Company: San Diego Gas & Electric Company (U 902 M)
Proceeding: 2024 General Rate Case
Application: A.22-05-016
Exhibit: SDG&E-13-2R

SECOND REVISED

PREPARED DIRECT TESTIMONY OF

JONATHAN T. WOLDEMARIAM

(WILDFIRE MITIGATION AND VEGETATION MANAGEMENT)

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

October 2022

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APPENDICES

SUMMARY

WILDFIRE MITIGATION O&M (In 2021 $)			
O&M	**2021 Adjusted-Recorded ($000)**	**Estimated TY 2024 ($000)**	**Change ($000)**
Non-Shared	168,436	168,955	519
Shared	0	0	0
Total O&M	**168,436**	**168,955**	**519**

WILDFIRE MITIGATION CAPITAL (In 2021 $)				
	2021 Adjusted-Recorded ($000)	**Estimated 2022 ($000)**	**Estimated 2023 ($000)**	**Estimated TY 2024 ($000)**
Total CAPITAL	**381,854**	**451,445**	**528,538**	**518,507**

Summary of Requests

- Safety is SDG&E's top value, and no activity implicates safety more than wildfire prevention and mitigation. To achieve its wildfire mitigation goals, San Diego Gas & Electric Company (SDG&E) requests the California Public Utilities Commission (CPUC or Commission) adopt Wildfire Mitigation and Vegetation Management's Test Year 2024 (TY 2024) general rate case (GRC) forecast of $518.5 million and $169 million for capital and Operations and Maintenance (O&M), respectively.
- The highest risks of wildfire and Public Safety Power Shutoff (PSPS) impacts are associated with electrical infrastructure within the High Fire Threat District (HFTD). Therefore, SDG&E has focused the majority of its wildfire mitigation efforts, customer engagement, and PSPS impact reduction on the HFTD areas within SDG&E's service territory. SDG&E's risk-based approach to prioritization of initiatives in its Wildfire Mitigation Plan promotes a reasonable balance between safety and cost-efficiency.
- Since the passage of Senate Bill (SB) 901 and Assembly Bill (AB 1054), the initiatives sponsored in this chapter have been reported on annually via SDG&E's Wildfire Mitigation Plan (WMP). The current WMP structure is prescribed by

the Office of Energy Infrastructure Safety (Energy Safety), whereby initiatives are placed into ten categories. To foster alignment between the WMP and this GRC request, O&M and capital requests have also been grouped into these same ten categories.

- SDG&E is requesting capital projects to reduce the risk of wildfire and the impacts of PSPS on customers. SDG&E will invest in modernizing and hardening its grid using covered conductor and strategically implemented undergrounding efforts. SDG&E has selected and scoped these initiatives to target areas with the highest risk of wildfire and reduce the number of customers impacted by PSPS. SDG&E will harden approximately 445 miles of electric distribution between 2022 and 2024 using covered conductor and undergrounding to reduce the risk of wildfire and impacts of PSPS.
- The O&M projects requested are also aimed at reducing the risk of wildfire and the impacts of PSPS. The largest O&M projects are encompassed in SDG&E's vegetation management program, which maintains an inventory tree database, completes annual patrols and inspections of all inventory trees, prunes and removes hazardous trees, and performs pole brushing activities across SDG&E's service territory. In the HFTD, SDG&E performs additional vegetation management activities described in its WMP, including performing additional inspections and pursuing enhanced clearances of trees at higher risk of coming into contact with electrical infrastructure. By performing these activities, the vegetation management program reduces the risk of vegetation contact with overhead infrastructure, reducing the risk of wildfire and improving reliability.
- The O&M request also contains SDG&E's Grid Design and System Hardening projects, which include several initiatives aimed at reducing the impacts of PSPS. These include SDG&E's generator programs which provide customers backup power during PSPS events with a focus on Medical Baseline and Access and Functional Needs (AFN) customers.
- SDG&E requests to establish a two-way balancing account to record WMP-related costs beginning in 2024 through this GRC cycle, (Wildfire Mitigation Plan Balancing Account or WMPBA). SDG&E proposes to keep its existing Wildfire

Mitigation Memorandum Account (WMPMA) open at this time to continue to record ongoing incremental WMP expenses through 2023. SDG&E also requests to maintain its existing Fire Risk Mitigation Memorandum Account (FRMMA).

- SDG&E proposes modifications to the existing Tree Trimming Balancing Account, mainly to expand the scope of the account to include all of SDG&E's vegetation management program, including pole brushing and sustainability efforts, and to rename the account the Vegetation Management Balancing Account (VMBA).
- Due to the timing of the implementation of the Wildfire Mitigation Plans in comparison to its GRC cycle, SDG&E has incurred significant incremental wildfire mitigation expenditures that are currently recorded to the WMPMA. Consistent with Public Utilities Code Section 8386,[1] SDG&E is seeking recovery of these balances through this GRC. To align the reasonableness review with incurred costs, SDG&E proposes that the Commission adopt a proceeding schedule that includes two additional phases, or "tracks," of this proceeding. This approach will allow the Commission to conduct a comprehensive review of WMP costs incurred prior to the Test Year.
- Since 2019, SDG&E's wildfire mitigation efforts have grown significantly and, per SDG&E's WMP, will continue to grow between 2019 and 2024. Due to the onramp of WMP activities, SDG&E's proposed post-test year mechanism will not provide adequate revenue. Accordingly, SDG&E is seeking a capital-related revenue requirement for 2025-2027 specific for wildfire-related costs. Further, because SDG&E is proposing to record such costs to a new balancing account, revenue specifically associated with wildfire mitigation for 2025-2027 is needed to balance over the GRC cycle.

[1] Pub. Util. Code §8386.4(b)(1).

SECOND REVISED PREPARED DIRECT TESTIMONY OF JONATHAN T. WOLDEMARIAM (WILDFIRE MITIGATION AND VEGETATION MANAGEMENT)

I. INTRODUCTION

A. Summary of Wildfire Mitigation and Vegetation Management Costs and Activities

Wildfire safety continues to be a key priority for SDG&E. The Wildfire Mitigation and Vegetation Management GRC area is responsible for several important aims of SDG&E, including but not limited to the following:

- Minimizing the risk of a catastrophic wildfire resulting from utility equipment,
- Reducing the impacts of PSPS,
- Reducing the impacts of vegetation on reliability and safety, and
- Adhering to requirements established by SDG&E's regulatory bodies, including the Commission and the Office of Energy Infrastructure Safety.

In accordance with California Public Utilities Code § 8386(a) and other applicable statutes and regulations, SDG&E constructs, maintains, and operates its electric system in a manner that minimizes the risk of catastrophic wildfire posed by its electric power lines and equipment. Since the catastrophic wildfires that impacted SDG&E and its service territory in 2007 and 2008, SDG&E has established itself as an industry leader in wildfire mitigation. These efforts have been recognized by the utility industry, California state officials,[2] and leading credit ratings agencies.[3]S&P Global Ratings described SDG&E's position on the forefront of wildfire innovation as follows:

> Over the past decade [SDG&E] has been a leader in wildfire on through the implementation of technology and system hardening. These measures reduce the probability that the company will be the cause of a catastrophic wildfire. As a direct result of the company's proactive ingenuity . . . the company has developed a strong

[2] "Wildfires and Climate Change: California's Energy Future" Governor Newsom's Strike Force Report ("Strike Force Report") (April 12, 2019) at 11 ("SDG&E engaged in a robust fire mitigation and safety program after experiencing devastating fires in its service territory in 2007 and has become a recognized leader in wildfire safety.") *See also* "Final Report of the Commission on Catastrophic Wildfire Cost and Recovery" (June 17, 2019) at 7 ("[SDG&E] is widely recognized as a global leader on utility wildfire practices.")

[3] *See* S&P Global Ratings, "How are California's Wildfire Risks Affecting Utilities' Credit Quality" (Jun. 3, 2021) at 10 (referring to SDG&E as a "global leader" in wildfire mitigation).

track record of either avoiding wildfires or not being the cause of a catastrophic wildfire.[4]

But in the face of a changing climate, increased drought, and the development of a year-round fire season, SDG&E cannot rest on its past achievements. Since the passage of SB 901 and AB 1054, SDG&E has implemented several additional wildfire mitigation initiatives aimed at improving both wildfire safety and customer resiliency during PSPS events. These activities include developing a best-in-class hardened grid but also the incorporation of leading-edge technology solutions to better understand situational awareness, isolate faults in a matter of seconds and de-energize falling lines before they reach the ground, and enhance inspections and asset management. As a partner in its community, SDG&E also supports fire response personnel with its trained aviation firefighting resources and promotes wildfire and PSPS awareness and preparedness through extensive community engagement. These and other initiatives aimed at keeping SDG&E at the forefront of wildfire mitigation are addressed in detail below.

My testimony supports the Test Year 2024 forecasts for O&M costs for non-shared services, and capital costs for 2024 associated with the Wildfire Mitigation and Vegetation Management area for SDG&E, and the business justification for two information technology (IT) capital projects for the forecast years 2022, 2023, and 2024 associated with the Wildfire Mitigation area for SDG&E. Tables JW-1 and JW-2 summarizes my sponsored costs for O&M and capital, respectively. Table JW-3 presents the IT capital costs for which I provide the business justification. I also sponsor proposals related to regulatory accounts and forecasts for the years 2025-2027.

[4] S&P Global Ratings, *Ratings Direct, San Diego Gas & Electric Co*., (Jun. 30, 2020) at 2.

TABLE JW-1
Test Year 2024 Summary of Total O&M Costs

WILDFIRE MITIGATION O&M (In 2021 $)			
Categories of Management	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
A. Emergency Planning & Preparedness	13,315	16,236	2,921
B. Situational Awareness and Forecasting	2,994	3,877	883
C. Grid Design & System Hardening	26,041	25,399	-642
D. Asset Management & Inspections	36,949	15,375	-21,574
E. Vegetation Mgmt & Insp	10,365	14,301	3,936
F. Vegetation Mgmt & Insp. - Tree Trimming Only	52,195	55,622	3,427
G. Grid Operations & Operating Protocols	10,079	14,769	4,690
H. Resource Allocation Methodology	3,823	7,748	3,925
I. Risk Assessment & Mapping	608	2,413	1,805
J. Data Governance	1,082	1,650	568
K. Stakeholder Cooperation & Community Engagement	10,985	11,565	580
Total Non-Shared Services O&M	**168,436**	**168,955**	**519**

TABLE JW-2
Test Year 2024 Summary of Total Capital Costs

WILDFIRE MITIGATION CAPITAL (In 2021 $)				
Categories of Management	**2021 Adjusted-Recorded**	**Estimated 2022 (000s)**	**Estimated 2023 (000s)**	**Estimated 2024 (000s)**
A. Risk Assessment and Mapping	1,446	2,200	2,420	2,662
B. Situational Awareness and Forecasting	1,550	7,803	800	1,864
C. Grid Design and System Hardening	312,290	343,110	405,162	471,146
D. Asset Management and Inspections	26,181	45,152	66,130	17,423
E. Grid Operations and Protocols	13,460	14,749	9,185	8,100
F. Data Governance	19,983	24,255	17,566	11,685
G. Emergency Planning and Preparedness	1,929	7,302	23,914	2,496
H. Stakeholder Cooperation and Community Engagement	5,015	6,874	3,361	3,131
Total Capital	**381,854**	**451,445**	**528,538**	**518,507**

TABLE JW-3
Summary of Total IT Capital Costs

IT CAPITAL (In 2021$)			
Capital	**Estimated 2022 ($000)**	**Estimated 2023 ($000)**	**Estimated TY 2024 ($000)**
Total IT Capital	**1,884**	**6,545**	**1,678**

B. Support To and From Other Witnesses

My testimony also references the testimony and workpapers of several other witnesses, either in support of their testimony or as referential support for mine. These include the following:

- Sustainability Policy testimony of Estela de Llanos (Exhibit SDG&E-02);
- Risk Policy testimony of Michael Schneider (Exhibit SDG&E-03, Chapter 1) and GRC-to-RAMP Integration testimony of Gregory Flores and R. Scott Pearson (Exhibit SCG-03/SDG&E-03, Chapter 2);
- Electric Distribution Capital testimony of Oliva Reyes (Exhibit SDG&E-11);
- Electric Distribution O&M testimony of Tyson Swetek (Exhibit SDG&E-12);
- Information Technology testimony of Tia Ballard and William J. Exon (Exhibit SDG&E-25);
- Safety Management Systems testimony of Kenneth Deremer (Exhibit SDG&E-31);
- Rate Base testimony of Steven Dais (Exhibit SDG&E-35);
- Regulatory Accounts testimony of Jason Kupfersmid (Exhibit SDG&E-43);
- Summary of Earnings testimony of Ryan Hom (Exhibit SDG&E-44); and
- Post-Test Year Ratemaking witness Melanie Hancock (Exhibit SDG&E-45).
- Wildfire Policy Testimony of Kevin C. Geraghty (Exhibit SDG&E-49).

C. Organization of Testimony

My testimony is organized as follows:

- Section II describes SDG&E's Wildfire Mitigation Plan, including an overview of the existing wildfire-related regulatory accounts, proposals for wildfire-related regulatory accounts for this GRC cycle, and proposed schedule for addressing reasonableness review of accumulated balances through 2023;
- Section III summarizes the Risk Assessment Mitigation Phase information that I sponsor;
- Section IV describes my sustainability-related information;
- Section V presents my O&M costs;
- Section VI presents my capital costs;
- Section VII provides my post-test year forecasts; and

- Sections VIII and IX provide my concluding remarks and witness qualifications.

II. SDG&E'S WILDFIRE MITIGATION PLAN AND TRACKING OF COSTS

A. Wildfire Mitigation Benefits All of SDG&E's Service Territory

SDG&E's service territory experiences a number of conditions conducive to wildfire, including the Santa Ana winds that have been directly linked to some of the largest and most destructive wildfires in Southern California. These Santa Ana winds, coupled with other weather conditions, dry fuels, and the impacts of climate change, results in an increased risk of catastrophic wildfires. Moreover, SDG&E's "fire season" continues to evolve—while the highest risk Santa Ana winds are still most prevalent during the late summer and early fall, wildfire conditions can be present almost year-round.

The Commission recognized specific areas of SDG&E's service territory at an even higher risk of fire in Decision (D.) 17-12-024, which established the HFTD. Approximately 64% of SDG&E's service territory is within the HFTD, where there is an increased potential for wildfires. The HFTD consists of two areas:

1) Tier 2, "where there is an elevated risk for destructive utility-associated wildfires," and;
2) Tier 3, "where there is an extreme risk for destructive utility-associated wildfires."[5]

Although wildfire risk is not limited to the HFTD, the majority of the risk is associated with conditions present in Tier 2 and Tier 3 areas. SDG&E estimates that roughly 61.4% of the ignition consequences will occur in Tier 3, 36.2% in Tier 2, and only 2.4% in the non-HFTD.[6] Because SDG&E prioritizes many of its wildfire mitigation efforts based on risk, the majority of SDG&E's wildfire mitigation initiatives are targeted and prioritized in the HFTD.

Mitigating the risk of ignition in the HFTD also results in qualitative benefits throughout SDG&E's service territory. For instance, a catastrophic wildfire that starts in the HFTD has the potential to spread outside the HFTD, posing a safety threat to additional homes, businesses, and lands. Additionally, fires that burn entirely within the HFTD may result in impacts outside of the burn area, including reduced air quality due to smoke and other environmental impacts. Fires also "poison the air across vast swaths of the state," putting public health at risk and emitting

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[5] D.17-12-024 at 2.

[6] SDG&E's 2022 Wildfire Mitigation Plan (WMP) Update at 157, *available at* https://www.sdge.com/sites/default/files/regulatory/SDG%26E%202022%20WMP%20Update%2002-11-2022.pdf.

millions of carbon particles into the air, compounding the challenge of reducing greenhouse gas emissions.[7] Thus SDG&E's efforts to reduce the risk of catastrophic wildfire positively impact the entirety of its customer base and the overall public.

B. SDG&E Has Significantly Increased Its Efforts to Mitigate the Threat of Catastrophic Wildfire and Promote Customer Resiliency

Safety is SDG&E's top value, and virtually no activity implicates safety for SDG&E's employees, contractors, and customers more than wildfire mitigation. In the aftermath of the catastrophic October 2007 wildfires in SDG&E's service territory and across Southern California, SDG&E dedicated itself to revamping and enhancing its wildfire prevention and mitigation measures across a wide spectrum of disciplines and activities. Many of those initiatives were undertaken without any precedent or road map for SDG&E to follow. Through the use of novel and continually improving initiatives, SDG&E has established itself as a leader in wildfire mitigation efforts for more than a decade.

In 2018, the California legislature enacted SB 901, which, among other things, established the requirement for electric utilities to submit annual Wildfire Mitigation Plans (WMP).[8] More recently, on July 11, 2019,[9] the California State Legislature passed an additional bill to address the growing risk of wildfires and ensure that electrical corporations had access to the investment capital necessary to implement large-scale improvements to statewide wildfire mitigation and system hardening. AB 1054, which was signed into law by Governor Newsom on July 12, 2019, became effective immediately. In AB 1054, the California Legislature stated that "[t]he increased risk of catastrophic wildfires poses an immediate threat to communities and properties throughout the state."[10] The Legislature further directed that "[t]he state has dramatically increased investment in wildfire prevention and response, which must be matched by increased efforts of the electrical corporations,"[11] and "[t]he state's electrical corporations

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[7] Strike Force Report at 5.

[8] The initial requirement to submit annual wildfire mitigation plans was set forth in SB 901, California P.U. Code § 8386(b). This P.U. Code section was subsequently amended by Assembly Bill (AB) 1054.

[9] AB 1054, Stats. 2019-2020, Ch. 79 (Cal. 2019).

[10] *Id*. at § 1(a)(1).

[11] *Id*. at § 2(a).

must invest in hardening of the state's electrical infrastructure and vegetation management to reduce the risk of catastrophic wildfire."[12]

SDG&E has responded to the Legislature's requirements with large-scale infrastructure hardening efforts, including strategic undergrounding, expanded use of covered conductor, expanded situational awareness, and increased inspections and asset management. These efforts have received approval during the WMP process as meeting the requirements laid out by SB 901 and AB 1054. Building on over ten years of wildfire prevention and mitigation work, SDG&E's GRC request emphasizes a continued focus on reducing wildfire risk and mitigating the impacts of PSPS in the face of ongoing climate change to meet the demands of the Legislature, SDG&E's regulators, and public safety. Each year, SDG&E identifies ways to enhance its wildfire mitigation efforts by improving or expanding existing programs and developing and implementing new programs. The success of many of these programs has led to their adoption by other utilities and served as a model for wildfire risk mitigation.

C. Overview of SDG&E's Wildfire Mitigation Plan

After the passage of SB 901, the Commission approved SDG&E's first WMP submission, finding that SDG&E's already existing efforts and additional planned future measures met the requirements of Public Utilities Code Section 8386(c). SDG&E's initial WMP addressed both the already existing wildfire mitigation efforts at the Company, as well as improvements and enhancements to existing programs to meet the state's wildfire mitigation objectives.[13] The WMP addressed an overarching strategy to develop

> "[p]rocesses and programs to understand wildfire risk, conditions, and behaviors to provide the Company and its customers with time and information to take appropriate action; build, construct, and operate a fire-hardened electric distribution and transmission system in a manner that minimizes the possibility of igniting a fire; educate customers and stakeholders on wildfire risk; and support customers affected by outages."[14]

[12] *Id*. at § 2(b).

[13] 2019 WMP.

[14] 2019 WMP at 6.

SDG&E further acknowledged that the WMP and implementation strategies need to be flexible to adapt to changing circumstances, weather, funding, and variables yet to be known.[15]

After the 2019 WMP was submitted, the Legislature modified the WMP process and requirements in AB 1054, including a new three-year WMP cycle. Consistent with Commission direction,[16] SDG&E filed its initial three-year comprehensive WMP in 2020. The 2020 WMP included additional detail on the Plan, organized in the structure required by the Commission. And since 2020, the Commission—and the successor to the Commission's Wildfire Safety Division, Energy Safety—have continued the "iterative"[17] process to further develop wildfire mitigation requirements, as well as the regulatory process regarding "reporting, monitoring, evaluation and updating to ensure the electrical corporations are targeting the greatest risk with effective programs."[18] SDG&E received approval of its 2019, 2020, and 2021 WMP submissions.[19]

SDG&E filed its most recent Wildfire Mitigation Plan Update on February 11, 2022 (2022 WMP Update), hereby incorporated by reference.[20] This 2022 WMP Update provides a comprehensive review and update on all of SDG&E's efforts to mitigate wildfire risk and reduce PSPS impacts for the 2020-2022 WMP cycle. These efforts include the ongoing development of situational awareness tools like SDG&E's first-of-its-kind weather network, which allows both real-time awareness of conditions during extreme weather events as well as data useful in SDG&E's modeling efforts. SDG&E has also used this data to develop a plan for a safe and hardened grid using targeted and cost-effective measures such as strategic undergrounding,

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15 2019 WMP at 2.

16 Rulemaking (R.) 18-10-007, Administrative Law Judge's Ruling on Wildfire Mitigation Plan Templates and Related Material and Allowing Comment, Attachment 1 – WMP Guidelines (December 16, 2019), as clarified by the Wildfire Safety Division (WSD) on January 15, 2020 and January 27, 2020.

17 Resolution WSD-002 at 8 (citing D.19-05-036 at 36).

18 *Id*.

19 D.19-05-039; Resolution WSD-005; Resolution WSD-019.

20 SDG&E's 2022 WMP Update is available at https://www.sdge.com/sites/default/files/regulatory/SDG%26E%202022%20WMP%20Update%2002-11-2022.pdf. As of the date of this submission, SDG&E's 2022 WMP Update is pending approval by Energy Safety.

covered conductor, and traditional hardening. SDG&E is also engaging the use of advanced technology, including a private high-speed Long-Term Evolution (LTE) network to support cutting edge advanced protection efforts, such as PSPS sectionalizing devices to limit the scope and scale of PSPS events and falling conductor protection to detect broken energized conductors and isolate them before they can reach the ground. Advanced communication also promotes reliability and reduces cyber risk.

Grid hardening efforts are also informed by SDG&E's Wildfire Risk Reduction Model (WRRM) and Wildfire Next Generation System (WiNGS), which enable risk assessment and further prioritization of distribution grid hardening. WRRM, developed by Technosylva and SDG&E subject matter experts, was the first project-scoping tool used to prioritize electric distribution fire hardening for SDG&E's FiRM Program. WRRM combines electric distribution asset data and wildfire simulations to predict the risk of potential equipment-related ignitions. To accomplish this, SDG&E engaged with Technosylva to aggregate millions of wildfire computer simulations to build a geospatial layer of wildfire vulnerability over the electric distribution overhead assets. This layer, combined with the assets' expected failure and ignition rates, was used to assign a wildfire risk score. The wildfire risk score, called the expected impact, was also generated for assets considered hardened by SDG&E construction standards. These hardened assets have reduced failure and ignition rates. The difference in risk scores between assets provided a risk reduction score used to prioritize circuits and sections for projects inside the FiRM program. SDG&E has shared this work with other utilities and led the development of a similar statewide approach. Some of these hardening efforts have also contributed to a reduction of the community impacts associated with PSPS.

As modeling efforts have improved based on stakeholder input and the availability of data, SDG&E's next generation system, WiNGS-Planning built upon the RSE methodology in RAMP and evaluates both wildfire and PSPS impacts at the sub-circuit/segment level to inform investment decisions by determining which initiatives provide the greatest benefit per dollar spent in reducing both wildfire risk and PSPS impact. The key decisions being driven from the WiNGS-Planning model are how to most efficiently and effectively apply wildfire and PSPS mitigations in the backcountry. Currently, the main mitigations being proposed in the model results are undergrounding and covered conductor, starting in 2023.

While SDG&E's risk reduction models are a component of initiative selection, it remains important to consider both the qualitative and the quantitative impacts of wildfire mitigation efforts. Modeling provides an important, data-based focus for quantitative initiative analysis. But it cannot take unknowns into account, such as construction difficulties, environmental constraints, or cultural and societal limitations. For these reasons, subject matter expertise derived from SDG&E's years of experience must also inform initiative selection.

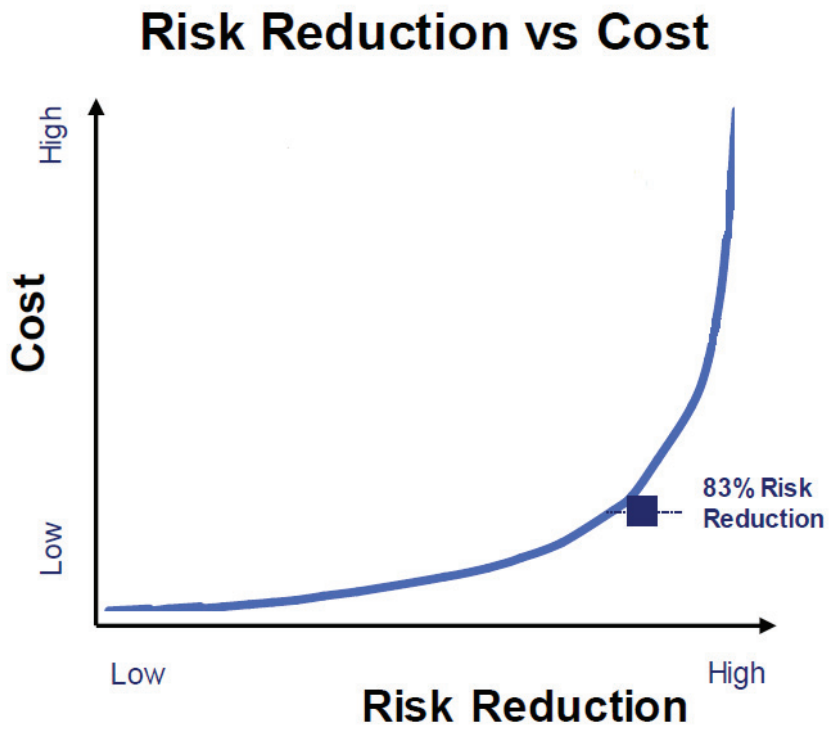
To further promote wildfire safety, SDG&E also operates a comprehensive vegetation management program, including the implementation of enhanced tree clearances above and beyond regulatory requirements where possible and necessary. These efforts are reinforced by SDG&E's comprehensive asset management and inspections, including the use of light detection and ranging (LiDAR) surveys, additional Tier 3 focused inspections, and the use of drones to inspect infrastructure not otherwise easily observed.

The 2022 WMP Update also details SDG&E's efforts regarding community engagement, including the development of partnerships with stakeholders in public safety, academia, and the private sector to promote safety efforts and community outreach. Community engagement, through public events such as SDG&E's Wildfire Safety Fairs and improved and expanded PSPS communications, is integral to SDG&E's efforts to promote wildfire safety and PSPS preparedness for residents of the service territory. SDG&E leverages a Community Based Organization network comprised of over 400 organizations to promote communications and outreach with a greater number of hard-to-reach vulnerable and AFN populations and provide them with additional preparedness resources, such as generators, access to mobile power sources, and Community Resource Centers.

Using its risk reduction models and subject matter expertise, SDG&E has targeted its wildfire mitigation efforts to achieve the most risk reduction at the best value for customers. As AB 1054 anticipated, the grid hardening and enhanced wildfire mitigation efforts undertaken since 2019 require significant investment. While they come at a cost, SDG&E estimates that it can achieve an 83% reduction in risk through 2031 by implementing the measures incorporated into its WMP. Upon careful analysis of the data and the cost impacts of various mitigation strategies, SDG&E selected its course because it provided the best value approach—achieving the most risk reduction possible without exponential increases in costs. While there are potential courses of action that could result in further reducing the risk of utility-caused wildfire, SDG&E

estimates that such additional risk reduction results in a dramatic increase in costs to ratepayers, as demonstrated in the chart below. SDG&E's selected mitigation approach achieves the highest risk reduction (X axis) before while still addressing the ratepayer impacts of these programs (y axis).

FIGURE JW-1
Value of Covered Conductor and Underground Grid Hardening Strategies



SDG&E's current WMP cycle will conclude in 2022 and a new three-year cycle will commence in 2023. During that cycle, SDG&E intends to continue to build upon the success of the programs and initiatives already in place, in addition to exploring new ideas to mitigate the threat of wildfires associated with utility equipment, promote wildfire safety and awareness, reduce PSPS impacts, and engage with customers and the community we serve.

For ease of review and reference, SDG&E's overarching Wildfire Mitigation Plan categories are consistent with my GRC presentation. The categories for initiatives within the Wildfire Mitigation Plan are also utilized to group the activities sponsored within the GRC. Table JW-4 below illustrates this alignment between the WMP and GRC categories.

TABLE JW-4
Comparison of WMP Categories to GRC Presentation

Wildfire Mitigation Plan Category	GRC Cost Categories
Risk Assessment and Mapping	O&M: 1WM007.001 Capital: 192480
Situational Awareness and Forecasting	O&M: 1WM002.000 Capital: 192470, 112530, 208770, 202400
Grid Design and System Hardening	O&M: 1WM003.000 Capital: 202580, 202850, 198730, 191340, 202840, 192420, 152590, 202820, 192490, 141400, 192450, 081650, 192460, 222420
Asset Management and Inspections	O&M: 1WM004.000 Capital: 002390, 201270, 202480
Vegetation Management and Inspections	O&M: 1WM005.000, 1WM005.001 Capital: N/A
Grid Operations and Protocols	O&M: 1WM006.000 Capital: 202770, 212550, 212560
Data Governance	O&M: 1WM007.002 Capital: 208910, 218840
Resource Allocation Methodology	O&M: 1WM007.000 Capital: 218770
Emergency Planning and Preparedness	O&M: 1WM001.000 Capital: 218790, 218820, 197800
Stakeholder Cooperation and Community Engagement	O&M: 1WM008.000 Capital: 208900, 218860

D. Existing Regulatory Accounts

1. Wildfire Mitigation Plan Memorandum Account and Fire Risk Mitigation Memorandum Account

Implementation of the Wildfire Mitigation Plans did not align with the timing of GRC cycles of the utilities. Thus, many of the initiatives SDG&E has put in place since 2019 were unanticipated in the TY 2019 GRC and have resulted in incremental costs. SB 901 and AB 1054 recognized this regulatory lag and acknowledged both the need for a mechanism to track incremental expenditures by the electrical corporations as well as an expedited process for review of those costs.[21]Specifically, Public Utilities Code § 8386 contains two provisions requiring the establishment of memorandum accounts to record costs incurred to mitigate wildfire risk.

SB 901 initially addressed the need to track incremental wildfire mitigation costs and provided that "[e]ach electrical corporation shall establish a memorandum account to track costs incurred for fire risk mitigation that are not otherwise covered in the electrical corporation's revenue requirements."[22] Based on this, SDG&E established the FRMMA to record costs associated with fire risk mitigation work that are not otherwise covered in SDG&E's authorized revenue requirements or in an approved Wildfire Mitigation Plan.[23]

The Legislature further added additional language to clarify the accounting treatment for costs related to WMP initiatives, providing, "[a]t the time it approves each [WMP], the commission shall authorize the utility to establish a memorandum account to track costs incurred to implement the plan."[24] The Commission approved the establishment of SDG&E's electric and gas Wildfire Mitigation Plan Memorandum Account (WMPMA), effective May 2019.[25] The WMPMA records costs incurred to implement SDG&E's Commission-approved Wildfire Mitigation Plan; its balance reflects those costs net of revenue requirement authorized in

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[21] *See* Pub. Util. Code §8386.4(b)(2) (requiring the Commission to review applications for recovery of incremental wildfire expenses within 12 months absent good cause).

[22] P.U. Code §8386.4(b)(1).

[23] Advice Letter 3333-E (January 16, 2019).

[24] P.U. Code §8386.4(a).

[25] *See* Advice Letter 3454-E / 2817-G (October 31, 2019). Approved on January 23, 2020, effective as of May 30, 2019; *See also* D.19-05-039.

SDG&E's GRC or other proceedings deemed appropriate by the Commission. The WMPMA also does not include costs recorded to other memorandum accounts.

Consistent with its tariffs,[26] SDG&E's current practice is to record costs associated with activities in an approved WMP to the WMPMA. In the event that SDG&E incurs costs that are not otherwise covered in authorized revenue requirements and that are either awaiting approval in a WMP or that will be included in an upcoming WMP submission, such costs would be recorded to the FRMMA. Upon approval of the WMP, costs are transferred from the FRMMA to the WMPMA. As such, the primary account for which SDG&E's wildfire mitigation activities are recorded is the WMPMA.

2. Tree Trimming Balancing Account

Pursuant to D.19-09-051 (2019 GRC Decision), SDG&E's Tree Trimming Balancing Account (TTBA) is a two-way account that records authorized revenues or expenses associated with tree trimming necessary to comply with both existing and new state and regulatory rules, less revenues and expenses for brush management. Tree trimming costs primarily include expenses for crews and labor, tree removals, mulching, and information systems support, among others. While vegetation management activities are a significant portion of SDG&E's WMP, all costs associated with tree trimming throughout the service territory, including WMP initiatives, are recorded to the TTBA.

Per the TY 2019 GRC Decision, D.19-09-051, SDG&E received two-way balancing treatment for the TTBA to permit the Company to more quickly respond to fire risks.[27] D.19-09-051 also included processes for addressing TTBA over and undercollections on an annual basis. If at the end of year there is an overcollection, the balance will be amortized in connection with its annual regulatory account balance update filing for rates effective January 1 of the following year. If, however, at the end of the year there is an undercollection, balances up to 35% of the revenue requirement may be recovered through a tier 3 advice letter. Any amounts in excess of 35% of the revenue requirement must be addressed through an application.

The TTBA for the 2019 GRC cycle remains open, and the resulting balances have not been completely addressed. Due to new initiatives in SDG&E's WMP, labor constraints, and

[26] Advice Letter 3454-E / 2817-G at 2.

[27] D.19-09-051 at 267.

additional costs of labor due to new legislation, SDG&E has recorded an undercollection in its TTBA since 2019. These undercollections have been, and will be, addressed via separate applications. Any balances in the TTBA from the 2019 GRC cycle (through 2023) are not requested or addressed in this GRC.

E. Proposed Schedule for Reasonableness Review of WMPMA Balances Through 2023

SDG&E's TY 2019 GRC was based on forecasts that predated AB 1054 and the substantial expansion of wildfire mitigation and system hardening efforts that have taken place since late 2019. This expansion has resulted in significant undercollected balances in SDG&E's WMPMA that continue to grow as SDG&E continues to invest in wildfire mitigation and further hardening of its electrical system.

AB 1054 provided two avenues for electrical corporations to request review and approval of WMP costs—either through the GRC process or a separate application.[28] SDG&E is electing to request recovery of the balances recorded in its WMPMA and predating the Test Year through the GRC proceeding. However, the cumulative recorded WMPMA balances for SDG&E's 2019 GRC cycle, which is through December 31, 2023, are not available at the time this GRC application is filed.

To facilitate a reasonableness review of costs already incurred to implement SDG&E's WMP, SDG&E proposes to use separate tracks of this proceeding by which SDG&E will seek a reasonableness review of WMPMA balances from the inception of the account (May 30, 2019) through December 2022 in Track 2 of its GRC. The costs represented in SDG&E's proposed Track 2 aligns with the time periods covered by SDG&E's 2019 WMP and the three-year 2020-2022 WMP cycle. SDG&E expects to file its reasonableness review in Track 2 in mid-2023, when recorded costs are available, and is requesting a schedule by which the Commission issues a proposed decision within 12 months.[29] SDG&E will seek a separate review of the 2023 WMPMA balances in Track 3, anticipated to be filed in mid-2024.

A similar track approach was used in Southern California Edison Company's (SCE) TY 2021 GRC and is also now being used in Pacific Gas and Electric Company's (PG&E) TY 2023

[28] Pub. Util. Code §8386.4(b)(1) and (2).

[29] Pub. Util. Code §8386.4(b)(2).

GRC.[30] Additionally, the Commission indicated its support for proposals by The Utility Reform Network and Utility Consumers Action Network that SDG&E seek a tracked process to review and approve WMPMA balances recorded prior to TY 2024.[31] The proposed track approach is consistent with other proceedings of this nature, meets the requirements of Public Utilities Code Section 8386.4, and provides a predictable and efficient process by which all parties may review the reasonableness of SDG&E's WMP costs.

In this Application, SDG&E is generally requesting CPUC approval to set a new revenue requirement beginning in Test Year 2024 and through its GRC cycle by seeking approval of O&M costs in 2024 and capital projects for 2022, 2023, and 2024. However, SDG&E's wildfire-related request is unique due to the need for review of incremental WMPMA balances incurred prior to the test year. If the Commission adopts SDG&E's proposed track approach, SDG&E will seek cost recovery for years 2022 and 2023 through Tracks 2 and 3 of this proceeding on an actual basis, after those costs are incurred and recorded to SDG&E's WMPMA.

Accordingly, SDG&E is not requesting 2022 and 2023 wildfire-related costs incremental to its current GRC and recorded in the WMPMA in this instant application. In my testimony and workpapers, I present 2022 and 2023 cost forecasts for illustrative purposes only, to demonstrate the progression of costs and better inform the Commission regarding the reasonableness of such costs beginning in 2024. The Rate Base testimony of Steven P. Dais (Ex. SDG&E-35) and Summary of Earnings testimony of Ryan Hom (Ex. SDG&E-44) excluded SDG&E's 2022 and 2023 wildfire-related costs from its calculations of rate base and overall revenue requirement request in this GRC Application.

F. Proposal for Regulatory Accounts

1. SDG&E Proposes to Establish a Two-Way Balancing Account for Costs Associated with WMP Implementation (WMPBA)

Wildfire mitigation is a constantly evolving field influenced by variable conditions including but not limited to improvements in science and technology, weather, drought, and climate change. SDG&E continues to assess the risk mitigation benefits, costs, and efficiencies

[30] A.19-08-013 (SCE); A.21-06-021 (PG&E).

[31] D.22-05-001 at 9.

of its WMP initiatives to achieve the largest reduction of risk at a reasonable cost. SDG&E's risk modeling tools rely on available data. As more data becomes available, SDG&E may conclude that an alternative initiative offers a more efficient risk reduction, or that a planned effort may be redundant in light of changed circumstances. For example, as covered conductor technology has proven to be a cost-effective method to reduce the risk of ignition, particularly resulting from line-object contact, SDG&E has shifted its strategy away from traditional bare conductor hardening and increased the number of miles planned to be hardened using covered conductor. Additionally, certain areas originally targeted for a microgrid to mitigate PSPS impacts were subsequently identified for undergrounding efforts—rendering the planned microgrid redundant. As SDG&E, other utilities, and industry stakeholders continue to innovate and advance wildfire mitigation technologies, it is important to maintain flexibility so that SDG&E can implement the optimal mitigation strategies that balance risk reduction with ratepayer impacts.

Additionally, the Wildfire Mitigation Plans remain relatively new, and the legislative and regulatory requirements continue to change. Energy Safety continues to revise and update the WMP requirements in a fashion that may impact SDG&E's proposed mitigation plan. Guidance and requirements for the 2023 WMP cycle are currently in development. Moreover, while AB 1054 focused on the necessity to mitigate wildfire risk, both the Legislature and the Commission continue to emphasize the need to reduce the impacts of PSPS on customers. Given the nature of SDG&E's service territory, the use of PSPS as a last resort will remain an important tool to prevent the occurrence of catastrophic wildfires. Initiatives that reduce the risk of wildfire, such as covered conductor, may not as effectively reduce PSPS impacts.[32] SDG&E is committed to addressing and mitigating the risks that PSPS events pose to customers, including those with AFN. SDG&E is working to better identify AFN customers and tools that provided needed support during de-energization, and as those needs emerge, SDG&E requires flexibility to give customers the support they need, when they need it. And to the extent that regulations continue to emphasize the need to reduce PSPS events, SDG&E may be required to alter its mitigation strategy to address those requirements.

[32] The effectiveness of covered conductor continues to be assessed by SDG&E as well as other electrical corporations in California.

The changing landscape in this dynamic area leads to a level of uncertainty regarding SDG&E's wildfire mitigation-related activities and the associated costs. This is more pronounced as SDG&E looks forward in this GRC for the purpose of setting rates for 2024-2027. In addition to the uncertainty around the changing WMP requirements and programs, some of the costs forecasted depend on variables outside of SDG&E's control. These variables include the timing of permitting for initiatives such as undergrounding, market conditions and available supply of both materials and labor, and the impacts of the changing climate on the weather—including drought conditions and increased red flag warning days.

Despite these uncertainties, SDG&E is committed to its wildfire mitigation strategy and is required to implement the initiatives and mitigations described in its approved Wildfire Mitigation Plan.[33] Recognizing that initiatives may change based on improved data or changed circumstances, Energy Safety has provided the utilities a mechanism by which it may describe changes to the WMPs, and the Commission should similarly recognize the need for a regulatory accounting mechanism to address this uncertainty. Thus, SDG&E requests establishment of a two-way balancing account for this GRC cycle (2024-2027) to record O&M and capital costs that SDG&E incurs to implement its WMP, to be named the Wildfire Mitigation Plan Balancing Account (WMPBA). This balancing account will replace SDG&E's existing WMPMA on a going-forward basis.

As mentioned above, SDG&E proposes to record both O&M and capital costs in the WMPBA. Capital costs typically span multiple years and tend to rise and fall when projects start and end. In the instance of wildfire mitigation costs over this GRC cycle, many of the capital and O&M costs are reoccurring in nature with many of the capital projects being put into service throughout a given year. For example, SDG&E's O&M costs support departments and inspections of overhead equipment are ongoing expenses. Most of the capital costs, such as covered conductor, high-speed communication infrastructure, and pole replacements, are also ongoing projects that routinely go into service within a calendar year. Because of this, SDG&E requests that the WMPBA be addressed over the GRC cycle, with the option to annually reflect WMPBA balances in rates. Given the reoccurring level of work, more frequent review of the

[33] *See* Pub. Util. Code §8386.1 (failure to substantially comply with an approved WMP may result in penalties).

