

Company: San Diego Gas & Electric Company (U 902 M)  
Proceeding: 2024 General Rate Case  
Application: A.22-05-015/016 (cons.)  
Exhibit: SDG&E-13-2R-E

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

**ERRATA**

**BEFORE THE PUBLIC UTILITIES COMMISSION**  
**OF THE STATE OF CALIFORNIA**



~~October 2022~~ May 2023

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~~SDG&E 2024 GRC Testimony Revision Log – August 2022.....Log 1~~

## SUMMARY

<b>WILDFIRE MITIGATION O&amp;M (In 2021 \$)</b>			
<b>O&amp;M</b>	<b>2021 Adjusted-Recorded (\$000)</b>	<b>Estimated TY 2024 (\$000)</b>	<b>Change (\$000)</b>
Non-Shared	168,436	168,955	519
Shared	0	0	0
<b>Total O&amp;M</b>	<b>168,436</b>	<b>168,955</b>	<b>519</b>

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

### 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,<sup>1</sup> 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.

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<sup>1</sup> Pub. Util. Code §8386.4(b)(1).



1 track record of either avoiding wildfires or not being the cause of a catastrophic  
2 wildfire.<sup>4</sup>

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

14 My testimony supports the Test Year 2024 forecasts for O&M costs for non-shared services, and  
15 capital costs for 2024 associated with the Wildfire Mitigation and Vegetation Management area  
16 for SDG&E, and the business justification for two information technology (IT) capital projects  
17 for the forecast years 2022, 2023, and 2024 associated with the Wildfire Mitigation area for  
18 SDG&E. Tables JW-1 and JW-2 summarizes my sponsored costs for O&M and capital,  
19 respectively. Table JW-3 presents the IT capital costs for which I provide the business  
20 justification. I also sponsor proposals related to regulatory accounts and forecasts for the years  
21 2025-2027.

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<sup>4</sup> S&P Global Ratings, *Ratings Direct, San Diego Gas & Electric Co.*, (Jun. 30, 2020) at 2.

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

<b>WILDFIRE MITIGATION O&amp;M (In 2021 \$)</b>			
<b>Categories of Management</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
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
<b>Total Non-Shared Services O&amp;M</b>	<b>168,436</b>	<b>168,955</b>	<b>519</b>

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

<b>WILDFIRE MITIGATION CAPITAL (In 2021 \$)</b>				
<b>Categories of Management</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022 (000s)</b>	<b>Estimated 2023 (000s)</b>	<b>Estimated 2024 (000s)</b>
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
<b>Total Capital</b>	<b>381,854</b>	<b>451,445</b>	<b>528,538</b>	<b>518,507</b>

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**TABLE JW-3**  
**Summary of Total IT Capital Costs**

<b>IT CAPITAL (In 2021\$)</b>			
<b>Capital</b>	<b>Estimated 2022 (\$000)</b>	<b>Estimated 2023 (\$000)</b>	<b>Estimated TY 2024 (\$000)</b>
<b>Total IT Capital</b>	<b>1,884</b>	<b>6,545</b>	<b>1,678</b>

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1           **B.     Support To and From Other Witnesses**

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

- 5           • Sustainability Policy testimony of Estela de Llanos (Exhibit SDG&E-02);
- 6           • Risk Policy testimony of Michael Schneider (Exhibit SDG&E-03, Chapter 1) and  
7           GRC-to-RAMP Integration testimony of Gregory Flores and R. Scott Pearson  
8           (Exhibit SCG-03/SDG&E-03, Chapter 2);
- 9           • Electric Distribution Capital testimony of Oliva Reyes (Exhibit SDG&E-11);
- 10          • Electric Distribution O&M testimony of Tyson Swetek (Exhibit SDG&E-12);
- 11          • Information Technology testimony of Tia Ballard and William J. Exon (Exhibit  
12          SDG&E-25);
- 13          • Safety Management Systems testimony of Kenneth Deremer (Exhibit SDG&E-  
14          31);
- 15          • Rate Base testimony of Steven Dais (Exhibit SDG&E-35);
- 16          • Regulatory Accounts testimony of Jason Kupfersmid (Exhibit SDG&E-43);
- 17          • Summary of Earnings testimony of Ryan Hom (Exhibit SDG&E-44); and
- 18          • Post-Test Year Ratemaking witness Melanie Hancock (Exhibit SDG&E-45).
- 19          • Wildfire Policy Testimony of Kevin C. Geraghty (Exhibit SDG&E-49).

