be able to
17 recover costs when it deploys the resources needed to comply with GO 166
18 and effectively respond to major emergencies.

19 Some major emergency response costs are recovered as part of the
20 CEMA in a separate proceeding outside the GRC. Costs are considered
21 eligible for CEMA when there is a state-of-emergency or disaster declaration
22 from a competent state or federal authority with respect to the event causing
23 the emergency response, and the costs are deemed to be incremental.³⁰
24 PG&E employs the criteria and guidance from Resolution (Res.) E-3238 and
25 Public Utilities Code Section 454.9 to determine the costs eligible for CEMA
26 recovery. Res.E-3238 authorizes PG&E to record in its CEMA incremental
27 catastrophic event repair and restoration costs, as well as costs associated
28 with complying with government orders in connection with declared state
29 and federal disasters. PG&E reviews all major emergency response costs
30 to determine if they are eligible for recovery through CEMA. Only those
31 major emergency costs (MWCs IF and 95) deemed ineligible for CEMA
32 recovery are recorded to MEBA for recovery in the GRC.

30 "Incremental" costs are costs not funded through existing rates.

2. Catastrophic Event Straight-Time Labor Costs

a. Background

Historically, intervenors have argued against the recovery of ST labor through the CEMA filing due to the incorrect assumption that ST labor associated with CEMA-eligible events is already funded via base rates. As noted above, however, the GRC and Gas Transmission and Storage (GT&S) Rate Case historically have included forecast costs based on activities, not specific people or positions. Those activity-based forecasts—which were reduced to remove the costs of CEMA activities—take into account various cost components such as the replacement of assets and tools, and labor rates, which include a combination of ST, overtime, and double-time labor. Had CEMA activities been included in prior GRCs and GT&S Rate Cases, the forecasts would have been higher. Accordingly, cost components associated with CEMA activities, including CEMA straight-time labor costs, are incremental to base rates. To the extent those costs are determined to not be recoverable in PG&E’s CEMA proceedings, as argued by intervenors, those costs should be deemed to be recoverable on a forecast basis in the GRC. Otherwise, PG&E’s CEMA expenses would be underfunded.

When a CEMA-eligible event occurs, PG&E may have to deprioritize non-event response work to devote as many resources as possible to repair damaged electric and gas facilities and restore service as quickly as possible. In performing this work, PG&E crews often work around the clock, incurring not only ST, but also overtime and double-time labor costs.

Once the repair and restoration activities have concluded, PG&E crews return to their routine duties, including activities that had been postponed due to the CEMA-eligible event. Completing the postponed activities requires incremental overtime labor as well as significant incremental contract resources to offset resources diverted to the CEMA event response work. Yet, PG&E does not rely on quantifying those incremental costs to serve as a proxy for CEMA ST time labor. The costs are not charged to CEMA specific orders, but rather are incurred

1 to replace the labor (ST and overtime) originally intended for executing
2 base work.

3 Hence, the test of incrementality is not whether a cost is ST or
4 overtime. If that were the test, PG&E would book overtime costs to
5 CEMA specific orders for work unrelated to the catastrophic event such
6 as incremental overtime required for reprioritized base work. Similarly,
7 PG&E would exclude from CEMA-specific orders costs directly related
8 to a catastrophic event only because the costs were incurred during
9 normal working hours. PG&E does neither. CEMA ST labor is
10 incremental for the simple reason that the GRC and GT&S forecasts are
11 reduced commensurate with the cost of CEMA activities.

12 In this GRC, no activity forecast includes funding for CEMA activities
13 during the 2023 GRC period. To avoid any future misunderstanding
14 around the incrementality and recovery of CEMA ST labor costs, to
15 simplify future CEMA recovery applications, and to account for the
16 variability of CEMA-eligible catastrophic events occurrences, PG&E
17 proposes to recover CEMA ST labor costs through the proposed
18 CESTLBA beginning in 2023.

19 **b. Summary of Request**

20 PG&E proposes to recover ST labor costs associated with
21 CEMA-eligible events through a new two-way balancing account
22 referred to as the CESTLBA. For a discussion on the CEMA, see
23 PG&E's 2020 WMCE, Chapter 3.³¹ PG&E's total company test-year
24 expense forecast for CEMA ST labor is \$23.2 million. PG&E's total
25 company test year capital forecast for CEMA ST labor is \$18.6 million
26 for 2023, \$19.1 million for 2024, \$19.6 million for 2025, and \$20.1 million
27 for 2026.^{32,33} For a forecast breakdown by line of business, please see
28 Tables 6-10 and Table 6-11 below. PG&E proposes that all CEMA ST

31 See A.20-09.019, PG&E 2020 Wildfire Mitigation and Catastrophic Events Prepared Testimony, Chapter 3.

32 Total company ST labor cost forecast includes Electric Operations' portion, which is also captured as part of EER program's total forecast. See Table 6-2, lines 3 and 5 above for the ST labor forecast breakdown of Electric and Other LOBs respectively.