WMPBA balances (as compared to waiting until the end of the GRC cycle) would allow for changes to be reflected in rates in alignment with the incurrence of costs.

Additionally, annual review of balances permits any overcollections to be timely refunded to customers and undercollections to be recovered from customers. To promote additional transparency in the event of an undercollection and provide appropriate review and approval of cost recovery, SDG&E proposes that recovery of WMPBA undercollections be addressed as follows:

- Undercollections less than 125% of authorized recovered through a Tier 2 Advice Letter
- Undercollections from 125% to 145% of authorized recovered through a Tier 3 Advice Letter;
- Undercollections in excess of 145% of authorized recovered through an application process.

The proposed approach to recovery of undercollections reasonably balances the need for SDG&E to maintain flexibility to meet its commitment to mitigating the risk of wildfire as addressed in its annual Wildfire Mitigation Plans and Updates, while allowing the commission and stakeholders insight and transparency regarding annual expenditures.[34]

While SDG&E does not anticipate experiencing an increase in wildfire mitigation costs from those forecasted in my testimony that would lead to significant undercollections, it is particularly important to establish a process by which the Commission, stakeholders, and staff may review and approve recovery of undercollected costs during the GRC cycle. Wildfire mitigation efforts statewide continue to evolve and it is possible that new initiatives or programs become necessary to respond to the threat of wildfire, or as a result of state mandates or legislation. The accumulation of significant ongoing undercollected amounts during the rate case cycle can lead to rate instability when those balances are finally incorporated into rates. The Commission recently declined to establish mechanism by which SDG&E could begin

[34] SDG&E also notes that, even though cost review and recovery is outside the scope of the WMP approval process, the Office of Energy Infrastructure Safety requires SDG&E to provide detailed forecasts and updates regarding total spend on WMP initiatives in the WMPs, and any "significant" changes to initiative spend must be detailed in SDG&E's Annual Change Order Report, filed November 1 of each year. These additional filings allow further transparency and understanding regarding SDG&E's wildfire mitigation costs throughout the year.

recovering its undercollected WMPMA balances from 2019-2023, deferring all cost recovery until after a reasonableness review.[35] For these reasons, it is imperative that the Commission establish a process in this GRC so that any future undercollections be addressed throughout the cycle.

SDG&E also proposes to keep the existing WMPMA open as well to allow SDG&E to record WMP-related costs through 2023 as well as facilitate the reasonableness reviews of incremental 2019-2023 costs. If the WMPBA is approved, SDG&E will stop recording costs associated with implementing approved WMP initiatives in the WMPMA and would instead record such costs in the WMPBA beginning in 2024. For additional discussion, please see the Regulatory Accounts testimony of Jason Kupfersmid (Exhibit SDG&E-43).

2. SDG&E Proposes to Maintain its FRRMA to Promote Innovation

SDG&E aspires to continue its role as a leader in wildfire mitigation, situational awareness, and emergency operations. To that end, SDG&E will continue to pursue new innovations and technology to promote the safety of its employees, customers, and the public. To the extent SDG&E begins to incur costs on new projects that have not yet been yet approved in a WMP, SDG&E currently records such costs to the FRMMA. SDG&E requests to continue the FRMMA without modification.

3. SDG&E Proposes Slight Modifications to its TTBA to Incorporate All Vegetation Management Activities (VMBA)

SDG&E proposes to continue the TTBA as previously approved in D.19-09-051 for this GRC cycle with two modifications. The first requested modification is to expand the TTBA to include all of SDG&E's vegetation management program. Other vegetation management program costs not currently included in the TTBA include pole brushing, fuels management, and tree planting and distribution through the 10,000 Trees Goal for fire prevention, public safety, and environmental enhancement and stewardship, and sustainability. These activities are addressed in greater detail in the discussion of cost category 1WM005 below. Since 2019 there has been increased uncertainty regarding SDG&E's vegetation management program costs, due to both wildfire mitigation efforts as well as legislative changes. For instance, wildfire mitigation efforts and requirements increased demand for qualified tree-trimmers across

[35] *See* D.22-05-001.

California after 2019 and shortages of available local labor. Additionally, Senate Bill 247 took effect in 2020, and increased labor-related costs for SDG&E's qualified line clearance tree trimmers. While SDG&E does not anticipate the significant change to labor costs that resulted from SB 247 to occur again, potential changes to labor costs will continue to drive overall vegetation management expenses into the future.

To allow SDG&E to remain compliant with the vegetation management standards established by the Commission and other regulatory authorities, as well as its WMP, SDG&E proposes to maintain the two-way balancing treatment for the TTBA and its current thresholds for undercollections whereby:

- Recovery of any TTBA under-collection amounts up to 35% of the revenue requirement will be subject to recovery through a Tier 3 Advice Letter.
- Any amounts above the 35% will be subject to a separate application procedure.

The mechanics of Regulatory Accounts is addressed in Mr. Kupfersmid's testimony (Ex. SDG&E-43).

Similar to any two-way balancing account and consistent with its current TTBA practice, SDG&E will return unspent funds to ratepayers, and in the event of an undercollection, SDG&E has an opportunity to recover funds subject to a review of costs. The Commission authorized similar vegetation management balancing accounts, with two-way balancing treatment, for PG&E and SCE in their most recently decided rate cases, finding that "the creation of a [Vegetation Management Balancing Account] would promote efficiency across activities that are similar, or that are expected to become similar over time; support ongoing wildfire mitigation activities, even if costs above authorized levels become necessary; allow the return of unused funds to ratepayers; and allow for enhanced review of larger cost recovery amounts."[36] The same reasoning used for PG&E's and SCE's cases apply here. This treatment is warranted for vegetation management given its critical nature in helping to mitigate wildfire risk and supporting sustainability initiatives to meet the State's clean energy goals.

If the first modification to expand the scope of the account is granted, the second modification SDG&E requests to revise the name of the account from the TTBA to the

[36] D.21-08-036 at 186, citing D.20-12-005 at 77-79.

Vegetation Management Balancing Account (VMBA). This aligns with the account names for both PG&E and SCE's balancing account.

III. RISK ASSESSMENT MITIGATION PHASE INTEGRATION

The costs supported in my testimony are driven by activities described in SoCalGas and SDG&E's respective 2021 Risk Assessment Mitigation Phase (RAMP) Reports (the 2021 RAMP Reports).[37] The 2021 RAMP Reports presented an assessment of the key safety risks identified for SoCalGas and SDG&E and proposed plans for mitigating those risks. As discussed in the testimony of the RAMP to GRC Integration witnesses Gregory S. Flores and R. Scott Pearson (Ex. SCG-03/SDG&E-03, Chapter 2), the costs of risk mitigation projects and programs were integrated from the 2021 RAMP Reports into the individual witness areas.

In the course of preparing the Wildfire Mitigation and Vegetation Management GRC forecasts, SDG&E continued to evaluate the scope, schedule, resource requirements, and synergies of RAMP-related projects and programs. Therefore, the final presentation of RAMP costs may differ from the ranges shown in the 2021 RAMP Reports. Table JW-5 and Table JW-6 provide summaries of the RAMP-related costs supported in my testimony.

[37] *See* Application (A.) 21-05-011/014 (cons.) (RAMP Proceeding). Please refer to the RAMP to GRC Integration testimony of Gregory S. Flores and R. Scott Pearson (Ex. SCG-03/SDG&E-03, Chapter 2) for more details regarding the 2021 RAMP Reports.

TABLE JW-5
Summary of RAMP O&M Costs*

WILDFIRE MITIGATION **Summary of RAMP O&M Costs (In 2021 $)**			
	BY2021 Embedded Base Costs (000s)	**TY2024 Estimated Total (000s)**	**TY2024 Estimated Incremental (000s)**
RAMP Risk Chapter			
SDG&E-Risk-1 Wildfire Involving SDG&E Equipment	150,604	150,700	-96
SDG&E-Risk-2 Electric Infrastructure Integrity	16,896	18,155	1,259
SDG&E-Risk-8 Incident Involving an Employee	0	100	100
Sub-total	**167,500**	**168,955**	**1,455**
RAMP Cross-Functional Factor Chapter			
SDG&E-CFF-1 Asset Management	Costs included in SDG&E-Risk-1		
SDG&E-CFF-3 Emergency Preparedness and Response and Pandemic	Costs included in SDG&E-Risk-1		
Sub-total	**0**	**0**	**0**
Total RAMP O&M Costs	**167,500**	**168,955**	**1,455**

* CFF-related information, in accordance with the March 30, 2022 Assigned Commissioner Ruling in A.21-05-011/-014 (cons.), is provided in the RAMP to GRC Integration testimony of R. Scott Pearson and Gregory S. Flores (Ex. SCG-03/SDG&E-03, Chapter 2).

TABLE JW-6
Summary of RAMP Capital Costs*

WILDFIRE MITIGATION **Summary of RAMP Capital Costs (In 2021 $)**				
	2022 Estimated RAMP Total (000s)	**2023 Estimated RAMP Total (000s)**	**2024 Estimated RAMP Total (000s)**	**2022-2024 Estimated RAMP Total (000s)**
RAMP Risk Chapter				
SDG&E-Risk-1 Wildfire Involving SDG&E Equipment	441,712	517,602	512,632	1,471,947
SDG&E-Risk-2 Electric Infrastructure Integrity	1,368	1,371	1,371	4,110
Sub-total	**443,080**	**518,973**	**514,003**	**1,476,057**
RAMP Cross-Functional Factor (CFF) Chapter				
SDG&E-CFF-1 Asset Management	1,784	3,065	2,008	6,857
SDG&E-CFF-4 Foundational Technology Systems	6,581	6,500	2,496	15,577
Sub-total	**8,365**	**9,565**	**4,504**	**22,434**
Total RAMP Capital Costs	**451,445**	**528,538**	**518,507**	**1,498,491**

A. RAMP Risk and Cross-Functional Factor Overview

As summarized in Table JW-5 and Table JW-6 above, my testimony includes costs to mitigate the risks and cross function-factors (CFFs) included in the 2021 RAMP report.[38] These risks and CFFs are further described in Table JW-7 below:

[38] Unless otherwise indicated, references to the 2021 RAMP Report refer to SDG&E's respective RAMP Report.

TABLE JW-7
RAMP Risk and CFF Chapter Description

SDG&E-Risk-1 Wildfire Involving SDG&E Equipment	The risk of catastrophic wildfire, especially those initiated by SDG&E equipment, resulting in fatalities, widespread property destruction, and multi-billion-dollar liability.
SDG&E-Risk-2 Electric Infrastructure Integrity	The risk of an asset failure, caused by degradation, age, operation outside of design criteria due to unexpected events or field conditions (e.g., force of nature) or an asset no longer complying with the latest engineering standards, which results in a safety or reliability incident.
SDG&E-8 Incident Involving an Employee	The risk of an incident, involving one or more on-duty employees, that causes serious injury or fatality (as defined by OSHA) to a company employee.
SDG&E-CFF-1 Asset Management	Asset Management is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. The Asset Integrity Management (AIM) program, driven by the Asset Management Department, advances the development and implementation of a comprehensive, sustainable, and risk-informed Asset Management System (AMS), encompassing people, process, data, analytics, and technology.
SDG&E-CFF-3 Emergency Preparedness and Response and Pandemic	Initiatives related to planning, training, exercising, and supporting responses and recovery efforts related to incidents, emergencies, disasters, and catastrophes.
SDG&E-CFF-4 Foundational Technology Systems	Describes the need for developing and maintaining stable technology platforms. Foundational technology systems are used in every aspect of operations, customer engagement, and emergency response. Included are a significant portion of the Companies' software application systems, communication networks, monitoring systems, end-user systems, and hardware and software platforms hosted in the Companies' data centers and on internal and external cloud platforms.

SDG&E prioritized these key safety risks to assess which risk mitigation activities Wildfire Mitigation and Vegetation Management currently performs and if incremental efforts are needed to further mitigate these risks. While developing the GRC forecasts, SDG&E evaluated the scope, schedule, resource requirement, and synergies of RAMP-related projects and programs to determine costs already covered in the base year and those that are incremental increases expected in the test year.

Messrs. Flores and Pearson (Ex. SCG-03/SDG&E-03, Chapter 2) discuss all of the risks and CFFs included in the 2021 RAMP Reports and the RAMP to GRC integration process.

B. GRC Risk and CFF Activities

All the activities and costs put forth in my testimony address risk and are therefore designated as "RAMP" in this GRC. These RAMP activities are discussed further below in Sections V (Non-Shared O&M) and VI (Capital), as well as in my workpapers (Ex. SDG&E-13-WP and SDG&E-13-CWP). The tables included in Appendix B also provide a narrative summary of the forecasted RAMP-related activities that I sponsor in my testimony and a roadmap identifying by workpaper the TY 2024 forecast dollars.

The RAMP risk mitigation efforts are associated with specific actions, such as programs, projects, processes, and utilization of technology. SDG&E evaluated each of these mitigation efforts to determine the portion, if any, already performed as part of historical activities (*i.e.*, embedded base costs) and the portion, if any, incremental to base year activities. Furthermore, SDG&E reviewed the incremental activities to determine if any portion of incremental activity was part of the cost categories' base forecast methodology. SDG&E performed these analyses to provide the best available representation of incremental increases over the base year.

My incremental request supports the ongoing management of risks that involve significant safety, reliability, and financial consequences.

C. Changes from RAMP Report

As discussed in more detail in the RAMP to GRC Integration testimony of Messrs. Pearson and Flores (Ex. SCG-03/SDG&E-03, Chapter 2), in the RAMP Proceeding, the Commission's Safety Policy Division (SPD) and intervenors provided feedback on the Companies' 2021 RAMP Reports. Appendix B in Ex. SCG-03/SDG&E-03, Chapter 2 provides a complete list of the recommendations received and SDG&E's responses.

Other than as discussed below, the RAMP-related activities described in my GRC testimony are consistent with the activities presented in the 2021 RAMP Report. General changes to risk scores or Risk Spend Efficiency (RSE) values are primarily due to changes in the Multi-Attribute Value Framework (MAVF) and RSE methodology, as discussed in Messrs. Flores and Pearson's RAMP to GRC Integration testimony.

Changes from the 2021 RAMP Report presented in my testimony, including updates to forecasts and the amount and timing of planned work, are summarized as follows:

- In response to stakeholder feedback received in the RAMP Proceeding, SDG&E changed the probability distribution underlying its risk analysis from Gamma distribution to a type of Power Law distribution.
- The scope and schedule of some of the mitigations discussed in the RAMP Report have been updated within the GRC. Examples include:
  - Wireless Fault Indicators (See SDG&E-13-CWP Budget Code 112530)
  - Bare Hardening Conductor (See SDG&E-13-CWP Budget Code 202840)
  - Cleveland National Forest (CNF) Fire Hardening Program (See SDG&E-13-CWP Budget Code 081650)
  - Distribution System Inspection – Drone Inspections Program (See SDG&E-13-CWP Budget Code 202480)
  - Aviation Firefighting program (See SDG&E-13-CWP Budget Code 202770)
  - Communication Practices Program (See SDG&E-13-EOWM Workpaper 1WM008)
- After the 2021 RAMP Report had been filed, SDG&E performed a detailed review of its risk mitigation programs. SDG&E determined that nine additional programs mitigate the Wildfire risk including BLM Land Management (1WM003), CNF Access Roads (1WM003), CNF Land Management (1WM003), 10K Trees (1WM005), Risk Assessment & Mapping (1WM007.001), Data Governance (1WM007.002), WMP AFN Customer Support (1WM008), WMP Tribal Customer Support (1WM008), and Strategic Pole Replacement Program (Budget Code 222420). Reference the table in Appendix B for additional details.

IV. SUSTAINABILITY AND SAFETY CULTURE

A. Sustainability Efforts

Safety, reliability, and sustainability are the cornerstones of SDG&E's core business operations and are central to SDG&E's GRC presentation. SDG&E is committed to not only delivering clean, safe, and reliable electric and natural gas service, but to doing so in a manner that supports California's climate policy, adaptation, and mitigation efforts. The Sustainability Strategy serves as SDG&E's guide to enable a more just and equitable energy future in SDG&E's service territory and beyond. As a "living" strategy, SDG&E will continue to update the goals and objectives as technologies, policies, and stakeholder preferences change. For

additional information, see the Sustainability Policy testimony of Estela de Llanos (Exhibit SDG&E-02).

Every time a catastrophic wildfire is avoided, thousands or millions of metric tons of black carbon emissions are also avoided. Understanding the nexus between climate change, wildfire risk mitigation, and sustainability is a key element of SDG&E's overall business strategy and this GRC presentation.

Climate change is one of the biggest issues facing San Diego, California, and the world in the coming decades. In addition to advancing the electrical system hardening found necessary by the Legislature, many of the activities described in further detail in this testimony align with SDG&E's Sustainability Strategy. Because the changing climate has led to an increased risk of high winds, drought, and wildfire conditions, wildfire mitigation is inexorably tied to the effects of climate change. Through ongoing enhancements to situational awareness, including a comprehensive network of weather stations, the use of cameras to measure drought impacts and live fuel moisture, and the accumulation of detailed data for scientific study and modeling, SDG&E continues to look forward and proactively address the impacts of climate change on wildfire risk. Wildfire mitigation initiatives such as sustainable microgrids also serve to increase safety, reliability, and resiliency that include permanent renewable resources.

As detailed in this testimony, SDG&E is also seeking to engage the power of nature as an ally to combat wildfire impacts and climate change through initiatives such as the 10,000 Trees Goal, which plants and distributes trees throughout the service territory. Forests and trees play a vital role in the planet's overall health, providing critical ecosystem services that allow Earth's natural cycles to function and as important carbon sinks. Climate change is threatening this relationship. In geographically diverse California, the forests are facing climate risks from extreme heat, drought, and wildfires. 2020 was one of the worst years in California wildfire history, with an estimated 1.75 million acres of forest burned and approximately 90 million metric tons of carbon dioxide released from the burning of California forests.[39] According to the California Air Resources Board, the natural and working lands have now become a source of

[39] California Air Resources Board, "Greenhouse Gas Emissions of Contemporary Wildfire, Prescribed, Fire, and Forest Management Activities", *available at* https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf.

carbon emissions.[40] The poor health and net greenhouse gas emissions of California's forests are expected to increase through a negative feedback loop as wildfires further stress these systems. It is imperative that work is performed to break this negative feedback loop.

B. Safety Culture

Safety is a core value and SDG&E is committed to providing safe and reliable service to all its stakeholders. This safety-first culture is embedded in every aspect of the Company's work. In 2020, SDG&E commenced development and deployment of an enterprise-wide Safety Management System (SMS), which better aligns and integrates safety, risk, asset, and emergency management across the entire organization. The SMS takes a holistic and pro-active approach to safety and expands beyond "traditional" occupational safety principles to include asset safety, system safety, cyber safety, and psychological safety for improved safety performance and culture. SDG&E's SMS is a systematic, enterprise-wide framework that utilizes data to collectively manage and reduce risk and promote continuous learning and improvement in safety performance through deliberate, routine, and intentional processes.

SDG&E's commitment to wildfire safety for its employees, contractors, and the public is at the heart of its Wildfire Mitigation Plan and daily operations. This commitment was reflected in the recent findings of SDG&E's most recent Safety Culture Assessment, conducted pursuant to Public Utilities Code Section 8389(d)(4) and Resolution WSD-011, which concluded:

> "The workforce survey and comments from the interview participants attest to the work SDG&E has done to advance its safety culture. The electrical corporation has a robust process for measuring and improving the safety culture, with ambitious near and long term safety objectives supported by field-based projects and initiatives for frontline supervisors, employees, and contractors. Workforce comments indicate that communication of information and issues flows freely up, down, and across the organization."[41]

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[40] California Air Resources Board, "California 2030 Natural and Working Lands Climate Change Implementation Plan", *available at* https://ww2.arb.ca.gov/sites/default/files/2020-10/draft-nwl-ip-040419.pdf.

[41] SDG&E 2021 Safety Culture Assessment Report (September 2021), *available at* https://energysafety.ca.gov/wp-content/uploads/2021-sca-report-sdge.pdf.

SDG&E continues to seek ways to improve its safety culture, drawing on lessons learned and best practices. To that end, SDG&E agreed to implement the findings of the Safety Culture Assessment, including the integration of additional safe behaviors into its Behavior Based Safety observation program.

Please see the Sustainability Policy testimony of Estela de Llanos (Ex. SDG&E-02) for additional detail on SDG&E's Sustainability Strategy and the Safety, Risk and Asset Management testimony of Kenneth Deremer (Ex. SDG&E-31) for additional detail of SDG&E's Safety Policy.

V. NON-SHARED O&M COSTS

"Non-Shared Services" are activities that are performed by a utility solely for its own benefit. Table JW-8 summarizes the total non-shared O&M forecasts for the listed cost categories.[42] I will discuss each cost category in Table JW-8 in turn.

TABLE JW-8
Non-Shared O&M Summary of Costs

WILDFIRE MITIGATION O&M (In 2021 $)			
Categories of Management	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
A. Emergency Planning & Preparedness	13,315	16,236	2,921
B. Situational Awareness and Forecasting	2,994	3,877	883
C. Grid Design & System Hardening	26,041	25,399	-642
D. Asset Management & Inspections	36,014	15,375	-21,574
E. Vegetation Mgmt & Insp	10,365	14,301	3,936
F. Vegetation Mgmt & Insp. - Tree Trimming Only	52,195	55,622	3,427
G. Grid Operations & Operating Protocols	10,079	14,769	4,690
H. Resource Allocation Methodology	3,823	7,748	3,925
I. Risk Assessment & Mapping	608	2,413	1,805
J. Data Governance	1,082	1,650	568
K. Stakeholder Cooperation & Community Engagement	10,985	11,565	580
Total Non-Shared Services O&M	**167,501**	**168,955**	**519**

A. 1WM001 – Emergency Planning & Preparedness

[42] SDG&E believes it has identified immaterial errors during the finalization of this testimony regarding the computation of vacation and sick. These items will be revised at an available opportunity in the upcoming proceeding.

TABLE JW-9
Emergency Planning & Preparedness O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
A. Emergency Planning & Preparedness	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Emergency Planning & Preparedness	13,315	16,236	2,921
Total	**13,315**	**16,236**	**2,921**

1. Description of Costs and Underlying Activities

The Emergency Planning & Preparedness cost category supports SDG&E's company-wide efforts associated with emergency planning, preparedness, response, and recovery for all hazards and risks, with a strong focus on wildfire-related events. The programs and processes in this cost category include planning, training, exercising, and supporting responses and recovery efforts related to incidents, emergencies, disasters, and catastrophes. Each program contributes to emergency preparedness and response efforts as described in the cross-functional factor chapter Emergency Preparedness and Response and Pandemic included in SDG&E's 2021 RAMP Report (Chapter SDG&E-CFF-3). The Emergency Planning & Preparedness cost category comprises of five divisions: (1) Emergency Services Division, (2) Operational Field and Emergency Readiness, (3) Aviation Services, (4) Training and Exercise, and (5) Emergency Management Technology Solutions.

Emergency Services Division

The Emergency Services Division (Emergency Services) facilitates SDG&E's emergency planning, preparedness, response, and recovery through the Emergency Operations Center (EOC) for incidents regardless of cause, size, or complexity. The EOC plays a substantial role in driving forward SDG&E's longstanding commitment to safety, reliability, and security risk mitigation. Cross-functional subject matter experts virtually or physically assemble in the EOC to assess and provide situational awareness to internal and external stakeholders, establish overarching incident objectives, planning, anticipation, response, communications, and coordination. Operating within a utility-compatible Incident Command System (ICS) framework, the EOC coordinates emergency response and preparedness activities.

To promote public safety and meet the increasing demands of the regulatory environment, Emergency Services addresses compliance with federal, state, local, and Company emergency preparedness and response plans, standards, and other regulatory requirements.

These requirements include responding to and corresponding with the Commission, Energy Safety, and the California Office of Emergency Services (CalOES). To promote the safety of employees reporting to SDG&E facilities, Emergency Services oversees the Emergency Action Plan program, which provides evacuation planning and training to all SDG&E facilities.

Continuing SDG&E's essential functions are of vital importance to the community during emergency events. Emergency Services facilitates 59 companywide business continuity plans that coordinate activities during catastrophic events so that SDG&E can continue to provide clean, reliable, and safe energy to its customers.

As an essential part of SDG&E's contingency planning and restoration process, Emergency Services also manages the Mutual Assistance program. Under Mutual Assistance, utilities impacted by a significant event can increase the size of their workforce by borrowing restoration workers from SDG&E. If necessary, SDG&E may also draw on Mutual Assistance from partners to promote community resilience, emergency response, and recovery.

Operational Field and Emergency Readiness

Maintaining safe and reliable utility service during an emergency, such as wildfire or earthquake, requires multi-disciplinary efforts among numerous stakeholders. When time is of the essence, coordination is key. SDG&E's Operational Field and Emergency Readiness (OFER) personnel are experienced public safety and emergency response professionals skilled in ICS implementation who work directly with SDG&E's field-level partners to develop flexible, scalable, sustainable, and measurable scene management processes. OFER facilitates three primary programs: the After Action Review (AAR) program, First Responder Outreach Programs (FROP), and the field mentoring program.

The AAR program is an essential aspect of SDG&E's emergency operations effort aimed at facilitating solutions and conversations between stakeholders to effectively identify risks post-incident and develop and share best practices for future improvements. SDG&E analyzes incidents and EOC activations to identify opportunities for improved safety, scene management, communications, or training. This comprehensive program serves as a critical connection point to the training and exercise division, the Safety Management System governance program, and other critical safety improvement programs such as the Serious Injury and Fatality (SIF) incident evaluation process.

The AAR program communicates lessons learned with internal stakeholders. Those lessons learned and critical incident findings are also communicated to first responders through FROP to external San Diego Country public safety partners. The FROP program is also instrumental in bridging relationships between SDG&E field personnel and first responder partners. FROP staff foster and maintain strong relationships by delivering dozens of annual natural gas safety awareness training and other outreach services to hundreds of first responders within SDG&E's service territory. SDG&E's staff of retired fire chiefs leverage their extensive industry knowledge and relationships to share information with first responders regarding natural gas safety and foundational operational information on SDG&E's facilities. FROP instructors complete needs assessments for first responder agencies to enhance and develop appropriate and relevant training to target their operational needs and maximize engagement.

OFER's third program weaves together elements from the AAR program and FROP. The field mentoring program designs and delivers emergency response and readiness training with mentorship to SDG&E's operational field employees. When requested, field mentors deploy to local field-level incidents and mutual assistance assignments from other utilities.They also fill critical roles within the ICS structure, such as Safety Officer or Agency Representative, during incidents and share Incident Command expertise. Following incidents, lessons learned and opportunities to strengthen ICS roles and responsibilities are integrated into the FROP with first responder agencies to further strengthen collaboration.

Aviation Services

The Aviation Services Division coordinates safe and effective aviation services 365 days per year to internal and external customers in SDG&E's service territory. Aviation Services manages SDG&E's aviation assets, including exclusive-use helicopters, SDG&E-owned helicopters, and Unmanned Aerial Systems (UAS). Exclusive-use and SDG&E's owned helicopters increase the overall level of situational awareness through a combination of innovative business practices and highly specialized mission equipment. For instance, helicopter-mounted cameras enable live streaming of ongoing situations to select public safety entities. During emergency operations, highly trained personnel coordinate with the appropriate controlling agencies to provide supplemental fire suppression capabilities to SDG&E's service territory.

Helicopter and drone inspections also allow SDG&E an additional tool to address compliance with federal and state requirements and identify issues that may need repair. The UAS operators perform safe, cost-effective, and time-saving visual inspection of the service territory and infrastructure to reduce infrastructure damage. The issues identified during these inspections may go unobserved during a visual ground inspection; these supplemental and complementary reviews allow a different perspective on assets to identify areas that may pose a risk. Aviation Services operates in compliance with applicable Federal Aviation Administration (FAA) rules and regulations.

To further enhance service reliability, Aviation Services has expanded its services to construction support. For example, helicopters are used to set poles for grid hardening efforts, to transport linemen and other personnel to areas with difficult access, and pull wire when installing new lines in areas with no road access.

Helicopters may also be utilized to patrol PSPS areas prior to and post RFW or PSPS events. This important activity helps to provide access to otherwise difficult to access areas, speed up the patrols, and promote safer operations. These patrols are critical to reduce the potential for wildfires and enable faster restoration during PSPS events.

Training and Exercise

Training and Exercises are a vital component of SDG&E's emergency preparedness — they provide each emergency preparedness and response division an opportunity to validate plans, teach processes, build and sustain capabilities, and address areas for improvement. The Training and Exercise Division (T&E Div.) develops and implements strategies and curricula to implement SDG&E's ICS-focused approach, designed to strengthen enterprise-wide emergency response and recovery practices. To establish a cohesive response across all risk factors, experienced staff develop training to enhance EOC responders' knowledge, skills, and abilities. Exercises utilize a progressive approach to assess plans, procedures, and capabilities and are delivered through innovative, virtual tools to maximize engagement.

Emergency Management Technology Solutions

The Emergency Management Technology Solutions Division (EMTS Div.) delivers state-of-the-art tools, applications, and expertise to maintain technical functionality in the EOC at all times. The EMTS Div. partners closely with all the other emergency preparedness and response

divisions to build tools and resources to streamline, collect, and combine data in support of operations. This collaboration builds enhanced and resilient data sources and dashboards for daily and emergency recovery efforts. The Incident Management System software tool, managed by EMTS, creates a companywide Common Operating Picture (COP) to provide near real-time information to decision-makers for public and employee safety.

In collaboration with IT and Cybersecurity, EMTS Div. works to build hardware standards to support all forms of EOC activations. This includes the current hardware used during remote activations of the EOC and the support and distribution of alternative communications solutions such as satellite phones. The goal and intent are to provide reliable hardware (e.g., computers) to support EOC activations. During the COVID-19 pandemic, SDG&E's EOC transitioned to a completely or hybrid virtual EOC. SDG&E's remote EOC response met the immediate need to take action to comply with heath guidance aimed at minimizing the spread of the COVID-19 virus and has proven to be a highly effective and safe response solution. The EMTS Div. continues to meet the increasing demands for critical maintenance and technology solutions to support both remote and hybrid EOC applications and processes. Hardware, technical expertise, and software support solutions are vital components of SDG&E's enhanced remote activation model.

a. RAMP Activities

Table JW-10 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM001.

TABLE JW-10
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE*
1WM001.000	SDG&E-Risk-1 - C41	Emergency Management Operations	13,315	16,236	2,921	0

* An RSE was not calculated for this activity

2. Forecast Method

SDG&E used base year (2021) as the forecast method for this cost category. SDG&E has enhanced many of its programs in recent years to address additional wildfire risk, respond to

increased threat conditions due to climate change, and meet additional requirements during PSPS activations. These enhancements are not captured in the historical costs of this cost category. Accordingly, 2021 base year expenses are the most representative of future needs of the organization based on the aforementioned expansion in complexity and scope of existing projects and initiatives and further described below.

3. Cost Drivers

SDG&E added incremental adjustments to its 2021 base year costs to best represent the future cost forecast for this cost category. The cost drivers behind this forecast are discussed in the paragraphs below for each initiative.

Human Factors Engineering

In partnership with the United States Department of Energy and the Pacific Science & Engineering (PSE) Group Inc., SDG&E developed the PSPS De-Energization Dashboard. This Human-Machine Interface tool uses Human Factors Engineering (HFE) to combine and allow analysis of dozens of elements that are assessed before circuit de-energization is used as a last resort. The use of HFE to view and understand system limitations and capabilities supports real-time risk management and decision-making. The PSPS dashboard is an indispensable tool used by the Utility Incident Commander in the EOC as it displays wind gust observations relative to alert speeds for all SDG&E weather stations in a dynamic and easily consumable information environment. SDG&E plans to weave HFE into the design of PSPS decision-making tools currently utilized by SDG&E. By incorporating this new HFE technology, SDG&E will improve the safety, consistency, and timeliness of de-energization and re-energization decisions.

The early successes of the PSPS De-Energization Dashboard demonstrated that the business uses and benefits of HFE are exponential. SDG&E is requesting additional funding to expand HFE beyond PSPS-based projects to Electric Distribution Operations, Electric Regional Operations, Mission Control Grid Operations, and companywide. To meet this need for efficiency and safety enhancements to the Company's technology, tools, and systems, SDG&E is proposing an initial extension to the current PSE contract, which includes contracted HFE Scientists and consulting services. Beginning in 2023, SDG&E intends to transition from contract resource hours to a full-time SDG&E HFE Scientist.

24/7 Watch Command Desk

The 24-hour, 7 days-a-week Watch Command Desk will provide dedicated SDG&E personnel to maintain around-the-clock situational awareness to enable rapid response to any risk related to electrical infrastructure in SDG&E's service territory. Dedicated watch desk personnel can provide consistent and timely information monitoring of all hazards and real-time risk impact assessment of SDG&E's assets, customers, and employees. The 24/7 Watch Command Desk will allow resources for SDG&E to comply with Energy Safety's new regulations requiring that all utility-involved ignitions necessitating fire agency response and any wildfires that threaten utility equipment shall be reported to Energy Safety within 12 hours.[43]

It is quickly becoming an industry standard to have a 24/7 Watch Command Desk; PG&E, SoCalGas, and SCE currently have this capability. In addition to adopting this best practice, the impetus of this program is to reduce potential redundancies that result from multiple people gathering information, missed issues or information, or an inconsistent notification process. SDG&E's current model for maintaining situational awareness through several on-duty position rotations is subject to human error and miscommunication. For more effective and efficient situational awareness across regional, national, and global information sources, SDG&E is requesting seven new positions and monitoring support equipment to stand up and maintain the 24/7 Watch Command Desk.

Advanced Emergency Response and Business Continuity Planning

Emergency Planning staff anticipate risk impacts and develop plans for response and recovery efforts in coordination with SDG&E's applicable operational units. SDG&E currently relies on contract (non-dedicated) staff to provide this function. Contract staff are short-term and can require a long learning curve to successfully integrate and coordinate with internal and external stakeholders. Dedicated resources are critical to anticipate new risks and threats and incorporate leading emergency management best practices, including situational awareness technology and information platforms, into strategic emergency plans, policies, and procedures.

Further, SDG&E's existing databases, systems, and regulatory reporting methods require enhancements and defect resolution to promote optimal operation. SDG&E lacks a dedicated full-time resource for focused business continuity planning, whereas its peer

[43] Cal. Code of Regulations §29300(a), 14 CCR § 29300.

utilities, such as SCE and PG&E, have as many as five. SDG&E is proposing two full-time equivalents to maintain the existing planning efforts' health and expand operations to include additional risks and threats beyond PSPS, including cybersecurity and climate change.

In addition to the response plans, the Emergency Services is responsible for the facilitation and oversight of 59 business continuity plans for all operating departments companywide. The number of required emergency response plans is consistent across all investor-owned utilities. These plans are a critical component to the resiliency of essential functions and promote SDG&E's ability to operate and provide essential services with minimal downtime during an emergency or disruption. With an increase in response types (*e.g.*, civil unrest and pandemic response), Emergency Services often pivots to meet the needs of a dynamic EOC activation environment, which detracts from critical advanced planning activities. The addition of a focused, dedicated resource on business continuity planning furthers SDG&E's preparedness in the event of a significant disruption.

Training and Exercise Expansion

The T&E Div. adapts to considerable challenges, including increasing external mandates, regulatory demands, an annual EOC responder attrition rate of 40%, and internal requests for readiness and response training and exercise.SDG&E's single full-time employee is responsible for an expanding list of high-priority areas including PSPS and wildfire risk. For instance, SDG&E is now required to conduct two annual PSPS exercises prior to July 1, while simultaneously developing training to meet operational changes and new regulatory requirements. Regulatory data requests have also increased by 288%, with reduced response timeframes. This expansion has rendered the existing resources unsustainable to meet expectations or fulfill the department's mission.

The T&E Div. must meet growing internal requirements beyond regulatory mandates. Training provides response team members with the requisite knowledge of response plans, process, and resources to respond to incidents safely and effectively. Exercises are the primary means outside of a real-world response to validate existing plans and find capability shortfalls in response systems, personnel training, or equipment. While it is nearly impossible to recreate the stress of a significant threat or emergency, it is through comprehensive training exercises that SDG&E can achieve a level of preparedness so that employees can competently respond to incidents and promote resiliency and reliability. Training and exercises will be delivered through

in-house EM Dept. subject matter experts and contract resources to meet state mandates and enhance SDG&E's internal response efficiency and responder safety.

Compared to other investor-owned utilities, the T&E Div. at SDG&E is resource deficient; PG&E maintains training and exercise activities with a team of 11, and SCE with a team of five.To meet CPUC regulatory compliance regarding PSPS and EOC staff training, exercise, and documentation, SDG&E is requesting two additional full-time resources and funding for contract training resources.

Emergency Management Technology Solutions Expansion

As described above, for the safety of its employees, contractors, and vendors, and to meet health guidance to mitigate the spread of COVID-19, SDG&E designed and established a virtual EOC beginning in 2020 to coordinate company-wide emergency response activities. This model was pressure tested by over a dozen successful virtual EOC activations in 2020 and 2021. While SDG&E believes virtual EOC activations are viable response solutions, there continues to be an immediate need to fortify it with advanced technology designed specifically for the virtual environment and technical specialists to support it. Support staff must verify that all work-from-home EOC responders experience stable and redundant connectivity, communications, and information flow to support decision-making during both foreseeable and unexpected risks and hazards. The EMTS Div. will continuously assess the gaps in the virtual environment model and integrate the equipment, processes, and methods to reliably sustain and enhance the Emergency Management's core delivery of services.

Albeit reliable, the virtual EOC model cannot permanently replace the primary or backup EOC given that specific risks and incidents, such as a telecommunications outage, would render the virtual EOC inaccessible and would, in turn, necessitate an in-person EOC response. If physically inaccessible due to a natural disaster or an incident response requires additional planning and coordination space, the backup EOC facility must duplicate the primary EOC's capacity to house the required number of EOC responders and function. The procurement of refresh and backup equipment is essential to maintaining the overall health of EOC technical equipment, including displays, computers, network infrastructure, and communications tools.

Emergency Management continues to monitor, evaluate, and adjust to best technology solutions practices. As SDG&E shifts to adapt to a hybrid emergency response model, SDG&E is requesting funds to procure and integrate a disaster recovery communications system into its emergency response arsenal to recover from catastrophic events. Should the widespread loss of power or telecommunications occur, this system would provide backup capabilities to critical situational awareness and notification applications used during emergency recovery efforts.The EMST Div. will support the IT functionality, continued growth, and enhancement of the disaster recovery system, all virtual, primary, and backup equipment in EOC locations, including audiovisual equipment, computers, network infrastructure, and communications tools. Staff will analyze workflows within Emergency Management and deploy automation technology to allow for faster decision-making and response times.

EMTS Div. currently relies on short-term, contract resources to fulfill these functions. Current staffing levels and existing hybrid EOC IT infrastructure are inadequate to meet and sustain these ends. Technical support ranges from the startup and configuration of the room to support tours and meetings to maintenance, troubleshooting and replacement of the various audio-visual components used to perform tours.

Additional responsibilities include maintenance and upkeep of the satellite phone program used in emergency communications at SDG&E as a whole and supporting the staff in Emergency Management with building defining and assisting in the drafting of requirements to support new applications necessary to maintain current and future operations with the intent to streamline and simplify business tasks. This may include the design and building of key applications and tools utilizing low code/no code solutions to identifying and coordinating the purchase and implementation of out-of-the-box solutions in collaboration with other IT and business resources. Finally, resources are intended to support the purchase and installation of technical and communications equipment utilized by Emergency Management including but not limited to defining standards for computer resources in collaboration with IT.

As such, SDG&E is requesting two full-time resources.The EMST Div. will support the IT functionality, continued growth, and enhancement of the disaster recovery system, all virtual, primary, and backup equipment in EOC locations, including audiovisual equipment, computers, network infrastructure, and communications tools. Staff

will analyze workflows within the EM Dept. and deploy automation technology to allow for faster decision-making and response times.

Introduction to the Incident Command System (ICS)

The CPUC's General Order (GO) 166, requires that the utilities shall adopt and participate in California's Standardized Emergency Management System (SEMS). SEMS is the cornerstone of California's emergency response system and the fundamental structure for the response phase of emergency management. Full agency utilization of Incident Command System (ICS) is a central pillar of SEMS. ICS is a standardized and repeatable approach to incident management and is used for all forms of incidents: emergencies, planned events, coordinated response, integration of resources, and common processes.

SDG&E has an unwavering commitment to protecting employees, contractors, and the public. In support of this mission, the EM Dept. will expand ICS core principles into the three initiatives outlined below. Response workgroups will have the management practices needed to unify under a centralized and adaptable response structure where standard operating conditions can be quickly escalated into an incident without any drastic changes to the business. This model benefits ratepayers by facilitating safer service restoration and faster response times through effective resource management and fluid communication channels with both internal and external stakeholders. Utilization of ICS results in a professionalized incident response organization that can manage risk and continually improve upon all aspects of our safety performance, ultimately working to limit or eliminate worker risk and public exposure.

Incident Command System Expansion

SDG&E has been utilizing Incident Command in field responses in Gas Operations and in the EOC but needs to expand these efforts toward other key response business units such as Electric Operations and Information Technology. The next phase of SDG&E's ICS maturity plan engages the T&E Div. to expand ICS protocols into additional operational areas, including routine and regularly scheduled work. The goal of the company's ICS implementation is to build simple, flexible, and scalable systems that seamlessly integrate daily business practices with the foundational principles necessary to rapidly escalate into a coordinated incident response. This resiliency initiative will require hundreds of hours of training and strategic coordination with subject matter experts across dozens of business units to standardize and expand ICS principles. Two full-time resources are requested to realize this substantial project scope.