20           **C.     Organization of Testimony**

21           My testimony is organized as follows:

- 22          • Section II describes SDG&E’s Wildfire Mitigation Plan, including an overview of  
23          the existing wildfire-related regulatory accounts, proposals for wildfire-related  
24          regulatory accounts for this GRC cycle, and proposed schedule for addressing  
25          reasonableness review of accumulated balances through 2023;
- 26          • Section III summarizes the Risk Assessment Mitigation Phase information that I  
27          sponsor;
- 28          • Section IV describes my sustainability-related information;
- 29          • Section V presents my O&M costs;
- 30          • Section VI presents my capital costs;
- 31          • 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.”<sup>5</sup>

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.<sup>6</sup> 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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<sup>5</sup> D.17-12-024 at 2.

<sup>6</sup> 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>.

1 millions of carbon particles into the air, compounding the challenge of reducing greenhouse gas  
2 emissions.<sup>7</sup> Thus SDG&E’s efforts to reduce the risk of catastrophic wildfire positively impact  
3 the entirety of its customer base and the overall public.

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

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

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

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<sup>7</sup> Strike Force Report at 5.

<sup>8</sup> 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.

<sup>9</sup> AB 1054, Stats. 2019-2020, Ch. 79 (Cal. 2019).

<sup>10</sup> *Id.* at § 1(a)(1).

<sup>11</sup> *Id.* at § 2(a).

1 must invest in hardening of the state’s electrical infrastructure and vegetation management to  
2 reduce the risk of catastrophic wildfire.”<sup>12</sup>

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

### 14 C. Overview of SDG&E’s Wildfire Mitigation Plan

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

21 “[p]rocesses and programs to understand wildfire risk, conditions, and  
22 behaviors to provide the Company and its customers with time and information to  
23 take appropriate action; build, construct, and operate a fire-hardened electric  
24 distribution and transmission system in a manner that minimizes the possibility of  
25 igniting a fire; educate customers and stakeholders on wildfire risk; and support  
26 customers affected by outages.”<sup>14</sup>  
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<sup>12</sup> *Id.* at § 2(b).

<sup>13</sup> 2019 WMP.

<sup>14</sup> 2019 WMP at 6.

1 SDG&E further acknowledged that the WMP and implementation strategies need to be  
2 flexible to adapt to changing circumstances, weather, funding, and variables yet to be known.<sup>15</sup>

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

13 SDG&E filed its most recent Wildfire Mitigation Plan Update on February 11, 2022  
14 (2022 WMP Update), hereby incorporated by reference.<sup>20</sup> This 2022 WMP Update provides a  
15 comprehensive review and update on all of SDG&E’s efforts to mitigate wildfire risk and reduce  
16 PSPS impacts for the 2020-2022 WMP cycle. These efforts include the ongoing development of  
17 situational awareness tools like SDG&E’s first-of-its-kind weather network, which allows both  
18 real-time awareness of conditions during extreme weather events as well as data useful in  
19 SDG&E’s modeling efforts. SDG&E has also used this data to develop a plan for a safe and  
20 hardened grid using targeted and cost-effective measures such as strategic undergrounding,

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<sup>15</sup> 2019 WMP at 2.

<sup>16</sup> 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.

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

<sup>18</sup> *Id.*

<sup>19</sup> D.19-05-039; Resolution WSD-005; Resolution WSD-019.

<sup>20</sup> 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.