33 See Exhibit (PG&E-4), WP 6-28, line 6.

labor costs be eligible for recovery through the new CESTLBA. If this proposal is approved, PG&E would stop recording CEMA ST labor costs to the CEMA. PG&E is proposing this change to simplify cost recovery in future CEMA applications that seek recovery of recorded incremental costs beginning in 2023.

c. Forecast

PG&E CEMA ST labor expense and capital forecasts are as follows:

**TABLE 6-10
CATASTROPHIC EVENT ST LABOR EXPENSE FORECAST
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	LOB	MWC	2023
1	Customer Care	IG	\$144
2	Electric Distribution	IF	20,079
3	Gas Operations	LX	2,878
4	Generation	LX	84
5	Total		\$23,186

**TABLE 6-11
CATASTROPHIC EVENT ST LABOR CAPITAL FORECAST
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	LOB	MWC	2023	2024	2025	2026
1	Electric Distribution	95	\$16,375	\$16,817	\$17,271	\$17,738
2	Gas Operations	3Q	2,098	2,151	2,200	2,251
3	Generation	3Q	121	124	127	129
4	Total		\$18,595	\$19,092	\$19,598	\$20,118

See Exhibit (PG&E-4) WP 6-28 for additional forecast details for all LOB CESTLBA forecasts.

d. Forecast Methodology

The CESTLBA forecast is the average of the most recent three years of recorded CEMA ST labor costs (2018-2020), escalated to 2020 base year recorded dollars using the escalation factors provided in Exhibit (PG&E-12) Chapter 3. That amount is then escalated to future

1 forecast year dollars using the escalation factors presented in Exhibit
2 (PG&E-12), Chapter 3.^{34,35}

3 **e. Catastrophic Events Memorandum Account Straight-Time Labor**
4 **Balancing Account**

5 PG&E proposes the new CESTLBA be applicable to ST labor for all
6 CEMA eligible events beginning in 2023. PG&E proposes the
7 CESTLBA to be trueed up annually through PG&E's annual electric and
8 annual gas true up advice letters. The CESTLBA would refund to
9 customers any overcollections should CEMA activities not materialize at
10 the forecasted level. Likewise, the CESTLBA would allow PG&E to
11 recover any under-collections should CEMA activities materialize at a
12 level greater than the forecast level in this GRC. For further discussion
13 on the mechanics of the balancing account, see Exhibit (PG&E-12),
14 Chapter 7.

15 **G. WMPMA: Reasonableness Review of Electric Emergency Costs**

16 In this GRC application, PG&E is also requesting recovery of certain costs
17 for work performed in 2020 and recorded in the WMPMA. Attachment A of
18 Chapter 2 in Exhibit (PG&E-4) summarizes the amounts recorded in the
19 WMPMA in 2020, which includes \$5.5 million of capital expenditures in MAT
20 Code 17B. PG&E's showing to demonstrate the reasonableness of costs
21 incurred for emergency incremental equipment repairs and replacements and
22 recorded in the WMPMA is found in Attachment A to this Chapter.

23 **H. Cost Tables**

24 The expense and capital forecasts for EER-related activities are
25 summarized in the following tables:

- 26 • Table 6-12 lists the expense MWCs showing 2016 through 2020 recorded
27 expenses and 2021 through 2023 forecast expenses; and
- 28 • Table 6-13 lists the capital MWCs showing 2016 through 2020 recorded
29 expenditures and 2021 through 2026 forecast expenditures.

34 See Exhibit (PG&E-12) Ch. 3, Table 3-1, Expense.

35 *Id.*, Table 3-2, Capital.

**TABLE 6-12
EXPENSE
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted					Forecast			Workpaper Reference
			2016	2017	2018	2019	2020	2021	2022	2023	
1	BH	Routine Emergency – Expense	\$60,812	\$57,422	\$59,196	\$71,327	\$67,075	\$59,274	\$59,361	\$73,678	WP 6-1, line 1
2	IF	Major Emergency – Expense	44,184	52,362	28,836	117,555	30,973	41,465	41,501	42,708	WP 6-8, line 10
3	IF	EER CESTLBA Expense	–	–	–	–	–	18,737	19,397	20,079	WP 6-21, line 8 ^(a)
4		Total	\$104,996	\$109,784	\$88,032	\$188,882	\$98,049	\$119,477	\$120,259	\$136,466	

(a) See Exhibit (PG&E-4), WP 6-28 lines 7,9,10 for other LOBs.