Incident Support Team

As primary subject matter experts on incident command principles, OFER's field mentoring program continues to drive SDG&E's safety culture forward through the creation of the nation's first utility-based Incident Support Team (IST). Ongoing field-safety observations during emergency incidents and events identified a critical need for various support positions within the Incident Command System (*e.g.,* Utility Field Safety Officer, Operations Section Chief, Agency Representative, and more) to integrate into the ICS response framework to allow utility incident command staff to focus on scene safety and incident management. OFER's field mentors will connect qualified SDG&E personnel (*i.e.,* trained IST) with field incident command to meet the dynamic needs of field-level emergencies that threaten to escalate, intensify, or likely extend beyond the initial response.

To advance SDG&E's ICS initiative, SDG&E is requesting a full-time resource as well as an incident support command vehicle to respond to and support requests for field-level incidents and mutual assistance deployments. Operating as a central hub for inter-agency coordination, the incident support vehicle functions as a mobile incident command post. Additional features include critical backup communications resources (e.g., radios and a landline), Wi-Fi access, and printing capabilities. In areas of the backcountry with rough terrain and SDPD enforced road-closures, SDG&E branded, 4-wheel drive vehicles will allow for ease of access to incidents. This position will formalize a deployable all-risk, all-hazard emergency IST resource. The scope of this position will include establishing pre-designated roles and responsibilities, coordinating IST position-specific training, and performing essential change management for successful IST program adoption and usage. This dedicated resource will champion the next phase of ICS field leadership mentoring to increase the safety of SDG&E personnel, the public, and public safety-first responders, responding to gas and electric emergencies, PSPS events, extensive service restorations, fires, and other catastrophic events in our service territory.

After-Action Review Program Expansion

As discussed above, SDG&E uses the AAR program for early identification of risks and continual learning and improvement with robust review processes to continually measure effectiveness.SDG&E's incident response is increasingly strengthened and shaped by the stakeholder feedback received through the AAR process. Examples of performance outcomes

that were developed through the AAR process include the PSPS Dashboard, the IT on-duty rotation, a joint SoCalGas natural gas curtailment playbook, and a Cybersecurity playbook. This process promotes continuous quality improvement projects and post-incident evaluations, and has contributed to the development of three major initiatives.

- First, the EM Dept. has set aggressive training and exercise goals in 2022 to comply with increasing regulatory requirements. For example, SDG&E was mandated by the CPUC in 2021 to complete one pre-fire season PSPS exercise. SDG&E is now required to complete three, all of which require pre-/post-fire season and post-event after-action analysis, reporting, and tracking. The T&E Div. will also leverage AAR staff to benchmark, measure the maturity of programmatic elements, and determine progress towards strengthening emergency response practices. This aggressive training and benchmarking are expected to continue through 2024.
- Second, to provide an enterprise-wide approach to risk and safety, the AAR program will partner, align, and adopt Emergency Management's continuous improvement processes with SDG&E's Safety Management System (SMS). This alignment will widen the scope of required after-action activities to now include risk-assessment scoring and post-incident investigations.
- Third, over the past five years, we have seen an increase in requests for post-incident evaluations from operations groups by 260%. This increase is a result of SDG&E's ambitious ICS implementation goal which has widened the scope of SDG&E Divisions to include Electric Regional Operations (ERO) and a wider range of hazards and risks beyond PSPS with a renewed focus on emerging threats (*e.g.,* Cybersecurity).

To be compliant with CPUC related decisions and proceedings (*i.e.*, GO 166 and the 10-day post-PSPS event reporting template) and to promote the achievement of the goals, SDG&E requests a dedicated full-time resource to promote continuous improvement activities, sustain the current growth rate, and expand the OFER's bandwidth to encourage a higher level of safety and effective incident management.

B. 1WM002 – Situational Awareness & Forecasting

TABLE JW-11
Situational Awareness & Forecasting O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
B. Situational Awareness and Forecasting	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Situational Awareness and Forecasting	2,994	3,877	883
Total	**2,994**	**3,877**	**883**

1. Description of Costs and Underlying Activities

Evidence continues to demonstrate that changing climate conditions are contributing to an increase in wildfire potential throughout California. SDG&E established a Fire Science and Climate Adaption (FSCA) department in 2018, which continues to expand and grow to meet the needs of increasing wildfire and climate-related risks. FSCA comprises of three groups: Fire Science & Coordination, Meteorology, and Wildfire Resilience & Operations. The department is comprised of meteorologists, community resiliency experts, fire coordinators, and project management personnel. This department's purpose is to respond to and strategize for SDG&E's fire preparedness activities and programs.

SDG&E's Fire Science and Coordination team consists of individuals who possess broad expertise in a variety of firefighting disciplines, from wildland fire control and municipal fire departments to aerial firefighting operations. This team works closely with engineering, operations, and construction to build fire safety and fire preventive measures and procedures into designs and operational and construction activities. They also provide fire prevention expertise during the planning phase of major projects. Because of their Incident Command System experience, the Fire Science and Coordination team can effectively integrate with first responders at the Command level to confirm the emergency response is safe, efficient, and coordinated. Fire Science and Coordination representation at strategic and operational planning meetings during an ongoing incident allows for SDG&E objectives to become part of the overall Incident Action Plan. The Fire Science and Coordination team also oversees SDG&E's contract fire prevention and suppression services, when electric crews are working in high fire threat districts during fire season and extreme fire weather such as red-flag Santa Ana events. The team provides fire safety training internally to SDG&E employees and electrical safety training

externally to fire department and law enforcement first responders. The Fire Science and Coordination team also provides subject matter expertise in regulatory proceedings.

SDG&E's Meteorology team currently has six meteorologists on staff. The meteorologists provide daily reports that are critical to making real-time operating decisions, in order to safely manage and operate the electric system, on a 24-hours a day, seven-days per week basis. The Meteorology group also manages the densest utility weather network in the country, and has developed a high-performance computing program, which uses state-of-the-art analytical methods to provide superior decision support tools to SDG&E and the communities it serves. This is especially important during periods of adverse weather conditions, with a special focus on mitigating fire risk and providing situational awareness during times of extreme Santa Ana weather conditions.

The third team within FSCA, Wildfire Resilience & Operations (WRO), is focused on a broad range of project support initiatives. This team is comprised of five subject matter experts in project management, program management, contracting, community engagement, and climate adaptation. WRO engages in support and advisor-level activities that assist each of the working groups within FSCA.In addition to support functions, this team is directly responsible for the maintenance and operations of SDG&E's world-class weather network, Community Resource Center Program, Wildfire Outreach & Education, Climate Change Adaptation projects, and initiates customer-focused resilience programs.

SDG&E's Director of FSCA currently has two staff in the group, the Director and the administrative professional for FSCA. In addition to labor costs, the FSCA Director and administrative professional support the entire organization by fostering strategic partnerships with vendors and academia to help advance science and technology to increase safety and wildfire mitigation, adapting to changing climate conditions.

a. RAMP Activities

Table JW-12 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP, 1WM002.

TABLE JW-12
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE*
1WM002.000	SDG&E-Risk-1 – C04	Fire Science and Climate Adaptation Department	2,994	3,777	783	0
1WM002.000	SDG&E-Risk-8 – M01	Air Quality Sensor System	0	100	100	59

* An RSE was not calculated for this activity

2. Forecast Method

The forecast method utilized for this cost category is base year. Labor and non-labor forecasts are based on the BY 2021 recorded data. Given that this department was initiated in 2018 and has continued to expand to address wildfire mitigation efforts as described in SDG&E's WMP, historical recorded information does not reflect the needs to support this initiative for Test Year 2024. Accordingly, base year recorded data was utilized as the forecasting method to best represent the structure of the organization.

3. Cost Drivers

The 2021 base year recorded information will not provide adequate funding for Test Year 2024 in light of the additional items in SDG&E's forecasts. As such, SDG&E added incremental adjustments to reflect the increased activities designed to enhance reliability and safety by enhancing situational awareness and promoting preparedness through enhanced forecasting, data analysis, and fire science study.

Proposed labor costs will increase to hire additional personnel necessary to increase capabilities in this area. SDG&E requires two new meteorologists to prepare daily meteorology reports and assist with modeling weather forecasts utilizing the supercomputer system. One new fire coordinator is necessary to assist with improving SDG&E's reporting and investigations of ignitions that occur within the service territory. The Office of Energy Infrastructure Safety has also recently implemented new regulations that significantly expand reporting of ignitions and wildfire threats beyond what was previously in place at the CPUC. Meeting these regulatory requirements requires additional resources and coordination.

Finally, a Climate Education Specialist, Community Engagement Planning Manager, and Community Resilience Specialist will be hired to assist with community engagement and promote efforts. This will allow communities to be engaged in and apprised of utility wildfire vulnerability assessments and adaptation planning in addition to being educated on how wildfire and climate hazards may impact them. These resources will support SDG&E's commitment to making equity a priority in all its ongoing wildfire adaptation planning and education. Additionally, SDG&E continues to expand community resilience programs such as the Wildfire Resilience Webinars, Wildfire Safety Fairs and generator programs to enhance community preparedness and resilience.

SDG&E requests an increase in non-labor increased funding for enhanced data management, including addressing SDG&E's weather network consisting of 221 stations and over 100 high-definition wildfire cameras enabled with new and advanced Artificial Intelligence (AI) Smoke Detection. Additionally, SDG&E continues to assess vegetation health from space-based sensors and is using remote sensing linked with camera feeds filtered by artificial intelligence to detect ignitions. Both enhanced data management and additional tools for ignition detection provide real-time alerts to SDG&E, which benefits customers by having the ability to quickly react and improve situational awareness. In addition, to enhance the state of the science and to foster innovation necessary to remain on the cutting edge of fire science, SDG&E must maintain its ongoing partnerships with four major academic institutions including the San Diego Super Computing Center, University of Wisconsin, Scripps Institute of Oceanography, and San Jose State University.

Non-labor costs to install air quality sensors are included in the forecast adjustments. Particulates contained in wildfire smoke are hazardous to employees and the public. In addition, the Division of Occupational Safety and Health (Cal/OSHA) Protection from Wildfire Smoke Program (Title 8 CCR Section 5141.1) requires employers to notify employees when the Air Quality Index (AQI) for Particulate Matter 2.5 microns or smaller in diameter (PM2.5) exceeds 150 or exceeds 500 during wildfires. SDG&E will install air quality sensors to measure particulate matter and an automatic notification system to meet this requirement. This program is built on the backbone of SDG&E's existing best-in-class utility weather network. Upon installation of this technology, real-time AQI values for townships in San Diego County will be available on SDG&E's Fire Science & Climate Adaptation App. The app will also have the

option of sending alerts of poor air quality to personnel if dangerous levels are detected. Currently, AQI is determined through manual collections performed by Safety team members. San Diego county has AQI monitoring stations; however, stations are limited in quantity and do not accurately represent the service territory. Additionally, AQI data published by the Environmental Protection Agency (EPA) and local air districts varies and is delayed.

The final non-labor adjustments are related to additional training for fire coordination staff and mobile command trailers. Additional training will provide fire coordination staff with the latest knowledge and teach protocols so that ignitions are investigated and reported in a complete and consistent manner. Mobile Command Trailers allow for fire coordination and other personnel to respond to wildfires or other emergency events utilizing one location that can be placed near the overall incident commander. This promotes the safety of the responding personnel and maintains ICS protocols for information flow during emergencies, allowing SDG&E and emergency response personnel to communicate and efficiently respond as necessary.

C. 1WM003 – Grid Design & System Hardening

TABLE JW-13
Grid Design & System Hardening O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
C. Grid Design & System Hardening	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Grid Design & System Hardening	26,041	25,399	642
Total	**26,041**	**25,399**	**642**

1. Description of Costs and Underlying Activities

SDG&E's grid hardening programs are a set of initiatives aimed at reducing wildfires caused by utility equipment and minimizing the customer impacts of PSPS. This section addresses the O&M activities associated with capital improvements supporting grid design and system hardening.[44]

SDG&E has a number of initiatives, including covered conductor and strategic undergrounding that reduce risk events on utility equipment, thus lowering the likelihood of

[44] For additional information regarding significant capital initiatives, including but not limited to traditional overhead hardening, covered conductor, and strategic undergrounding, please refer to their respective capital workpapers and the capital section of my testimony.

ignition. Protection and equipment programs such as advanced protection, the expulsion fuse replacement program, and the lightning arrestor program further aid in reducing ignition risk. These programs reduce the chance that a risk event results in an ignition by utilizing protection settings and/or equipment that address a specific failure mode known to lead to ignition. Replacement of hotline clamps with compression connections to eliminate the risk of the wire down failure associated with hotline clamps, which in turn will reduce wire down events and ignitions associated with connection failures.

SDG&E has also implemented a number of programs with the purpose of reducing PSPS impacts on customers, including the PSPS sectionalizing program, microgrids, and generator programs.[45] SDG&E measures the impact of these programs in the number of customers who will no longer be impacted by a PSPS event assuming weather conditions similar to previous events, or experienced reduced impacts through the use of backup power.

SDG&E's Resiliency Grant Programs focus on enhancing PSPS resiliency among vulnerable customer segments in SDG&E's territory. This program consists of several projects aimed at providing customers with renewable backup power options during PSPS events. The primary initiative in this category is the Generator Grant Program (GGP), which was launched in 2019.The GGP offers portable battery units with solar charging capacity to customers, leveraging cleaner, renewable generator options to give vulnerable customers a means to keep small devices and appliances charged and powered during PSPS events. While these are not whole facility solutions, they allow vulnerable customers access to needed power to support life-saving devices and means of communication.

To optimize available program resources to vulnerable customers, the GGP initially targeted Medical Baseline (MBL) customers who have experienced a previous PSPS outage. Since 2021, SDG&E has proactively contacted eligible customers previously impacted by PSPS to inform them of GGP offerings. SDG&E also partnered with Indian Health Councils to promote the availability of these backup battery units to vulnerable customers in tribal nation communities. In response to additional customers—including AFN customers—requiring access

[45] Certain PSPS mitigations, including Microgrids and the PSPS sectionalizing program, are largely comprised of capital spend and are thus further discussed in the capital section below. This section of my testimony includes O&M associated with microgrids.

to critical electric services, SDG&E is expanding this offering. Through 2024, the Generator Grant Program is expected to reduce PSPS impacts to over 7,000 customers.

Despite SDG&E's extensive hardening efforts, certain customers and communities may not directly benefit from other grid hardening programs and will continue to experience PSPS as a tool of last resort. Since these customers reside in the backcountry and are so widely distanced from one another, SDG&E's grid hardening initiatives will not reduce the PSPS impacts on this subset of customers. To promote resiliency for these customers and dramatically reduce the impacts they experience from PSPS, SDG&E's Standby Power Programs provide alternative energy solutions aimed at providing the participating customer a comprehensive source of power to energize their entire home or business. Targeted customers –residential, small commercial, critical facilities, and mobile home park clubhouses will experience fewer PSPS risks as a result of this program.

The first of SDG&E's Standby Power Programs is now known as the Fixed Backup Power (FBP) Program. This program is aimed at providing whole facility power solutions for backcountry residences, businesses, and local communities in the HFTD that may not benefit from planned hardening initiatives. Through 2024, the Standby Power Program is expected to reduce PSPS impacts to approximately 1,200 customers. This number is calculated based on the count of customers that would receive the generator and is used to estimate the reduction in PSPS impact to calculate the RSE. Because the generators provided to customers as a part of this program are whole-facility solutions that are expected to keep the customers energized throughout a PSPS event, the effectiveness of the mitigation is estimated to be 100%.

SDG&E is also minimizing risk by increasing customer resilience through its Resiliency Assistance Programs, which provide eligible customers point-of-sale rebates for generators purchased through traditional retailers. The Resiliency Assistance Programs were enhanced in several ways starting 2021. Expansion of the type of offered rebates allowed customers more choice and opened supply chain options to additional local and national retailers by allowing customers to purchase generators at their preferred stores and then redeem coupons post purchase. In an effort to provide new options for customers, SDG&E also added portable batteries and power station options to the rebate program, following demonstrated demand for these products at other utilities in California and beyond.

Finally, the Generator Assistance Program includes an expanded focus on well pump customers in SDG&E's territory with additional need for backup power capability during PSPS outages. SDG&E partnered with the County of San Diego to identify these customers and will target these homes and small businesses. Finally, SDG&E continues to pursue new ways to educate and inform customers about smart customer resiliency tips and recommendations. These efforts include "Resiliency Audits," which allow customers to self-evaluate PSPS preparedness. These audit/surveys will inform customers about programs available to solve their unique resiliency gaps while also gathering critical information from customers on new ways to help prepare them even better in future years.

a. RAMP Activities

Table JW-14 provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP 1WM003.

TABLE JW-14
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE*
1WM003.000	SDG&E-Risk-1 – C07/M2 T1-T2	OH Dist Fire Hardening – Covered Cond	518	592	74	-
1WM003.000	SDG&E-Risk-1 – C10/M5 T1-T2	Microgrids	1,492	1,607	115	28
1WM003.000	SDG&E-Risk-1 – C12/M7 T1-T2	Hotline Clamps	3,648	365	-3,283	-
1WM003.000	SDG&E-Risk-1 – C13/M8 T1-T2	Resiliency Grant Programs	7,892	7,550	-342	-
1WM003.000	SDG&E-Risk-1 – C14/M9 T1-T2	Standby Power Programs	8,934	10,350	1,416	-
1WM003.000	SDG&E-Risk-1 – C15/M10 T1-T2	Resiliency Assistance Programs	745	1,828	1,083	-
1WM003.000	SDG&E-Risk-1 – C16/M11 T1-T2	Strategic Undergrounding	90	2,921	2,831	-
1WM003.000	SDG&E-Risk-1 – C17/M12 T1-T3	OH Dist Fire Hardening – Bare Conductor	2,722	48	-2,674	41
1WM003.000	SDG&E-Risk-1 – N/A	BLM Land Management	0	4	4	0
1WM003.000	SDG&E-Risk-1 – N/A	CNF Land Management	0	134	134	0

*Tranche level RSEs and additional details are available in SDG&E-13-WP 1WM003.000.

2. Forecast Method

The forecast method developed for this cost category is 2021 base year. SDG&E has expanded its efforts in the system hardening area in recent years, executing additional units in 2021 in almost all programs. Because of this expansion, historical costs prior to 2021 are not representative of the costs SDG&E is forecasting to incur in Test Year 2024. Accordingly, base year is the selected forecast method.

3. Cost Drivers

SDG&E forecasts a number of increases in activities related to grid design and system hardening as it continues to implement its WMP and improve wildfire mitigation strategies. These efforts meet the Legislative directive of AB 1054 to increase the hardening of the California grid. SDG&E is diverting efforts from traditional bare hardening, which is less efficacious than the use of covered conductor and strategic undergrounding in preventing ignitions. As SDG&E deploys increased use of covered conductor, it plans to install 60 miles in 2024, an increase of 40 miles over 2021. O&M associated costs will increase $74,000. Additionally, to respond to the dual need to reduce wildfire risk and PSPS impacts to customers, SDG&E designed its strategic undergrounding program. Undergrounding assets is the most effective way to prevent electrical line-related ignitions and the only way to significantly reduce the need for and impacts of PSPS for customers on the undergrounded circuit. SDG&E intends to underground 125 miles of electrical infrastructure in 2024, an increase of 100 miles over 2021. SDG&E forecasts an associated O&M cost increase of $2,831,000.

As the use of covered conductor and strategic undergrounding increases, SDG&E will decrease traditional bare hardening efforts in the coming years. SDG&E forecasts a decrease of 95 miles as compared to 2021, with an associated cost reduction of $2,674,469.

The cost drivers for SDG&E's other grid hardening programs are as follows:

- Hotline clamps are forecasted to have a reduction of 2,533 units in 2024 from the 2021 values which leads to a decrease in cost of $3,283,596. The reduction in units is driven by the program's completion of these replacements within the HFTD.
- SDG&E has identified upward cost drivers to implement Cleveland National Forest (CNF) and Bureau of Land Management (BLM) Operations and Maintenance Plans. The Federal Land Policy and Management Act was amended to establish requirements for the development, approval, and implementation of vegetation management and facility inspection for electric utilities operation on National Forest Service and BLM lands. These requirements became effective on August 10, 2020, and SDG&E forecasts an increase of $4,000 and $134,000 for BLM Land Management and CNF Land Management respectively in 2024.

- SDG&E's Resiliency Grant Programs have downward drivers in 2024 due to the decrease of 890 units which leads to a decrease in cost of $342,000. The decrease in units is driven by SDG&E reaching maturity in the program and focusing on the most vulnerable customers who have experienced PSPS events. The costs will not decrease proportionally to the units as there are certain fixed costs and future replacements for existing customers that have not been reflected in historical costs.
- SDG&E's Standby Power Programs has an upward driver of $1,416,000 in forecasted 2024 costs compared to 2021. The cost increase is driven by the shift to sustainable power offerings such as batteries in lieu of the traditional propane generators. The program also expects an increase of 12 units in 2024 over 2021.
- SDG&E's Resiliency Assistance Programs are forecasted to increase 515 units which leads to an increase in cost of $1,083,703. The increase is driven by identifying and marketing towards eligible customers and an increased capability to deliver generators by expanding eligible options.
- SDG&E's Microgrids are forecasted to remain constant; however, because of the scope of the Microgrid projects in 2024, there was a cost increase of $115,000 compared to 2021.

D. 1WM004 – Asset Management and Inspections

TABLE JW-15
Asset Management and Inspections O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
D. Asset Management & Inspections	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Asset Management & Inspections	36,949	15,375	-21,574
Total	**36,949**	**15,375**	**-21,574**

1. Description of Costs and Underlying Activities

The costs in this workpaper reduce the risk of wildfire resulting from equipment failure by funding programs and initiatives aimed at identifying equipment deterioration and repairing or replacing equipment before failures occur. While SDG&E performs inspections throughout its service territory as required by applicable regulations and guidelines, the inspections and the resulting minor repairs associated with this workpaper and request are limited to those performed

within the HFTD. The inspection types performed by SDG&E include the following categories, which are further discussed below: Drone Inspections and Repair, Five-Year Detail Inspections, Patrol Inspections, 10-Year Intrusive Inspections, HFTD Tier 3 Inspections, Distribution Infrared (IR) Inspections, and LiDAR Inspections.

Drone Inspections and Repair (DIAR)

The Drone Inspections and Repair (DIAR) program is discussed in detail in the Capital section of this testimony under budget code 202480. The O&M costs associated with the DIAR program include performing the drone flights, assessing the drone imagery, performing minor repairs, and maintenance to keep running machine learning models that review drone imagery for infractions. Documentation of forecasted DIAR O&M costs are included with supplemental capital workpapers. *See* SDG&E-13-CWP Budget Code 202480.

Five-Year Detailed Inspections

The Commission's General Order (G.O.) 165 requires SDG&E to perform a service territory-wide inspection of its electric distribution system, which is referred to as the Corrective Maintenance Program (CMP). This inspection program mitigates the risk of equipment failure by identifying equipment deterioration and making the repair and/or replacement before failures occur. Equipment failure can lead to electrical faults, which can lead to ignitions. G.O. 165 establishes inspection cycles and record-keeping requirements for utility distribution equipment. Utilities must conduct detailed inspections at a minimum every three to five years, depending on the type of equipment. For detailed inspections, the utilities' records must specify the condition of inspected equipment, any problems found, and a scheduled date for corrective action if identified. Utilities are also required to perform intrusive inspections of distribution wood poles depending on the age and condition of the pole and prior inspection history.

The costs included in this exhibit are only related to inspections within the HFTD. For costs associated with CMP inspections outside of the HFTD see the testimony of Electric Distribution - O&M witness Tyson Swetek (Ex. SDG&E-12).

The CMP helps to mitigate wildfire risk by providing SDG&E additional information about its electric distribution system, including infrastructure in the HFTD. With this information, SDG&E's corrective actions address and remedy potential issues before they develop into a risk event. Corrective actions can include O&M repairs of minor equipment,

which are included in this workpaper. Capital repairs associated with pole replacements are represented in Budget Code 002390.

SDG&E conducts an annual audit to measure the effectiveness of CMP inspections. This audit is managed by SDG&E's operational and engineering managers, who are responsible for certain districts. Typically, 1.5% of the combined (overhead and underground) territories are identified for audit to assess the condition of equipment and determine if the appropriate improvements have been properly carried out.

Patrol Inspections

In general, utilities must patrol their systems once a year in urban areas and in Tier 2 and Tier 3 of the HFTD. Patrols in rural areas outside of the HFTD are required to be performed once every two years. As a long-standing practice, however, SDG&E performs patrols in all areas on an annual basis as part of the CMP. These patrols differ from the Detailed Inspections in that they are not inspecting the pole for all types of infractions, but only those that could lead to failure and ignition. These patrols mitigate wildfire risk by identifying and repairing or replacing deteriorated equipment before the failures occur in the HFTD. This program reduces faults due to equipment failure, which reduces the probability of ignitions. Corrective actions can include O&M repairs of minor equipment, which are included in this workpaper. Capital repairs associated with pole replacements are represented in Budget Code 239. The costs included in this chapter are only for patrols within the HFTD. For costs associated with CMP patrols outside of the HFTD, please refer to Mr. Swetek's testimony (Ex. SDG&E-12).

10-Year Intrusive Inspections

SDG&E performs wood pole intrusive inspections on a 10-year (average) cycle on all wood poles throughout SDG&E's service territory. This program mitigates the risk of a pole failing due to internal degradation prior to SDG&E identifying the issue and replacing the pole. A pole failure can lead to a fault on the system and a potential ignition. Each pole is inspected visually and intrusively if conditions warrant. G.O. 165 requires that any pole 15 years of age or older is inspected intrusively. The form of the intrusive inspection is normally an excavation about the pole base and/or a sound and bore of the pole at ground-line. Treatment is applied at this time in the form of ground-line pastes and/or internal pastes. The 10-year cycle fulfills the requirements of G.O. 165: (1) all wood poles over 15 years of age are intrusively inspected within 10 years, and (2) all poles which previously passed intrusive inspection are to be

inspected intrusively again on a 20-year cycle. Corrective actions can include O&M repairs of minor equipment, which are included in this workpaper. Capital repairs associated with pole replacements are represented in Budget Code 239. The costs included in this chapter are only for intrusive inspections within the HFTD. For costs associated with intrusive inspections outside of the HFTD, please refer to Mr. Swetek's testimony (Ex. SDG&E-12).

Depending on the wood cavities found, or the amount of rot found, an estimate of the remaining pole strength is determined utilizing industry-wide standards. Depending on the severity of the deterioration, the pole either passes, must be reinforced with a steel truss to provide it another five to ten years of useful life or replaced.

HFTD Tier 3 Inspections

SDG&E has implemented an HFTD Tier 3 Inspection program to perform Quality Assurance/Quality Control (QA/QC) inspections within the HFTD Tier 3 prior to fire season. These additional proactive inspections are scheduled on a three-year cycle, in addition to the G.O. 165 five-year detailed inspections, exceeding the requirements of G.O. 165. These additional inspections are designed to identify potential structural and mechanical problems before they fail. SDG&E has performed HFTD Tier 3 Inspections of its overhead electric distribution poles in high-risk fire areas with a focus on identifying areas where maintenance would improve fire safety and reliability, with a goal of mitigating the probability that SDG&E's overhead electric system, facilities, and equipment would be the source of ignition for a fire. Corrective actions can include O&M repairs of minor equipment, which are included in this workpaper. Capital repairs associated with pole replacements are represented in Budget Code 239.

These inspections were conducted from 2010 through 2016 as a result of a settlement agreement adopted in D.10-04-047. In 2017, SDG&E decided to proactively continue the HFTD Tier 3 Inspections as part of its normal program. In 2018, when the CPUC adopted the current statewide fire threat map, SDG&E began applying the QA/QC three-year inspection cycle to the newly defined HFTD Tier 3. SDG&E performs HFTD Tier 3 Inspections on an average of 11,000 poles annually (approximately one-third of the distribution poles in the HFTD Tier 3.

Distribution Infrared (IR) Inspections

Infrared distribution inspections mitigate the risk of issues with electrical connections and equipment that cannot be seen during SDG&E's traditional visual inspections. Left undetected,

these issues could cause an equipment failure that could lead to an ignition. Connections are difficult to fully assess from the ground or air as it is not possible to visually see the electrical flow. If connections look secure but are not truly tight, the electrical flow may all follow one path resulting in overheating and potential premature failure of a connection. Thermographers utilize infrared technology, which looks at the radiation emitted by the connections to determine if there are potential issues with a connection prior to failure.

Issues identified through the infrared program are often issues that would not have been identified through current visual or detailed inspections. SDG&E plans to track the infrared inspection findings to evaluate the risk reduction potential. At this time, only a few inspection findings have been discovered utilizing the infrared technology that would not have been seen through traditional visual inspections. The issues identified to date are conditions that could pose a fire or public safety risk.

The initial focus of the program in 2020 was on distribution circuits located within Tier 3 of the HFTD. Circuits were initially selected within Tier 3 based on the historical fault counts. Based on the results from the initial year of the program and a comparison to visual findings for a similar region, the prioritization of the program has been changed. Due to the low current running through the lines in the more rural areas, it is thought this may have an impact on the effectiveness of the technology in determining potential connection issues. Based on the risk avoided and cost, the program did return value in the Tier 3 HFTD, and SDG&E plans to continue the program on more urban circuits within Tier 2 of the HFTD through 2024.

LiDAR Inspections

Accurate surveys of the electric distribution right of ways, including existing distribution lines, telecommunication lines, structures, crossings, vegetation, and other potential hazards, are critical to effective and accurate electric line design. While previous design methods relied upon standard structure heights, span lengths, and sag and tension charts, enhanced design tools and survey methods are required to mitigate the risk of wildfires.

LiDAR surveys have evolved into a foundational component for SDG&E's overhead transmission and distribution line engineering analysis and design. In 2013 with the start of the FiRM program, SDG&E began utilizing LiDAR for the distribution system for clearance and structural adequacy prior to implementation of the grid hardening program. LiDAR surveys

provide the most cost-effective, scalable, and accurate solution for overhead power line analysis, increasing both system reliability and safety.

Ideally, a distribution line can be modeled with a single deployment of LiDAR and subsequent modeling. But distribution systems are often changing with joint use additions, customer relocations, compliance, reliability and maintenance modifications, conductor creep and pole settling, and external development. Rural lines, particularly in HFTD, may also require attentive vegetation analysis. As such, it is important that LiDAR is field verified. Priority for LiDAR spend follows post-construction survey, pre-construction design, and vegetation analysis.

a. RAMP Activities

Table JW-16 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM004.

TABLE JW-16
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE
1WM004.000	SDG&E-Risk-1 – C22 T1-T2	Dist Syst Inspect– CMP –5 Yr Detail Inspect	165	313	148	-
1WM004.000	SDG&E-Risk-1 – C24 T1-T2	Dist System Inspection – IR/Corona	146	175	29	372
1WM004.000	SDG&E-Risk-1 – C25 T1-T2	Intrusive Poles	803	126	-677	-
1WM004.000	SDG&E-Risk-1 – C26	LiDAR Flights	1,151	1,500	349	0
1WM004.000	SDG&E-Risk-1 – C27 T1-T2	Dist System Inspection – HFTD Tier 3 Inspections	290	328	38	187
1WM004.000	SDG&E-Risk-1 – C28 T1-T2	Dist System Inspection – Drone Inspections	33,228	12,656	-20,572	-
1WM004.000	SDG&E-Risk-1 – C30 T1-T2	Dist System Inspect – CMP – Annual Patrol	231	278	47	-

*Tranche level RSEs and additional details are available in SDG&E-13-WP 1WM004.000.

2. Forecast Method

The forecast method utilized for this cost category is base year. Labor and non-labor forecasts are based on the BY 2021 recorded data. The base year forecast methodology was utilized to best represent the structure of the organization while accounting for the additional programs SDG&E plans to implement moving forward. Historical information prior to 2021 do not accurately capture the future needs for this workpaper given the evolving nature of the activities and the fact that SDG&E has largely been expanding these activities in recent years.

3. Cost Drivers

SDG&E forecasts $15,375,000 in Test Year 2024, an overall reduction of $21,574,000 from 2021 mainly driven by reductions in DIAR. Cost drivers associated with each inspection program are discussed in more detail below.

Drone Inspections and Repair

The DIAR program completed assessments of Tier 3 in 2020 and before beginning Tier 2 assessments in 2021 underwent a change in program management to more efficiently complete flights and follow-up repairs. This change shifted the start date of drone assessments to May of 2021. While the program was able to complete the assessments of 22,000 poles, the associated repairs were pushed into 2022, leading to a spike in program costs in 2022 and 2023, which are expected to level out in 2024 after the program transitions to a regular five-year inspection cycle in 2023. SDG&E forecasts $12,656,000 for DIAR in 2024, a reduction of $20,572,000 from 2021.

10-Year Intrusive Inspections

The 10-Year intrusive inspection program is a cyclical program that performs wood pole intrusive inspections both inside and outside of the HFTD. The timing of these inspections is such that SDG&E performed 9,796 inspections within the HFTD in 2021, but only has 2,000 inspections within the HFTD planned for 2024. This reduction in inspections has an associated cost reduction of $677,000 in 2024 from 2021.

E. 1WM005 – Vegetation Management & Inspections

TABLE JW-17
Vegetation Management & Inspections O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
E. Vegetation Mgmt & Insp	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Vegetation Mgmt & Insp	10,365	14,301	3,936
Total	**10,365**	**14,301**	**3,936**

1. Description of Costs and Underlying Activities

Vegetation management is an integral component of SDG&E's goals to reduce the risk of utility-caused wildfire, promote reliability, maintain compliance with regulatory directives, and support sustainability. The costs in this workpaper support SDG&E's Vegetation Management program. SDG&E's Vegetation Management program includes the activities of pole brushing, fuels management, and tree planting for compliance, fire prevention, public safety, and environmental enhancement and stewardship, and sustainability. Tree Trimming expenses, which are currently recorded to a two-way balancing account for distribution-related work, the TTBA, are addressed in workpaper 1WM005.001.

Pole Brushing

Pole brushing involves the required fire prevention activity of clearing flammable brush and vegetation away from distribution poles subject to California Public Resources Code (PRC), Section 4292. PRC § 4292 aids in preventing energized electrical infrastructure from igniting a fire by keeping the area adjacent to subject poles clear of flammable vegetation. These clearance requirements include removing all vegetation down to bare mineral soil out to 10 radial feet from the pole, removing all vegetation up to eight vertical feet, and removing all dead material up to the height of the conductors. Currently, approximately 78,000 distribution structures are inspected annually to comply with PRC 4292 throughout the State Responsibility Area (SRA). Of the 78,000 distribution structures inspected, approximately 35,000 have hardware that makes them subject to pole brushing per PRC 4292.

Pole brushing consists of three separate activities: chemical pole brushing, mechanical pole brushing, and re-clear pole brushing.

- Chemical pole brushing involves mechanically clearing all vegetation from around the pole base and applying an EPA approved herbicide. SDG&E treats approximately 10,000 poles to suppress regrowth and to reduce overall maintenance costs. Not all subject poles can be treated with herbicide because of environmental constraints, such as slope, proximity to water and adjacent vegetation, and customer approval.
- Mechanical pole brushing involves the removal of vegetation from around the pole base using mechanical means.
- Re-clear pole brushing involves removing any flammable vegetation which has grown, or blown into, the required clearance area since the last maintenance activity. The need to revisit a subject pole multiple times is not uncommon due to instances such as leaf litter blown back into the managed clearance zone during windy conditions, and due to the growth of weeds and grasses that cannot be easily controlled by mechanical clearing or herbicide treatments.

Trees adjacent to subject poles also require pruning to keep dead, dying or diseased tree limbs, branches, and foliage from encroaching into the radius of the cleared cylinder.

In addition to the required brushing of subject poles within the SRA, SDG&E performs this activity on select poles within the Local Responsibility Area (LRA), which are not subject to PRC 4292. SDG&E performs this activity on poles identified as a relatively higher fire risk as a proactive and additional measure to mitigate the threat of ignition and propagation into the SRA and increase public safety. SDG&E brushes approximately 2,500 poles annually within the LRA.

SDG&E's pole brushing costs are anticipated to remain near historic and base-year levels; these expenses primarily driven by required compliance levels and the continuance of enhanced fire risk reduction strategies. Funding includes the cost of contracted services to perform pole brushing activities, as well as the pole brushing portion of the contractor's excess liability insurance coverage. Also included in SDG&E's pole brushing costs are related activities such as pole pre-inspection, quality control, SDG&E staff, and other support costs.

Fuels Management

Protecting SDG&E's electric system from wildfires is critical to system reliability and first responder and public safety. SDG&E's Fuels Management program sustainably manages

land through selective vegetation thinning to mitigate the risk of wildfire affecting SDG&E's energy infrastructure and the communities it serves. Wildland fuel reduction involves the thinning, pruning, and in some cases, removal of vegetation along SDG&E rights of way and adjacent fire-prone corridors to minimize source material that could ignite and propagate a wildfire. The reduction of wildland fuel in these areas has the potential to slow the spread of a fire and make it more likely to be contained.

SDG&E began its fuels modification activities in 2019 through an initial pilot within SDG&E's Environmental Service Department as a strategy to engage and collaborate with land management agencies. Fuels modification was performed around power poles located within the HFTD out to a radial distance of 50 feet from the pole. SDG&E established the initial 50 feet radial clearance, including pole height and wind effect. In 2021, the fuels modification activity was integrated under the Vegetation Management group to engage synergies with pole brushing activities. The method of selecting locations was modified to focus the activity on poles that carry hardware that pose a higher relative risk of ignition and are subject to the pole brushing clearance requirements of PRC 4292.

The Fuels Management Program consists of three activities: fuels treatment, vegetation abatement, and fuels reduction grants.

- Fuels Treatment activity – Increased clearances around select structures (poles) that carry hardware that could possibly spark and ignite a fire. The scope of this activity entails the removal of dead or dying fine fuels at ground level within a 50-foot radius of selected poles. The Fuels Treatment activity was developed to reduce the risk of ignition in high fire risk areas that could occur from equipment or pole failure or a wire-down event. This activity is also intended to protect infrastructure in the event of a wildfire that originates beyond SDG&E facilities.
- Vegetation Abatement activity – Vegetation Abatement activity was implemented to maintain SDG&E-owned parcels in a fire-safe manner as required by various municipal compliance ordinances, Fire Marshal directives, and community safety expectations. This activity is intended to reduce the fuel loading from overgrown vegetation that may propagate a fire if an ignition were to occur and consists primarily of the removal of ground level, non-native flashy fuels and the thinning of tree branches (to 6-8 feet) above ground on SDG&E-owned properties and

right of way corridors. Typically, the same properties are abated annually or on a frequency based on vegetation growth. Depending on conditions such as plant species and rainfall frequency, inspection activities may occur monthly or weekly and may change depending on the season.

- Fuels Reduction MOU & Grant activity – SDG&E sponsors funding for memoranda of understandings (MOUs) and grants to external partners for the purpose of reducing fuels near electrical infrastructure and to enhance community wildfire prevention and safety. The Fuels Reduction MOU & Grant activity targets electric rights of way, evacuation routes, and community defensible space areas to reduce the risk of a fire of consequence and to strengthen community resiliency. Fuel reduction treatments follow best practices and can act to slow fire spread, assist in firefighting efforts, and reduce the impact of fires on a community. The Fuels Reduction MOU & Grant activity is a partnership with community organizations to help reduce the risk of catastrophic fire in their respective communities associated with electric infrastructure.

SDG&E's fuels reduction programs, including the fuels reduction grants, promote community resiliency and sustainability, often in disadvantaged communities. Past grants have been awarded to Native American reservations and local community safe fire councils. And to further minimize the environmental impacts of repeated fuels abatement sessions, SDG&E piloted a goat grant grazing program, which promotes sustainability.

10,000 Trees Goal

SDG&E's robust vegetation management program, discussed below, comprehensively inspects, trims, and removes over 460,000 identified inventory trees within the vicinity of SDG&E electrical infrastructure. Both in and outside of the HFTD, vegetation management is essential to ensure compliance with applicable regulations, as well as SDG&E's WMP initiatives.

Inspection and patrols help target and remove problematic species before they become a danger by visually inspecting them top to bottom, 360 degrees around. In the HFTD, the Enhanced Vegetation Management (EVM) Program further targets tree species that pose an additional risk to electrical infrastructure, including Palm and Eucalyptus. SDG&E performs enhanced inspections of these trees and, where necessary and feasible, trims or removes them to

attain clearances exceeding 12 feet and up to 25 feet. SDG&E performs hazard tree inspections in the HFTD by International Society of Arboriculture (ISA) Certified Arborists. As a result of the inspection findings, SDG&E removes approximately 8,500 non-compatible trees per year for fire risk and reliability concerns. As discussed below, SDG&E has achieved success through its EVM efforts; SDG&E's 2022 WMP Update included a scientific analysis supporting both the implementation of enhanced clearances as well as the selection of target species.[46]

While vegetation management is necessary for both reliability and wildfire mitigation, SDG&E recognized the impact that tree removals have on the local environment. Vegetation management operations are conducted with an eye toward their environmental impacts and in accordance with all applicable rules and regulations, including protocols of the wildlife agency approved Natural Communities Conservation Plan (NCCP). As a customer service, SDG&E initiated the Right Tree Right Place program, by which customers may request and receive replacement trees that are compatible with powerlines and the local terrain. Planting utility-compatible trees improves safety, reliability, and compliance, and minimizes the probability of vegetation-related outage, ignition, and wildfires. This program has been and continues to be a component of SDG&E's tree trimming costs and tracked to the TTBA.