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

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

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

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

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

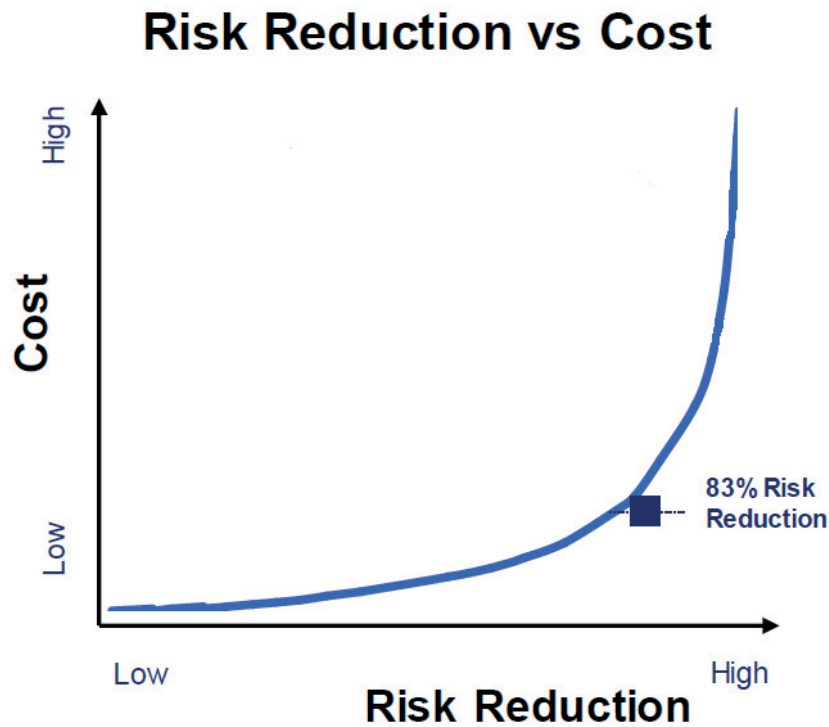
13 The 2022 WMP Update also details SDG&E’s efforts regarding community engagement,  
14 including the development of partnerships with stakeholders in public safety, academia, and the  
15 private sector to promote safety efforts and community outreach. Community engagement,  
16 through public events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

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



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

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



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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**

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

1           **D. Existing Regulatory Accounts**

2                   **1. Wildfire Mitigation Plan Memorandum Account and Fire Risk**  
3                   **Mitigation Memorandum Account**

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

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

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

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<sup>21</sup> 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).

<sup>22</sup> P.U. Code §8386.4(b)(1).

<sup>23</sup> Advice Letter 3333-E (January 16, 2019).

<sup>24</sup> P.U. Code §8386.4(a).

<sup>25</sup> 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.

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

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

## 10 **2. Tree Trimming Balancing Account**

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

19 Per the TY 2019 GRC Decision, D.19-09-051, SDG&E received two-way balancing  
20 treatment for the TTBA to permit the Company to more quickly respond to fire risks.<sup>27</sup> D.19-09-  
21 051 also included processes for addressing TTBA over and undercollections on an annual basis.  
22 If at the end of year there is an overcollection, the balance will be amortized in connection with  
23 its annual regulatory account balance update filing for rates effective January 1 of the following  
24 year. If, however, at the end of the year there is an undercollection, balances up to 35% of the  
25 revenue requirement may be recovered through a tier 3 advice letter. Any amounts in excess of  
26 35% of the revenue requirement must be addressed through an application.

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

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<sup>26</sup> Advice Letter 3454-E / 2817-G at 2.

<sup>27</sup> D.19-09-051 at 267.

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

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

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

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

18 To facilitate a reasonableness review of costs already incurred to implement SDG&E's  
19 WMP, SDG&E proposes to use separate tracks of this proceeding by which SDG&E will seek a  
20 reasonableness review of WMPMA balances from the inception of the account (May 30, 2019)  
21 through December 2022 in Track 2 of its GRC. The costs represented in SDG&E's proposed  
22 Track 2 aligns with the time periods covered by SDG&E's 2019 WMP and the three-year 2020-  
23 2022 WMP cycle. SDG&E expects to file its reasonableness review in Track 2 in mid-2023,  
24 when recorded costs are available, and is requesting a schedule by which the Commission issues  
25 a proposed decision within 12 months.<sup>29</sup> SDG&E will seek a separate review of the 2023  
26 WMPMA balances in Track 3, anticipated to be filed in mid-2024.

27 A similar track approach was used in Southern California Edison Company's (SCE) TY  
28 2021 GRC and is also now being used in Pacific Gas and Electric Company's (PG&E) TY 2023

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<sup>28</sup> Pub. Util. Code §8386.4(b)(1) and (2).

<sup>29</sup> Pub. Util. Code §8386.4(b)(2).

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

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

15 Accordingly, SDG&E is not requesting 2022 and 2023 wildfire-related costs incremental  
16 to its current GRC and recorded in the WMPMA in this instant application. In my testimony and  
17 workpapers, I present 2022 and 2023 cost forecasts for illustrative purposes only, to demonstrate  
18 the progression of costs and better inform the Commission regarding the reasonableness of such  
19 costs beginning in 2024. The Rate Base testimony of Steven P. Dais (Ex. SDG&E-35) and  
20 Summary of Earnings testimony of Ryan Hom (Ex. SDG&E-44) excluded SDG&E's 2022 and  
21 2023 wildfire-related costs from its calculations of rate base and overall revenue requirement  
22 request in this GRC Application.