**TABLE 6-13
CAPITAL
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	MWC	Description	Recorded Adjusted								Forecast			Workpaper Reference
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
1	17	Routine Emergency – Capital	\$171,406	\$183,903	\$187,744	\$212,620	\$247,499	\$193,244	\$233,354	\$239,188	\$246,137	\$253,271	\$260,615	WP 6-9, line 1
2	95	Major Emergency – Capital	46,303	62,705	33,078	72,935	64,253	60,810	62,069	63,621	65,470	67,367	69,321	WP 6-18, line 9
3	95	EER CESTLBA Capital	–	–	–	–	–	15,541	15,945	16,375	16,817	17,271	17,738	WP 6-28, line 2 ^(a)
4		Total	\$217,709	\$246,608	\$220,822	\$285,555	\$311,753	\$269,595	\$311,368	\$319,184	\$328,424	\$337,910	\$347,674	

(a) See Exhibit (PG&E-4), WP 6-28, lines 3,4,5 for other LOBs.

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 6
ATTACHMENT A
RECOVERY OF ELECTRIC EMERGENCY RECOVERY COSTS
RECORDED IN THE WILDFIRE MITIGATION PLAN
MEMORANDUM ACCOUNT

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 6
ATTACHMENT A
RECOVERY OF ELECTRIC EMERGENCY RECOVERY COSTS RECORDED IN
THE WILDFIRE MITIGATION PLAN MEMORANDUM ACCOUNT

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 6**
3 **ATTACHMENT A**
4 **RECOVERY OF ELECTRIC EMERGENCY RECOVERY COSTS**
5 **RECORDED IN THE WILDFIRE MITIGATION PLAN MEMORANDUM**
6 **ACCOUNT**

7 **A. Introduction**

8 The purpose of this testimony is to demonstrate the reasonableness of costs
9 incurred and recorded in the Wildfire Mitigation Plan Memorandum Account
10 (WMPMA) for the year 2020 for enhanced inspection and replacement of
11 damaged facilities found during inspection (Maintenance Activity Type (MAT)
12 code 17B). The 2020 incremental costs for this program are \$5.5 million in
13 capital expenditures for MAT code 17B.¹ Pacific Gas and Electric Company
14 (PG&E) seeks a determination that these costs were reasonably incurred and
15 approval to recovery them through customer rates.

16 **B. Project/Work Scope Overview**

17 This section summarizes the work activities completed in connection with
18 MAT 17B.

19 **1. Background**

20 The Wildfire Safety Plan (WSP) is PG&E's comprehensive plan to
21 reduce the risk of catastrophic wildfires from occurring in 2019 and beyond.
22 As part of the WSP, PG&E created and commenced a Wildfire Safety
23 Inspection Program (WSIP) to perform accelerated and enhanced
24 inspections of its electric distribution, transmission, and substation facilities,
25 with objective of identifying and repairing non-conforming or degraded
26 facilities that pose a safety and/or reliability risk. The WSIP focused on
27 PG&E's electric assets located in Tier 2 and Tier 3 High Fire Threat
28 Districts (HFTDs), as defined by the California Department of Forestry and
29 Fire Protection and adopted by the California Public Utilities Commission

¹ Please see Exhibit (PG&E-4), Ch. 2, Attachment A (p. 2-AtchA-3, line 1 to p. 2-AtchA-4, line 3) for a summary of the 2020 WMPMA and Fire Risk Mitigation Memorandum Account (FRMMA) costs.

1 (CPUC or Commission). WSIP activities include inspections of adjacent
2 areas with structures in close proximity to the HFTD areas. Over half of
3 PG&E's service territory lies in the HFTD Tiers 2 and 3, as identified by the
4 CPUC in 2018.²

5 Since 2019, the WSIP inspection process has been completed on all
6 distribution assets located in Tier 2 and Tier 3 HFTD areas. These
7 accelerated and enhanced inspections exceed General Order (GO) 165
8 five-year cycle requirements as follows:

- 9 • Tier 3 – enhanced overhead inspection yearly; and
- 10 • Tier 2 – enhanced overhead inspection every three years.

11 The Electric Corrective maintenance notifications that PG&E workers
12 issue following WSIP inspections are assigned a priority based on the
13 potential safety impact. PG&E uses the following priorities:

- 14 • A: conditions that require immediate action;
- 15 • B: conditions that generally need to be addressed within three months
16 from the date a condition is identified;
- 17 • E: conditions that need to be addressed within twelve months from the
18 date the condition is identified or within six months for conditions
19 creating a fire risk located in Tier 3 HFTD areas; and
- 20 • F: conditions that need to be addressed within five years from the date
21 the condition is identified.