Forest and trees play a vital role in our planet's overall health, providing critical ecosystem services that allow Earth's natural cycles to function and as important carbon sinks. Climate change and wildfires threaten this relationship. In geographically diverse California, forests are facing climate risks from extreme heat, drought, and wildfires. 2020 was one of the worst years in California wildfire history, with an estimated 1.75 million acres of forest burned and approximately 90 million metric tons of carbon dioxide released from the burning of forests.[47] According to the California Air Resources Board, our natural and working lands have now become a source of carbon emissions.[48]

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[46] *See* SDG&E 2022 WMP Update at Attachment E.

[47] California Air Resources Board, "Greenhouse Gas Emissions of Contemporary Wildfire, Prescribed, Fire, and Forest Management Activities", *available at* https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf.

[48] California Air Resources Board, "Greenhouse Gas Emissions of Contemporary Wildfire, Prescribed, Fire, and Forest Management Activities", *available at* https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf.

In 2021, as part of its sustainability initiative,[49] SDG&E also introduced the 10,000 Trees Goal, setting a goal to plant or distribute over 10,000 trees annually. The program will mitigate tree removals focused in the HFTD through planting efforts that are largely focused in areas that are not prone to wildfire and outside the HFTD. In working towards this goal, SDG&E emphasizes planting the right tree in the right place, following the industry-established program, but expands beyond SDG&E's existing tree replacement offerings. And through this program, SDG&E also promotes additional community outreach and education regarding safe planting around utility infrastructure.

Through the 10,000 Trees Goal, SDG&E is enlisting nature in the fight against climate change to further the path toward net zero emissions and build resilience to climate impacts. Tree planting can provide important resilience and health benefits to local communities. As our climate continues to change, using trees as mitigation and adaptation measures for communities will bolster resilience for many community generations to come. Tree planting improves community resilience by mitigating local air pollution and economic resilience by cooling surrounding air temperatures. These "nature-based solutions" have been embraced as means to keep communities cooler, reduce "heat-island effects," lower the risk of heat-related illnesses and reduce energy bills.[50] Further, trees offset the GHG emissions of catastrophic wildfires and sustainable reforestation efforts can in fact work to prevent their spread. Any trees planted by SDG&E will provide continuous improvements to air quality throughout the service territory, but planting the right trees in the right places can also provide increased local benefits such as erosion control, stormwater runoff mitigation, and improvements to water quality.

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[49] SDG&E's Sustainability Strategy is available at https://www.sdge.com/sites/default/files/documents/SDG%26E%20Sustainability%20Report_0.pdf?nid-18226.

[50] *See*, "Statements from the White House Office on Science and Technology Policy (OSTP) on the Intergovernmental Panel on Climate Change's Working Group II Report," Dr. Alondra Nelson. February 28, 2022. *Available at*https://www.whitehouse.gov/ostp/news-updates/2022/02/28/statements-from-the-white-house-office-on-science-and-technology-policy-ostp-on-the-intergovernmental-panel-on-climate-changes-working-group-ii-report/.

a. RAMP Activities

Table JW-18 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM005.000.

TABLE JW-18
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE
1WM005.000	SDG&E-Risk-1 - C32/M15 T1-T2	Fuels Management Program	4,416	6,274	1,858	-
1WM005.000	SDG&E-Risk-1 - C34 T1-T3	Pole Brushing	5,556	7,027	1,471	-
1WM005.000	SDG&E-Risk-1 - N/A	10,000 Trees Goal	393	1,000	607	0

*Tranche level RSEs and additional details are available in SDG&E-13-WP 1WM005.000.

2. Forecast Method

The forecast method developed for this cost category is base year. New initiatives and programs have been implemented due to the WMP, and these enhancements are not captured in historical costs. For instance, the fuels management programs, including community grants continue to develop. Additionally, historical costs do not accurately capture the increases to contractor rates because of SB 247, which went into effect in 2020.

The Tree Planting program was initiated in 2021 and SDG&E plans to continue to build this program in TY 2024. Thus, relying on historical information prior to 2021 does not reflect the costs SDG&E believes is necessary for TY 2024. As such, the base year was selected to most accurately forecast this workpaper.

3. Cost Drivers

Cost drivers related to pole brushing include changes to regulatory requirements and increased work volume. The primary driver in this area, however, relates to contractor costs, including but not limited to contracted services, contractor's excess liability insurance coverage, and related pre-inspection and audit. SDG&E also expects an increase in vegetation contractor

rates. To support these efforts, SDG&E is also increasing internal resources, including a Fuels Management Lead Forester.[51]

SDG&E forecasts increased use of fuels reduction grants to promote community engagement and lead defensible space efforts. These grants are consistent with SDG&E's 2022 WMP Update initiatives. Further, contract labor costs to perform mechanical vegetation in SDG&E rights of way are forecasted to increase. SDG&E forecasts that this program will also include third-party engagement to study the methodology and impacts of the effectiveness of the fuels treatment and research potential enhancements to promote sustainability.

The cost drivers for the 10,000 Trees Goal include contracted services, tree sourcing and installation. These cost pressures result in additional forecasts costs to continue these vegetation management programs in TY 2024.

F. 1WM005.001 – Vegetation Management & Inspections - Tree Trimming Only

TABLE JW-19
Tree Trimming O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
F. Vegetation Mgmt & Insp. - Tree Trimming Only	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Vegetation Mgmt & Insp. - Tree Trimming Only	52,195	55,622	3,427
Total	**52,195**	**55,622**	**3,427**

1. Description of Costs and Underlying Activities

a. SDG&E's Vegetation Management Program

SDG&E maintains a tree inventory database containing records for approximately 460,000 specific trees located near its electric power lines. This database and work management system are referred to collectively as Powerworkz, which includes an Esri-based electronic mapping mobile application, and a server-based workflow tool. Inventory trees are defined as those with the potential of impacting the power lines by encroachment and/or tree failure within three years of the inspection date. All trees in the database are monitored using known species growth rates, with additional consideration of precipitation and past pruning practices. Each

[51] See Workpaper 1WM005.001 for details.

inventory tree is assigned a unique alpha-numeric identification number within the electronic database, which allows the activity history of each tree to be tracked.

SDG&E divides its service territory into 133 distinct zones known as Vegetation Management Areas (VMA). Activities within each VMA are driven by a master schedule that identifies the specific activities which occur annually. These activities include: pre-inspection, tree pruning and removal, and auditing. These activities are managed within the Powerworkz work management system. Inspections and maintenance activities are performed annually for purposes of regulatory compliance. During the pre-inspection activity, trees in proximity to SDG&E's powerlines are evaluated and documented within the tree record. Each tree is visited on an annual cycle. The inspection activity determines which trees require pruning for the annual cycle based on growth and/or to abate a hazard condition such as dead, dying, decadent, or structural defect. Trees that may not remain compliant or have the potential to impact powerlines within the annual pruning cycle are identified and assigned to the tree contractor to work. If a tree requires urgent work the inspector has the latitude to issue the job to the tree contractor for priority completion. SDG&E also performs additional, annual patrols of problematic species (e.g., bamboo and century plants) with fast and unpredictable growth rates that are difficult to safely manage near powerlines.

SDG&E tree contractors follow American National Standards Institute (ANSI) A300 industry tree standards and the concept of directional pruning, which fosters the health of a tree while maximizing clearance and extending the pruning cycle. All tree branches overhanging conductors are considered a potential risk; therefore, SDG&E removes all branches that cross the vertical plane of the conductors from the conductor to the top of the tree. The post-pruning clearances obtained by the tree contractor are determined by factors such as species, tree growth, wind sway, line sag, tree health, and proper pruning practices. On average, SDG&E prunes approximately 175,000 trees each year. Tree operations that occur in sensitive environmental areas are reviewed to determine protocols that must be followed to protect species and habitat.

SDG&E's robust tree removal program targets problematic species such as eucalyptus and palms and any others that cannot be maintained safely near power lines. These include "hazard trees" which pose a threat to electrical infrastructure. Removal of trees is necessary to promote reliability and mitigate the risk of a vegetation-related ignition. The scope for removing trees includes the chipping and removal of the debris off-site. Larger wood (> 6-8-inch

diameter) is left on site. Any large debris left on slopes is positioned to prevent movement of the material by gravity. All debris associated with pruning and removal operations is removed from watercourses to prevent flooding or degradation of water quality. Through its Right Tree Right Place Program SDG&E offers free tree replacements as an added incentive to allow removal of incompatible trees. SDG&E removes approximately 8,500 trees annually.

As another tool in the management of its inventory trees, SDG&E has for several years implemented the use of Tree Growth Regulators (TGR). TGR is a soil injected chemical application that inhibits new shoot growth in the tree canopy and has shown to improve health and vigor of trees. Arborists and other plant healthcare professionals take advantage of TGR's to help trees in many different urban tree stress situations. The application of a growth regulator helps SDG&E manage fast-growing trees, improves the programs ability to maintain safety, compliance, and service reliability, as well as reducing annual tree pruning costs.

SDG&E has historically utilized a contracted workforce to perform its vegetation management program activities of tree pre-inspection, tree trimming, pole brushing, and quality assurance. The rapid increase in demand for vegetation work throughout the state in 2019 and 2020 resulted in labor constraints and general concerns regarding the demand and availability of vegetation management contractors. In 2019 SDG&E began using subcontractors to augment its prime tree trim contract crews to address the increase in hazard tree work and the need to maintain schedule. SDG&E anticipates the possible future need to increase its contracted tree workforce and/or utilize outside tree crews to meet the high demand while at the same time maintaining safety compliance, and reliability.

The enactment of Senate Bill 247 resulted in a significant increase in the labor cost for represented qualified line clearance tree trimmers beginning in 2020. This increase, along with an anticipated increase in other related labor costs will continue to drive overall vegetation management expenses into the future. Due to the demand for line clearance qualified tree trimmers, in 2020 SDG&E collaborated with the San Diego Community College to develop and implement a local utility arborist training program focused on developing local workforce resources to support the utilities. This program has successfully provided trained utility arborist graduates that have been hired by the contractors working on SDG&E property since 2021. SDG&E see immense value in this program, developing specialized job skills, consistency in

safe work practices, career growth opportunities, great benefits, and providing job opportunities locally in San Diego.

b. Enhanced Vegetation Management

SDG&E introduced its Enhanced Vegetation Management (EVM) Program as an additional wildfire mitigation tool in the 2019 WMP. Within the HFTD, SDG&E's EVM Program includes activities beyond those required by applicable General Orders and regulations by including additional tree inspections and enhanced post pruning clearances annually. The enhanced tree inspection activity is a second, incremental assessment of all trees located within the HFTD. The enhanced inspections are performed by ISA Certified Arborists and include a 360-degree assessment of every tree within the "strike zone" of the power lines. The strike zone includes the area adjacent to power lines both inside and outside the rights-of-way with trees that are tall enough to potentially strike the overhead facilities. Work identified during the enhanced inspections is scheduled for completion prior to the start of the peak Santa Ana fire season (September 1).

EVM activities also include pruning and trimming trees to enhanced clearances. SDG&E's enhanced inspections and clearances target five identified high-risk species that pose additional threat to power lines, including palm, pine, oak, sycamore, and eucalyptus.[52]SDG&E's enhanced tree pruning is defined as trimming to clearances greater than 12 feet, the recommended clearance in G.O. 95, and up to 25 feet where necessary and feasible. SDG&E faces certain impediments to achieving higher clearances, including customer refusals, environmental constraints, and land management agencies. SDG&E employs outreach initiatives to engage with and educate the general public on the benefits of greater clearances between trees and power lines.

Additional wildfire mitigation activities include enhanced audit practices. SDG&E utilizes a third-party contractor to perform quality assurance audits on all the vegetation management activities. These audits include an average 15% sample of all completed work to determine compliance, work performance, and contract adherence. For EVM tree operations in the HFTD, SDG&E performs a 100% audit of all completed work identified during the EVM patrol.

[52] *See* SDG&E 2022 WMP Update at Attachment E.

In addition to EVM activities, in advance of a forecasted Red Flag Warning event, SDG&E will determine if vegetation management patrols are warranted to assess tree conditions before, during, or immediately following the event. SDG&E vegetation management contractors are kept informed of the current conditions, allowing them time to relocate crews into safe work areas. In instances of emergency tree pruning during extreme fire conditions, additional fire equipment and/or support from the contracted, professional fire services may be utilized.

SDG&E has begun to integrate data science into its vegetation management operations. SDG&E is utilizing the information from its tree inventory database, outage history and meteorology data in the development of its Vegetation Risk Index (VRI) of the highest tree risk areas of its service territory. The merging of SDG&E's extensive vegetation and meteorological datasets provides additional insights into how atmospheric conditions impact growth rate of certain species and identify certain high-risk vegetation areas. The VRI is also used to inform where SDG&E may want to focus tree patrol activities in advance of the fire season or specific Red Flag Warning (RFW)/PSPS events to identify high risk areas.

As noted in Section II, Tree Trimming expenses are currently treated under a two-way balancing account for distribution-related work. SDG&E request related to the continuation and modification of the current TTBA is addressed in Section II.

c. RAMP Activities

Table JW-20 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM005.001.

TABLE JW-20
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE
1WM005.001	SDG&E-Risk-1 - C31 T1-T2	Tree Trimming (HFTD)	25,344	27,232	1,888	-
1WM005.001	SDG&E-Risk-1 - C33/M16 T1-T2	Enhanced Vegetation Management (HFTD)	9,955	10,235	280	-

1WM005.001	SDG&E-Risk-2 - C06	Tree Trimming (non-HFTD)	16,896	18,155	1,259	109

*Tranche level RSEs and additional details are available in SDG&E-13-WP, 1WM005.001.

2. Forecast Method

The forecast method developed for this cost category is base year. Tree trimming costs are primarily comprised of labor, and historical costs do not incorporate the effects of SB 247 and statutorily mandated increases to the contractor rates. Additionally, the volume of Vegetation Management work continued to increase due to the expanded and enhanced inspection and tree trimming/removal activities for wildfire mitigation.

Accordingly, relying on averages of historical years do not best reflect the costs SDG&E expects to incur in 2024. Base year appropriately includes the substantial labor cost pressures associated with the implementation of SB 247 in addition to the amount increased work as a result of the WMP.

3. Cost Drivers

The cost drivers for Tree Trimming are driven by regulatory requirement, work volume, contracted services, contractor's excess liability insurance coverage, SDG&E support staff and other expenses. At this time, SDG&E does not anticipate significant increases in work volume, but believes that the existing two-way balancing account structure remains necessary to allow the Company to perform vegetation management work necessary to maintain reliability and mitigate the risk of wildfire. Cost increases over base year are largely tied to forecasted increases in labor costs, including increased rates as a result of contract renegotiations, inflationary and labor market pressures, increased liability insurance costs for contractors, and scheduled annual contractor rate increases.

G. 1WM006 – Grid Operations & Operating Protocols

TABLE JW-21
Grid Operations & Operating Protocols O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
G. Grid Operations & Operating Protocols	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Grid Operations & Operating Protocols	10,079	14,769	4,690
Total	**10,079**	**14,769**	**4,690**

1. Description of Costs and Underlying Activities

SDG&E's grid operations and protocols activities consist of mitigations that reduce risk through changing the way SDG&E operates during periods of elevated and extreme wildfire risk. This includes the disabling of reclosing in the HFTD, the enabling of fast recloser settings, restricting work in the HFTD during extreme fire potential and Red Flag Warnings, the Aviation Firefighting Program, and sending contract fire resources (Wildfire Infrastructure Protection Teams) into the field during elevated days in the HFTD. These operational decisions strive to reduce ignitions on the electric system and limiting the impacts of ignitions if they occur.

Aviation Firefighting Program

SDG&E's Aviation Firefighting Program serves as a critical wildfire suppression resource to San Diego County. The program mitigates the risk of a wildfire growing rapidly and endangering public safety by providing supplemental available aerial firefighting resources. SDG&E has two leased firefighting helicopters available, an Erickson S-64 helitanker (Air Crane) with a 2,650-gallon capacity and a Sikorsky UH-60 Blackhawk helitanker (Blackhawk) with an 850-gallon capacity. Both firefighting assets are Type 1 firefighting helicopters, and the Blackhawk is configured for night vision device flight. The helicopters have successfully supported fire suppression activities and are a necessary construction tool allowing SDG&E to set structures in more rural areas with accessibility issues. SDG&E has agreements with the County of San Diego, California Department of Forestry and Fire Protection (CAL FIRE), and the Orange County Fire Authority for aerial firefighting within SDG&E's service territory.

SDG&E employs flight operations staff to assist in dispatching SDG&E aerial assets 365 days per year, allowing assets to launch rapidly once dispatched by CAL FIRE. SDG&E does night currency and proficiency flights for pilot training and has increased hangar space for maintenance and security of these aerial firefighting assets.

In support of SDG&E's Aviation Firefighting Program, SDG&E installs Aviation Crossing Markers within the SDG&E service territory as a safety mitigation for the aircraft. Aviation Crossing Markers are high visibility marked crossing signs located on towers and distribution poles at pre-arranged distances from locations that have wires that cross over or under one another. These markings indicate a potential hazard due to potential wire strike locations and alert the pilot of the crossing ahead. These markings are placed at intervals leading up to the crossing and at the crossing itself. This reduces the hazard and provides a mitigation

tool for an early and highly visible marking to helicopters and other aviation assets that are in the area.

Wildfire Infrastructure Protection Teams

SDG&E's Wildfire Infrastructure Protection Teams are Contract Fire Resources that service to mitigate the fire risks associated with high-risk work activities performed in areas adjacent to wildland fuels. Qualified firefighters join electric crews to serve in a prevention and ignition mitigation role. The protection team's primary objective is preventing ignitions from utility activities, and they are trained and equipped to notify the agency having jurisdiction over an ignition and safely mitigate the impact of an ignition through suppressive action until first responders arrive. More than 50% of SDG&E's infrastructure is in the HFTD, where these resources are focused.

While all SDG&E field personnel attend annual fire prevention training, the use of Contract Fire Resources during times of increased fire risk (e.g., during Elevated or Extreme Fire Potential Index or Red Flag Warning days) enables SDG&E to perform necessary at-risk activities, including emergency repairs, reducing the risk of an ignition or a fire growing into a fire of consequence. These resources are also on site during PSPS service restorations to promote safe re-energization efforts. The program is continually refined with the training qualifications of personnel serving on Contract Fire Resources and utility activities are reviewed annually.

a. RAMP Activities

Table JW-22 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM006.

TABLE JW-22
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE
1WM006.000	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	7,008	11,539	4,531	-
1WM006.000	SDG&E-Risk-1 - C36 T1-T2	Wildfire Infrastructure Protection Teams	3,071	3,230	159	-

*Tranche level RSEs and additional details are available in SDG&E-13-WP 1WM006.000.

2. Forecast Method

The forecast method developed for this cost category is base year. SDG&E has increased this cost category in recent years due to new initiatives and programs that have been implemented beginning in 2020 through the Wildfire Mitigation Plan; these enhancements are not captured in the historical costs of this category. Accordingly, SDG&E selected the base year forecast methodology to best represent SDG&E's plans to implement programs moving forward.

3. Cost Drivers

Aviation Firefighting Program O&M costs are associated with the two leased firefighting helicopters, leasing a hangar, and the training facility. Cost drivers related to the Aviation Flight Program are associated with helicopter utilization, which is measured by flight hours. SDG&E forecasts a 10% incremental increase of flight hours year over year and increase in maintenance expenses. The basis for the increased flight hours and maintenance expenses are yearly weather patterns exacerbated by climate change and heightened fuels condition, which result in a potential increase in fire activity. The lease of an additional hangar to assist with housing the additional aircraft is expected to begin in 2022 and carry through 2024. Further details on the helicopter purchases are provided in the Capital section of the testimony in budget codes 202770 and 212560. Additional training costs associated with the new aviation training facility (described in the Capital section of the testimony in budget code 202770) also increases ongoing O&M costs. SDG&E forecasts expenditures of $11,539,000 for the Aviation Firefighting Program in 2024, an increase of $4,531,000 over 2021.

Costs for SDG&E's Wildfire Infrastructure Protection Teams are associated with the number of resource shifts per year. SDG&E expects an increased need for contract firefighting resources due to address potential fire activity caused by additional fire-related weather patterns, heightened fuels conditions, and the scope and complexity of at-risk work activities. While SDG&E's service territory still experiences its peak Santa Ana winds from September through November, there is no dispute that fire season is now year-round. The additional resources requested permit SDG&E to perform necessary work when its needed and still promote the safety of its employees and contractors, the nearby public, and the service territory. SDG&E forecasts expenditures of $3,230,000 for Wildfire Infrastructure Protection Teams in 2024, an increase of $159,000 over 2021.

H. 1WM007– Resource Allocation Methodology

TABLE JW-23
Resource Allocation Methodology O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
H. Resource Allocation Methodology	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Resource Allocation Methodology	3,823	7,748	3,925
Total	**3,823**	**7,748**	**3,925**

1. Description of Costs and Underlying Activities

Resource Allocation Methodology consists of Wildfire Mitigation Personnel and Asset Management. These groups were instituted to develop standards and methodologies to understand SDG&E's risk and help shape investment strategies for wildfire mitigation initiatives.

Wildfire Mitigation Personnel consists of three departments overseen by the Director of Wildfire Mitigation:

- The Wildfire Mitigation Programs group is involved with the various regulatory proceedings that address wildfire and de-energization as well as legislative and media inquiries.
- The Wildfire Mitigation Strategy group develops metrics, leads vision projects, promotes new ways to enhance fire safety, and explores advancements to further drive improvement and change including risk modeling capabilities.
- The Wildfire Mitigation Accountability group is responsible for monitoring fire-related metrics, tracking WMP activities, complying with reporting requirements, and providing for governance specifications and procedures.

SDG&E's Asset Management department provides a consistent framework that is based on risk to evaluate various projects and allocate resources to different areas. Asset Management has been working on building the governance process, resource allocation methodology, and software development to support the creation of long-term and short-term plans for capital investment, operation & maintenance, and asset retirement.

While the Asset Management initiative focuses on enterprise-wide resource allocation, there was a need to develop a more granular application of the same type of modeling to tackle specific wildfire-related issues such as targeted grid hardening to reduce the risk of wildfire and PSPS. To do that, SDG&E's Wildfire Mitigation Strategy team developed the WiNGS model to specifically tackle the issue of quantifying the impacts of and identify the optimal solutions to target both wildfire risk reduction as well as PSPS reduction.

a. RAMP Activities

Table JW-24 provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM007.

TABLE JW-24
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE*
1WM007.000	SDG&E-Risk-1 - C40	Wildfire Mitigation Personnel	3,823	7,748	3,925	0

* An RSE was not calculated for this activity

2. Forecast Method

The forecast method utilized for this cost category is base year. Given that the Wildfire Mitigation department was initiated in 2019 and has continued to expand since its inception, historical recorded information does not reflect the needs to this workpaper for Test Year 2024. Accordingly, the base year recorded data was utilized as the forecasting method to best represent the structure of the organization.

3. Cost Drivers

The cost drivers behind this forecast include labor costs for additional workforce under Wildfire Mitigation Personnel including a new PSPS Department, and non-labor costs associated with the Independent Evaluator and Joint Investor-Owned Utility (IOU) Enhanced Vegetation Analysis.

With increased requirements associated with Wildfire Mitigation and PSPS, SDG&E has the need to increase workforce to manage compliance requirements and timely delivery of additional plans and reports. When the Wildfire Mitigation department was established in 2019 the only deliverable was the annual Wildfire Mitigation Plan. Now, the Wildfire Mitigation department is responsible for the annual Wildfire Mitigation Plan, three separate quarterly reports (Quarterly Data Report, Quarterly Initiative Update, and Quarterly Notification Letter), an Annual Report on Compliance, an annual Changer Order Report, leading the annual Independent Evaluator process, leading the annual Wildfire Safety Culture Assessment, participating in Energy Safety mandated joint IOU workstreams, and responding to data requests across all wildfire-related areas. In order to meet these additional requirements, new full-time employees are being requested. In total fifteen new employees are being requested across the three Wildfire Mitigation Personnel departments.

Wildfire Mitigation Programs is requesting five additional employees to address the increasing regulatory requirements. Specifically, these employees will focus on setting up consistent schedules and guidelines for all regulatory reports, and assist with data analysis of wildfire mitigation initiatives including the efficacy of covered conductor and undergrounding.

Wildfire Mitigation Strategy is requesting seven additional employees to address the increasing work around risk modeling, including RSEs. These employees will help to further develop WiNGS, probability of ignition models, and RSE calculations. These new employees will also participate in the mandated joint IOU risk workstreams created by Energy Safety as part of the 2021 WMP Update approval.

The new PSPS department will be created to address the increasing focus on PSPS. This department will take the lead on the creation of the additional reporting around PSPS including the pre-season and post-season PSPS reports, while taking over the existing post-event reports. The PSPS department will also help to inform PSPS preparation so that SDG&E meets the applicable requirements and best practices for notifications, data gathering, and operations. The new department will also inform and track the various mitigation efforts that reduce the impact of PSPS to customers. The department will be led by a Director of PSPS. Reporting to the Director will be the managers of PSPS Compliance, PSPS Strategy, and PSPS Programs. Each manager will have two project managers reporting to them for a total of six project managers.

The non-labor increases requested are attributed to additional scope related to the Independent Evaluator process and the Energy Safety mandated joint IOU Enhanced Vegetation Management workstream. The first year of the Independent Evaluator in 2021 was performed on a short timeline with Energy Safety issuing a final scope of work on April 21, 2021, and the final Independent Evaluator report due on June 30, 2021. In 2022 and future years, SDG&E expects that the process will allow for more time and an expanded scope of work for the Independent Evaluator, resulting in increased costs to the utility. As part of the approval of the 2021 WMP Update for all three large California utilities, Energy Safety ordered the joint IOUs to lead a multi-year study to evaluate the effectiveness of enhanced vegetation clearances. SDG&E is hiring a third-party vendor to assist with project management of the study, as well as analysis of the large quantities of IOU data.

Documentation of these cost drivers are included as supplemental O&M workpapers.

I. 1WM007.001 – Risk Assessment & Mapping

TABLE JW-25
Risk Assessment & Mapping O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
I. Risk Assessment & Mapping	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Risk Assessment & Mapping	608	2,413	1,805
Total	**608**	**2,413**	**1,805**

1. Description of Costs and Underlying Activities

Understanding the risk of wildfire and the potential impacts of a catastrophic wildfire on SDG&E's system, the public, and the environment is critical to developing effective wildfire mitigation strategies. As risk models improve, targeting mitigation strategies can be further refined to efficiently address the areas of highest concern. These forecasted O&M expenditures support the company's goals of safety, reliability, and risk reduction through the enablement of data-driven, risk-informed decision making

The O&M associated with SDG&E's risk assessment and mapping models is addressed in this section. Capital costs are described in SDG&E-13-CWP Budget Code 192480.

SDG&E continues to develop its risk assessment and mapping models and is refining a primarily automated risk assessment and mapping methodology. The aim of the risk assessment effort is to quantify the risk of wildfire and the impacts of PSPS events more effectively to

identify optimal solutions that target risk reduction of both elements across the system. Working with Technosylva and others, SDG&E is implementing innovative approaches to leverage these models for the evaluation of hardening projects and for the safe operation of the system. Proposed grid hardening projects and emergency actions are also evaluated and prioritized from the standpoint of reducing or eliminating fire risk potential from overhead electric facilities and reducing the impact of PSPS on customers.

Several models have been developed and will continue to be refined and enhanced to further SDG&E's risk modeling capabilities.

1. The WRRM model was developed in collaboration with fire behavior experts and leverages 30 years of high-resolution weather data to establish climate scenarios and failure rates of SDG&E's assets, establishing risk maps showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment. This model was further enhanced into an operational system, WRRM-Ops, by developing a fully-automated process to ingest daily weather and fuel moisture data and to re-calculate risk levels to support emergency operations.
   SMEs, including fire coordinators and fire scientists, analyze the model's performance for all wildfires on the landscape, identifying deviations from the risk and propagation modeling. These findings drive future development of the model and will result in more specific quantifiable outcomes, allowing for better decision making in the overall hardening effort.
2. The WiNGS-Planning model was developed to aid with the allocation of grid hardening initiatives across HFTD segments based on an assessment of both wildfire risk and PSPS impacts. WiNGS-Planning is built upon the MAVF framework in RAMP and evaluates both wildfire and PSPS impacts at the sub-circuit/segment level. Information is used to inform investment decisions by determining and prioritizing mitigation based on RSEs, improving wildfire safety, and limiting the impact of PSPS on customers.
3. Additionally, WiNGS-Ops model, a real-time risk assessment model, helps quantify the wildfire risk and PSPS risk in real-time as a function of wind and provides a range of wind gusts where the fire risk is likely greater than the PSPS risk based on a wind

curve. This information will provide an additional data point for consideration during PSPS events.

4. In 2021, more granular Probability of Ignition (PoI) models at the asset and ignition source level were developed in collaboration with the Fire Science and Climate Adaptation department and Technosylva, who helped gather data on significant ignitions, ignition sources, and weather. These include models that capture the ignition risk associated to specific ignition drivers, including conductor failure, vegetation contact, balloon contact, vehicle contact, and animal contact. The models are developed at the span level and are additionally aggregated to the segment/sub-circuit level for available analysis at multiple levels of granularity. This level of granularity will provide an understanding of the different ignition risk drivers, assisting in the selection of mitigation measures and effective operational decision making.

a. RAMP Activities

Table JW-26 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM007.001.

TABLE JW-26
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE*
1WM007.001	SDG&E-Risk-1 - N/A	Risk Assessment & Mapping	608	2,413	1,805	0

* An RSE was not calculated for this activity

2. Forecast Method

The forecast method utilized for this cost category is base year. Due to organizational growth, the development of SDG&E's Wildfire Mitigation Group, and changes to cost tracking methods, this cost category has no cost history prior to 2021. Accordingly, the base year recorded data was utilized as the forecasting method to best represent the future needs in this area.

3. Cost Drivers

Risk modeling and the associated technology continues to improve as data becomes more readily available through increased data management and collaborative partnerships. Regulatory bodies, such as the Energy Safety, as well as stakeholders, also provide feedback and refinements to modeling technology requiring additional review and incorporation where warranted. Additionally, collaboration amongst stakeholders regarding risk modeling both through the WMP process at Energy Safety as well as at the Commission continues to require the use of resources.

SDG&E forecasts increases in non-labor contract costs associated with several initiatives. SDG&E expects to have additional contract resources to consult on the development and review of risk models, joint IOU alignment efforts, risk spend efficiency calculations, and associated work. SDG&E's forecast also includes contract costs associated with an independent study to quantify the impacts of PSPS. The results of this study would be used in existing models to capture the risk and impact of PSPS on customers more accurately, consistent with regulatory direction and stakeholder input. To facilitate and oversee these contract related costs, SDG&E expects to hire an additional project manager to oversee the development of additional risk models. SDG&E forecasts an associated labor increase of $125,000 in 2024 over 2021.

SDG&E forecasts ongoing cloud costs associated with new data analytics tools such as those described in capital budget code 218840, WMP Advanced Analytics. This transition will allow for the connection of multiple data sets and more granular models to be run on an hourly basis during high-risk situations such as RFWs or PSPS events. SDG&E also forecasts acquiring new software tools for risk modeling data visualization to align with the other large California IOUs.

In total, these labor and non-labor enhancements result in forecasted costs of $2,413,000 in 2024, an increase of $1,805,000 over 2021.

J. 1WM007.002 – Data Governance

TABLE JW-27
Data Governance O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
J. Data Governance	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Data Governance	1,082	1,650	568
Total	**1,082**	**1,650**	**568**

1. Description

Management of programs and initiatives for mitigation of utility-related wildfires is a data-driven process. It requires data from a variety of static and real-time source systems to support operational needs, trend analysis, and predictive modeling. So that this data has high quality and integrity, the data must be governed through a set of standards and practices that uses people, process, and technology. Such practices will result in company data that is complete, accurate, consistent, accessible, compliant, and safeguarded appropriately.

Initially, SDG&E almost exclusively collected data metrics and measures manually. To enhance data quality and improve the efficiency of the data gathering process, SDG&E began developing a WMP Data Governance Framework (DGF) and an automated Central Data Repository (CDR) for wildfire-related data, which can be used by multiple internal and external stakeholders in the future. These changes will improve data collection by moving away from manual collection to a more uniform, electronic format that will provide data metrics in a searchable format, similar to a GIS data structure. Creating the CDR to be scalable and sustainable will accommodate future regulatory requirements and enhance SDG&E's ability to utilize data to evaluate the effectiveness of utility-related wildfire mitigation programs.

The DGF will define a set of repeatable standards, policies, processes, and controls for wildfire-related data. The vision of SDG&E's DGF is to make its wildfire-related data actionable, accessible, aligned, and auditable.

a. RAMP Activities

Table JW-28 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP, 1WM007.002.

TABLE JW-28
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE*
1WM007.002	SDG&E-Risk-1 - N/A	Data Governance	1,082	1,650	568	0

* An RSE was not calculated for this activity

2. Forecast Method

Base year was selected as most indicative of future work. New initiatives and programs have been implemented beginning in 2020 due to the Wildfire Mitigation Plan, and utilizing the base year captures these changes. Given that aspects of this workpaper were initiated in 2019, utilizing historical data prior to 2019 would not represent the costs for this workpaper in test year 2024. Most recent recorded data, base year 2021, more accurately reflects the future costs for this workpaper.

3. Cost Drivers

The underlying cost drivers for this workpaper relate to the continued build out of the central repository and maturity of the data governance for data collection, transparency, and analytics. Wildfire Mitigation Accountability is requesting three additional employees to collect and standardize data collection across wildfire mitigation initiatives. These employees will continue to advance SDG&E's data governance framework, managing the creating of the centralized repository for data (see capital budget code 208910), and creating internal reports and dashboards to ensure all of SDG&E's data is reported accurately and consistently. This will help create consistency in the way data is collected and reported across the Wildfire Mitigation Plan, the Quarterly Initiative Update, and the Quarterly Data Report. The three positions consist of a Data Governance Team Lead, a Data Governance Project Manager, and a Technical Advisor. SDG&E forecasts these employees will create an upward cost driver of $375,000 in 2024.

K. 1WM008 – Stakeholder Cooperation and Community Engagement

TABLE JW-29
Stakeholder Cooperation and Community Engagement O&M Costs

WILDFIRE MITIGATION (In 2021 $)			
K. Stakeholder Cooperation & Community Engagement	**2021 Adjusted-Recorded (000s)**	**TY2024 Estimated (000s)**	**Change (000s)**
1. Stakeholder Cooperation & Community Engagement	10,985	11,565	580
Total	**10,985**	**11,565**	**580**

1. Description of Costs and Underlying Activities

Engagement and cooperation among all wildfire stakeholders are extremely important to SDG&E, as it endeavors to fulfill its commitment to mitigating the risk of wildfires and adverse impacts of PSPS events. SDG&E remains dedicated to partnering with utility customers, elected officials, nonprofit support organizations, first responders and all other public safety and community partners, understanding they all play a unique and important role in achieving wildfire prevention and mitigation in SDG&E's service territory. SDG&E provides an essential service, and it takes its role within the communities it serves very seriously. This is especially true during times of PSPS events, when communities – neighborhoods in which SDG&E's employees, families and friends live – depend on complete, accurate, and timely information for their well-being.

SDG&E will continue to strive to provide all stakeholders with awareness and information, doing everything in its power to educate the public on wildfire preparedness, including PSPS events. It is SDG&E's goal to equip those it serves with information and resources to navigate the adversity of an emergency, wildfire or PSPS event. Through thoughtful education campaigns and strategic partnerships, SDG&E has implemented a robust, external communication strategy, which is continuously analyzed to identify areas of improvement. SDG&E also leverages its broadened and increased relationships with community-based organizations (CBOs) and stakeholders to amplify and disseminate critical, sometimes life-saving information. These year-round efforts and partnerships are further explained below.

Communication Practices

The nearly year-round threat of wildfire risk in California and changing conditions illustrates the need for SDG&E to continually educate customers and the general public about

wildfire safety, resiliency and emergency preparedness. Thus, a comprehensive wildfire safety communications and outreach plan has been developed with the intent of increasing community resiliency to wildfires and PSPS impacts.

The importance of providing accurate, timely information to increase public awareness cannot be understated. By educating communities before an emergency, wildfire, or PSPS event occurs, customers can take the necessary steps to prepare for and navigate the inherent difficulties these events bring. Additionally, SDG&E leverages channels outside of its internal outreach campaigns, in the form of partnerships and external events. These provide additional avenues for SDG&E to interact with the public. Providing myriad outreach and engagement channels increases public touchpoints and leads to increased awareness.

SDG&E has a team of outreach advisors that work with community organizations to provide education, programs and services beneficial to customers, with a key focus on wildfire preparedness, PSPS notifications and support services. A key channel and support network utilized by outreach advisors to promote wildfire preparedness information, PSPS notifications, and available support services during PSPS events is SDG&E's Energy Solutions Partner network. This network is comprised of nearly 200 CBOs who serve a critical role in connecting SDG&E with their constituencies. Through this partner network, SDG&E is able to reach diverse, multicultural, multilingual, senior, special needs, disadvantaged and AFN communities. In many cases they are considered trusted partners and experts by the communities they serve, and are able to provide valuable feedback to SDG&E on the needs of their constituents, as well as amplify SDG&E's wildfire preparedness and notification messaging to hard-to-reach customers.

As part of its ongoing efforts to support wildfire mitigation and community fire safety, the SDG&E Wildfire Safety Community Advisory Council (WSCAC) is a forum allowing community leaders to provide direct and constructive input, feedback, recommendations, and support to SDG&E senior management and the Safety Committee of SDG&E's Board of Directors. SDG&E takes the information discussed during these meetings very seriously, as the council members provide useful insight into how SDG&E can continue to help protect the region from wildfires.

Wildfire Safety Fairs will also continue to serve the communities with information, education, resiliency and opportunities to help before, during and after a PSPS activation and/or

any other emergency situation. The Company will also review and assess the prevalent languages identified. The expanded CBO collaboration will help with this effort.

SDG&E plans to continue strategically enhancing collaboration with community partners, including Fire Safe Councils, local Fire Departments, Community Emergency Response Team (CERT), local town organizations and other CBOs to educate on PSPS, emergency response and programs available to all communities. Additionally, SDG&E will continue to partner with CBOs, and will be focusing on building new partnerships with organizations that represent the needs of customers with AFN in the future.

In addition to and in coordination with its wildfire safety communications discussed above, SDG&E conducts PSPS-specific communications in three phases: prior to, during, and following a PSPS event. Efforts before a PSPS focus on educating customers and the public about what a PSPS is and tactics they can employ to remain safe, resilient, and updated during a PSPS occurrence. In 2020, SDG&E expanded its public education and outreach efforts associated with its PSPS Communications Plan. In light of COVID-19 considerations, special emphasis was placed on reaching and educating customers and the public in new and novel manners. For example, in September 2020, the Company launched its novel PSPS Mobile App (Alerts by SDG&E). This new tool enables customers to receive information including, but not limited to, notifications, Community Resource Center information with GPS directions, and other real-time updates and safety information related to PSPS activities. During a PSPS, the company focuses on providing real-time awareness and updates about the event and how to remain safe. For instance, SDG&E assigns a dedicated 2-1-1 organization liaison who is responsible for conveying real-time updates and talking points. The Company will also employ standard communication channels to promote 2-1-1 service resources including, but not limited to, social media channels, broadcast and print media, and the SDG&E NewsCenter and website. Lastly, following a PSPS, the Company examines communications and solicits customer feedback with the intent of refining and improving communication efforts for the following year. Specifically, SDG&E reaches out to customers, through formal surveys, to establish a baseline awareness of PSPS-related messaging and communications at the beginning of wildfire season. At the end of wildfire season, customers will again be surveyed to measure the effectiveness of public education efforts and communications.

SDG&E assigns a dedicated 2-1-1 organization liaison who is responsible for conveying real-time updates and talking points. SDG&E will be investing in improvements that enhance both the wildfire safety and PSPS communications. The public education campaign will start sooner in the year and will work to expand the reach of communications within the service territory. Also, the formal CBO contract established in 2020 will continue, and the lessons learned during the 2020 wildfire season will be applied to future campaigns. The Company will also review and assess the prevalent languages identified. The expanded CBO collaboration will help with this effort. Additionally, the Company is considering and evaluating additional efforts including, but not limited to, working with local school districts to enhance public education efforts. Considerations include school newsletters, communications to parents as well as leveraging established school communication platforms (emails, text messages, and collateral materials). SDG&E is also examining new opportunities within its established partnerships with local Tribal Councils and other resources that serve Native American communities. Along with the expanded communication efforts, SDG&E is working to develop new communications in a culturally appropriate and relevant manner.

Non-Conductive Balloon Alternatives

Metallic foil balloons continue to disrupt the reliability of the electric grid and are a source of reportable ignitions. In 2020, SDG&E attributed two CPUC reportable ignitions to balloons, and according to SDG&E's 2020 Wildfire Mitigation Plan (Table 11a), SDG&E reported an average of 3.6 ignitions per year caused by balloons from 2015 to 2019.

As a potential solution, SDG&E is pursuing the development of a non-conductive balloon with a major manufacturer in the balloon industry. SDG&E brings expertise in electrical engineering and the distribution power grid, and the balloon manufacturer brings expertise in manufacturing processes and retail commercialization. Both companies are working collaboratively to develop a prototype non-conductive balloon, which will not cause an electrical fault when it comes in contact with overhead distribution power lines. Both companies are also involved in drafting an industry standard to test balloons in distribution power lines to identify whether a balloon will cause a fault to overhead distribution power lines. Such a test standard might be adopted by local authorities to limit the sale of balloons that do not pass the test.

The non-conductive balloons are being tested according to distribution power voltages, rather than geographic areas. The balloons so far have passed tests at 12 kV and 21 kV, in

conditions that represent the highest distribution voltages in SDG&E's territory and PG&E's territory. Currently, tests are underway to test higher distribution voltages in use within SCE's territory and some municipal electric utilities in the State.

The next high-voltage tests will address 33 kV to model distribution voltages used across other Californian electric utilities. The work will also clarify what standard test conditions should apply to an industry-wide standard test.