## 23 **F. Proposal for Regulatory Accounts**

### 24 **1. SDG&E Proposes to Establish a Two-Way Balancing Account for** 25 **Costs Associated with WMP Implementation (WMPBA)**

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

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<sup>30</sup> A.19-08-013 (SCE); A.21-06-021 (PG&E).

<sup>31</sup> D.22-05-001 at 9.

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

14 Additionally, the Wildfire Mitigation Plans remain relatively new, and the legislative and  
15 regulatory requirements continue to change. Energy Safety continues to revise and update the  
16 WMP requirements in a fashion that may impact SDG&E’s proposed mitigation plan. Guidance  
17 and requirements for the 2023 WMP cycle are currently in development. Moreover, while AB  
18 1054 focused on the necessity to mitigate wildfire risk, both the Legislature and the Commission  
19 continue to emphasize the need to reduce the impacts of PSPS on customers. Given the nature of  
20 SDG&E’s service territory, the use of PSPS as a last resort will remain an important tool to  
21 prevent the occurrence of catastrophic wildfires. Initiatives that reduce the risk of wildfire, such  
22 as covered conductor, may not as effectively reduce PSPS impacts.<sup>32</sup> SDG&E is committed to  
23 addressing and mitigating the risks that PSPS events pose to customers, including those with  
24 AFN. SDG&E is working to better identify AFN customers and tools that provided needed  
25 support during de-energization, and as those needs emerge, SDG&E requires flexibility to give  
26 customers the support they need, when they need it. And to the extent that regulations continue  
27 to emphasize the need to reduce PSPS events, SDG&E may be required to alter its mitigation  
28 strategy to address those requirements.

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<sup>32</sup> The effectiveness of covered conductor continues to be assessed by SDG&E as well as other electrical corporations in California.

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

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

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

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<sup>33</sup> See Pub. Util. Code §8386.1 (failure to substantially comply with an approved WMP may result in penalties).



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

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

- 8             • Undercollections less than 125% of authorized recovered through a Tier 2 Advice  
9             Letter
- 10            • Undercollections from 125% to 145% of authorized recovered through a Tier 3  
11            Advice Letter;
- 12            • Undercollections in excess of 145% of authorized recovered through an  
13            application process.

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

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

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<sup>34</sup> 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.



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

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

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

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

## 18 **3. SDG&E Proposes Slight Modifications to its TTBA to Incorporate All** 19 **Vegetation Management Activities (VMBA)**

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

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<sup>35</sup> See D.22-05-001.

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

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

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

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

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

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

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<sup>36</sup> D.21-08-036 at 186, citing D.20-12-005 at 77-79.

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

3 **III. RISK ASSESSMENT MITIGATION PHASE INTEGRATION**

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

11 In the course of preparing the Wildfire Mitigation and Vegetation Management GRC  
12 forecasts, SDG&E continued to evaluate the scope, schedule, resource requirements, and  
13 synergies of RAMP-related projects and programs. Therefore, the final presentation of RAMP  
14 costs may differ from the ranges shown in the 2021 RAMP Reports. Table JW-5 and Table JW-  
15 6 provide summaries of the RAMP-related costs supported in my testimony.

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<sup>37</sup> 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.

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

<b>WILDFIRE MITIGATION</b>			
<b>Summary of RAMP O&amp;M Costs (In 2021 \$)</b>			
	<b>BY2021 Embedded Base Costs (000s)</b>	<b>TY2024 Estimated Total (000s)</b>	<b>TY2024 Estimated Incremental (000s)</b>
<b>RAMP Risk Chapter</b>			
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
<b>Sub-total</b>	<b>167,500</b>	<b>168,955</b>	<b>1,455</b>
<b>RAMP Cross-Functional Factor Chapter</b>			
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		
<b>Sub-total</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total RAMP O&amp;M Costs</b>	<b>167,500</b>	<b>168,955</b>	<b>1,455</b>

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\* 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).