22 **2. Work Performed (MAT 17B)**

23 The costs under review in this section are capital expenditures that were
24 incurred from inspection-related tags in HFTDs and subsequent
25 replacement of non-conforming or damaged facilities found during those
26 inspections (MAT 17B). Given the high volume of identified tags, PG&E
27 utilized a risk-informed prioritization approach to address the highest risk
28 issues on PG&E's facilities. The tags identified for these corrective actions
29 include findings such as chipped or broken insulators, pole replacements ,
30 transformers, conductors and cutouts loose cotter keys, missing markers,
31 signage, or foundation mastic application. PG&E has prioritized execution

2 CPUC, Fire-Threat Maps & the High Fire-Threat District (HFTD), at:
<www.cpuc.ca.gov/firethreatmaps> (accessed May 28, 2021).

1 of these tags based on ignition risk circuit prioritization and plans to continue
2 to make replacements based on this prioritization.

3 **C. Reasonableness Analysis**

4 This section addresses the reasonableness analysis for replacement of
5 damaged facilities found during enhanced inspections and includes the following
6 sections:

- 7 • Summary of Project/Program Work Costs; and
- 8 • Project/Program Work Need.

9 **1. Summary of Costs**

10 Forecasted costs for MAT code 17B were included in the 2020 General
11 Rate Case (GRC). However, in 2020, PG&E completed a substantially
12 higher volume of work than was forecast due to wildfire risk. These costs
13 were included in PG&E's 2020 WMP and PG&E is requesting their recovery
14 through the WMPMA. Table 6-1 shows the 2020 GRC imputed adopted,
15 2020 WMP target spend, and recorded costs, any disallowance amount
16 under the Wildfire OII decision, and the amount being requested for cost
17 recovery.

TABLE 6-1
SUMMARY OF 2020 DETAILED INSPECTION PROGRAM COSTS
(THOUSANDS OF DOLLARS)

Line No.	MAT Code	Imputed Adopted	WMP Target Spend	Recorded Adjusted	WMPMA Recorded	Wildfire OII Disallowance	WMPMA Request
1	17B	90,893	31,857	145,208	5,536	N/A	5,536

18 As shown in the table, the 2020 GRC imputed adopted amount for
19 MAT Code 17B is \$90.9 million. Subsequent to the forecasting process for
20 the 2020 GRC, PG&E identified the need to substantially increase WSIP
21 activities and forecasted costs for anticipated replacement of facilities under
22 WSIP due to wildfire risk. PG&E's 2020 costs for MAT 17B were
23 \$145.2 million, of which \$5.53 million was recorded to the WMPMA and the
24 remainder is part of base spending. The amount recorded to the WMPMA
25 are capital expenditures for wildfire mitigation activities under Priority A,
26 which includes inspection and replacement of damaged facilities found
27 during inspection.

1 **2. Project/Program Work Need**

2 PG&E’s 2020 replacement of non-conforming or damaged facilities
3 found during enhanced inspections under WSIP was included in
4 Section 4.2.1 of PGE’S 2019 WMP and Section 5.3.3 of PG&E’s 2020
5 WMP, which was approved by the Commission on June 11, 2020.³ As
6 described above, the costs are for replacement work identified under WSIP,
7 the purpose of which to identify non-conforming or damaged facilities that
8 have the potential to cause asset failures posing wildfire risk. This work is
9 key to reducing wildfire risk by proactively correcting non-conforming or
10 damaged facilities before the risk materializes and threatens the safety of
11 our customers and the public. The costs PG&E is seeking recovery of in
12 this attachment are the capital expenditures associated with replacing
13 facilities to correct the issues identified during the inspections. This work is
14 directly connected to reducing the risk of wildfires related to utility
15 equipment.

16 The total costs for the capital work was \$5.5 million and involved
17 replacing approximately 190 poles, 100 transformers, 90 cross arms,
18 40 conductors, 20 cutouts, 15 Insulators, and less than 10 each of Tree
19 Wire, guy, anchor, and other Overhead facilities. All costs associated with
20 this work is from Priority A tags identified in Tier 2 and Tier 3 HFTDs, and
21 reduced or eliminated wildfire risks posed by non-conforming or damaged
22 facilities.

23 **D. Conclusion**

24 The wildfire mitigation costs we present in this attachment are for activities
25 that are necessary to improve the safety and reliability of our system and are
26 consistent with the policies underlying the establishment of the WMPMA. As
27 described above, all costs the Company incurred for this work are reasonable
28 and PG&E requests that the Commission approve full cost recovery.

3 Resolution WSD-003 (June 11, 2020).