The test standard is being developed within the Institute of Electrical and Electronic Engineers (IEEE, ieee.org). The trial-use standard is in the drafting stage, and is being developed by a task force within the Distribution Reliability Working Group of IEEE. The task force is made up of representatives from electric utilities across the U.S., a high voltage test lab, a balloon manufacturer, and other consultants and experts. The draft standard is titled "Trial Use Standard for Testing and Evaluating the Dielectric Performance of Celebratory Balloons in Contact with Overhead Power Distribution Lines Rated up to 38 kV System Voltage." The goal is to have a standard test that could be performed by any high-voltage lab to determine if a celebratory foil balloon will cause a fault in overhead distribution lines or not. According to the IEEE process for developing draft standards, the expected date of submitting the draft for the initial sponsor ballot is December 2022.

If the prototypes continue to have success in the high voltage tests, the balloon manufacturer may seek improvements to lower the production costs and apply the technology to complex balloon designs. SDG&E does not anticipate it will fund any of those product improvements but may participate in ensuring the industry-standard test applies to any new product developments.

a. RAMP Activities

Table JW-30 below provides the RAMP activities, their respective cost forecasts, and the RSEs for this workpaper. For additional details on these RAMP activities, please refer to my workpapers SDG&E-13-WP for 1WM008.

TABLE JW-30
RAMP Activity O&M Forecasts by Workpaper
In 2021 Dollars ($000)

Workpaper	RAMP ID	Activity	2021 Embedded-Recorded	TY 2024 Estimated Totals	Change	GRC RSE*
1WM008.000	SDG&E-Risk-1 - C42	PSPS Communication Practices	9,766	9,889	123	0
1WM008.000	SDG&E-Risk-1 - C43	Mylar Balloon Alternative	37	86	49	0
1WM008.000	N/A	WMP AFN Customer Support	1,127	1,390	263	0
1WM008.000	N/A	WMP Tribal Customer Support	54	200	146	0

* An RSE was not calculated for this activity

2. Forecast Method

The forecast method developed for this cost category is base year. Labor and non-labor forecasts are based on the BY 2021 recorded data. The base year forecast methodology was utilized to best represent the structure of the organization, while accounting for the additional programs SDG&E plans to implement moving forward.

3. Cost Drivers

The cost drivers behind this forecast are related to improving communication with SDG&E's customers, specifically AFN and Tribal customers.

SDG&E is planning to hire a communications compliance project manager in 2022 who will be responsible for managing all compliance requirements related to wildfire mitigation and PSPS, and all other communications regulatory requirements. This position will specifically follow all regulatory proceedings related to wildfire, PSPS and emergency communication practices, customer support during emergencies, community outreach and public education and communication efforts, track requirements and drive progress towards implementing requirements. Additionally, this role will be responsible for collaborating with subject matters experts in developing regulatory responses to filings, data requests and reporting to demonstrate SDG&E is achieving its communication and public education compliance obligations. Communications, public education and customer research are at the nexus of expanding and emerging PSPS, wildfire mitigation and emergency response regulations, with regulatory activity

in those areas increasing over 280% since 2019. The impact to the business of this position not being filled makes SDG&E vulnerable to falling out of compliance, incurring penalties, and suffering reputational damage.

The AFN team is hiring two additional FTEs that will monitor requirements and drive implementation of CPUC proceedings, meet compliance with all reporting requirements, participate in quarterly AFN PSPS Working Group meetings, make presentations to the CPUC, and attend meetings for the AFN Statewide Council. The CPUC and SDG&E have put a heavy emphasis on supporting customers with access and functional needs, especially during PSPS, causing regulatory reporting requirements to increase exponentially, as mentioned above. These positions will support decisions including the Wildfire Mitigation Plan and De-energization Decisions – Phase 1 (D.19-05-042), Phase 2 (D.20-05-051), and Phase 3 (D.21-06-034). In total, these FTEs will support 19 CPUC proceedings, more than 20 reports, and all PSPS events and reports. Due to the growing focus and reporting requirements, additional contractor support may be needed.

In 2021, SDG&E added a Tribal Relations Manager to provide dedicated and proactive engagement, education, and outreach for the tribal communities SDG&E serves. There are 18 federally recognized tribal governments within SDG&E's service territory, all of which are located within high fire threat districts. The Tribal Relations Manager supports these tribal communities through listening sessions, providing information on SDG&E fire hardening efforts, programs, offerings and CPUC requirements, and by resolving inquiries and concerns. California, the CPUC and SDG&E have all increased focus on providing deeper engagement with tribal communities within the last few years. There have been a number of recent regulatory directives issued by the CPUC for SDG&E to increase engagement with tribal communities, including, but not limited to, directives in the de-energization Order Instituting Rulemaking (OIR), broadband OIR, microgrid OIR, tribal policy OIR, and low-income proceeding. In 2019, Governor Newsom passed two policies, a Tribal Consultation Policy and a Tribal Land Transfer Policy, in support of tribes. In 2020, Governor Newsom appointed the CPUC's Tribal Advisor to serve as its main point of contact with the Native American Tribes in California. This growing focus and policies may necessitate additional contractor support to contribute to the success of SDG&E tribal relations.

In total, SDG&E forecasts expenditures of $11,565,000 in 2024 for Stakeholder Cooperation and Community Engagement, an increase of $580,000 over 2021.

VI. CAPITAL

The capital projects requested reduce the risk of wildfire and the impacts of PSPS on customers. The largest capital projects are the grid hardening initiatives of covered conductor and undergrounding. These initiatives form the backbone of SDG&E's WMP system hardening efforts and afford long lasting, significant grid improvements that promote resiliency, reduce the risk of ignition from electrical facilities, and limit the need for and impact of PSPS events. Table JW-31 summarizes the total capital forecasts for 2022, 2023, and 2024.

As explained in Section II above, SDG&E is not requesting 2022 and 2023 wildfire-related costs herein because SDG&E is proposing to address the reasonableness and cost recovery of those costs in tracks of this proceeding. In this section, I present 2022 and 2023 cost forecasts for illustrative purposes only, to demonstrate the progression of costs and better inform the Commission regarding reasonableness of such costs beginning in 2024.

TABLE JW-31
Capital Expenditures Summary of Costs

WILDFIRE MITIGATION CAPITAL (In 2021 $)				
Categories of Management	**2021 Adjusted-Recorded**	**Estimated 2022 (000s)**	**Estimated 2023 (000s)**	**Estimated 2024 (000s)**
A. Risk Assessment and Mapping	1,446	2,200	2,420	2,662
B. Situational Awareness and Forecasting	1,550	7,803	800	1,864
C. Grid Design and System Hardening	312,290	343,110	405,162	471,146
D. Asset Management and Inspections	26,181	45,152	66,130	17,423
E. Grid Operations and Protocols	13,460	14,749	9,185	8,100
F. Data Governance	19,983	24,255	17,566	11,685
G. Emergency Planning and Preparedness	1,929	7,302	23,914	2,496
H. Stakeholder Cooperation and Community Engagement	5,015	6,874	3,361	3,131
Total	**381,854**	**451,455**	**528,538**	**518,507**

A. Risk Assessment and Mapping

SDG&E initially developed the Wildfire Risk Reduction Model (WRRM) to enable risk assessment and prioritize its distribution grid hardening approach. SDG&E has shared this work with other utilities, leading others to adopt a similar approach. The WRRM Operations (WRRM-Ops) tool continued to advance the use of the WRRM model to understand fire propagation and is used during live fire incidents. And SDG&E's WiNGS-Planning model to provides an understanding of the fire risk at a more granular level across the service territory to aid in informing which mitigations should be applied in which areas. WiNGS-Planning was expanded to create WiNGS-Ops to better quantify PSPS risks and assist emergency operations personnel with real-time decision making during PSPS events. WiNGS-Planning continues to be used to scope and prioritize future covered conductor and undergrounding projects.

SDG&E continues to develop its risk assessment and mapping models and is refining a primarily automated risk assessment and mapping methodology. The ultimate aim of the risk assessment effort is to better quantify the risk of wildfire and the impacts of PSPS events to identify optimal solutions that efficiently target reduction of both risks across the system.

TABLE JW-32
Risk Assessment and Mapping Capital Expenditures

WILDFIRE MITIGATION CAPITAL (In 2021 $)				
A. Risk Assessment and Mapping	**2021 Adjusted-Recorded**	**Estimated 2022(000s)**	**Estimated 2023(000s)**	**Estimated 2024(000s)**
1. Fire Science Enhancement	1,446	2,200	2,420	2,662
Total	**1,446**	**2,200**	**2,420**	**2,662**

1. 192480 – Fire Science Enhancement

a. Description

WRRM, developed by SDG&E's partner Technosylva and SDG&E subject matter experts, was the first project-scoping tool used to prioritize electric distribution fire hardening to promote wildfire mitigation. WRRM combines electric distribution asset data and wildfire simulations to predict the risk of potential equipment-related ignitions. To accomplish this, Technosylva aggregated millions of wildfire computer simulations to build a geospatial layer of wildfire vulnerability over the electric distribution overhead assets. This layer, combined with the assets' expected failure and ignition rates, was used to assign a wildfire risk score. The

difference in risk scores between assets provided a risk reduction score used to prioritize circuits and sections for hardening.

Further refinement of fire modeling technologies, geospatial data, and computer capabilities allowed WRRM to evolve into WRRM-Ops, a tool with more granular fire weather forecasting instead of a single aggregated simulation model. WRRM-Ops was developed using 30 years of historical weather data. The purpose of the WRRM-Ops model is to leverage the latest fire science available to help anticipate, prepare for, react to, and recover from wildfire activity during emergency operations, including PSPS. The model uses the latest available fuels and weather information to model wildfire consequence, anticipate where risk is highest across the service territory, and predict how a wildfire may grow and impact the community once ignited.

Increasingly, the WRRM-Ops model is being used to inform internal wildfire risk modeling efforts. The previous iteration of WRRM is also utilized in the WiNGS-Planning to help characterize sub-circuit fire consequence and the latest WRRM and WRRM-Ops models are currently utilized as tools to understand the consequence

SDG&E is investing in the development of new fire science technologies to increase the effectiveness of existing tools such as the Fire Potential Index (FPI). The FPI, another fire modeling tool, leverages weather data into the fire potential that is updated daily. These tools provide forecasters with information on the probability of ignition and the potential for wildfire to grow rapidly.

The Fire Science Enhancement cost category mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-33 below shows the forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-33
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
192480.001	SDG&E-Risk-1 - C01	WRRM - OPS	2,200	2,420	2,662	0

* An RSE was not calculated for this activity because it is considered foundational to supporting wildfire mitigation efforts.

b. Forecast Method

The forecast method for this budget code is zero-based. This initiative is relatively new and continues to develop, thus historical costs do not represent the planned enhancements for TY 2024. The forecast is based on cost estimates that were developed to meet the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project specific details.

c. Cost Drivers

Modernizing existing tools and maximizing the available data is critical to daily operations, enhances efficiencies, and increases reliability by potentially reducing the number of required patrols following outages. This project enhances the fire science capabilities at SDG&E. New tools and technologies will be developed to enhance current technologies and create the next generation of fire weather tools. This project has also been called FireSafe 4.0 and it embodies a massive collaboration between SDG&E, academia, and private industry enabling efficient management and significant cutting-edge output from terabytes of data.

Given that wildfires are the top risk to the SDG&E's infrastructure and pose a significant risk to the community it serves, it is important to be a part of leading-edge science. SDG&E achieves perpetual modernization of the existing software through collaborative research and development with industry and academia. Modern and efficient fire science tools also permit SDG&E to assess the risk and the impacts accurately, allowing for safer daily utility operations and garnered best practice efficiencies, such as reducing the number of required patrols following outages.

The underlying cost drivers of this budget code are to support the safe and reliable operation of the system and decision making with best-in-class risk forecasting during dangerous fire weather conditions. To achieve efficiencies and reduce risk, SDG&E must continually review and improve its models in response to third-party review and regulatory and stakeholder feedback. Increased availability of data also improves models and methods of model evaluation, but SDG&E must engage resources to best utilize that data.

Investment in the latest wildfire risk reduction modeling and forecasting is necessary to create synergies between industry and academia and refine the critical fuels inputs into the fire risk modeling. This is needed to enable more real-time updates and facilitate scenario planning, which helps SDG&E and the public. Additionally, SDG&E is and plans to continue leveraging supercomputing resources for archiving and organizing massive amounts of environmental data. The strength and reliability of supercomputing power assists SDG&E in running the models and keeping the underlying information in the models current.

SDG&E monitors and accounts for the contribution of fuel conditions to ignition probability and estimated wildfire consequence in its decision-making by integrating all collected weather data and forecast modeling into its fire behavior and fire potential tools. SDG&E will be partnering with San Jose State University to develop a live fuel moisture model to better understand the vegetation conditions within the service territory, and to improve the accuracy of fire spread modeling.

Another academic partner, Scripps Institute of Oceanography, will be leveraged to apply a downscaling high resolution weather model to SDG&E's service territory. This will provide SDG&E with more accurate predictive weather information in advance of PSPS or other extreme weather conditions. Continued collaboration will occur with the San Diego Supercomputer Center to enhance existing tools and allow for the archiving and accessibility of all SDG&E supercomputer output and post processed indices. Expansion of the information archived at the Supercomputer Center benefits not only SDG&E but promotes ongoing study of both climate change and fires science.

Finally, SDG&E will continue its partnership with Technosylva to enhance fire behavior modeling and Wildfire Risk modeling. This will be accomplished through data analytics enhancements, software enhancements, and integration with SDG&E modeling such as WiNGS and WiNGS-Ops.

Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 192480.

B. Situational Awareness and Forecasting

SDG&E's Situational Awareness and Forecasting capability is based on a solid technological and data-rich foundation on which the next generation of advanced prediction and analytics will be built. Data gathered from a Weather Station Network exceeding 220 stations in 4,100 square miles and collecting over 31,000 observations per day helps initialize six high-resolution models operating on three supercomputers that generate nearly 200 gigabytes of daily data. This data is archived for accessibility and searchability through a joint venture with the San Diego Super Computing Center and represents a first-of-its-kind effort to advance wildfire science and research.

TABLE JW-34
Capital Expenditures Summary of Costs

B. Situational Awareness and Forecasting	2021 Adjusted-Recorded	Estimated 2022(000s)	Estimated 2023(000s)	Estimated 2024(000s)
1. Advanced Weather Station Integration	391	917	380	380
2. Wireless Fault Indicators	1,106	666	0	1,064
3. Circuit Risk Index	53	420	420	420
4. Meteorology Super Computer Replacement	0	5,800	0	0
Total	**1,550**	**7,803**	**800**	**1,864**

1. 192470 – Advanced Weather Station Integration

a. Description

In the aftermath of the 2007 wildfires, SDG&E developed a first-of-its-kind network of utility weather systems and an in-house meteorology team to enable the Company to undertake advanced preparations for severe weather events. This network of dense, utility-owned weather stations provides detailed weather data across the service territory, which informs day-to-day operational decision-making at all levels. SDG&E also leverages this data for its risk modeling and to better understand the ongoing impacts of climate change.

The purpose of this project is to strategically enhance SDG&E's weather network to enable continued operations of critical fire weather infrastructure. SDG&E has utilized its

weather network extensively since its inception finding the information provided to be valuable, especially during Red Flag Warnings and heighten weather events. The weather network offers real-time data where SDG&E's infrastructure is located providing additional resources and surveillance of potentially impacted areas. This is critical given the presence of year-round fire conditions, increased drought, and the ongoing effects of climate change. The improvements to situational awareness afforded by a robust weather network are essential to mitigate and manage the risk.

The Advanced Weather Station Integration cost category mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.Table JW-35 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-35
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
192470.001	SDG&E-Risk-1 - C02	Advanced Weather Station Integration	917	380	380	0

* An RSE was not calculated for this capital activity

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

SDG&E's weather network was originally developed and deployed in 2009. Some weather stations are now reaching end of life. Improvements to the network of weather station are necessary to maintain continued operations of critical fire weather infrastructure. Additionally, SDG&E is integrating multi-spectral cameras, fuel moisture sensors, and Air

Quality Index sensors to help predict and monitor extreme weather events that threaten the infrastructure and its workforce. In addition, SDG&E is installing Normalized Difference Vegetation Index (NDVI) cameras, all integrated with a planned LTE communication infrastructure backbone in the most remote locations in San Diego County. These upgrades are necessary to refresh the aging technology of SDG&E's current weather network.

This project will continuously enhance the SDG&E weather network to provide a reliable flow of operationally critical fire weather information. This information will be fed into fire weather tools such as the Fire Potential Index (FPI) and the Santa Anna Wildfire Threat Index (SAWTI). Also, this data is used for critical decision-making during emergency situations to mitigate fire and weather-related risks and inform PSPS decision making. Detailed understanding of local climate and conditions, including fuel moisture, wind speeds, and air quality allow SDG&E to most efficiently target PSPS events when necessary. Accordingly, this project will increase reliability and enhance safety by having access to critical weather observations during adverse weather events enabling data driven decision making based on actual real-time observations.

Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 192470.

2. 112530 – Wireless Fault Indicators

a. Description

Wireless Fault Indicators (WFIS) are used to monitor overhead and underground lines and locate faults more efficiently and accurately. SDG&E plans to build and place in service 1,300 WFIs in HFTD Tiers 2 and 3 by the end of the Test Year. The forecast for Wireless Fault Indicators for 2022, 2023, and 2024 are $666,000, $0, and $1,064,000, respectively.

If an outage occurs during a time of heightened wildfire risk, all infrastructure is patrolled for damage prior to restoring power. In instances where large areas are de-energized due to sensitive protective relay settings, WFIs are used to concentrate focus on a smaller portion of the electric circuit, which allows for a faster response in the event of an ignition; a greater chance of determining and correcting a fault cause when damage on the overhead electric system is not immediately obvious; and potentially faster power restoration which could offset customer reliability impacts caused by wildfire mitigation measures. WFIs are typically mounted on conductors or in underground vaults. When a fault occurs, the fault causes a state change on a

mechanical target flag, LED, or remote indication device. When WFIs are coupled with the On-Ramp Wireless System, the WFIs will communicate information to distribution system operators.

These forecasted capital expenditures enhance reliability by allowing operators to dispatch electric troubleshooters closer to the exact fault location, isolate the fault, and begin service restoration more expediently. The technology may also assist with locating instances of ignition and routing responders faster. The Wireless Fault Indicators project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.Table JW-36 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-36
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE
112530.001	SDG&E-Risk-1 - C03-T3	Wireless Fault Indicators	666	0	1,064	244

b. Forecast Method

The forecast method used is zero-based. The program was developed as a component of SDG&E's WMP and historical costs do not accurately reflect the projected scope and cost of work. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project specific details.

c. Cost Drivers

Wireless fault indicators are a proven technology that helps narrow the search area to determine where a system failure has occurred, so SDG&E can quickly identify a search area and dispatch crews to find system failures. This technology is important to SDG&E's operational

mitigation measures that decrease wildfire ignition risk. SDG&E has been installing WFI, as shown in my workpapers, with historical costs in the last five years. With its experience with this program, SDG&E is requesting to continue this project at a reduced cost than SDG&E has incurred previously. The underlying cost drivers for this capital project relate to construction labor rates and availability of Supervisory Control and Data Acquisition (SCADA) and relay technicians, material and equipment cost, and the planned number of units installed each year.

Additional information regarding these cost drivers is included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 112530.

3. 208770 – Circuit Risk Index

a. Description

The purpose of the CRI project is to develop machine learning models to predict failures and ignitions for different assets and drivers of ignitions. The models developed in this project will be used to inform both operational and long-term decision making. The CRI also informs SDG&E's PSPS decision making by affording operations personnel to identify locations in the system with a potential of having higher failure rates. The forecast for the Circuit Risk Index (CRI) for 2022, 2023, and 2024 are $420,000, $420,000, and $420,000, respectively.

Several models will be developed for different asset types (poles, conductors, transformers, etc.) as well as other ignition drivers (vegetation, vehicle, balloon contact, etc.). These models will then be aggregated up to a single model such as WiNGS and/or WiNGS-Ops as an enhancement to those tools. This project was identified as a key area of improvement to improve SDG&E's risk assessment processes and tools especially when benchmarking against the other utilities. Further improvements to the information and CRI inputs will result in improvements to SDG&E's decision-making tools for grid hardening and PSPS.

The Circuit Risk Index project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-37 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-37
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
208770.001	SDG&E-Risk-1 - C04	Fire Science and Climate Adaptation Department	420	420	420	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.The initial implementation focused primarily on building a model for conductor risk. However, these historical costs are not representative as future work will expand to incorporate additional assets and ignition drivers which supports the forecasted annual spend of $420,000.

c. Cost Drivers

The CRI was initiated to develop wildfire risk assessments for circuits to support PSPS operations. The initial phase of the work and a preliminary version of the model was created in 2020. However, there is a continued need to integrate weather information and develop correlations between wind speeds and failures, build more sophisticated machine learning probability of ignition and probability of failure models, enhance the risk assessment process, increase situational awareness during PSPS. Therefore, the proposed costs include the labor associated with two full-time employees working to develop three new models per year. This funding will support the development and enhancement of wildfire risk modeling. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 208770.

4. 202400 – Meteorology Super Computer Replacements

a. Description

SDG&E utilizes high performance supercomputing to run the Weather Research and Forecasting model specifically tailored to the unique weather and terrain characteristics of the service territory. Additionally, the computing cluster is critical to numerous big data analytics projects that generate terabytes of data required for SDG&E. The forecast for Meteorology Super Computer Replacements for 2022 is $5.8 million.

SDG&E's Situational Awareness and Forecasting capability is based on a solid technological and data-rich foundation on which the next generation of advanced prediction and analytics will be built. Data and information are necessary to meet regulatory requirements, enable predictive models, better understand climate change impacts, and further SDG&E's position as a leader in wildfire science and research SDG&E's Weather Station Network collects over 31,000 observations per day running 6 high-resolution models operating on 3 supercomputers that generate nearly 200 gigabytes of daily data. Through a joint venture, SDG&E utilizes high performance supercomputing to run the Weather Research and Forecasting model specifically tailored to the unique weather and terrain characteristics of the service territory. Additionally, the computing cluster is critical to numerous big data analytics projects that generate terabytes of data required for SDG&E. The San Diego Supercomputing Center archives these SDG&E datasets for the weather forecast, fire potential index, and fuels to enable metadata-based querying for various stakeholders through web portals and visual maps.

The Meteorology Super Computer Replacements project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-38 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-38
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
202400.001	SDG&E-Risk-1 - C05	High Performance Computing Infrastructure	5,800	0	0	0

* An RSE was not calculated for this activity because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.

b. Forecast Method

The forecast method used is zero-based as there are no historical costs. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

SDG&E owns and operates three High Performance Computing Clusters (HPCC) that have reached the end of operational life and will require replacement with the latest cluster technology to accommodate an ever-increasing big data computational demand. To address the end of useful life for the existing computing infrastructure, SDG&E plans to acquire a new high-performance computing platform in 2022.

The HPCC system is critical for all meteorology data applications. Generating nearly 200 gigabytes of numerical weather prediction data on a daily basis, SDG&E HPCC output not only provides station-level weather forecasts for all 221 weather station out seven days in the future, but is also the foundational data for all post processed indices, including the SAWTI, the FPI, and the Outage Potential Index (OPI).

SDG&E's current supercomputers generate weather-related forecast data that is shared with several partners, including the U.S. Forest Service, which disseminates the data through

their public website, and the National Weather Service. SDG&E plans to continue the production and sharing of forecast products as well as prioritize data analytics and modeling for the foreseeable future. SDG&E intends to maintain and update this project to stay aligned with the latest computing technology and intends to share all the data that is generated with the wildfire community.

The new high-performance computing infrastructure is essential to the ongoing development of fire science and big data analytics. SDG&E intends to work closely with the San Diego Supercomputer Center to closely monitor data science advancements to ensure that this program remains highly capable of providing the advanced analytics required to operate the utility of today and of the future. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 202400.

C. Grid Design and System Hardening

After the 2007 fires in its service territory, SDG&E began grid hardening initiatives focused on hardening transmission and distribution lines. With an emphasis on reducing wildfire risk and PSPS impacts, SDG&E continues to transition its distribution hardening from bare conductor hardening toward covered conductor and undergrounding. As shown in Table JW-39, SDG&E performs multiple Grid Design and System Hardening capital projects as part of its overall strategy. The capital forecasts for this GRC are presented in Table JW-39 below.

TABLE JW-39
Capital Expenditures Summary of Costs

C. Grid Design and System Hardening	2021 Adjusted-Recorded	Estimated 2022(000s)	Estimated 2023(000s)	Estimated 2024(000s)
1. SCADA Capacitor Replacement	1,945	2,010	1,378	1,427
2. Overhead System Covered Conductor	38,731	78,593	69,222	59,217
3. Private LTE	49,901	79,569	65,349	70,179
4. HFTD Transmission Fiber Optics	6,641	9,444	7,700	7,700
5. Overhead System Traditional Hardening	93,973	16,311	5,479	5,479
6. Expulsion Fuse Replacements	6,052	842	0	0
7. Advanced Protection	10,787	12,783	11,562	5,540
8. Lightning Arrestor Replacement Program	1,794	4,213	3,603	3,557
9. Microgrids	13,053	5,069	36,229	2,400
10. Overhead Transmission Fire Hardening (Distribution Underbuild)	5,476	4,729	8,635	14,464

11. PSPS Sectionalizing Enhancements	1,903	1,567	1,567	1,567
12. Cleveland National Forest Fire Hardening	12,496	1,999	1,675	1,206
13. Strategic Undergrounding	69,538	125,981	191,143	292,062
14. High Risk Pole Replacement Program	0	0	1,620	6,348
Total	**312,290**	**343,110**	**405,162**	**471,146**

1. 202580 – HFTD SCADA Capacitor Replacement

a. Description

The SCADA Capacitor Replacement program will remove and/or replace existing non-SCADA capacitors with more modern SCADA switchable capacitors and remove the non-SCADA devices. The forecast for HFTD SCADA Capacitor Replacement for 2022, 2023, and 2024 are $2,010,000, $1,378,000, and $1,427,000, respectively. SDG&E plans to build and place in service 83 SCADA capacitors by the Test Year.

The SCADA Capacitor Replacement program will remove and/or replace existing non-SCADA capacitors with more modern SCADA switchable capacitors and remove the non-SCADA devices. The current non-SCADA capacitors are designed to provide voltage and power factor correction for the distribution system. During a failure of a capacitor from either mechanical, electrical, or environmental overstress, an internal fault is created resulting in internal pressure and the potential to rupture the casing, which could create a potential ignition hazard to employees and the public.

The modernization of these capacitors will introduce a monitoring system to check for imbalances and internal faults and to open based on the protection settings. Additionally, the SCADA capacitor will provide a method for remote isolation and monitoring of the system, providing additional situational awareness during extreme weather conditions. The program first prioritizes replacing fixed capacitors within the system and then addressing capacitors with switches. Both types of capacitors will be modernized to a SCADA switchable capacitor.

These forecasted capital expenditures support reliability. SCADA capacitors allow early indications of problems and potential failures of line capacitors which support expedited repair work and minimized downtime. Isolating failures expediently on the grid supports improved safety, and quicker identification of failures through SCADA devices instead of crews improves system reliability.

The SCADA Capacitor Replacement project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.The SCADA Capacitor Replacement project will extend from the HFTD into the Wildland Urban Interface (WUI), accounting for the difference between RAMP forecast and previous project completion in 2022.Table JW-40 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-40
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE
202580.001	SDG&E-Risk-1 - C06/M1 T2	SCADA Capacitors (HFTD Tier 2)	2,010	1,378	1,427	2,623

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details. The forecast is based on the number of units being installed, which has already been scoped through 2024.

c. Cost Drivers

The underlying cost drivers for this capital project relate to construction labor rates, material costs, and contract pricing/quotes. The costs will scale depending on the number of SCADA Capacitors to be replaced each year. SDG&E has forecasted replacement of 36, 23, and 24 SCADA Capacitors in 2022, 2023, and 2024, respectively. An overall reduction of 11 SCADA Capacitors from Base Year 2021 results in a reduction of $518,000 in Test Year 2024. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 202580.

2. 202850 – Overhead System Covered Conductor

a. Description

The Covered Conductor program is focused on hardening SDG&E's overhead distribution facilities within the HFTD Tier 3, Tier 2, and the Wildland Urban Interface (WUI) by implementing long-term solutions focused on significant reduction of both the fire risk and impact to the public due to PSPS events. The forecast for Covered Conductor for 2022, 2023, and 2024 are $78,593,000 $ 69,222,000 and $59,217,000, respectively.

SDG&E operates and maintains nearly 3,500 miles of overhead distribution circuit miles within the HFTD. This infrastructure was originally designed to meet GO 95 requirements of an 8 pounds-per-square-foot (psf) or 55 mph transverse wind load for elevations below 3,000 ft and 6 psf or 48 mph transverse wind load with a half inch of radial ice on conductor for elevations above 3,000 feet. With the effects of climate change and changing conditions in the service territory, wind speeds can reach 85 mph to 111 mph in certain areas of the HFTD during extreme Santa Ana conditions. Aging infrastructure, combined with these extreme weather conditions, can increase the possibility of equipment failure on these lines. Further, high winds and outdated design techniques make these lines more vulnerable to foreign object in line contacts, both risk events that could lead to ignitions.

The primary objective of this program encompasses the rebuilding of the distribution system in fire prone areas with primary conductors covered with a 3-layer covering extruded over the standard conductors. The cover acts to prevent ignitions resulting from incidental contacts from wire slap or other objects such as tree branches, and mylar balloons. Other construction activities may be required to accommodate the covered conductor and comply with pole loading and clearance requirements. These activities will be performed simultaneously with covered conductor installation and may include: replacing wood poles to steel; replacing wood crossarms with fiberglass; replacing insulators with new polymer insulators; replacing guys and anchors; replacing aged or open wire secondary conductor; replacing aged switches, transformers, regulators, and fuses; and replacement of a small section of underground related to riser poles.

SDG&E is transitioning its overhead system hardening efforts from bare conductor to covered conductor because of the additional risk reduction the covered conductor provides. SDG&E estimates that risk events and ignitions would be reduced by approximately 65% on

circuit segments that have covered conductor installed, an improvement over the approximate 45% reduction in risk events and ignitions SDG&E has seen with its traditional hardening installations.[53]

The Covered Conductor program also has the potential to reduce PSPS impacts by raising the threshold for PSPS events to higher wind speeds compared to traditional overhead hardening. Covered conductor continues to be relatively new technology in nascent stages of deployment across California. SDG&E is still completing its covered conductor testing and has not yet completed installation of a full circuit with covered conductor. SDG&E forecasts that the first complete circuit will be in service in 2023. While SDG&E is able to more accurately measure the effectiveness of covered conductor in protecting against ignition as a result of line contact, further testing is necessary to fully understand the extent covered conductor will increase wind thresholds for de-energization. Through the WMP efforts at Energy Safety, SDG&E is collaborating with other electrical corporations to share information and better understand the effectiveness of covered conductor. Southern California Edison, who has completed isolatable segments with covered conductor, was able to increase de-energization thresholds for those segments.[54]

Covered conductor acts as a tool to cost effectively mitigate the risk of ignition from object-line contact and increase wind speed thresholds when compared to bare conductor. For this reason, SDG&E has shifted its efforts to increase the use of covered conductor beginning in 2021. SDG&E projects deploying 60 miles of covered conductor in 2022, 2023, and 2024.

The priority and scope of the projects are dictated by full circuit analysis using the WiNGS-Planning model and input and expertise gathered from operational teams. WiNGS-Planning assists in the allocation of grid hardening initiatives across the HFTD based on assessment of both wildfire risk and PSPS impacts. WiNGS-Planning is built upon the MAVF framework in RAMP and evaluates both wildfire and PSPS impacts at the sub-circuit/segment level. Information is used to inform investment decisions by determining and prioritizing mitigation based on RSE, improving wildfire safety, and limiting the impact of PSPS on customers.

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[53] For additional information regarding covered conductor effectiveness, see Appendix C.

[54] SDG&E 2022 WMP Update, Attachment H at 37-38.

The Covered Conductor project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-41 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-41
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
202850.001	SDG&E-Risk-1 - C07/M2 T1-T2	OH Dist Fire Hardening – Covered Conductor	78,593	69,222	59,217	-

*Tranche level RSEs and additional details are available in SDG&E-13-CWP 202850.

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details. The forecast is based on the number of miles of covered conductor being designed and constructed each year, which has already been scoped through 2024.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the circuit miles of work being performed to design and install covered conductor. To efficiently maximize risk reduction, SDG&E is increasing the amount of covered conductor being installed per year. An increase of 40 miles of covered conductor installation over Base Year 2021 results in an associated cost increase of $20,485,000. Installing covered conductor provides a safer, more reliable system aimed both at reducing ignitions and PSPS impacts, which benefits the public and SDG&E alike. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 202850.

3. 198730 – WMP Private LTE

a. Description

SDG&E's WMP Private LTE Communication Network consists of the Distribution Communications Reliability Improvements (DCRI) program and Spectrum License Acquisition. The forecast for the DCRI program and spectrum license acquisition for 2022, 2023, and 2024 are $79,569,00, $65,349,000, and $70,179,000, respectively.

The current communication system within the HFTD does not have the bandwidth to support some of the technologies deployed as wildfire mitigations, including the Advanced Protection Program and Falling Conductor Protection. These programs require high-speed data communication between field devices to operate quickly, de-energizing a circuit before a broken conductor can reach the ground, reducing the safety and wildfire risk associated with energized wire-down events. In addition, there are gaps in coverage of third-party communication providers in the rural areas of eastern San Diego County that limit the ability to communicate with field personnel during Red Flag Crew deployments and EOC activations. Without adequate communication and data transmission speed, many wildfire mitigation technologies may be compromised or rendered unusable. The DCRI program and associated upgraded communication infrastructure will enhance the overall reliability of SDG&E's communication network, further enabling critical fire prevention and public safety programs. The ability to reliably enable and disable sensitive settings, enable or disable reclosing, or remotely operate a switch during a high-risk weather event requires reliable communication that the DCRI program will provide.

A privately owned LTE network in the service territory will yield significant benefits both to reliability and wildfire mitigation, these include:

- Enable Falling Conductor Protection and other Advanced Protection initiatives.
- Allow for reliable communication with sectionalizing devices utilized during PSPS events.
- Provide enhanced cybersecurity capabilities.
- Reduce cybersecurity risk.
- Apply enhanced failover and redundancy capabilities and yield high availability and reliability.
- Provide forward-looking technology lifecycle with global adoption.

- Provide solutions that are upgradable over time and adaptable for new utility use cases and requirements.

SDG&E plans to build and place in service the expanded DCRI through 142 new base station units by the Test Year. SDG&E is deploying the DCRI program using licensed radio frequency (RF) spectrum. The licensed RF spectrum allows SDG&E the rights to air space to communicate over the network without any other interruption. Additionally, as part of the DCRI program, wireless communication will also be installed or upgraded.

The WMP Private LTE Communication Network project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-42 shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-42
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
198730.001	SDG&E-Risk-1 - C20	LTE Communication Network	79,569	65,349	70,179	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details. This method is most appropriate because milestone payments for the Spectrum License are paid over three years beginning in 2021.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the additional base stations being installed, and the additional Spectrum Licenses being purchased in 2022 and 2023. Test Year 2024 sees an increase in the number of installed base stations from 10 in 2021 to 72 in

2024, and an associated cost increase of $20,364,000. The Spectrum License costs are expected to occur only in 2022 and 2023 and do not contribute to the Test Year 2024 forecast. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 198730.

4. 191340 – HFTD Transmission Fiber Optics

a. Description

The Trans Fiber Link HFTD infrastructure buildout program provides high-speed communications through fiberoptic infrastructure attached to existing structures within existing electric right-of-ways. SDG&E is constructing the HFTD Trans Fiber Link Infrastructure project with forecasts for 2022, 2023, and 2024 of $9,444,000, $7,700,000, and $7,700,000, respectively.

In concert with the LTE project that uses wireless communication infrastructure, SDG&E plans to build and place in service Trans Fiber Link Infrastructure (wired) across 84 miles of the HFTD by the Test Year. The infrastructure buildout includes All-dielectric Self-supporting (ADSS) mainly used for wood pole attachments and underground installations, and Optical Ground Wire (OPGW) fiber replaces static ground wire on steel poles and towers.

The fiber optic infrastructure and associated upgraded communication infrastructure will enhance the overall reliability of SDG&E's communication network which is critical for enabling fire prevention and public safety programs. SDG&E's communication network is foundational to many initiatives that demand reliable communication. SDG&E's communication network is critical for enabling operation of fire prevention and public safety programs. Service to customers is also improved through the infrastructure buildout program which provides high-speed communications.

The HFTD Trans Fiber Link Infrastructure project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-43 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-43
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
191340.001	SDG&E-Risk-1 - C20	LTE Communication Network	9,444	7,700	7,700	0

* An RSE was not calculated for this activity

b. Forecast Method

The base-year forecast methodology was selected as most indicative of future work. This budget code did not have any significant historical costs prior to 2021.Accordingly, historical forecast methods would not accurately capture the costs needed in 2024. The 2021 base year forecast method is the most representative of future needs.

c. Cost Drivers

The underlying cost drivers for this capital project relate to internal project management oversight, and the contract costs for the engineering, construction, and material costs related to the installation of the fiber cable. In Test Year 2024, SDG&E is forecasting to install 26 miles of fiber cable at $250,000 per mile along with one FTE for project management. The HFTD Transmission Fiber Optics project continues the ramp up its scope of work. Accordingly, a project management professional is needed to manage the future work. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 191340.

5. 202840 – Overhead System Traditional Hardening

a. Description

The forecast for the Overhead System Traditional Hardening workpaper for 2022, 2023, and 2024 is $16,311,000, $ 5,479,000, and $5,479,000, respectively. SDG&E plans to build and place in service 15 miles in 2022 and five miles each in 2023 and 2024.

The Electric System Hardening (ESH) Overhead (OH) Traditional Hardening program is focused on hardening SDG&E's overhead distribution facilities within the HFTD Tier 3, Tier 2, and the WUI by implementing long-term solutions focused on reduction of fire risk. The primary objective of this program is to replace the older bare conductor with a new, stronger bare conductor consisting of Aluminum Core Steel Reinforced (ACSR) or Aluminum Wire Aluminum Core (AWAC). Historically the predominant bare conductor that was replaced consisted of small copper wire (#8, #6, #4 single and three strand copper), which was determined to be the highest risk wire asset, oldest and most predominant in our fire prone areas. Other activities are performed simultaneously and may include: replacing wood poles to steel; replacing wood crossarms with fiberglass; replacing insulators with new polymer insulators; replacing guys and anchors; replacing aged or open wire secondary; replacing aged switches, transformers, regulators, and fuses; replacement of a small section of underground related to riser poles; and in some cases, permanent removal of poles, wires, equipment, guys, and anchors when possible. The priority and scope of the projects will be dictated by full circuit analysis using the WiNGS model, and input gathered from operational teams.

SDG&E's Distribution Overhead System Hardening program combines SDG&E's overhead hardening programs, formerly known as Fire Risk Mitigation (FiRM), Pole Risk Mitigation Engineering (PRiME), and Wire Safety Enhancement (WiSE) into one program. The consolidation of these hardening programs involves a strategy evolution compared to SDG&E's 2019 GRC and is consistent with SDG&E's 2022 WMP Update.[55] It will result in the execution of projects based on a circuit-by-circuit approach that weighs risk inputs alongside the need to reduce PSPS impacts, rather than scoping projects based on specific wire or at-risk poles. Ultimately combining overhead distribution hardening programs into one program has made the engineering, design, construction, and management of the projects more efficient and has minimized impacts to customers during job walks, construction, and post-construction close-out activities.

The Overhead System Traditional Hardening project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP

[55] 2022 WMP Update at 233.

activity. Table JW-44 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-44
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
202840.001	SDG&E-Risk-1 - C17/M12 T1	OH Dist Fire Hardening – Bare Conductor	16,311	5,479	5,479	41

*Tranche level RSEs and additional details are available in SDG&E-13-CWP 202840.

b. Forecast Method

The base-year forecast methodology was selected as most indicative of future work. As noted above, several historical programs, including FiRM, PRiME, and WiSE were consolidated into the Overhead System Traditional Hardening program in 2021. Historical costs prior to 2020 will not accurately represent the current project scope. Accordingly, 2021 base year costs are most representative of future needs.

c. Cost Drivers

Traditional hardening is being reduced in scope in favor of covered conductor and strategic undergrounding, which provide additional mitigation against ignition and PSPS events. SDG&E conducted a research study that measured the effectiveness of bare conductor hardening and estimates that it reduced risk events by 47%. Given this is the lowest cost of its major hardening mitigation programs, SDG&E continues to leverage this program as an efficient method to reduce risk for the near future. This will allow for additional time to gain more experience with covered conductor and to transition from bare conductor scope of work to covered conductor or strategic undergrounding.

A reduction in units from Base Year 2021 to Test Year 2024 of 95 miles leads to a reduction in cost of $88,494,000. Documentation of these cost drivers are included in my capital workpapers. *See* SDG&E-13-CWP, budget code 202840.

6. 192420 – HFTD Expulsion Fuse Replacement

a. Description

The fuse replacement program proactively replaces at-risk electric distribution cutout bodies and fuses in the HFTD Tier 2 and Tier 3 with CAL FIRE approved devices to reduce the risk of wildfire ignition. The forecast for HFTD Expulsion Fuse Replacement for 2022, 2023, and 2024 are $842,000, $0, and $0, respectively. SDG&E plans to build and place in service 277 Expulsion Fuses by the Test Year. Expulsion fuse replacement in the HFTD is expected to be completed at the end of 2022. Infrastructure upgrades may also be implemented, if required, to facilitate the fuse changeouts.

Fuses act as electrical safety devices that operate to provide overcurrent protection of an electrical circuit. Replacing expulsion fuses in the HFTD will replace incompatible or deteriorated fuses and other necessary hardwire with CAL FIRE approved cutout body and fuse assemblies, delivering wildfire risk reductions through fewer sparks and potential ignitions at a low cost per asset.

The HFTD Expulsion Fuse Replacement project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-45 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-45
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
192420.001	SDG&E-Risk-1 - C08/M3 T2	Expulsion Fuse Replacements	842	0	0	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on

current construction labor rates, material costs, contract pricing/quotes, and other project-specific details. The forecast for this budget code is based on the number of fuse replacements completed, and the scoping for these jobs is complete.

c. Cost Drivers

The underlying cost drivers for this capital project relate to construction labor rates, material costs, and the quantity of fuse replacements being completed each year. SDG&E expects to complete the replacement of all expulsion fuses within the HFTD with CAL FIRE approved fuses in 2022. There are no forecasted fuse replacements in Test Year 2024 and accordingly no proposed costs are requested in the Test Year. Documentation of these cost drivers are included in my capital workpapers. *See* SDG&E-13-CWP, budget code 192420.

7. 152590 – Advanced Protection

a. Description

The Advanced Protection Program (APP) develops and implements advanced protection technologies within electric substations and on the electric distribution system. It aims to prevent and mitigate the risks of fire incidents, provide better distribution sectionalization, create higher visibility and situational awareness in fire-prone areas, and allow for the implementation of new relay standards in locations where protection coordination is difficult due to lower fault currents attributed to high impedance faults. The APP forecast for 2022, 2023, and 2024 are $12,783,000, $11,562,000, and $5,540,000, respectively. SDG&E plans to build and place in service advanced protection on 38 circuits by the Test Year.

More advanced technologies, such as microprocessor-based relays with synchrophasor/phasor measurement unit (PMU) capabilities, real-time automation controllers, auto-sectionalizing equipment, line monitors, direct fiber lines, and wireless communication radios comprise the portfolio of devices that are installed in substations and on distribution circuits to allow for a more comprehensive protection system and greater situational awareness in the fire-prone areas of the HFTD. The portfolio of advanced technology allows SDG&E to implement new protection systems, such as:

- Falling Conductor Protection (FCP) designed to trip distribution overhead circuits before broken conductors can reach the ground energized, reducing the risk of an ignition or safety incident. FCP can sense a break in conductor and isolate a fault

before it occurs and is focused on mitigating risk events associated with wire downs.

- Sensitive Ground Fault Protection for detecting high impedance faults resulting from downed overhead conductors that result in very low fault currents, reducing the risk of ignition.
- Sensitive Profile Relay Settings enabled remotely on distribution equipment during red flag events to reduce fault energy and fire risk.
- Early Fault Detection proactively monitors the distribution system to detect failing overhead equipment before it can permanently fail and cause an outage or ignition.
- High Accuracy Fault Location for improved response time to any incident on the system.
- Remote Event Retrieval and Reporting for real-time and post-event analysis of system disturbances or outages.
- SCADA Communication to all field devices being installed for added situational awareness.

These forecasted capital expenditures support safety and reliability. These upgrades with increased sectionalization can also lead to reduced PSPS impacts. The reduction in PSPS impacts is directly related to the greater number of sectionalizing devices installed on the system as a part of this program. This reduces the customer counts between sectionalizing devices, which can reduce the number of customers de-energized during weather events.

On distribution circuits within the HFTD, APP coordinates with the overhead system hardening programs to strategically install or replace sectionalizing devices, line monitors, direct fiber lines, and communication radios to facilitate the requirements of SDG&E's advanced protection systems.

The APP has a goal of completing all 76 HFTD Tier 3 circuits by 2026. Improvements to APP technology include expanding FCP to include two-phase and single-phase distribution circuits, further extending branch circuit protection for improved reliability. The program will also begin migrating new FCP communication designs to leverage the Company's private LTE communication initiative to improve wireless network coverage, increase path resiliency and optimize deployment cost.

The Advanced Protection project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-46 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-46
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE
152590.001	SDG&E-Risk-1 - C11/M6 T1	Advanced Protection	12,783	11,562	5,540	832

b. Forecast Method

The forecast method developed for this cost category is zero-based. This method is most appropriate because Advanced Protection hardware needs vary across each site and vendor services incorporate numerous contracts over this period. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for this capital project relate to construction labor rates, material costs, and the number of circuits having Advanced Protection enabled each year. The unit cost per circuit is expected to reduce each year as the larger substation equipment is installed, and the remaining circuits require less equipment for installation. For this reason, the increase in completed circuits from four in Base Year 2021 to eight in Test Year 2024 does not lead to an increase in overall costs. A reduction of $5,247,000 is forecasted in Test Year 2024 compared to Base Year 2021. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 152590.

8. 202820 – Lightning Arrestor Replacement Program

a. Description

This budget code contains the work of two projects that are often bundled together for efficiency into program: lightning arrestor replacements and avian protection. The forecast for budget code 202820 for 2022, 2023, and 2024 is $4,213,000, $3,603,000, and $3,557,000, respectively. SDG&E plans to build and place in service 5,544 lightning arrestors and protect 1,101 poles with avian protection equipment by the Test Year.

Lightning arrestors are installed to protect electric power equipment from exceeding thermal insulation ratings in the event of surge voltages due to lightning strikes or other faults. The lightning arrestor enables a surge in the current to be diverted through the arrestor to a ground terminal and protect the insulation and conductors on the distribution system. The CAL FIRE approved lightning arrestors come with an external Spark Prevention Unit that operates prior to the arrestor overloading, dramatically reducing the potential of becoming an ignition source.

SDG&E's Avian Protection project involves installing avian protection equipment on distribution poles in the service territory to prevent electrocution of birds and to facilitate compliance with Federal and State Laws. The project is aimed at reducing the risk of faults and wire-down events associated with avian contact that can lead to ignitions and improve reliability. Field observations by subject matter experts estimate that the installation of avian covers can reduce the risk of faults and ignitions due to avian contact by 90% at those locations.

This is a new initiative in the Wildfire Mitigation Chapter. In the RAMP proceeding, avian protection was solely listed within Electric Infrastructure Integrity. However, due to the increase in work being performed in the HFTD including hot line clamp replacements, fuse replacements, and lightning arrester replacements, SDG&E has found that many of these poles need avian protection installed in concurrence with these projects to bring the equipment up to current standards. If avian protection is not installed or replaced at the same time, the risk of avian contact will remain and crews will need to revisit the pole in the future to install the avian protection at a later date resulting in additional outages or impacts to customers. Therefore, the avian protection installations within the HFTD are now sponsored by Wildfire Mitigation.

The Lightening Arrestor Replacement program mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.

Table JW-47 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-47
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
202820.001	SDG&E-Risk-1 - C21/M14 T1	Lightning Arrestor Removal / Replacement Program	2,845	2,232	2,206	-
202820.002	SDG&E-Risk-2 – C08	Avian Protection Program	1,368	1,371	1,371	-

*Tranche level RSEs and additional details are available in SDG&E-13-CWP 202820.

b. Forecast Method

The forecast method used is zero-based. This budget code has minimal historical costs prior to 2021. The historical costs do not contain the avian protection work as this work was previously recorded to another budget code. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details. The forecast is based on the number of lightning arrestors being replaced and number of avian protection installations being completed each year, and this work has been scoped through 2024.

c. Cost Drivers

The underlying cost drivers for this capital project relate to construction labor rates, material costs, and the number of units being performed for both the lightning arrestor replacement program and avian protection program. SDG&E expects to install 1,848 lightning arrestors in 2024, an increase of 36 over 2021. SDG&E forecasts an associated capital increase of $391,000. SDG&E does not have any base year costs associated with avian protection.

SDG&E expects to install avian protection at 570 poles in 2024 and forecasts an associated capital cost increase of $1,371,000. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 202820.

9. 192490 – WMP Microgrids

a. Description

The Microgrid program designs and builds microgrids that can be electrically isolated during a PSPS event, thereby maintaining electric service to customers who would otherwise be affected. The forecast for Microgrids for 2022, 2023, and 2024 are $5,069,000, $36,229,000, and $2,400,000, respectively.

The forecasted capital costs for Microgrids are comprised of the activities associated with installing four microgrids: Cameron Corners, Ramona, Butterfield and Shelter Valley. SDG&E initiates PSPS events as a last resort mitigation during extreme weather conditions and aims to limit them as much as feasible to the specific areas that are experiencing extreme risk. PSPS events have negative customer impacts which SDG&E mitigates through numerous measures, including microgrids. These efforts are especially important for critical facilities providing firefighting resources and life-saving services for and AFN customers who may require medical devices to be powered 24 hours a day, seven days a week.

While alternative hardening solutions, such as strategic undergrounding, may be better at simultaneously mitigating wildfire risk, those options are not always technically feasible or cost-effective. For instance, customers who are located far away from a substation or central source of generation would require additional mileage of undergrounding that can be cost-prohibitive. This budget code includes four large microgrid projects, and several smaller off-grid solutions:

- *Cameron Corners:* a solar and battery storage yard to enable the local critical infrastructure to stay energized during PSPS events. Designed to support 300 kW of critical load continuously including a medical care facility, CAL FIRE station, telecom switching center, gas (and propane) stations, a school, a library, convenience stores, and local food establishments. The microgrid will be powered by a 875 kW solar generation and 2.4 MWh Iron Flow Battery Storage System. The battery storage is first of its kind at a utility scale.
- *Ramona*: a battery storage yard to enable the local critical infrastructure to stay energized during PSPS events. Designed to support CAL FIRE Air Support,

United States Forest Service Air Support, and fire-retardant mixing stations. This microgrid will be powered by a 2.1 MWh Battery Energy Storage System.

- *Butterfield:* a solar and battery storage yard to enable the local critical infrastructure to stay energized during PSPS events. Communications equipment installations are included in the site scope allowing for enhanced network and line monitoring. The microgrid will be powered by 2,100 kW of solar generation and a 4,800 kWh Battery Energy Storage System designed to support 119 residential customers.
- *Shelter Valley*: a solar and battery storage yard to enable the local critical infrastructure to stay energized during PSPS events. Communications equipment installations are included in the site scope allowing for enhanced network and line monitoring. The microgrid will be powered by 2,100 kW of solar generation and a 4,800 kWh Battery Energy Storage System designed to support 218 residential customers and critical customers (San Diego Country Fire Station and Community Center).
- *Off-Grid Solutions*: enables the temporary islanding of critical infrastructure to stay energized during PSPS events. The systems may consist of energy storage and other distributed generation. Approximate sizing of these systems will be determined by the load it is serving.

The Microgrid project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-48 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-48
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE
192490.001	SDG&E-Risk-1 - C10/M5 T2	Microgrids	5,069	36,229	2,400	28

b. Forecast Method

The forecast method used is zero-based. The scope and size of the microgrids installed previously does not reflect the scope and size of microgrids forecast in future years. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the specific scope of work being conducted in the forecasted years. The four large microgrids are expected to be completed by 2023. The Test Year 2024 costs consist of eight off-grid power solutions at approximately $300,000 each for a total forecast of $2,400,000. This is a reduction of $10,653,000 from Base Year 2021.

As stated above, microgrids provide power continuity to customers during both planned and unplanned outages. Specifically, during PSPS events, this results in reduced duration and severity of disruption to customers' electric service. The reduction of PSPS impacts is key to increasing resiliency and reliability to customers.

To target customers for potential microgrid solutions, SDG&E uses a combination of data including, but not limited to, the risk of wildfire from overhead infrastructure, feasibility of alternative solutions such as undergrounding distribution infrastructure, and historical PSPS impact data. This analysis is performed in concert with determining if a traditional overhead hardening or undergrounding solution could mitigate both the wildfire and PSPS impact risks.

While other solutions may be the preferred approach from a wildfire and/or PSPS risk reduction perspective (e.g., undergrounding), those options may not be technically feasible or cost-effective. Additional information such as identification of critical facilities or AFN customers is incorporated into prioritizing targeted locations for a potential microgrid project. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 192490.

10. 141400 – Overhead Transmission Fire Hardening (Distribution Underbuild)

a. Description

The forecast for Overhead Transmission Fire Hardening (Distribution Underbuild) for 2022, 2023, and 2024 is $4,729,000, $8,635,000, and $14,464,000, respectively. SDG&E plans to build and place in service 25.4 miles of Distribution Underbuild by the Test Year.

SDG&E operates and maintains approximately 1,995 miles of transmission infrastructure, including 994 miles of overhead transmission infrastructure in the HFTD. Aging infrastructure makes lines more suspectable to equipment failures and outdated design techniques make these lines more vulnerable to foreign object in line contacts during high winds, all of which could lead to ignitions. SDG&E is hardening the transmission system by utilizing enhanced design criteria to replace wood poles with steel poles, replace aging conductors with high strength conductors, and increase conductor spacing in the HFTD to reduce the chance of risk events and ignitions. The costs associated with this area are limited only to the distribution underbuilt components of the transmission hardening work.[56] It is estimated that the hardening of the distribution underbuild components will achieve the same risk reduction as the traditional hardening of distribution infrastructure. The risk events and ignitions are estimated to be reduced by 45% after hardened.

These forecasted capital expenditures increase service reliability of the transmission system during extreme weather conditions and to reduce the risk of ignition associated with the electric transmission system and distribution underbuild in SDG&E HTFD territory.

[56] SDG&E notes that the tie lines hardened in accordance with this strategy are driven by Federal Energy Regulatory Commission (FERC)-jurisdictional projects, given that hardening efforts address the 69 kV transmission system and the associated 12 kV distribution system located in the HFTD. The costs associated with this initiative include only the CPUC-jurisdictional elements related to this strategy.

The Overhead Transmission Fire Hardening (Distribution Underbuild) project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.Table JW-49 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-49
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
141400.001	SDG&E-Risk-1 – C18/M13 T1-T2	OH Trans Fire Hardening – Dist Underbuild	4,729	8,635	14,464	-

*Tranche level RSEs and additional details are available in SDG&E-13-CWP 141400.

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for Overhead Transmission Fire Hardening (Distribution Underbuild) projects relate to as the replacement of wood to steel poles and reconductoring distribution underbuild. The costs are driven by the increased number of miles being hardened each year. SDG&E expects to complete 13.9 miles of distribution underbuild hardening in 2024, an increase of 10.5 miles over 2021. SDG&E forecasts an associated cost increase of $8,987,000. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 141400.

11. 192450 – PSPS Sectionalizing Enhancements

a. Description

Installing distribution sectionalizing devices (e.g., switches, associated automation devices, etc.) will minimize customer impacts during PSPS events. The PSPS Sectionalizing Enhancements project installs switches in strategic locations, improving the ability to isolate high-risk areas for potential de-energization. For example, switches are installed on circuits that have significant sections undergrounded, allowing customers with this lower-risk infrastructure to remain energized during extreme weather events. Another example is combining weather stations with sectionalizing devices to de-energize only sections of circuits that are experiencing extreme wind events.

The forecast for PSPS Sectionalizing Enhancements for 2022, 2023, and 2024 is $1,567,000, $1,567,000, and $1,567,000, respectively. SDG&E plans to build and place in service 30 new PSPS sectionalizing devices by the Test Year. These forecasted capital expenditures will increase reliability and enhance service. Adding sectionalizing enhancements will minimize service interruptions resulting from PSPS events caused by adverse fire weather conditions, minimize the number of customers affected by PSPS events, decrease required patrol times, and ultimately restore service faster.

The PSPS Sectionalizing Enhancements project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-50 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-50
RAMP Activity Capital Forecasts by Workpaper
In 2021 Dollars ($000s)

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE
192450.001	SDG&E-Risk-1 - C09/M4 T1-T3	PSPS Sectionalizing Enhancements	1,567	1,567	1,567	280

b. Forecast Method

The forecast method used is zero-based. This program selects specific locations for new installations each year. The forecast is based on cost estimates that were developed for the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for this capital project relate to construction labor rates, material costs, and the number of sectionalizing devices being installed each year. SDG&E expects to install ten sectionalizing devices in 2024, a reduction of three devices from 2021. SDG&E forecasts an associated decrease of $336,000 compared to 2021 recorded costs.

By continuing to add sectionalizing devices within the HFTD, SDG&E is able to reduce the number of impacted customers based on past weather events, and improve the restoration times for the smaller circuit segments that will still be impacted. SDG&E utilizes lessons learned from historical PSPS events to identify and prioritize locations for switches. This typically means installing switches in the HFTD, and SDG&E has made significant progress in this area. But as recent weather patterns have become more extreme and widespread, as experienced in October 2019 and December 2020, SDG&E is utilizing the lessons learned from those events to place switches with the goal of limiting PSPS exposure in future years, which includes locations in the HFTD and the wildland urban interface. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 192450.001.

12. 081650 – CNF Fire Hardening

a. Description

The Cleveland National Forest (CNF) Fire Hardening program hardens distribution electric infrastructure within CNF boundaries by replacing wood poles with steel poles, replacing aged conductors with new high-strength conductors, and associated upgrades. The forecast for CNF Fire Hardening for 2022, 2023, and 2024 is $1,999,000, $1,675,000, and $1,206,000 respectively.

The CNF project design was based on various recommendations addressing fire prevention and the U.S. Forest Service's environmental requests. Using an analytical matrix

reflecting elements of fire risks and environmental concerns, SDG&E and the U.S. Forest Service collaborated to determine which sections of the electric system should be upgraded. Each segment required a custom solution based on many factors, including the location of the customer being served by the distribution system, the topography of the land, and various biological, cultural, and environmental factors. Because of the known local wind conditions, the grid hardening activities were designed to handle the higher wind speeds and utilize increased wire spacing to decrease the likelihood of wire-to-wire contact or arcing as the result of contact by flying debris.

The CNF projects include the hardening of facilities and select undergrounding of several existing 12 kV and 69 kV electric facilities spread throughout an approximately 880 square-mile area in the eastern portion of San Diego County located in the HFTD. The existing electric lines located within CNF also extend outside of CNF boundaries. Generally, the CNF program will increase the safety and reliability of SDG&E's system by hardening existing electric infrastructure that currently serves the U.S. Forest Service, emergency service facilities (i.e., fire, communication, and other), campgrounds, homes, businesses, and other customers with the CNF and surrounding areas.

The CNF Fire Hardening projects were completed in 2021, but environmental restoration costs will continue. Final restoration activities for the Cleveland National Forest Power Line Replacement projects as required by the Mitigation Monitoring, Reporting, and Compliance Program (MMRCP).

SDG&E notes that the transmission lines hardened in accordance with this project are driven by FERC-jurisdictional projects, given that hardening efforts address the 69 kV transmission system and the associated 12 kV distribution system located in the HFTD. The costs presented include only the CPUC-jurisdictional elements related to this project.

The CNF Fire Hardening project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-51 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-51
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
081650.001	SDG&E-Risk-1 - C19	Cleveland National Forest Fire Hardening T1-T2	1,999	1,675	1,206	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. Prior historical costs included the work to fire harden the distribution circuits within the Cleveland National Forest. This fire hardening work is complete, and these historical costs are not applicable to the future restoration work represented by this budget code.

c. Cost Drivers

Construction commenced on the CNF program in late 2016 and was completed in 2021. All of the transmission lines that were identified on this project have been completed and the overhead distribution lines within the CNF have been fire hardened. The underlying, remaining cost driver is the environmental restoration of the work areas that were impacted by the CNF Fire Hardening construction. These restoration activities are driven by the MMRCP. SDG&E forecasts 2024 expenditures to be $1,206,000 a reduction of $11,291,000 from 2021. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 81650.001.

13. 192460 – Strategic Undergrounding

a. Description

Strategic undergrounding converts overhead systems to underground, providing the dual benefits of nearly eliminating wildfire risk and the need for PSPS events in these areas. SDG&E estimates that Strategic Undergrounding reduces the risk of ignition related to electrical infrastructure by 98% or greater. The chance of PSPS is also significantly reduced on circuits

that are fully undergrounded as the wind speed and other weather conditions do not impact the infrastructure.

These forecasted capital expenditures support the company's goals of reducing the risk of wildfire and the impacts of PSPS. The forecast for Strategic Undergrounding for 2022, 2023, and 2024 is $125,981,000, $191,143,000, and $292,062,000, respectively. SDG&E plans to build and place in service 270 miles of underground infrastructure in the SDG&E HFTD area.

Strategic undergrounding is deployed in the HFTD, targeting areas of the highest wildfire risk, as well as in areas where substantial PSPS-event reductions can be gained through installation of an underground electric system. PSPS impact reductions are targeted at critical facilities, including schools, or other areas with frequent PSPS events. SDG&E completed undergrounding a section of overhead infrastructure in the Hellhole Canyon area, which has seen wind gusts over 90 miles per hour, and experienced seven PSPS events in 2019 and 2020 but was not de-energized during SDG&E's PSPS event in 2021.

To improve the program, SDG&E has identified several improvements affecting the cost and feasibility of undergrounding projects. SDG&E has developed new standards allowing for a decreased trench depth from 30 inches to 24 inches of trench cover. This new design standard allows for a reduction in construction effort and cost, especially in difficult rocky terrain. SDG&E has also implemented reduced conduit diameters, instead of applying a one-size-fits-all-approach. By using the minimum conduit size for the project's cable size and future system need, a decreased trench depth can be achieved reducing the civil construction effort, utilities conflict, and overall cost. Additionally, SDG&E has implemented breakaway technology when overhead service wire is required for a customer. This allows the service wire to disconnect from power when struck by debris and the span of overhead wire to break free and deenergize. This technology is a useful alternative when customers raise concerns about undergrounding or SDG&E encounters difficulties physically undergrounding some routes.

To reduce the overall schedule of undergrounding projects, SDG&E made several improvements to the program. SDG&E identifies permitting requirements as early as possible to accurately scope and schedule the project. Agencies such as Cleveland National Forest, Caltrans, and the Bureau of Indian Affairs typically have a longer permitting lead time compared to San Diego County permits, and those timelines need to be accurately reflected in the schedule. When working with these agencies SDG&E involves them early in the process to define a clear

permitting approach and strategy. SDG&E has also utilized trenchless technologies such as Horizontal Directional Drilling (HDD) and Auger Boring (also known as Jack and Bore) when environmentally sensitive areas or difficult easements are encountered. These technologies are also used at Caltrans crossings to reduce the permitting process time.

The priority and scope of the projects will be dictated by full circuit analysis using the WiNGS model, and input gathered from operational teams. WiNGS-Planning assists in the allocation of grid hardening initiatives across the HFTD based on assessment of both wildfire risk and PSPS impacts. WiNGS-Planning is built upon the MAVF framework in RAMP and evaluates both wildfire and PSPS impacts at the sub-circuit/segment level. Information is used to inform investment decisions by determining and prioritizing mitigation based on RSE, improving wildfire safety, and limiting the impact of PSPS on customers.

The Strategic Undergrounding project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-52 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-52
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
192460.001	SDG&E-Risk-1 - C16/M11 T1-T2	Strategic Undergrounding	125,981	191,143	292,062	-

*Tranche level RSEs and additional details are available in SDG&E-13-CWP 192460.

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details. The forecast is based on the number of miles of strategic undergrounding being designed and constructed each year, which has already been scoped through 2024.

c. Cost Drivers

Strategic undergrounding provides the dual benefits of nearly the risk of wildfire related to electrical infrastructure for the areas where overhead system is converted to underground and eliminating the need and impacts of PSPS for customers fed by underground systems. Undergrounding is, however, often the most expensive major hardening alternative on a per-mile basis. Thus SDG&E is deploying undergrounding efforts strategically. SDG&E seeks to underground infrastructure in areas where wildfire risk is very high as well as in areas where substantial PSPS reductions can be gained through an efficient installation of underground electric system.

The strategic underground initiative will continue to evolve as SDG&E gains a better understanding of the costs and constraints involved. Although SDG&E has extensive experience in installation of underground cable, performing undergrounding within the HFTD makes this initiative challenging to implement. Challenges include difficult terrain, environmental constraints, permitting timelines, and acquisition of easements. Lessons learned from each year's undergrounding accomplishments will help to alleviate some of these constraints through process improvements and stakeholder engagement.

SDG&E expects to complete the installation of 125 miles of strategic undergrounding in 2024, an increase of 99 miles over 2021. SDG&E forecasts an associated cost increase of $222,524,000. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 192460.001.

14. 222420 – High Risk Pole Replacement Program HFTD

a. Description

The forecast for High Risk Pole Replacement Program HFTD for 2022, 2023, and 2024 are $0, $1,620,000, and $6,348,000, respectively. The purpose of this project is to target high-risk poles located throughout SDG&E service territory for replacement. This will continue SDG&E's efforts in hardening the system within the HFTD. Examples of poles this program will focus on will include but not be limited to, gas-treated poles (may be known as Cellon treatment), steel reinforced and poles that are set in concrete. These identified poles are also nearing the end of their useful life and are known to have a higher failure potential than average.

Funding related to the High Risk Pole Replacement Program outside of the HFTD is addressed in the Electric Distribution – Capital testimony of Oliva Reyes (Exhibit SDG&E-11).

This program will have multiple categories of risk. SDG&E is prioritizing gas-treated poles in combination with being steel reinforced and encased in concrete. Based on research, it has been determined that the gas-treated poles are considered high priority based on the pole's interaction with the moisture in the soil. In combination with identified rot and inspection limitations of the pole being in concrete, SDG&E believes these are the highest risk group of poles to target. As SDG&E investigates further, there may be other contributing factors that present risks that need to be mitigated and/or prioritized. For continued improvement of the Wildfire Mitigation Plan, gas-treated poles have been determined to be high-risk poles especially those that have steel reinforcement and/or are set in concrete. Determining the integrity of Cellon treated poles encased in concrete is very difficult, which causes the greatest concern. The average age of these assets is nearing 50 years. Gas-treated poles have a higher propensity for dry rot due to the moisture in the soil. This program will mitigate the failure of these poles within the HFTD that could lead to ignitions.

The High Risk Pole Replacement Program HFTD is a newly proposed project that was not identified in the 2021 RAMP Report. This project, however, does mitigate safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, is designated as a RAMP activity. Table JW-53 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-53
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
222420.001	SDG&E-Risk-1 - New 01	Strategic Pole Replacement Program (HFTD)	0	1,620	6,348	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code has no historical costs and is related to a new initiative set to begin in 2023. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost driver is the targeted replacement of high-risk poles throughout the SDG&E service territory. These identified poles are nearing the end of their useful life and are known to have a higher failure potential than average and their replacement will reduce the risk of ignition in the HFTD. SDG&E expects to replace 200 poles in 2024. SDG&E forecasts an associated cost increase of $6,348,000. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 222420.001.

D. Asset Management and Inspections

SDG&E's asset management and inspection programs are designed to promote safety for the general public, SDG&E personnel, and contractors by providing a safe operating and construction environment while maintaining system reliability. Both established and newly developed inspection and maintenance programs identify and repair conditions and components to reduce potentially defective equipment on the electric system to minimize hazards and maintain system reliability.

TABLE JW-54
Capital Expenditures Summary of Costs

D. Asset Management and Inspections	2021 Adjusted-Recorded	Estimated 2022(000s)	Estimated 2023(000s)	Estimated 2024(000s)
1. Pole Replacement and Reinforcement in HFTD	13,179	11,007	9,670	9,862
2. Corrective Maintenance Program HFTD Tiers 2&3	504	700	1,140	580
3. Drone Investigation Assessment & Repair	12,498	33,445	55,320	6,981
Total	**26,181**	**45,152**	**66,130**	**17,423**

1. 002390 – Pole Replacement and Reinforcement in HFTD

a. Description

This project provides funding for the pole replacements and reinforcement activities within the HFTD of overhead and electric distribution facilities. This program is mandated under CPUC G.O. 165 to promote safe, high-quality electrical service and compliance with SDG&E and CPUC construction standards found in G.O. 95 and 128. The forecast for Pole Replacement and Reinforcement for 2022, 2023, and 2024 are $11,007,000, $9,670,000, and $9,862,000, respectively.

Inspections are performed on a cyclical basis as described in the O&M portion, 1WM004, of my testimony. When the conditions found during those inspections result in a pole replacement or reinforcement, the capital costs associated with the pole replacement are recorded as part of this budget code. These costs include the material costs for the pole and associated equipment, and SDG&E or contractor labor to perform the work. For costs associated with pole replacement and reinforcement activities outside of the HFTD, please see the testimony of Electric Distribution O&M witness Tyson Swetek (Exhibit SDG&E-12).

The Pole Replacement and Reinforcement project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-55 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-55
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
002390.001	SDG&E-Risk-1 - C22 T1-T2	Distribution System Inspection – CMP – 5 Year Detailed Inspections T1-T2	6,715	5,898	6,016	-
002390.002	SDG&E-Risk-1 - C25	Distribution System Inspection – CMP – 10 Year Intrusive T1-T2	1,321	1,161	1,183	-
002390.003	SDG&E-Risk-1 - C27	Distribution System Inspection – HFTD Tier 3 Inspections T1-T2	2,201	1,934	1,972	-
002390.004	SDG&E-Risk-1 - C30	Distribution System Inspection – CMP – Annual Patrol T1-T2	770	677	691	-

*Tranche level RSEs and additional details are available in SDG&E-13-CWP 002390.

b. Forecast Method

The base-year forecast methodology was selected as most indicative of future work. New initiatives and programs, such as drone inspections, have been implemented beginning in 2020 due to the Wildfire Mitigation Plan, and the effects of these enhancements are not captured in the historical costs of this category. Accordingly, 2021 base year expenses are most representative of future needs based on an expansion in complexity and scope of existing projects and initiatives.

c. Cost Drivers

The cost driver for this activity is driven by the number of pole replacements performed in a given year. Based on the number of inspections being performed in the HFTD, and the annual rate of inspections that result in a pole replacement, program costs reduce from the base year to the test year of approximately eighteen percent or $3,318,000.

2. 201270 – Corrective Maintenance Program Tier 2 & 3

a. Description

To meet SDG&E's obligation to serve and the safety requirements promulgated by CPUC GO 95, AB 1890, and AB 1017, among others, this project provides funds for a pole restoration program for in-service transmission wood poles. This project replaces wood poles with steel poles, changes insulators, replaces conductor, and associated hardware upgrades in the HFTD (Tier 2 and Tier 3) areas. The costs sponsored here are for the CPUC components related to underbuilt distribution.[57]

The forecast for Transmission Corrective Maintenance Program for 2022, 2023, and 2024 is $700,000, $1,140,000, and $580,000 respectively. These forecasted capital expenditures help meet SDG&E's obligation to serve by providing funding for the Transmission Corrective Maintenance Program in areas designated as HFTD.

The Transmission Corrective Maintenance Program project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-56 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-56
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
201270.001	SDG&E-Risk-1 - C23	Transmission System Inspection	700	1,140	580	0

* An RSE was not calculated for this activity

b. Forecast Method

The base-year forecast methodology was selected as most indicative of future work. New initiatives and programs were implemented beginning in 2020 due to the Wildfire Mitigation

[57] Costs related to transmission infrastructure are subject to FERC jurisdiction.

Plan, and the effects of these enhancements are not captured in the historical costs of this category. Accordingly, 2021 base year expenses are most representative of future needs.

c. Cost Drivers

The project is needed to mitigate the risk of aging and/or damaged poles that are at an increased risk of failure which may cause an ignition. The underlying cost drivers for this capital project relate to the quantity of wooden poles replaced with steel poles each year in HFTD (Tier 2 and Tier 3) areas. The costs fluctuate slightly as SDG&E expects to replace 28 poles in 2022, 38 poles in 2023, and 33 poles in 2024. SDG&E forecasts an associated cost increase in 2024 of $74,000 over 2021.

3. 202480 – Drone Investigation Assessment and Repair

a. Description

Inspecting electrical infrastructure to identify potential deficiencies, aging components, or defects is critical to preventing potential risk events. To better identify these conditions, SDG&E explored the use of drones to inspect infrastructure difficult to observe using traditional inspection methods. The forecast for Drone Investigation Assessment and Repair (DIAR) for 2022, 2023, and 2024 is $33,445,000, $55,320,000, and $6,981,000, respectively.

Improving identification methods for potential fire hazards on distribution facilities can serve to minimize the risk of wildfire ignition and faults that cause outages. SDG&E began a pilot program at the end of 2019 to determine whether the use of drone technology could help improve or enhance its existing inspection efforts in the HFTD. Specifically, SDG&E was interested in determining whether drones and the high-resolution imagery captured by the drones could be used to identify issues that could not be or were difficult to identify from the ground during traditional inspections.

SDG&E prioritized the drone inspections within the HFTD starting with Tier 3 in 2020 and moving into Tier 2 in 2021 and 2022, with the goal of completing inspections for all HFTD structures within the three-year period. An analysis of the data collected by the drone program concluded that the program found a higher percentage of total issues than current inspection programs.[58] The top issues that were found significantly more by the drone program included:

[58] SDG&E believes the number of issues discovered during DIAR inspections demonstrates material improvements over the use of traditional inspections alone, however, the timing of the inspections or

damaged arrestors, damaged insulators, issues with pole top work, issues with armor rods, crossarm or pole top damage, exposed connections, loose hardware, improper splices, and damaged conductor, damaged transformer and Communication Infrastructure Provider (CIP) connection issues.

For the DIAR Program, the rate at which issues were found is significantly higher than the 5-year average of ground-based inspections. This was expected as the program evaluates infrastructure, at a high level of detail, from the top-down as opposed to the bottom-up method of traditional inspections. SDG&E's 2022 Wildfire Mitigation Plan Update performs risk reduction calculations across the various inspection programs which shows the benefit of the DIAR program. These risk reduction calculations show a clear benefit of the drone inspections as they are expected to reduce approximately 88 overhead faults per year compared to the ground-based inspection programs of Detailed Inspections (20 overhead faults per year) and HFTD Tier 3 Inspections (10 overhead faults per year).

The imagery collected by the drones does allow for improved identification of potential fire hazards for certain types of issues or where conditions such as terrain and vegetation density present difficulties in completing full detailed inspections. Additionally, the number of images (over 1 million) being captured during the pilot drone program highlighted the need to review the drone image data more efficiently in the future. As the amount of data coming into SDG&E's system increases, the ability for humans to review all the data would become impossible, costly, and burdensome. Therefore, SDG&E began using intelligent image processing (*i.e.*, machine learning or artificial intelligence) technology to process large amounts of data and focus human resources on potential issues. Once the models are developed and tested, SDG&E could potentially be able to process thousands of images in real-time or in a fraction of what it would take for a qualified electrical worker (QEW) to review.

For the intelligent image processing effort, SDG&E prioritized the types of models it developed to focus on the highest risk items and highest frequency issues. As SDG&E gained experience through the pilot program, efficiencies in flight planning, customer outreach, and image collection and review were gained over the approximate 15-month schedule for completion of flights. After completing the initial three-year inspections of all HFTD structures,

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other efforts, such as vegetation management schedules, can influence a straight comparison between programs.

the program will transition to completing inspections within the HFTD on a five-year cycle in 2023.

SDG&E's intelligent image processing models now in development include 25 models detecting 15 asset variations and 12 damage conditions within a range of 65-97% accuracy. These models are generally associated with the pole, crossarm, insulator, and transformer. SDG&E has invested approximately $2 million in the development of these models and intends to continue refining the current models and building additional models to eventually allow for a full evaluation of the pole, depending on the images provided.

The Drone Investigation Assessment and Repair project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-57 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-57
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
202480.001	SDG&E-Risk-1 - C28 T1-T2	Distribution System Inspection – Drone Inspections	33,445	55,320	6,981	-

*Tranche level RSEs and additional details are available in SDG&E-13-CWP 202480.

b. Forecast Method

The forecast method developed for this cost category is zero-based. This method is most appropriate because the drone inspection program will undergo a significant change in 2023 as the program transitions from an initial three-year cycle to an ongoing five-year cycle. Accordingly, a forecast method based on historical data would not accurately reflect the future needs for this program.

c. Cost Drivers

The DIAR project is beneficial because it identifies issues on SDG&E's infrastructure that might have gone undetected using traditional inspection methods and that if left unresolved,

could result in ignition. The DIAR project thus helps fill a gap that previously existed and posed a potential risk to infrastructure and safety. SDG&E is now better able to mitigate these potential hazards and has developed a cyclical program to monitor and identity potential issues in the future. The underlying cost drivers for this capital project are the number of capital pole-replacement jobs that are completed as a result of inspections and the capital expenditures related to developing the intelligent image processing models.

To help decrease the costs for flight and assessments while maintaining quality and effectiveness of the drone program, SDG&E plans on implementing two significant changes in the next phase: (1) reducing the number of images taken by the drone, and (2) deploying a QEW to act as the visual observer with the drone pilot.

Reducing the number of images taken will allow the field teams to complete flights on more poles per day and decrease the time it takes the QEW to review all images and perform the assessment. This will ultimately reduce the cost to perform the flights and assessments on a per pole basis. SDG&E based this change on an analysis of which images were used by the assessment team were most effective in identifying issues. The results indicated that more than 65% of the issues were identified using the level 2 image, which is taken from an angle above the pole and at a close distance from the pole. While only approximately 13% of issues were identified using the level 1 image, this photograph was useful in executing the repair and providing context to the assessment team when performing their reviews. Thus, SDG&E will be eliminating the level 3 image capture, which is taken below the crossarm and presents the highest risk of collision when flying the drone. While this image offers additional angles and views of hardware and connections, it represents what can generally be seen from the ground.

Next, the drone teams consisted of a two-person crew with a drone pilot and the visual observer, both of which were not QEWs. By pairing the drone pilot with a QEW, SDG&E can achieve more efficiencies and promote cost savings by reducing manpower and the benefit of having a trained and qualified individual to observe the pole in the field. This change will help better determine the advantages and disadvantages between ground-based and drone-based inspections and better inform decisions about how to incorporate drone technology into its inspection programs in the future. Finally, SDG&E will continue to enhance the intelligent image processing models to reduce future costs associated with inspections and provide the means necessary to address the increasing need to consume and process data.

Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 202480.001.

E. Grid Operations and Protocols

SDG&E's grid operations and protocols consist of mitigations that reduce risk by changing or enhancing the way SDG&E operates during periods of elevated and extreme wildfire risk. These operational protocols have led to reduced ignitions on the electric system and have reduced ignitions during operational periods where an ignition is more likely to lead to a catastrophic fire.

This includes SDG&E's Aviation Firefighting Program capital costs, as well as the O&M expenditures explained in 1WM006.

TABLE JW-58
Capital Expenditures Summary of Costs

E. Grid Operations and Protocols	2021 Adjusted-Recorded	Estimated 2022(000s)	Estimated 2023(000s)	Estimated 2024(000s)
1. Aviation Firefighting Program	10,461	2,753	9,185	8,100
2. Helicopter IR & HD Cameras	817	400	0	0
3. Twin Engine Medium Lift Helicopter	2,182	11,596	0	0
Total	**13,460**	**14,749**	**9,185**	**8,100**

1. 202770 – Aviation Firefighting Program

a. Description

The forecast for Aviation Firefighting Program for 2022, 2023, and 2024 are $2,753,000, $9,185,000, and $8,100,000 respectively. The Aviation Firefighting Program serves as a wildfire suppression resource, so that access to aerial firefighting resources remain available in the region. SDG&E has two firefighting helicopters available, an Erickson S-64 helitanker (Air Crane) and a Sikorsky UH-60 Blackhawk helitanker (Blackhawk). Both firefighting assets are Type 1 firefighting helicopters, which are defined as carrying over 700 gallons of water to fight fires. The Air Crane has the capability of dropping up to 2,650 gallons of water, and the Blackhawk has the capability of dropping up to 850 gallons of water. Additionally, the Blackhawk hardware is configured for night vision device flight and is capable of night firefighting with the appropriate crew, training, and CAL FIRE support. SDG&E based its

decision for these two resources on two missions. First, both resources provide exceptional fire suppression capability to the service territory. Second, SDG&E performs capital work in the more rural areas with access issues. In areas of difficult access, aerial resources are a necessary construction tool to be able to set structures. Both leased assets fit the requirement for SDG&E.

SDG&E has agreements with the County of San Diego, CAL FIRE, and the Orange County Fire Authority for aerial firefighting within the service territory. Dispatch of aviation firefighting assets is performed through CAL FIRE and these assets support the initial attack strategy to contain wildfires to less than 10 acres. SDG&E employs flight operations staff to assist in dispatching aerial assets 365 days per year, throughout the service territory. This allows the assets to be launched rapidly once dispatched by CAL FIRE. This program's request includes the purchase of additional helicopters, the expansion of the UAS program, and the development of the Aviation Training Center. SDG&E plans to build and place in service the purchase of one helicopter (Bell 412 EPX) in 2022, which is addressed in budget code 212560. The assets included in this budget code include a second helicopter and costs related to the Aviation Training Center, both expected in 2023, and the purchase of the third helicopter and the expansion of UAS assets, which are forecasted in year 2024.

The Aviation Firefighting Program mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-59 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-59
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
202770.001	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	2,753	9,185	8,100	-

* Tranche level RSEs and additional details are available in SDG&E-13-CWP 202770

b. Forecast Method

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details. Given the increased activity associated with this budget code, a forecast method based on historical data would not accurately reflect the future needs for this program.

c. Cost Drivers

The Aviation Firefighting Program mitigates risks associated with aviation operations incidents. Documentation of these cost drivers are included as supplemental capital workpapers and are further discussed below. *See* SDG&E-13-CWP, budget code 202770.001.

Aviation Training Center

SDG&E is proposing an Aviation Training Center to mitigate the risks of incidents associated with aviation operations. It is essential to safety and successful missions that pilots, crews, and flight support personnel receive adequate training and flight hours. SDG&E will accomplish this goal by providing a controlled environment to facilitate helicopter and UAS operator proficiency training and other related work.

The FAA sets minimum standards for when flights may be conducted and pilot proficiency. But given the types of aircraft involved, the public safety implications of wildfire suppression, and the proficiency required for construction support, SDG&E looks beyond minimum proficiency for aviation personnel. Aviation Services leverages contract pilots to enhance reliability and agility to respond to operational and public safety needs. However, developing a proficient staff of pilots, UAS operators, and other flight personnel that are familiar with utility operations and SDG&E's service territory mitigates a critical aviation operations risk.

Helicopter and UAS operator proficiency training, new pilot evaluations, and night firefighting practice all reinforce aviation safety. That said, proficiency extends beyond the pilots and UAS operators. SDG&E ground personnel and partnering agencies, including fire response teams, benefit from increased depth of knowledge in aviation safety and operations. Observation feedback will enhance safety and efficiency of existing policies and procedures. Additionally, the use of a training facility allows UAS and aviation-related proof of concepts to be applied in a safe and controlled environment.

The training facility will furnish FAA-approved airspace and ground structures to allow practice in a controlled environment. Associated program costs include land acquisition, office space for classroom-style instruction and office personnel, and the construction and development of training props, such as lattice towers, distribution circuits complete with poles, an observation tower, and a helicopter landing pad.

Unmanned Aerial System Program Expansion

SDG&E is proposing the expansion of the UAS program. This request includes a specialized vehicle to travel with and house assets and the acquisition of UAS technology (*i.e.,* drones) to facilitate a scalable and impactful UAS program. This expansion maintains a forward-thinking, safe, and efficient UAS program to meet the increasing need for missions to strengthen infrastructural knowledge, situational awareness, and improve electric system reliability. The existing UAS program has positively impacted the safety of utility workers by limiting exposure to hazards inherent to vehicle patrols, foot patrols, and pole climbing for line workers. This program creates innovative opportunities to partner with SDG&E business units and prime contractors to provide on-call UAS flight teams to assist with emergency response, public safety, and construction activities. While the existing program has yielded measurable results, an expansion of the program is needed and warranted to keep pace with growing mission demand, continual UAS technological advancements, and safer and more efficient work methods.

Aerial Firefighting Assets

The fire season in SDG&E's service territory is no longer limited to the months of the year when Santa Ana wind conditions peak. Accordingly, the demand for multi-mission helicopters to support fire mitigation activities, including construction demand, intensifies and strains SDG&E's current aviation resources. SDG&E is requesting the purchase of three helicopters to facilitate Wildfire Mitigation Plan initiatives, protect the community from the spread of wildfire, and enhance the reliability of its infrastructure.

Over the last decade, SDG&E has heavily invested in hardening its infrastructure to reduce utility-related wildfire risk. Wildfire Mitigation Plan construction projects have increased construction load requirements, which call for additional lift capacity. To meet this growing need, SDG&E proposes to acquire the twin-engine Sikorsky S-70M Firehawk. This heavy-lift helicopter will specialize in heavy construction projects, contribute to fire suppression with its

1,000-gallon belly-mounted water tank, and will carry out continual distribution improvement work in the HFTD.

To replace the leased H135 asset, SDG&E proposes to acquire an Airbus H145/H135-like helicopter for patrolling, light construction, and further reduce other Call When Needed leases. This helicopter will augment the current H145.

To address the heavier loads of the power poles, SDG&E is requesting the purchase of a twin-engine Bell 412 EPX asset in budget code 212560.001 below. Each helicopter will fill an immediate need and gap in SDG&E's service profile, replacing single engine call-when-needed leased aircraft with company controlled dual engine aircraft.

2. 212550 – Helicopter IR & HD Cameras

a. Description

The forecast for Helicopter IR and HD Cameras for 2022 is $400,000. This project's request includes the purchase of high-definition infrared (HD-IR) cameras for use on SDG&E helicopters. SDG&E plans to build and place in service the HD-IR Cameras by year end 2022.

The Helicopter HD-IR Cameras project mitigate safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-60 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-60
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
212550.001	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	400	0	0	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code has no historical costs prior to 2021. The specific cameras being installed in 2022 are scoped and forecasted independently of

previous costs. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for the Helicopter HD-IR Cameras project relate to mitigating risks associated with aviation operations incidents. SDG&E is requesting to expand regional support initiatives by purchasing HD-IR camera technology and mounting equipment. HD-IR technology provides SDG&E's utility operations groups with improved strategic and effective data for detailed infrastructure inspections on transmission and distribution systems. Additionally, community partners and first responder agencies have access to this powerful situational awareness tool integrated into a live mesh network for real-time situational awareness during emergencies. Cameras mounted onto aerial firefighting assets will have live stream capabilities via a mesh network to display imagery, video, or infrared video on ground stations. This video will be accessible to public safety entities that require information on the collected data.

Various equipment such as the infrared cameras mounted on helicopters, the mesh network downlink system, and other highly specialized mission equipment, will deepen SDG&E's ongoing commitments with City and County of San Diego public safety partners.

Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 212550.001.

3. 212560 – Twin Engine Medium Lift Helicopter

a. Description

The Twin Engine Medium Lift Helicopter project requests the purchase of one Bell 412 EPX helicopter. The forecast is 2022 is $11,596,000.

The Twin Engine Medium Lift Helicopter project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-61 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-61
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
212560.001	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	11,596	0	0	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code has no historical costs prior to 2021. The costs in 2022 are specific to the purchase of the helicopter and are forecasted separately from historical costs. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The Twin Engine Medium Lift Helicopter mitigates risks associated with aviation operations incidents. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 212560.001.

As stated above, the demand for multi-mission helicopters to support fire mitigation activities has increased in recent years, which intensifies and strains SDG&E's current aviation resources. SDG&E is requesting approval to purchase a Twin Engine Medium Lift helicopter to protect SDG&E's community from wildfire and enhance the reliability of its infrastructure.

Over the last decade, SDG&E has heavily invested in hardening its infrastructure to reduce utility-related wildfire risk. Wildfire Mitigation Plan construction projects have increased construction load requirements. The purchase this Bell 412 EPX standard category medium-lift utility helicopter will meet the increasing need for construction loads in the HFTD. For example, the lift capacity of the Bell 412 EPX is about 6,000 lbs. The new, larger poles SDG&E utilizes is beyond the lift capacity of SDG&E's H145 helicopter (approximately 2,000 lbs). The Bell 412 EPX is also equipped with a 750 gallon "Bambi Bucket" to conduct secondary missions for firefighting.

This helicopter will fill an immediate need and gap in SDG&E's service profile, replacing single engine call-when-needed leased aircraft with company controlled dual engine aircraft, reducing fixed costs.

F. Data Governance

SDG&E's data governance initiatives encompass both its enterprise-wide efforts and efforts specific to wildfire mitigation and prevention. The enterprise-wide initiative seeks to build a central data repository and establish an asset data foundation integrating key asset-related attributes to enable predictive health analyses and risk modeling and improve inspection/assessment strategies and prioritization.

TABLE JW-62
Capital Expenditures Summary of Costs

F. Data Governance	2021 Adjusted-Recorded	Estimated 2022(000s)	Estimated 2023(000s)	Estimated 2024(000s)
1. Centralized Repository for Data	17,778	16,403	10,506	5,683
2. Advanced Analytics	0	6,068	3,995	3,994
3. Asset Investment Prioritization	2,205	1,784	3,065	2,008
Total	**19,983**	**24,255**	**17,566**	**11,685**

1. 208910 – WMP Centralized Repository for Data

a. Description

The forecast for WMP Centralized Repository for Data for 2022, 2023, and 2024 are $16,403,000, $10,506,000, and $5,683,000, respectively.

The WMP Centralized Repository for Data is consolidating data from over 10 different sources into a central repository, with a focus on automating data processes for the spatial and non-spatial components of the WMP Quarterly Data Report as well as to advance SDG&E's Asset Management capabilities as they relate to electric assets. There is also work in support of WMP Data Governance for data auditability and the data catalog.

The Centralized Repository for Data will focus on automating aggregated metrics required for the WMP non-spatial data tables (Tables 1-12). Raw data will be gathered and centralized from multiple sources. The project will work in close collaboration with WMP Data Governance for data auditability and initial WMP data catalog development advancing the maturity of data governance processes.

Energy Safety requires submission of a Quarterly Data Report (QDR) utilizing a defined data taxonomy and schema for many feature classes to use for future WMP data analysis. This project will provide an automated solution to gather the required data, convert the data to geospatial format, and create the QDR for submission to Energy Safety, reducing human-related errors associated with data entry and reporting.

These forecasted capital expenditures support the company's goals of increasing its data governance maturity for data collection, transparency, and analytics. The solution supports the Wildfire Mitigation Plan Data Governance initiatives, and the regulatory requirement for timely, accurate Quarterly Data Reports.

The Centralized Repository for Data project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-63 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-63
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
208910.001	SDG&E-Risk-1 - C38	Centralized Repository for Data	16,403	10,506	5,683	0

* An RSE was not calculated for this activity

b. Forecast Method

Base-year was selected as most indicative of future work. This budget code has no significant historical costs prior to 2021. Therefore, relying on a forecast method that incorporates historical information would not be reflected of the Test Year needed. As such, the base year forecast method was utilized as most indicative of future development for the Centralized Repository for Data.

c. Cost Drivers

This capital project supports the continued development of the central repository and maturity of the data governance for data collection, transparency, and analytics. SDG&E

forecasts $5,683,000 in 2024, a decrease of $11,982,000 from 2021 as the project reaches maturity. The requirements for wildfire-related data in specified formats continue to grow both through the WMP and RAMP processes. Accordingly, investing in efforts to centralize and organize data will allow SDG&E to develop better reporting tools and meet its reporting requirements.

2. 218840 – WMP Advanced Analytics

a. Description

The forecast for WMP Advanced Analytics for 2022, 2023, and 2024 are $6,068,000, $3,995,000, and $3,994,000, respectively.

The WMP Advanced Analytics initiative continues to mature analytic capabilities to enable and develop predictive use cases and support ongoing wildfire mitigation and risk management objectives using a modern platform with machine learning services. This project includes the development of a data lake and machine learning pipeline to leverage cloud-based machine learning capabilities. These additional tools will allow SDG&E to develop analytics that identify where to reduce wildfire-related risk. A core set of reusable, cloud-based data science workspaces will enable faster model creation and feedback loops that evaluate and validate the model. The use and validation of centralized datasets will also improve data quality for the inputs and outputs of newly developed models or tools.

These forecasted capital expenditures support additional transparency related to asset health and risk models that aid in data-driven decisions for wildfire mitigation efforts.

The Advanced Analytics project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-64 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-64
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
218840.001	SDG&E-Risk-1 - C38	Centralized Repository for Data	6,068	3,995	3,994	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code does not have historical costs except for a partial year of development in 2021. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

This is a relatively new project and, as such, the costs are increasing compared to historical values. Cost drivers include building a project team comprised of FTEs with business subject matter expertise and vendor partner with varying system, data, or project expertise for support with implementation. Non-labor contract services are included for the development of the cloud data lake and machine learning operations and implementation. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 218840.001.

3. 218770 – WMP Asset Investment Prioritization

a. Description

The forecast for WMP Asset Investment Prioritization for 2022, 2023, and 2024 is $1,784,000, $3,065,000, and $2,008,000, respectively.

As explained in the Safety, Risk & Asset Management Systems testimony of Kenneth J. Deremer (Exhibit SDG&E-31), the WMP Asset Investment Prioritization (AIP) project has been in progress since early 2020 and this phase is to expand the implementation of the Copperleaf C55 investment prioritization and optimization SaaS solution to other internal business units.

Further detail and justification of the project can be found in Mr. Deremer's testimony. Wildfire Mitigation sponsors approximately 35% of the overall project cost and Information Technology sponsors the remainder. For details on the Information Technology costs, please refer to Mr. Exon's capital workpapers, Exhibit SDG&E-25-CWP.

The AIP project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-65 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-65
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
218770.001	SDG&E-CFF-1 - 1	Asset Management	1,784	3,065	2,008	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code does not have historical costs prior to 2020. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

This capital project enables an improved method to prioritize and optimize asset investments to improve asset reliability and integrity in support of wildfire safety and safety of the public. Cost drivers include procuring a new Asset Investment Planning application and assembling a project team to implement the solution for SDG&E business units. SDG&E researched various best of breed asset investment planning application and selected Copperleaf Technologies Asset Prioritization and Optimization application particularly since it is the software of choice in the utilities and other industries for managing asset investments.

SDG&E will assemble a project team to implement the Copperleaf application with expertise specific to the Copperleaf Technologies application and in asset investment optimization. SDG&E will assign FTE's for project management, business input, and decision making but will require external support with the required expertise with the Copperleaf Technologies application and asset investment prioritization and optimization.

Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 218770.001.

G. Emergency Planning and Preparedness

As discussed in 1WM001 in the O&M section of my testimony, the mission of Emergency Management is to coordinate safe and effective emergency preparedness for SDG&E's customers and emergency response personnel. That mission extends to safely and efficiently preparing for, responding to, and recovering from all threats and hazards through strategic planning, training, and exercising, and to sustaining a Quality Assurance and Improvement process.

TABLE JW-66
Capital Expenditures Summary of Costs

G. Emergency Planning and Preparedness	2021 Adjusted-Recorded	Estimated 2022(000s)	Estimated 2023(000s)	Estimated 2024(000s)
1. Emergency Management Operations	1,910	1,889	1,970	2,496
2. Digital Fortress	0	4,692	4,530	0
3. Wildfire and Climate Resilience Center (WCRC)	19	721	17,414	0
Total	**1,929**	**7,302**	**23,914**	**2,496**

1. 218790 – Emergency Management Operations

a. Description

The forecast for Emergency Management Operations for 2022, 2023, and 2024 is $1,889,000, $1,970,000, and $2,496,000 respectively.

WebEOC supports mission critical functions in SDG&E's EOC for tracking, managing, and reporting incidents for both utilities. Implemented more than eight years ago, it has fallen behind current information technology advancements and cannot be integrated with other mission critical systems such as GIS and Microsoft Active Directory. It continues to be limited

in its ability to expand and adapt to changing business, regulatory and technical requirements. The new Noggin 2.0 system was implemented in 2020 to replace WebEOC for SDG&E's Emergency Management group with the digitization of four forms for about 20 end users.

The Noggin Phase Three project will expand on the functionalities of the new system with the digitization of about 10-20 incident management forms, integration with 3-5 internal systems, configuration of additional dashboards and reporting capabilities to meet compliance reporting requirements for utilization by approximately 500 SDG&E end users.

The Noggin Phase Four project will expand on the functionalities of the new system with the enhancement of mobile functionalities to allow accessibility of the incident management forms via mobile device as well as implementation of 5-10 internal integrations to further streamline the current business processes and reduce manual data entry.

These forecasted capital expenditures for Noggin Phase Three and Four support the company's goals of enhancing safety by providing a centralized, company-wide incident awareness cloud portal. In addition, the Noggin platform will be the central repository for all SDG&E events and incidents so that SDG&E can collect and disseminate data for situational awareness and to satisfy reporting mandates.

The Emergency Management Operations project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-67 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-67
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
218790.001	SDG&E-CFF-4 - C41	Emergency Management Operations	1,889	1,970	2,496	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code has minimal costs prior to 2020. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for the Noggin Phase 3 and 4 project relate to Internal and Non-Internal Labor to make up the project team. Internal labor will consist of business project managers, IT project managers, business leads, IT leads, IT architects, Business System Analysts, and developers. This team is essential to the management of the project from requirement gathering, design solutioning, configuration, testing and implementation. External labor will consist of business analysts that will be recruited to supplement the business team who will focus on requirement gathering and maintenance of the priority backlog for every project's sprint. Partner vendor will configure the solution, implement the solution, and provide storm support in accordance with the executed agreement. Additionally, the partner vendor will support the system testing of every sprint's cycle, including regression testing in accordance with the executed agreement. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 218790.001.

2. 218820 – Digital Fortress

a. Description

The forecast for Digital Fortress for 2022 and 2023 is $4,692,000 and 4,530,000 respectively. SDG&E plans to build and place in service Digital Fortress Phase II by year 2023.

The Amazon Web Services (AWS) cloud EOC Digital Fortress site hosts the PSPS, Outage, and Responder Management Dashboards. These dashboards are used to provide critical data to the Emergency Operations Center Responders during emergency activations. It is important that these dashboards are highly resilient, accurate, and available so that there is minimal downtime during activation operations when critical de-energization decisions are being made. As part of Phase I, the dashboards were migrated into the AWS Cloud environment. Phase II will add increasing levels of resiliency through the following: creation of a stand-alone EOC cloud account; refactoring and migration of other EOC related applications into the cloud;

architecting and configuring the environment to have multiple instances, multiple zones and automatic fail-over; automating data flow processes including real-time worker interactions and creating a data lake; and adding other High-Availability and Disaster Recovery configurations such as elastic load balancing and multi-cloud active-active connection. These forecasted capital expenditures support the company's goals of safety and reliability by providing critical data to the EOC during emergency operations to prevent potential damage and loss of life.

The Digital Fortress project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-68 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-68
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
218820.001	SDG&E-CFF-4 - C41	Emergency Management Operations	4,692	4,530	0	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code has no historical costs prior to 2021. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for Digital Fortress Phase II project relate to Internal Labor and Non-Labor. Internal Labor consists of members of the EOC Technologies team and other teams including but not necessarily limited to IT Quality Assurance (ITQA), Cloud, and Cybersecurity. There is also a need for non-Labor roles to bring in AWS expertise and Agile team roles. The entire team is needed to plan, design, code, test and implement the solution to

meet the project scope and goals. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 218820.001.

3. 197800 – Wildfire and Climate Resilience Center (WCRC)

a. Description

The forecast for Wildfire and Climate Resilience Center (WCRC) capital project for 2022 is $721,000 and for 2023 is $17,414,000. SDG&E plans to build and place in service the WCRC by year 2023. There are multiple business purposes and benefits with the development of the Wildfire and Climate Resilience Center (WCRC). Rapidly changing climate conditions are changing the way SDG&E maintains and operates its system, and the WCRC will be a physical space that is committed to climate resilience. This includes housing the Wildfire Science and Innovation Lab which collaborates with academia to advance climate science. It will also be focused on fostering community partnerships and educating stakeholders in the wildfire and climate community. This facility will also serve as a great venue to train SDG&E employees on the importance of wildfire safety, emergency preparedness, sustainability, and climate resilience. Importantly, this space will also house the primary EOC for the organization and will be the central response hub for the organization when emergencies occur. The WCRC will serve as a centralized workspace for all employees working in Wildfire Mitigation, Emergency Management, Fire Science and Climate Adaptation, increasing employee collaboration and innovation in this space.

Climate resilience is becoming a cornerstone of SDG&E, and its work facility and actions should reflect this cultural shift. From wildfire to community resilience, having a physical space to educate customers and communities will be a paramount opportunity. Additionally, the existing EOC and support spaces do not currently function optimally for the requirements of emergency situations. The existing space also limits potential growth and innovative techniques that keep SDG&E on the leading edge of emergency management and climate resilience. Reallocating space and redesigning the inefficiencies will complement the Company's growing demand.

The WCRC project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-69 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-69
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
197800.001	SDG&E-Risk-1 - C41	Emergency Management Operations	721	17,414	0	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. The minimal historical costs 2019 through 2021 associated with preliminary design do not accurately represent the expected construction costs in 2023. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for this capital project relate to the design, construction, move management and project management for the buildout of the new Emergency Operations Center. Design includes all costs from programming through closeouts. Construction includes pre-construction, demolition, installation of furniture, Audio/Visual such as a direct view LED wall in the "Situation Room," branding, graphics, security systems, and a green wall. Move management includes the move-out and reoccupation post construction. This space will provide an updated Situation Room that organizes the room based on EOC response teams, providing a more collaborative and innovative environment. A larger policy room with a connected Risk Management Center (RMC) will allow for faster decisions with the critical company leaders. The meteorology room has expanded and grown into an Innovation Lab that will support meteorologists and fire coordinators along with space for Wildfire Mitigation and academic partners to have touchdown locations for better efficiencies. The overall space will provide workstations and offices for team members that require direct adjacencies to the Situation Room. The space will also provide branding and communications to illustrate the work of the EOC as partners within the larger San Diego and California community. Documentation of these cost

drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 197800.001.

H. Stakeholder Cooperation and Community Engagement

SDG&E recognizes that collaboration, the sharing of best practices, and the exchange of lessons learned are of the utmost importance to protect public safety. SDG&E remains dedicated to partnering with utility customers, elected officials, AFN partners, tribal nations, nonprofit support organizations, first responders, and all other public safety and community partners, understanding they all play a unique and significant role in achieving wildfire prevention and mitigation in the service territory. SDG&E regularly solicits feedback from communities it serves in an effort to identify gaps in processes, communications, and partnerships. This feedback is analyzed as part of an iterative improvement process.

TABLE JW-70
Capital Expenditures Summary of Costs

WILDFIRE MITIGATION CAPITAL (In 2021 $)				
H. Stakeholder Cooperation and Community Engagement	**2021 Adjusted-Recorded**	**Estimated 2022(000s)**	**Estimated 2023(000s)**	**Estimated 2024(000s)**
1. PSPS Mobile and ENS Enhancements	4,488	5,627	3,361	3,131
2. PSPP Enhancements	527	1,247	0	0
Total	**5,015**	**6,874**	**3,361**	**3,131**

1. 208900 – WMP PSPP Mobile and ENS Enhancements

a. Description

The forecast for WMP PSPP Mobile and ENS Enhancements for 2022, 2023, and 2024 are $5,627,000, $3,361,000, and $3,131,000, respectively. This budget code contains the costs associated with enhancing the Emergency Notification System (ENS) and developing a mobile application for the Public Safety Partner Portal (PSPP).

ENS is a critical business application used in notifying customers of both planned and unplanned outages across the SDG&E service territory. Customers can be notified of events that may impact their electric service via email, text, and voice messages. During wildfire or PSPS events, these notifications are required to meet statutory requirements.[59] Regular maintenance

[59] Pub. Util. Code § 8387(b)(2)(G).

and improvements to the ENS system are required to keep the system up-to-date, integrate with other internal systems, support mass customer communications, and support internal and external reporting requirements.

Included within the ENS project is the Alerts by SDG&E mobile application. At the beginning of September 2020, the Alerts by SDG&E app was launched and its capabilities were expanded in 2021. This tool enables customers to receive information including, notifications, Community Resource Center information with GPS directions, and other real-time updates and safety information related to PSPS activities. Awareness of the app is included in SDG&E's PSPS public education campaign that primarily enlists digital tactics to reach customers and the public with direct links to app stores on available mobile platforms. PSPS notifications for up to five customizable addresses are pushed directly to the app concurrently with other PSPS phone, text, and email alerts.The app also provides real-time updates about each PSPS and information for the user about what stage of the PSPS process they are currently in. Users can also get information about any Community Resource Centers and 211 resources.

The PSPP mobile application will be created to meet additional functionality and accessibility requests made by external public safety partners. The application will allow for push notifications and enhanced accessibility for field-centric partners. Further details regarding the PSPP are provided in the description of budget code 218860.

These forecasted capital expenditures support the company's goal of safety by providing a portal to its partners, effectively providing essential information for dissemination to customers. This information allows customers to safely prepare for a Public Safety Power Shutoff event.

The PSPS mobile and ENS Enhancements project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-71 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-71
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
208900.001	SDG&E-Risk-1 - C42	Communication Practices	5,627	3,361	3,131	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code has minimal costs prior to 2020. Rather than relying on a forecast method that uses historical information, the forecast is based on cost estimates that were developed based on the specific scope of work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

Cost drivers for the ENS Enhancements project include labor costs related to two FTEs, an Infrastructure Technologist and Senior Infrastructure Technologist, to develop and implement planned enhancements to the systems. The non-labor portion is related to contracted costs for enhancements to the Alerts by SDG&E app and ENS. Enhancements to the Alerts by SDG&E app include integration with third-party weather data and threat indices, display of Electric Vehicle charging stations, the ability to report an outage, information on safety threats beyond wildfires (earthquake, winds, etc.), and bi-directional communication such as the ability to report unsafe conditions. Enhancements to the ENS include reporting on SMS and email confirmations, integration with weather stations, enhanced reporting capabilities, and integration with other internal systems to provide additional information.

Cost drivers for the PSPP Mobile App include the labor costs of an IT Project Manager, IT Architect, and Senior Software Developer to manage the development of the app. As the app expands its capabilities, additional personnel are needed to manage the app. Non-labor cost drivers include contract costs related to the design, implementation, and testing of the PSPP

Mobile App. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 208900.001.

2. 218860 – PSPP Enhancement

a. Description

The PSPP Enhancement project encapsulates the enhancements to the PSPP web portal. The forecast for PSPP Enhancement for 2022 is $1,247,000.

The SDG&E PSPP project directly supports stakeholder cooperation and community engagement by enabling third-party access to real-time PSPS event resources, as defined by the CPUC's PSPS Phase III decision.[60] Resources for the PSPP Portal include near real-time PSPS event information such as GIS maps, the number of customers potentially impacted, and supplemental resources to help facilitate efficient cross-agency collaboration. Public Safety Partners are then able to provide targeted messaging and resources to communities in need through various support networks.

The PSPP Enhancement project mitigates safety risks identified in the 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-72 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021 RAMP Report.

TABLE JW-72
RAMP Activity Capital Forecasts by Workpaper

Workpaper	RAMP ID	Description	2022 Estimated RAMP Total (000s)	2023 Estimated RAMP Total (000s)	2024 Estimated RAMP Total (000s)	GRC RSE*
218860.001	SDG&E-Risk-1 - C42	Communication Practices	1,247	0	0	0

* An RSE was not calculated for this activity

b. Forecast Method

The forecast method used is zero-based. This budget code has no historical costs prior to 2021. The forecast is based on cost estimates that were developed based on the specific scope of

[60] D.21-06-034 at 37-38.

work for the project. Cost estimates are based on current construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

c. Cost Drivers

The underlying cost drivers for the PSPP capital project relate to implementing and enhancing the PSPP web portal. Enhancement to the PSPP Web Portal will include an "Urgent News Module," community resource center information, an outage map, critical facility information, and community status during the PSPS event. SDG&E will assemble a project team to implement the PSPP web portal enhancements with expertise specific to the web application and cloud technologies. SDG&E will assign a Project Manager, Business System Analyst, and IT Architect for project management, business input, and decision making but will require external support with the required expertise from Vendor Partners to design and configure the solution, conduct testing, and implement solutions as well as provide support as needed. Documentation of these cost drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code 218860.001.

I. IT Sponsored Costs

Capital costs for the forecast years 2022, 2023, and 2024 for IT projects that support Wildfire Mitigation, are sponsored by Mr. Exon (Ex. SDG&E-25, Chapter 2). The purpose of this section of my testimony is to describe the business rationale for these projects. Please refer to Mr. Exon's workpapers (Exhibit SDG&E-25-CWP) for the basis of the costs. Table JW-73 captures the capital project forecast for 2022, 2023, and 2024.

TABLE JW-73
Capital Expenditures Summary of Costs
Summary of IT Capital Expenditures

Wildfire Mitigation IT CAPITAL COSTS In 2021 $ (000s)				
IT Capital Workpaper Number	**Project Name**	**2022 Estimated**	**2023 Estimated**	**2024 Estimated**
00920AN	Geospatial Field Improvement	$1,884	$792	$0
00920R	Vegetation Management – Work Management	$0	$5,753	$1,678
	Total	**$1,884**	**$6,545**	**$1,678**

1. Geospatial Field Improvement

The forecast for Geospatial Field Improvement for 2022 and 2023 is $1,884,000 and $792,000 respectively. The purpose of this project is to improve the workflow of vegetation management patrols and inspections. This will be accomplished by sharing vegetation management database information stored in PowerWorkz across the EpochField application used by inspectors performing the work. The project will also allow for high-resolution offline aerial imagery to be used by mobile field users to plan and perform field inspections. A mobile solution for the Vegetation Electronic Ticketing System (VETS) will allow for field personnel to review work being assigned to them on a mobile device, promoting the efficient reporting of Vegetation Management data. Finally, the project will improve Vegetation Management billing reports through simplified integrations with SAP, allowing for more accurate and detailed cost information related to vegetation management. The specific details regarding the Geospatial Field Improvement project costs can be found in Mr. Exon's capital workpapers (Ex. SDG&E-25-CWP, 00920AN).

2. Vegetation Management – Work Management

The forecast for Vegetation Management – Work Management for 2023 and 2024 is $5,753,000 and $1,678,000 respectively. The purpose of this project is to align with the Field Service Delivery (FSD) goal to build a streamlined technology landscape for the field. Currently, vegetation management relies on multiple systems. Powerworkz and EPOCH are

used for work management, and a homegrown system (VETS) is used for the intake of requests and communication with vendors. This project will utilize various SAP products to meet vegetation management's overall work management needs in a more holistic single system solution.

The project will replace both the three disparate systems with an SAP Work Management solution. This solution would utilize existing SAP and ESRI Geographic Information Systems (GIS) allowing the vegetation management personnel to visualize their work, and manage the creation, editing, or viewing of data in a geographical view linked to GIS. SAP Analytics Cloud will also be incorporated allowing the Vegetation Management department to explore data by forecasting work, tracking progress, and analyzing resource capacity. The new system will holistically allow vegetation management to review planned inspections, prepare for additional planned work, and track corrective work. The specific details regarding the Vegetation Management – Work Management project costs can be found in Mr. Exon's capital workpapers (Ex. SDG&E-25-CWP, 00920R).

VII. POST-TEST YEAR

As described in the Post-Test Year Ratemaking testimony of Melanie Hancock (Ex. SDG&E-45), in this GRC, SDG&E is requesting a revenue requirement for 2025-2027. Ms. Hancock proposes a mechanism to determine the level of revenue requirement for those years. The mechanism proposed by Ms. Hancock for capital-related costs will not provide SDG&E with adequate funding to make the necessary investments in wildfire mitigation. Accordingly, I sponsor forecasts for 2025-2027 that will enable SDG&E to continue to invest in wildfire mitigation activities utilizing the planned work for 2024.

As described in Section II of my testimony, WMP-related efforts were initiated in 2019 and have ramped up to meet SDG&E's and the state's goals of reducing the risk of catastrophic wildfires. Since 2019, SDG&E has accelerated its efforts and invested in innovative, emerging technologies to mitigate the wildfire risk. Many of the projects and programs discussed in this testimony and in SDG&E's 2022 WMP were either not in place prior to 2019 or not being performed at the level as they are today. Relying on historical averages, therefore, is not representative of the work nor the investment SDG&E intends to make in wildfire mitigation in the future. SDG&E is still increasing its units of work in the 2022-2024 period. However, SDG&E expects to maintain its critical wildfire mitigation work at or around 2024 levels for the

remainder of this GRC cycle, with the exceptions of Strategic Undergrounding, Covered Conductor, and the Generator Grant Program as noted in the next section of my testimony. Accordingly, rather than applying the capital-related part of the post-test year mechanism proposed by Ms. Hancock to wildfire mitigation capital, which is based on a historical average, SDG&E proposes to use the capital-related costs associated with TY 2024 as the starting point to establish revenue requirement for years 2025-2027 and escalate those costs consistent with all of capital costs in Ms. Hancock's proposed mechanism. Because SDG&E is proposing miles for Strategic Undergrounding and Covered Conductor in the post-test years that differ from the miles proposed in 2024, SDG&E has adjusted its forecast to reflect these discrete mile requests. The mileage requests and the corresponding cost reductions from the original filing are provided below in Table JW-75. The direct costs for SDG&E's proposal for all wildfire-related capital are provided in Table JW-74. Escalation is not included in the figures in the table below and would be applied to the forecasts.

Table JW-74

WILDFIRE MITIGATION CAPITAL (In 2021 $)				
	Estimated TY 2024 ($000)	**Estimated 2025 ($000)**	**Estimated 2026 ($000)**	**Estimated TY 2027 ($000)**
Total CAPITAL	**518,507**	**557,181**	**580,546**	**603,911**

The post-test year proposal herein is limited to capital treatment in the post-test years. The O&M costs associated with wildfire mitigation are included in Ms. Hancock's post-test year mechanism proposal.

In addition to the post-test year mechanism not resulting in adequate revenue for wildfire mitigation, revenue requirement specifically for wildfire mitigation is needed for each year of the GRC cycle in order to effectively operate the balancing account proposed by SDG&E in this Application. If SDG&E's proposal to balance WMP-related costs in a Wildfire Mitigation Plan Balancing Account is adopted, this proceeding would establish revenues for which incurred costs are "balanced" against in that account. The balancing account would begin in 2024 and be effective through the GRC cycle, 2027. To know what revenues are being authorized by the CPUC for 2024 through 2027 for WMP, SDG&E is proposing that the CPUC authorize discrete figures for WMP. This will allow SDG&E to accurately operate the mechanics of the balancing

account and match the revenues to expenses, rather than needing to impute what is adopted by the CPUC for the post-test years.

SDG&E requests the CPUC adopt a post-test year capital forecasts, as shown in Table JW-74 above, for years 2025, 2026, and 2027. Ms. Hancock provides the revenue requirement associated with the figures in Table JW-74, which incorporates escalation and loading considerations.[61]

VIII. SDG&E UPDATE RELATED TO PLANNED GRID DESIGN AND SYSTEM HARDENING

A. WiNGS Modeling Changes

An integral component of SDG&E's ongoing commitment to innovation and enhancing its wildfire mitigation program involves ongoing reassessment of its risk modeling to address changes in data, science, and technology. SDG&E has worked to ensure the current version of its risk modeling tool, WiNGS Planning, remains up to date with the latest information and industry best practices. In preparation for the submission of its 2023-2025 WMP, SDG&E has been engaged in reassessment of both its wildfire mitigation initiatives as well as its risk assessment and risk modeling. Through its participation in Energy Safety led joint IOU risk modeling working groups and internally driven improvements, SDG&E has incorporated several updates and enhancements to the WiNGS Planning model, referred to as version 2.0. In version 2.0, SDG&E has advanced the data quality by more accurately capturing hardening miles within the HFTD, adjusted the overhead to underground mileage conversion contingency factor, and updated the data incorporated from WRRM.

SDG&E is constantly evolving its risk models by improving data quality and integrating new methods for analysis. These improvements lead to more accurate wildfire risk assessment and increased effectiveness of proposed mitigations. SDG&E has incorporated updated data, such as the effectiveness of different mitigations at reducing wildfire risk and refreshing historical ignition counts to enhance the model's estimated ignition rates. A data refresh between models now allows SDG&E to use the most up to date and accurate information to inform decisions regarding grid hardening strategy. Components like historical wind, weather

[61] Ms. Hancock's testimony reflects the wildfire-related request in the first revision of this testimony. SDG&E plans to reflect the post-test year impacts of this Second Revised Testimony during the Update Phase.

station additions, PSPS history, system assets, information regarding vulnerable customers (including AFN), and vegetation data have all been updated. SDG&E is constantly evolving its risk models by improving data quality and integrating new methods for analysis. These improvements lead to more accurate wildfire risk assessment and increased effectiveness of proposed mitigations.

SDG&E has also incorporated updated data to reflect additional information gained through implementation of its wildfire mitigation plans. For instance, SDG&E now includes additional data associated with Strategic Undergrounding, such as avoided costs associated with fewer vegetation management activities, reduced PSPS scope, and reduced maintenance costs which allow for life cycle costs to be modeled. In addition, SDG&E's undergrounding cost per mile has decreased by approximately 12% since the filing of its GRC Application, resulting in an increased Risk Spend Efficiency associated with undergrounding.

As a result of the WiNGS model updates, SDG&E is revising its original GRC forecasts in this second revised version of my testimony. SDG&E's aim is for both its GRC and its 2023 WMP filing to reflect the revised scope of both Covered Conductor and Strategic Undergrounding work. Approximately 110 miles of Covered Conductor hardening scope that was originally slated for 2023 and 2024 is now being converted to Strategic Undergrounding scope. SDG&E will continue to install covered conductor in areas where both the risk level and cost warrant this mitigation strategy. But, as addressed below, additional implementation of strategic undergrounding is better poised to both reduce the risk of catastrophic wildfire and substantially reduce PSPS impacts both over the GRC cycle and over the next ten years. Due to this revision, SDG&E's target miles of hardening for covered conductor have been reduced from 100 to 60 miles in 2023, and from 100 to 60 miles in 2024.[62] From 2025 through 2027, SDG&E forecasts completion of 40 miles of covered conductor installation each year.

This reduction in the planned scope of covered conductor in 2023 and 2024 will also relieve the pressure on the various workstreams that support the lifecycle of covered conductor projects and allow for reallocation of resources to support the transition to increased strategic undergrounding as it continues to ramp-up. This includes, but is not limited to, project

[62] SDG&E's 2022 targets for covered conductor and strategic undergrounding are included in its approved 2022 WMP and are unchanged from Revision 1 of this testimony.

management, engineering, design, land services, environmental, permitting, construction, and material management.

B. Strategic Undergrounding

As discussed above, SDG&E's enhanced data and risk models demonstrate that, given the ongoing risk associated with climate change and the need to reduce PSPS impacts and improve reliability, implementation of additional strategic undergrounding is necessary. SDG&E continues to implement a balanced approach between covered conductor and undergrounding in areas where risk and conditions warrant to provide a value and risk-based approach to grid hardening. But given the data enhancements available, and through the implementation of lessons learned to reduce costs associated with undergrounding—both in construction and in realized lifecycle costs—SDG&E is able to meet a higher level of risk reduction and provide a better value to customers through a reallocation of the amounts of strategic undergrounding and covered conductor installed. The overall change in allocation between initiatives and the associated direct costs by year are summarized as follows:

Table JW-75

	2023[63]	2024	2025	2026	2027	Total
Original Covered Conductor	100 mi.	100 mi.	100 mi.	100 mi.	100 mi.	500 mi.
Revised Covered Conductor	60 mi.	60 mi.	40 mi.	40 mi.	40 mi.	240 mi.
Change in Direct Costs ($000)	-$81,650	-$100,402	-$120,141	-$120,141	-$120,141	-$542,475
Original Undergrounding	125 mi.	150 mi.	150 mi.	150 mi.	150 mi.	725 mi.
Revised Undergrounding	80 mi.	125 mi.	150 mi.	160 mi.	170 mi.	685 mi.
Change in Direct Costs ($000)	-$163,059	-$119,439	-$61,026	-$37,661	-$14,296	-$395,481

Overall, over the next ten years the amount of covered conductor SDG&E proposes to install decreases from approximately 880 miles to approximately 370 miles, and the amount of strategic undergrounding recommended increases from approximately 880 miles to

[63] 2023 undergrounding forecasts are shown for information only and to give context to the baseline and increasing scope of SDG&E's grid hardening efforts.

approximately 1,500 miles. The shift of grid hardening scope from covered conductor to more undergrounding helps to reduce wildfire risk at a greater rate. SDG&E expects to decrease wildfire risk by over 80% in the next ten years, and by nearly 60% over the course of the GRC. The previous scope of 880 miles each of covered conductor and undergrounding when run through SDG&E's updated WiNGS-Planning model provides only a 64% reduction in wildfire risk over the same ten-year timeframe. The increase in strategic undergrounding also accelerates the reduction of PSPS impacts and risks to customers. SDG&E expects to substantially reduce PSPS impacts to approximately 35,000 customers and reduce PSPS across the most frequently impacted circuits by 93% over the next ten years.

Strategic undergrounding remains one of the costliest wildfire mitigations available, but when viewed against the long-term benefits, wildfire risk reduction, and PSPS impact reduction that result from additional use of undergrounding targeted to the highest risk areas, it is apparent that it is a prudent investment in the future of the regions electrical grid. SDG&E's models also indicate a long-term offset of the investment associated with undergrounding through a reduction in numerous lifecycle costs that will be substantially reduced for underground infrastructure. These include costs such as vegetation management, PSPS related operations, inspections, and repairs. Moreover, as further discussed in the testimony of Kevin C. Geraghty (Ex. SDG&E-49), there are numerous societal and environmental benefits associated with undergrounded infrastructure, including safer ingress/egress during emergencies, improved sustainability and reduced GHG impacts due to the reduced need for tree trimming and removal, improved overall reliability, and fewer customer inconveniences associated with inspections and maintenance of overhead lines. As climate change renders the region's weather and environment increasingly unpredictable, further undergrounding is best poised to promote both the safety and reliability of SDG&E's distribution system.

SDG&E is working to increase the overall mileage of undergrounding installed over the next ten years. This involves an onramp approach to slowly increase undergrounding over time, and a proposed revision to lower the initial mileage of strategic underground originally proposed at the time of SDG&E's application. In the short term, there are two main issues that are driving a longer ramp up to completing 150 miles or more of undergrounding per year. The main drivers for this short-term reduction are permitting delays and material shortages.

SDG&E's construction permits for strategic undergrounding from agencies such as San Diego County, Caltrans, Bureau of Indian Affairs (BIA), Cleveland National Forest, and the Bureau of Land Management are taking longer than anticipated. San Diego County permitting lead times have increased from approximately two months to six months. Caltrans permitting lead times are approximately one year. A recent change in the processing of BIA permits has increased lead times to approximately eight to twelve months. SDG&E's initial schedules for these projects included permitting lead times approximately half as long as the current process. These permitting delays are pushing project completion times out into future years.

Additionally, supply chain delays have caused material shortages. Components such as transformers and electrical connectors have longer procurement times than anticipated, causing projects to finish later than the originally forecasted dates.

To remedy these issues and increase constructed mileage in future years, SDG&E is in the process of creating a Project Management Office and identifying strategic partnerships that will streamline the process of design, permitting, land rights, engineering, and construction and allow for the construction of increased undergrounding each year through 2027. Further, as discussed above, reducing the overall scope of covered conductor installation will allow for reallocation of resources to aid in the shift to increased undergrounding.

C. Generator Grant Program

SDG&E has refined its strategy for the Generator Grant Program (GGP) and is planning to deliver backup battery units to approximately 1,400 additional customers on an annual basis (starting in 2023). This is a reduction from the originally filed 3,000 customers based on additional analysis of customer information and forecasted needs. Specifically, SDG&E refined the delivery strategy to target the most vulnerable and highest impacted customers, i.e., those who are designated as Medical Baseline, Life Support, or select Access and Functional Needs (AFN) customers within the High Fire Threat District – and who have experienced at least one prior PSPS. The prior PSPS criterion is an important consideration and reduces the potential for distributing battery units too broadly to customers who have very low risk or no historical frequency of PSPS. Through 2024, the Generator Grant Program is expected to reduce PSPS impacts to approximately 7,000 customers. In terms of budget to support this program, while the amount will be reduced due to the lower amount of backup battery units, there are fixed costs

that will not reduce proportionally, including those related to program administration, reporting, marketing, customer support, product evaluation, delivery logistics, and unit replacements. This results in a reduction in 2024 O&M costs of approximately $2.8M.

IX. CONCLUSION

SDG&E requests that the CPUC approve the Test Year 2024 forecasts for wildfire mitigation and vegetation management and IT capital projects presented in this testimony. This funding request will enable SDG&E to continue to invest in activities that reduce the risk of wildfire and PSPS impacts.

This concludes my second revised prepared direct testimony.

X. WITNESS QUALIFICATIONS

My name is Jonathan T. Woldemariam. My business address is 8330 Century Park Court, San Diego, California, 92123. I am employed by SDG&E as the Director of Wildfire Mitigation. I am responsible for developing and overseeing the execution of the Company's Wildfire Mitigation Plan, which includes the vegetation management program. I work to optimize a portfolio of initiatives to help decrease wildfire risk.

I joined SDG&E in 1994 and have served as a director for Transmission and Substation Operations, Electric Transmission and Distribution Engineering, and Construction Services. I have over 28 years of experience in the electric utility industry. I am currently serving on the Board of Directors 2-1-1 San Diego, a local non-profit which is the region's trusted source for access to community, health, social, and disaster services.

I have a bachelor's degree in electrical engineering, with a major field of study in Electrical Power and am a licensed Professional Engineer in California.

I have previously testified before this Commission.

APPENDIX A – Glossary of Terms

ACRONYM	DEFINITION
A.:	Application
AAR:	After Action Review
AB:	Assembly Bill
ACSR:	Aluminum Core Steel Reinforced
ADSS:	All-Dielectric Self-Supporting
AFN:	Access and Functional Needs
AI:	Artificial Intelligence
AIM:	Asset Integrity Management
AIP:	Asset Investment Prioritization
AMS:	Asset Management System
ANSI:	American National Standards Institute
APP:	Advanced Protection Program
AQI:	Air Quality Index
AWAC:	Aluminum Wire Aluminum Core
AWS:	Amazon Web Services
BIA:	Bureau of Indian Affairs
BLM:	Bureau of Land Management
BY:	Base Year
CAL FIRE:	California Department of Forestry and Fire Protection
CalOES:	California Office of Emergency Services
Cal/OSHA:	Division of Occupational Safety and Health
CBOs:	Community-Based Organizations
CC:	Covered Conductor
CERT:	Community Emergency Response Team
CFF:	Cross-Functional Factor
CIP:	Communication Infrastructure Provider
CMP:	Corrective Maintenance Program
CNF:	Cleveland National Forest
CNF MSUP:	Cleveland National Forecast Master Special Use Permit
CO2:	Carbon Dioxide
CRI:	Circuit Risk Index
CPUC or Commission:	California Public Utilities Commission
D.:	Decision
DCRI:	Distribution Communications Reliability Improvements
DIAR:	Drone Inspections and Repair
Energy Safety:	Office of Energy Infrastructure Safety
ENS:	Emergency Notification System
EOC:	Emergency Operations Center
EPA:	Environmental Protection Agency
ESH:	Electric System Hardening

EVM:	Enhanced Vegetation Management
Ex.:	Exhibit
FAA:	Federal Aviation Administration
FBP:	Fixed Backup Power
FCP:	Falling Conductor Protection
FERC:	Federal Energy Regulatory Commission
FLPMA:	Federal Land Policy and Management Act
FPI:	Fire Potential Index
FRMMA:	Fire Risk Mitigation Memorandum Account
FROP:	First Responder Outreach Program
FSCA:	Fire Science and Climate Adaptation
FSD:	Field Service Delivery
GGP:	Generator Grant Program
GHG:	Greenhouse Gas
GIS:	Geographic Information Systems
G.O.:	General Order
GRC:	General Rate Case
HDD:	Horizontal Directional Drilling
HD-IR:	High-Definition Infrared
HLC:	Hotline Clamps
HFTD:	High Fire Threat District
HPPP:	High Performance Computing Clusters
ICS:	Incident Command System
IEEE:	Institute of Electrical and Electronic Engineers
IOU:	Investor-Owned Utility
IR:	Infrared
ISA:	International Society of Arboriculture
ISO:	International Organization for Standardization
IT:	Information Technology
ITQA:	Information Technology Quality Assurance
LiDAR:	Light Detection and Ranging
LRA:	Local Responsibility Area
LTE:	Long-Term Evolution (LTE)
MAVF:	Multi-Attribute Value Function
MBL:	Medical Baseline
MMRCP:	Mitigation Monitoring, Reporting, and Compliance Program
NDVI:	Normalized Difference Vegetation Index
NWL:	Natural and Working Lands
O&M:	Operations and Maintenance
OFFR:	Operational Field and Emergency Readiness
OH:	Overhead
OIR:	Order Instituting Rulemaking
OPGW:	Optical Ground Wire
OPI:	Outage Potential Index

PM2.5:	Particulate Matter 2.5
PMU:	Phasor Measurement Unit
PRC:	Public Resources Code
PSF:	Pounds-Per-Square-Foot
PSPP:	Public Safety Partner Portal
PSPS:	Public Safety Power Shutoff
QA/QC:	Quality Assurance/Quality Control
QDR:	Quarterly Data Report
QEW:	Qualified Electric Worker
R.:	Rulemaking
RF:	Radio Frequency
RFW:	Red Flag Warning
RMC:	Risk Management Center
RSE:	Risk Spend Efficiency
SAWTI:	Santa Anna Wildfire Threat Index
SB:	Senate Bill
SCADA:	Supervisory Control and Data Acquisition
SDG&E:	San Diego Gas & Electric Company
SMS:	Safety Management System
SRA:	State Responsibility Area
SUG:	Strategic Undergrounding
TGR:	Tree Growth Regulators
TTBA:	Tree Trimming Balancing Account
TY:	Test Year
UAS:	Unmanned Aerial Systems
VETS:	Vegetation Electronic Ticketing System
VMA:	Vegetation Management Areas
VMBA:	Vegetation Management Balancing Account
VRI:	Vegetation Risk Index
WCRC:	Wildfire and Climate Resilience Center
WFI:	Wireless Fault Indicators
WiNGS:	Wildfire Next Generation System
WMP:	Wildfire Mitigation Plan
WMPBA:	Wildfire Mitigation Plan Balancing Account
WMPMA:	Wildfire Mitigation Plan Memorandum Account
WP:	Workpaper
WRO:	Wildfire Resilience & Operations
WRRM:	Wildfire Risk Reduction Model
WSCAC:	Wildfire Safety Community Advisory Council
WSD:	Wildfire Safety Division
WUI:	Wildland Urban Interface

APPENDIX B –RAMP ROADMAP

Table JW-B-1
Summary of RAMP Risk and CFF Activities

WILDFIRE MITIGATION **RAMP Activity by Workpaper**			
Workpaper	**RAMP ID**	**Activity**	**Description**
1WM001.000	SDG&E-Risk-1 - C41	Emergency Management Operations	The mission of Emergency Management is to coordinate safe and effective emergency preparedness for SDG&E's customers and emergency response personnel. That mission extends to safely and efficiently preparing for, responding to, and recovering from all threats and hazards through strategic planning, training, and exercising, and to sustaining a Quality Assurance and Improvement process.
DD1WM002.000	SDG&E-Risk-1 - C04	Fire Science and Climate Adaptation Department	The Fire Science & Climate Adaptation Department is comprised of meteorologists, community resiliency experts, fire coordinators, and project management personnel. Its purpose is promoting situational awareness, responding to threats posed by wildfire and climate change impacts, and strategizing for SDG&E's fire preparedness activities and programs.
1WM002.000	SDG&E-Risk-8 - M01	Wildfire Smoke Particulates	The AQI program will install particulate sensors and an automatic notification system to notify employees when the AQI for Particulate Matter 2.5 microns or smaller in diameter (PM2.5) exceeds 150 or exceeds 500 during wildfires.
1WM003.000	SDG&E-Risk-1 - C07/M2 T1-T2	OH Dist Fire Hardening – Covered Cond	Covered conductor utilizes conductors manufactured with an internal semiconducting layer and external insulating ultraviolet-resistant layer to provide incidental contact protection. The Covered Conductor program has the potential to raise the threshold for PSPS events to higher wind speeds compared to bare conductor.
1WM003.000	SDG&E-Risk-1 - C10/M5 T1-T2	Microgrids	The Microgrid program designs and builds sustainable microgrids that can be electrically isolated during a PSPS event, thereby maintaining electric service to customers who might otherwise be de-energized.
1WM003.000	SDG&E-Risk-1 - C12/M7 T1-T2	Hotline Clamps	The Hotline Clamps (HLC) Replacement Program replaces HLC connections that are connected directly onto the overhead primary conductors with compression connections to eliminate the risk of the wire down failure and the associated wildfire risk.

1WM003.000	SDG&E-Risk-1 - C13/M8 T1-T2	Resiliency Grant Programs	The Resiliency Grant Programs offer portable battery units with solar charging capacity to provide vulnerable customers with a means to keep small devices and appliances charged and powered during PSPS events.
1WM003.000	SDG&E-Risk-1 - C14/M9 T1-T2	Standby Power Programs	This program assists backcountry residences, businesses, and local communities in the HFTD by providing a fixed installation backup generator, or a solar panel and battery backup system to keep customers energized during PSPS.
1WM003.000	SDG&E-Risk-1 - C15/M10 T1-T2	Resiliency Assistance Programs	The Resiliency Assistance Programs focus on enhancing resiliency for customers who reside in the HFTD and may be impacted by PSPS events. The program offers a rebate to customers providing a 70-to-90 percent discount on average portable generator models to mitigate the impacts of PSPS.
1WM003.000	SDG&E-Risk-1 - C16/M11 T1-T2	Strategic Undergrounding	Strategic undergrounding converts overhead systems to underground, providing the dual benefits of nearly eliminating the risk of utility-caused wildfire and the need for PSPS events in these areas.
1WM003.000	SDG&E-Risk-1 - C17/M12 T1-T3	OH Dist Fire Hardening – Bare Conductor	Bare Conductor Hardening includes the replacement of wood poles with steel, replacement of conductor with high-strength bare conductor, and in some cases permanent removal of overhead facilities.
1WM003.000	SDG&E-Risk-1 - N/A	BLM Land Management	SDG&E complies with the Federal Land Policy and Management Act (FLPMA) Section 512, which establishes requirements for the development, approval, and implementation of vegetation management, facility inspection, and O&M plans for electric utilities operating in rights-of-ways on National Forest Service and Bureau of Land Management (BLM) lands.
1WM003.000	SDG&E-Risk-1 - N/A	CNF Land Management	The Cleveland National Forecast Master Special Use Permit (CNF MSUP) authorizes both SDG&E transmission and distribution assets in the Cleveland National Forest. SDG&E activities under the CNF MSUP include routine vegetation management (including hazard tree trimming and removal and pole brushing), inspections and repairs of poles, cross arms, conductors, vaults, substations and helipads, internal communications and weather station equipment installation/repairs.

1WM004.000	SDG&E-Risk-1 - C22 T1-T2	Dist Syst Inspect– CMP –5 Yr Detail Inspect	SDG&E performs five-year detailed inspections as mandated by GO 165.
1WM004.000	SDG&E-Risk-1 - C24 T1-T2	Dist System Inspection – IR/Corona	The Distribution Infrared Inspection program utilizes thermographers with infrared technology to look at the radiation emitted by the connections to determine if there are potential issues with a connection prior to failure.
1WM004.000	SDG&E-Risk-1 - C25 T1-T2	Intrusive Poles	The Wood Pole Intrusive program performs intrusive inspections of wood poles on a 10-year cycle to comply with GO 165.
1WM004.000	SDG&E-Risk-1 - C26	LiDAR Flights	LiDAR inspections are used on distribution lines to support grid hardening design efforts. LiDAR data allows for analysis of the distribution system for clearance and structural adequacy.
1WM004.000	SDG&E-Risk-1 - C27 T1-T2	Dist System Inspection – HFTD Tier 3 Inspections	HFTD Tier 3 Inspections of overhead electric distribution poles are performed on a three-year cycle in high-risk fire areas with a focus on identifying areas where maintenance would improve fire safety and reliability.
1WM004.000	SDG&E-Risk-1 - C28 T1-T2	Dist System Inspection – Drone Inspections	The Drone Inspection program involves flight planning, drone flight and image capture, image assessment and determination of issues, and repair. Imagery collected by the drones improves identification of potential ignition hazards related to certain types of issues or where conditions such as terrain and vegetation density make full detailed inspections difficult.
1WM004.000	SDG&E-Risk-1 - C30 T1-T2	Dist System Inspect – CMP – Annual Patrol	In general, utilities must patrol their systems annually in Tier 2 and Tier 3 of the HFTD. Patrol inspections mitigate the risk of equipment failure by identifying equipment deterioration and facilitating repair and/or replacement before failures occur.
1WM005.000	SDG&E-Risk-1 - C32/M15 T1-T2	Fuels Management Program	Wildland fuel reduction involves the thinning, pruning, and in some cases, removal of vegetation for the purpose of minimizing source material that could ignite and propagate a wildfire.
1WM005.000	SDG&E-Risk-1 - C34 T1-T3	Pole Brushing	Pole brushing is a fire prevention measure involving the removal of vegetation at the base of poles that carry specific types of electrical hardware that could cause sparking or molten material to fall to the ground.
1WM005.000	SDG&E-Risk-1 - N/A	10,000 Trees Goal	SDG&E has expanded its tree planting initiatives to include planting and distributing up to 10,000 trees annually. This initiative expands beyond the replacement of removed trees as a customer

			courtesy to promote safe tree planting throughout the service territory, combating carbon emissions and promoting environmental stewardship.
1WM005.001	SDG&E-Risk-1 - C31 T1-T2	Tree Trimming (HFTD)	Vegetation management operations are driven by regulatory requirements and follow an annual, schedule that includes inspection, tree trimming, and auditing. During the annually scheduled routine inspection activity, all inventory trees are inspected to determine whether they require pruning to maintain mandated clearances from electrical lines.
1WM005.001	SDG&E-Risk-1 - C33/M16 T1-T2	Enhanced Vegetation Management	Vegetation Management defines enhanced clearances as greater than or equal to 12 feet at time of trim, which is the CPUC-recommended post-trim clearance for distribution voltages in the HFTD. SDG&E aims to achieve clearances up to 25 feet, where feasible, to achieve the optimal risk mitigation.
1WM005.001	SDG&E-Risk-2 - C06	Tree Trimming (non-HFTD)	Vegetation management operations are driven by regulatory requirements and follow an annual, schedule that includes inspection, tree trimming, and auditing. During the annually scheduled routine inspection activity, all inventory trees are inspected to determine whether they require pruning to maintain mandated clearances from electrical lines.
1WM006.000	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	The aviation firefighting program serves as a wildfire suppression resource, ensuring aerial firefighting resources remain available in the region.
1WM006.000	SDG&E-Risk-1 - C36 T1-T2	Wildfire Infrastructure Protection Teams	Wildfire Infrastructure Protection Teams are utilized during times of increased fire risk (e.g., during Extreme or RFW FPI days) and during at-risk work activities that are performed in areas adjacent to wildland fuels. These teams are trained and equipped to notify the agency having jurisdiction of an ignition and can safely mitigate the impact of an ignition through suppressive action until first responders arrive.
1WM007.000	SDG&E-Risk-1 - C40	Wildfire Mitigation Personnel	Wildfire Mitigation Personnel address aspects of the overall wildfire mitigation effort including regulatory proceedings, risk modeling, and metrics.
1WM007.001	SDG&E-Risk-1 - N/A	Risk Assessment & Mapping	Risk Assessment and Mapping includes the ongoing development and implementation of SDG&E's wildfire modeling. SDG&E continues to refine a primarily automated risk assessment and mapping methodology to analytically

			evaluate and prioritize proposed grid hardening projects and emergency actions from the standpoint of reducing fire risk potential from overhead electric facilities.
1WM007.002	SDG&E-Risk-1 - N/A	Data Governance	SDG&E requires data from a variety of static and real time source systems to support operational needs, trend analysis, and predictive modeling. Data Governance creates a set of standards and practices that uses people, process, and technology to enhance company data and confirm that it is complete, accurate, consistent, accessible, compliant, and safeguarded appropriately.
1WM008.000	SDG&E-Risk-1 - C42	PSPS Communication Practices	SDG&E developed a robust communications and outreach effort to educate customers and the general public about PSPS events and how to prepare for potential outages. The goal of this effort is increased awareness, preparation, and community resiliency to wildfire and PSPS events.
1WM008.000	SDG&E-Risk-1 - C43	Mylar Balloon Alternative	SDG&E is pursuing the development of a non-conductive balloon with a major manufacturer in the balloon industry to mitigate the risks associated with balloon contact with electrical infrastructure causing outages and ignitions.
1WM008.000	SDG&E-Risk-1 - N/A	WMP AFN Customer Support	SDG&E is working to enhance its identification of AFN customers for the purposes of targeting outreach, communications, and solutions.
1WM008.000	SDG&E-Risk-1 - N/A	WMP Tribal Customer Support	SDG&E is working to enhance identification of tribal nation customers for the purposes of targeting outreach, communications, and solutions.

Table JW-B-2
Summary of RAMP Risk and CFF Costs by Workpaper

WILDFIRE MITIGATION & VEGETATION MANAGEMENT RAMP Activity O&M Forecasts by Workpaper (In 2021 $)						
Workpaper	**RAMP ID**	**Description**	**BY2021 Embedded Base Costs (000s)**	**TY2024 Estimated Total (000s)**	**TY2024 Estimated Incremental (000s)**	**GRC RSE**
1WM001.000	SDG&E-Risk-1 - C41	Emergency Management Operations	13,315	16,236	2,921	0
1WM002.000	SDG&E-Risk-1 - C04	Fire Science and Climate Adaptation Department	2,994	3,777	783	0
1WM002.000	SDG&E-Risk-8 - M01	Wildfire Smoke Particulates	0	100	100	59.000
1WM003.000	SDG&E-Risk-1 - C07/M2 T1-T2	OH Dist Fire Hardening – Covered Cond	518	592	74	-
1WM003.000	SDG&E-Risk-1 - C10/M5 T2	Microgrids	1,492	1,607	115	28.000
1WM003.000	SDG&E-Risk-1 - C12/M7 T1-T2	Hotline Clamps	3,648	364	-3,284	-
1WM003.000	SDG&E-Risk-1 - C13/M8 T1-T2	Resiliency Grant Programs	7,892	7,550	-342	-
1WM003.000	SDG&E-Risk-1 - C14/M9 T1-T2	Standby Power Programs	8,934	10,350	1,416	133.000
1WM003.000	SDG&E-Risk-1 - C15/M10 T1-T2	Resiliency Assistance Programs	745	1,828	1,083	-
1WM003.000	SDG&E-Risk-1 - C16/M11 T1-T2	Strategic Undergrounding	90	2,921	2,831	-
1WM003.000	SDG&E-Risk-1 -	OH Dist Fire Hardening – Bare Conductor	2,722	48	-2,674	41.000

	C17/M12 T1-T3					
1WM003.000	SDG&E-Risk-1 - N/A	BLM Land Management	0	4	4	0
1WM003.000	SDG&E-Risk-1 - New03	CNF Land Management	0	134	134	0
1WM004.000	SDG&E-Risk-1 – C22 T1-T2	Dist Syst Inspect– CMP –5 Yr Detail Inspect	165	313	148	-
1WM004.000	SDG&E-Risk-1 - C24 T1-T2	Dist System Inspection – IR/Corona	146	175	29	372.000
1WM004.000	SDG&E-Risk-1 - C25 T1-T2	Intrusive Poles	803	126	-677	-
1WM004.000	SDG&E-Risk-1 - C26	LiDAR Flights	1,151	1,500	349	0
1WM004.000	SDG&E-Risk-1 - C27 T1-T2	Dist System Inspection – HFTD Tier 3 Inspections	290	328	38	187.000
1WM004.000	SDG&E-Risk-1 - C28 T1-T2	Dist System Inspection – Drone Inspections	33,228	12,656	-20,572	-
1WM004.000	SDG&E-Risk-1 - C30 T1-T2	Dist System Inspect – CMP – Annual Patrol	231	278	47	-
1WM005.000	SDG&E-Risk-1 - C32/M15 T1-T2	Fuels Management Program	4,416	6,274	1,858	-
1WM005.000	SDG&E-Risk-1 - C34 T1-T3	Pole Brushing	5,556	7,027	1,471	-
1WM005.000	SDG&E-Risk-1 - New04	10,000 Tree Program	393	1,000	607	0
1WM005.001	SDG&E-Risk-1 - C31 T1-T2	Tree Trimming	25,344	27,232	1,888	-
1WM005.001	SDG&E-Risk-1 - C33/M16 T1-T2	Enhanced Vegetation Management	9,955	10,235	280	-
1WM005.001	SDG&E-Risk-2 - C06	Tree Trimming (non-HFTD)	16,896	18,155	1,259	109.000

1WM006.000	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	7,008	11,539	4,531	-
1WM006.000	SDG&E-Risk-1 - C36 T1-T2	Wildfire Infrastructure Protection Teams	3,071	3,230	159	0
1WM007.000	SDG&E-Risk-1 - C40	Wildfire Mitigation Personnel	3,823	7,748	3,925	0
1WM007.001	SDG&E-Risk-1 - New05	Risk Assessment & Mapping	608	2,413	1,805	0
1WM007.002	SDG&E-Risk-1 - New06	Data Governance	1,082	1,650	568	0
1WM008.000	SDG&E-Risk-1 - C42	PSPS Communication Practices	9,766	9,889	123	0
1WM008.000	SDG&E-Risk-1 - C43	Mylar Balloon Alternative	37	86	49	0
1WM008.000	SDG&E-Risk-1 - New07	WMP AFN Customer Support	1,127	1,390	263	0
1WM008.000	SDG&E-Risk-1 - New08	WMP Tribal Customer Support	54	200	146	0
Total			**167,500**	**168,955**	**1,455**	

WILDFIRE MITIGATION & VEGETATION MANAGEMENT RAMP Activity Capital Forecasts by Workpaper (In 2021 $)						
Workpaper	**RAMP ID**	**Description**	**2022 Estimated RAMP Total (000s)**	**2023 Estimated RAMP Total (000s)**	**2024 Estimated RAMP Total (000s)**	**GRC RSE**
002390.001	SDG&E-Risk-1 - C22 T1-T2	Distribution System Inspection – CMP – 5 Year Detailed Inspections T1-T2	6,715	5,898	6,016	-
002390.002	SDG&E-Risk-1 - C25 T2	Distribution System Inspection – CMP – 10 Year Intrusive T2	1,321	1,161	1,183	10.000
002390.003	SDG&E-Risk-1 - C27	Distribution System Inspection – HFTD Tier 3 Inspections T1-T2	2,201	1,934	1,972	187.000
002390.004	SDG&E-Risk-1 - C30 T1-T2	Distribution System Inspection – CMP – Annual Patrol T1-T2	770	677	691	-
081650.001	SDG&E-Risk-1 - C19	Cleveland National Forest Fire Hardening T1-T2	1,999	1,675	1,206	0
112530.001	SDG&E-Risk-1 – C03 T1 – T3	Wireless Fault Indicators	666	0	1,064	-
141400.001	SDG&E-Risk-1 - C18/M13 T1-T2	OH Trans Fire Hardening – Dist Underbuild	4,729	8,635	14,464	-
152590.001	SDG&E-Risk-1 – C11/M6 T1	Advanced Protection	12,783	11,562	5,540	832.000
191340.001	SDG&E-Risk-1 – C20	LTE Communication Network	9,444	7,700	7,700	0
192420.001	SDG&E-Risk-1 – C08/M3 T2	Expulsion Fuse Replacements	842	0	0	-
192450.001	SDG&E-Risk-1 -	PSPS Sectionalizing	1,567	1,567	1,567	280.000

	C09/M4 T1-T3					
192460.001	SDG&E-Risk-1 - C16/M11 T1-T2	Strategic Undergrounding	125,981	191,143	292,062	-
192470.001	SDG&E-Risk-1 - C02	Advanced Weather Station Integration	917	380	380	0
192480.001	SDG&E-Risk-1 - C01	WRRM - OPS	2,200	2,420	2,662	0
192490.001	SDG&E-Risk-1 - C10/M5 T2	Microgrids	5,069	36,229	2,400	28.000
197800.001	SDG&E-Risk-1 - C41	Emergency Management Operations	721	17,414	0	0
198730.001	SDG&E-Risk-1 - C20	LTE Communication Network	79,569	65,349	70,179	0
201270.001	SDG&E-Risk-1 - C23	Transmission System Inspection	700	1,140	580	0
202400.001	SDG&E-Risk-1 - C05	High Performance Computing Infrastructure	5,800	0	0	0
202480.001	SDG&E-Risk-1 - C28 T1-T2	Distribution System Inspection – Drone Inspections	33,445	55,320	6,981	-
202580.001	SDG&E-Risk-1 - C06/M1 T2	SCADA Capacitors (HFTD Tier 2)	2,010	1,378	1,427	2623.000
202770.001	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	2,753	9,185	8,100	-
202820.001	SDG&E-Risk-1 - C21/M14 T1	Lightning Arrestor Removal/Replacement Program	2,845	2,232	2,186	-
202820.002	SDG&E-Risk-2 – C08	Avian Protection Program	1,368	1,371	1,371	226.000
202840.001	SDG&E-Risk-1 – C17/M12 T1-T3	OH Dist Fire Hardening – Bare Conductor	16,311	5,479	5,479	41.000
202850.001	SDG&E-Risk-1 – C07/M2 T1-T2	OH Dist Fire Hardening – Covered Conductor	78,593	69,222	59,217	-

208770.001	SDG&E-Risk-1 - C04	Fire Science and Climate Adaptation Department	420	420	420	0
208900.001	SDG&E-Risk-1 - C42	Communication Practices	5,627	3,361	3,131	0
208910.001	SDG&E-Risk-1 - C38	Centralized Repository for Data	16,403	10,506	5,683	0
212550.001	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	400	0	0	-
212560.001	SDG&E-Risk-1 - C35 T1-T3	Aviation Firefighting Program	11,596	0	0	-
218770.001	SDG&E-CFF-1 - 1	Asset Management	1,784	3,065	2,008	0
218790.001	SDG&E-CFF-4 - C41	Emergency Management Operations	1,889	1,970	2,496	0
218820.001	SDG&E-CFF-4 - C41	Emergency Management Operations	4,692	4,530	0	0
218840.001	SDG&E-Risk-1 - C38	Centralized Repository for Data	6,068	3,995	3,994	0
218860.001	SDG&E-Risk-1 - C42	Communication Practices	1,247	0	0	0
222420.001	SDG&E-Risk-1 - New 01	Strategic Pole Replacement Program (HFTD)	0	1,620	6,348	-
Total			**451,445**	**528,538**	**518,507**	

Appendix C
SDG&E Covered Conductor Effectiveness

Excerpt from SDG&E 2022 Wildfire Mitigation Plan Update

SDG&E

SDG&E initially began to examine covered conductor from a personnel safety and reliability standpoint. The three-layered construction showed prospective reduction of injuries to people in the event of an energized wire-down in which the wire contacted a person and/or also might reduce the step potential to people in the vicinity. Outages that result from light momentary contacts (e.g., mylar balloons, birds, and palm fronds) also have shown the potential to be reduced. In late 2018, focus was shifted towards using covered conductor as an alternative to SDG&E's traditional overhead hardening program with the primary focus of reducing utility-caused ignitions.

SME's conducted research on the history and use of covered conductor in the industry. Additionally, the SMEs reached out to utilities on the East Coast and internationally to receive their feedback of the effectiveness and work methods for installation purposes.

In addition to other studies/tests that have been and will be performed by SCE and PG&E, as described in the Testing section, SDG&E will have a third party evaluate the likelihood and effect specific to conductors clashing at various wind speeds. Accelerated aging studies will also be performed to mimic a 40-year service life; after which, the samples will be subjected to tests designed to understand the potential for both mechanical degradation, as well as a reduction in the dielectric strength of the covering. These tests will be performed in accordance with ASTM or other industry recognized standards.

In order to quantify the risk reduction of wildfires that would be achieved by covered conductor, SDG&E evaluated 80 events that resulted in ignitions. SMEs weighed in on the likelihood that covered conductor installation would prevent an ignition for the particular type of outage depending on the severity of the incident. As seen in Table 5, the result is a reduction in ignitions from 80 to 28.4, and a resulting effectiveness estimate of 64.5%.

Table 5: SDG&E Covered Conductor Mitigation Effectiveness Estimate

Fault/Ignition Cause	Number of Ignitions	SME Effectiveness	Post-Mitigation Ignitions
Animal contact	5	90%	0.5
Balloon contact	8	90%	0.8
Vegetation contact	10	90%	1.0
Vehicle contact	14	20%	11.2
Other contact	4	10%	3.6
Other	2	10%	1.8
Equipment - All	34	80%	6.8
Unknown	3	10%	2.7

Fault/Ignition Cause	Number of Ignitions	SME Effectiveness	Post-Mitigation Ignitions
Total	**80**	**64.5%**	**28.4**

SDG&E 2024 GRC Testimony Revision Log October 2022

Exhibit	Witness	Page	Line or Table	Revision Detail
SDGE-13	Jonathan Woldemariam	JTW-ix	O&M Table	Non-shared and Total O&M Rows: changed Estimated TY 2024 from "174,002" to "168,955" and "Change" from "5,566" to "519"
SDGE-13	Jonathan Woldemariam	JTW-ix	Capital Table	Changed Estimated 2022 from "560,868" to "451,445", Estimated 2023 from "773,247" to "528,538", and Estimated TY 2024 from "738,348" to "518,507"
SDGE-13	Jonathan Woldemariam	JTW-ix	Summary Bullet 1	Changed "$738.3 million" to "$518.5 million" and "174 million" to "169 million"
SDGE-13	Jonathan Woldemariam	JTW-x	Summary Bullet 4	Changed "590" to "445"
SDGE-13	Jonathan Woldemariam	JTW-3	Table JW-1	Row C: changed TY2024 Estimated from "30,446" to "25,399" and Change from "4,405" to "642" Row D: changed 2021 Adjusted-Recorded from "36,014" to "36,949" Total Non-Shared Services O&M: changed 2021 Adjusted-Recorded from "167,501" to "168,436", TY2024 Estimated from "174,002" to "168,995" and Change from "5,566" to "519"
SDGE-13	Jonathan Woldemariam	JTW-3	Table JW-2	Row C: changed Estimated 2022 from "452,533" to "343,110", Estimated 2023 from "649,871" to "405,162" and Estimated 2024 from "690,987" to "471,146" Total Capital: changed Estimated 2022 from "560,868" to "451,445", Estimated 2023 from "773,247" to "528,538" and Estimated 2024 from "738,348" to "518,507"
SDGE-13	Jonathan Woldemariam	JTW-4	Line 19	Added "Wildfire Policy Testimony of Kevin C. Geraghty (Exhibit SDG&E-49)
SDGE-13	Jonathan Woldemariam	JTW-8	Line 9	Corrected "monitory" to "monitoring"
SDGE-13	Jonathan Woldemariam	JTW-23	Table JW-5	Risk 1: changed TY2024 Estimated Total from "155,748" to "150,700" and TY2024 Estimated Incremental from "5,144" to "96" RAMP Risk Chapter Sub-total: changed TY2024 Estimated Total from "174,003" to "168,955" and TY2024 Estimated Incremental from "6,503" to "1,455"

				Total RAMP O&M Costs: changed TY2024 Estimated Total from "174,003" to "168,955" and TY2024 Estimated Incremental from "6,503" to "1,455"
SDGE-13	Jonathan Woldemariam	JTW-24	Table JW-6	Risk 1: changed 2022 Estimated RAMP Total from "551,135" to "441,712", 2023 Estimated RAMP Total from "762,311" to "517,602", 2024 Estimated RAMP Total from "732,473" to "512,632 and 2022-2024 Estimated RAMP Total from "2,045,919" to "1,471,947" RAMP Risk Chapter Sub-total: changed 2022 Estimated RAMP Total from "552,503" to "443,080", 2023 Estimated RAMP Total from "763,682" to "518,973", 2024 Estimated RAMP Total from "733,844" to "514,003" and 2022-2024 Estimated RAMP Total from "2,050,029" to "1,476,057" Total RAMP Capital Costs: changed 2022 Estimated RAMP Total from "560,868" to "451,445", 2023 Estimated RAMP Total from "773,247" to "528,538", 2024 Estimated RAMP Total from "738,348" to "518,507" and 2022-2024 Estimated RAMP total from "2,072,463" to "1,498,491"
SDGE-13	Jonathan Woldemariam	JTW-29	Line 1	Deleted "the"
SDGE-13	Jonathan Woldemariam	JTW-30	Table JW-8	Row C: changed TY2024 from "30,466" to "25,399" and Change from "4,405" to "642" Total Non-Shared Services O&M: changed TY2024 Estimated from "174,002" to "168,955" and Change from "5,566" to "519"
SDGE-13	Jonathan Woldemariam	JTW-48	Table JW-13	Row C and Total: changed TY2024 Estimated from "30,446" to "25,399" and change from "4,405" to "642"
SDGE-13	Jonathan Woldemariam	JTW-52	Table JW-14	Risk-1-C07/M2: changed TY2024 Estimated Totals from "1,596" to "592" and Change from "1,078" to "74" Risk-1-C12/M7: changed TY2024 Estimated Totals from "364" to "365" and Change from "-3,283" to "-3,284" Risk-1-C13/M8: changed TY2024 Estimated Totals from "10,399" to "7,550" ad Change from "2,507" to "342" Risk-1-C15/M10: changed "TY2024 Estimated Totals from "1,829" to "1,828" and Change from "1,084" to "1,083" Risk-1-C16/M11: changed TY2024 Estimated Totals from "4,115" to "2,921" and Change from "4,025" to "2,831"

SDGE-13	Jonathan Woldemariam	JTW-53	Lines 7-8	Changed “100” to “60”, “80” to “40” and “$1,078,190” to “$74,000”
SDGE-13	Jonathan Woldemariam	JTW-53	Lines 11-12	Changed “eliminate” to “significantly reduce” and added “and impacts of”
SDGE-13	Jonathan Woldemariam	JTW-53	Lines 13-14	Changed “150” to “125”, “124” to “100” and “$4,025,109” to “$2,831,000”
SDGE-13	Jonathan Woldemariam	JTW-54	Lines 1-2	Changed “upward” to “downward”, “increase of 690” to “decrease of 890” and “increase in costs of $2,507,643” to “decrease in cost of $342,000.”
SDGE-13	Jonathan Woldemariam	JTW-54	Lines 2-7	Replaced “The increase in units is driven by SDG&E expanding the program to include additional customers such as AFN and tribal nation communities.” with “The decrease in units is driven by SDG&E reaching maturity in the program and focusing on the most vulnerable customers who have experienced PSPS events. The costs will not decrease proportionally to the units as there are certain fixed costs and future replacements for existing customers that have not been reflected in historical costs. “
SDGE-13	Jonathan Woldemariam	JTW-93	Table JW-31	Row C: changed Estimated 2022 from “452,533 to 343,110”, Estimated 2023 from “649,871” to “405,162” and Estimated 2024 from “690,987” to “471,146” Total: changed Estimated 2022 from“560,868” to “451,455”, Estimated 2023 from “773,247” to “528,538” and Estimated 2024 from “738,348” to “518,507”
SDGE-13	Jonathan Woldemariam	JTW-106-107	Table JW-39	Row 2: changed Estimated 2022 from “124,634” to “78,593”, Estimated 2023 from “150,872” to “69,222” and Estimated 2024 from “159,619” to “59,217” Row 13: changed Estimated 2022 from “189,354” to “125,981”, Estimated 2023 from “354,202” to “191,143” and Estimated 2024 from “411,501” to 292,062” Total: changed Estimated 2022 from “452,533” to “343,110”, Estimated 2023 from “649,871” to “405,162” and Estimated 2024 from “690,987” to “471,146”
SDGE-13	Jonathan Woldemariam	JTW-109	Line 7	Changed “$124,643,000” to “$78,593,000”, “$150,872,000” to “$69,222,000” and “$159,619,000” to “$59,217,000”

SDGE-13	Jonathan Woldemariam	JTW-109	Line 29	Replaced “most of its overhead system hardening” with “its overhead system hardening efforts”
SDGE-13	Jonathan Woldemariam	JTW-110	Line 20	Replaced “and continuing to increase installation with 100 miles planned for 2024.” with “,2023, and 2024.”
SDGE-13	Jonathan Woldemariam	JTW-111	Table JW-41	Changed 2022 Estimated RAMP Total from “124,643” to “78,593”, 2023 Estimated RAMP Total from “150,872” to “69,222” and 2024 Estimated RAMP Total from “159,619” to “59,217”
SDGE-13	Jonathan Woldemariam	JTW-111	Lines 19-20	Changed “80” to “40” and “$120,887,000” to “$20,485,000”
SDGE-13	Jonathan Woldemariam	JTW-132	Lines 22-23	Added “related to electrical infrastructure” and “The chance of”. Replaced “eliminated” with “significantly reduced”
SDGE-13	Jonathan Woldemariam	JTW-133	Lines 5-6	Changed “$189,354,000” to “$125,981,000”, “$354,202,000” to “191,143,000”, “$411,501,000” to “$292,062,000” and “333” to “270”
SDGE-13	Jonathan Woldemariam	JTW-134	Table JW-52	Changed 2022 Estimated RAMP Total from “189,354” to “125,981”, 2023 Estimated RAMP Total from “354,202” to “191,143” and 2024 Estimated RAMP Total from “411,501” to “292,062”
SDGE-13	Jonathan Woldemariam	JTW-135	Lines 17-19	Changed “150” to “125”, “124” to “99” and “$341,963,000” to “$222,524,000”
SDGE-13	Jonathan Woldemariam	JTW-170	Lines 1-2	Added “, with the exceptions of Strategic Undergrounding, Covered Conductor, and the Generator Grant Program as noted in the next section of my testimony.”
SDGE-13	Jonathan Woldemariam	JTW-170	Lines 7-11	Added “Because SDG&E is proposing miles for Strategic Undergrounding and Covered Conductor in the post-test years that differ from the miles proposed in 2024, SDG&E has adjusted its forecast to reflect these discrete mile requests. The mileage and the corresponding cost reduction from the original filing are provided below in Table JW-75.” And “for all wildfire-related capital”
SDGE-13	Jonathan Woldemariam	JTW-171	Lines 4-5	Deleted “The capital WMP forecasts should be based on the level adopted by the CPUC for 2024.”
SDGE-13	Jonathan Woldemariam	JTW-171	Line 6	Added footnote 61.
SDGE-13	Jonathan Woldemariam	JTW-171	Line 7	Added new Section VIII: SDG&E UPDATE RELATED TO PLANNED GRID DESIGN AND SYSTEM HARDENING

SDGE-13	Jonathan Woldemariam	JTW-176	Line 5	Conclusion becomes Section IX
SDGE-13	Jonathan Woldemariam	JTW-176	Line 10	Added “second”
SDGE-13	Jonathan Woldemariam	JTW-177	Line 1	Witness Qualifications becomes Section X
SDGE-13	Jonathan Woldemariam	JTW-B-6	Risk-1 - C07/M2	Changed TY2024 Estimated Totals from “1,596” to “592” and TY2024 Estimated Incremental from “1,078” to “74”
SDGE-13	Jonathan Woldemariam	JTW-B-6	Risk-1 - C13/M8	Changed TY2024 Estimated Totals from “10,399” to “7,550” and TY2024 Estimated Incremental from “2,507” to “342”
SDGE-13	Jonathan Woldemariam	JTW-B-6	Risk-1 - C15/M10	Changed TY2024 Estimated Totals from “1,829” to “1,828” and TY2024 Estimated Incremental from “1,084” to “1,083”
SDGE-13	Jonathan Woldemariam	JTW-B-6	Risk-1 - C16/M11	Changed TY2024 Estimated Totals from “4,115” to “2,921” and TY2024 Estimated Incremental from “4,025” to “2,831”
SDGE-13	Jonathan Woldemariam	JTW-B-7	Risk-1 – C28	Changed TY2024 Incremental from “-20,392” to “-20,572”
SDGE-13	Jonathan Woldemariam	JTW-B-8	Risk-1 – C35	Changed TY2024 Incremental from “4,560” to “4,531”
SDGE-13	Jonathan Woldemariam	JTW-B-8	Total	Changed TY2024 Estimated Totals from “174,003” to “168,955” and TY2024 Estimated Incremental from “6,325” to “1,455”
SDGE-13	Jonathan Woldemariam	JTW-B-10	Risk-1 - C16/M11	Changed 2022 Estimated RAMP Total from “189,354” to “125,981”, 2023 Estimated RAMP Total from “354,202” to “191,143” and 2024 Estimated RAMP Total from “411,501” to “292,062”.
SDGE-13	Jonathan Woldemariam	JTW-B-10	Risk-1 – C07/M2	Changed 2022 Estimated RAMP Total from “124,643” to “78,593”, 2023 Estimated RAMP Total from “150,872” to “69,222” and 2024 Estimated RAMP Total from “159,619” to “59,217”.
SDGE-13	Jonathan Woldemariam	JTW-B-11	Total	Changed 2022 Estimated RAMP Total from “560,868” to “451,445”, 2023 Estimated RAMP Total from “773,247” to “528,538” and 2024 Estimated RAMP Total from “738,348” to “518,507”.