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**TABLE JW-6**  
**Summary of RAMP Capital Costs\***

<b>WILDFIRE MITIGATION</b>				
<b>Summary of RAMP Capital Costs (In 2021 \$)</b>				
	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>2022-2024 Estimated RAMP Total (000s)</b>
<b>RAMP Risk Chapter</b>				
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
<b>Sub-total</b>	<b>443,080</b>	<b>518,973</b>	<b>514,003</b>	<b>1,476,057</b>
<b>RAMP Cross-Functional Factor (CFF) Chapter</b>				
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
<b>Sub-total</b>	<b>8,365</b>	<b>9,565</b>	<b>4,504</b>	<b>22,434</b>
<b>Total RAMP Capital Costs</b>	<b>451,445</b>	<b>528,538</b>	<b>518,507</b>	<b>1,498,491</b>

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**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.<sup>38</sup> These risks and CFFs are further described in Table JW-7 below:

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<sup>38</sup> Unless otherwise indicated, references to the 2021 RAMP Report refer to SDG&E's respective RAMP Report.

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**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.

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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.

1           **B.       GRC Risk and CFF Activities**

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

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

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

17           **C.       Changes from RAMP Report**

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

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

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

- 1 • In response to stakeholder feedback received in the RAMP Proceeding, SDG&E  
2 changed the probability distribution underlying its risk analysis from Gamma  
3 distribution to a type of Power Law distribution.
- 4 • The scope and schedule of some of the mitigations discussed in the RAMP Report  
5 have been updated within the GRC. Examples include:
  - 6 ○ Wireless Fault Indicators (See SDG&E-13-CWP Budget Code 112530)
  - 7 ○ Bare Hardening Conductor (See SDG&E-13-CWP Budget Code 202840)
  - 8 ○ Cleveland National Forest (CNF) Fire Hardening Program (See SDG&E-13-  
9 CWP Budget Code 081650)
  - 10 ○ Distribution System Inspection – Drone Inspections Program (See SDG&E-13-  
11 CWP Budget Code 202480)
  - 12 ○ Aviation Firefighting program (See SDG&E-13-CWP Budget Code 202770)
  - 13 ○ Communication Practices Program (See SDG&E-13-EOWM Workpaper  
14 1WM008)
- 15 • After the 2021 RAMP Report had been filed, SDG&E performed a detailed  
16 review of its risk mitigation programs. SDG&E determined that nine additional  
17 programs mitigate the Wildfire risk including BLM Land Management  
18 (1WM003), CNF Access Roads (1WM003), CNF Land Management (1WM003),  
19 10K Trees (1WM005), Risk Assessment & Mapping (1WM007.001), Data  
20 Governance (1WM007.002), WMP AFN Customer Support (1WM008), WMP  
21 Tribal Customer Support (1WM008), and Strategic Pole Replacement Program  
22 (Budget Code 222420). Reference the table in Appendix B for additional details.

#### 23 **IV. SUSTAINABILITY AND SAFETY CULTURE**

##### 24 **A. Sustainability Efforts**

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



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

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

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

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

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<sup>39</sup> 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](https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf).

1 carbon emissions.<sup>40</sup> The poor health and net greenhouse gas emissions of California’s forests are  
2 expected to increase through a negative feedback loop as wildfires further stress these systems.  
3 It is imperative that work is performed to break this negative feedback loop.

#### 4 **B. Safety Culture**

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

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

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

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<sup>40</sup> 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>.

<sup>41</sup> 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.<sup>42</sup> I will discuss each cost category in Table JW-8 in turn.

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

<b>WILDFIRE MITIGATION O&amp;M (In 2021 \$)</b>			
<b>Categories of Management</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
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
<b>Total Non-Shared Services O&amp;M</b>	<b>167,501</b>	<b>168,955</b>	<b>519</b>

**A. 1WM001 – Emergency Planning & Preparedness**

<sup>42</sup> 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**

<b>WILDFIRE MITIGATION (In 2021 \$)</b>			
<b>A. Emergency Planning &amp; Preparedness</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
1. Emergency Planning & Preparedness	13,315	16,236	2,921
<b>Total</b>	<b>13,315</b>	<b>16,236</b>	<b>2,921</b>

**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.

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

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

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

#### 14 **Operational Field and Emergency Readiness**

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

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

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

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

### 21 **Aviation Services**

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

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

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

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

### 17 **Training and Exercise**

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

### 28 **Emergency Management Technology Solutions**

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



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

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

18 **a. RAMP Activities**

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

22 **TABLE JW-10**  
 23 **RAMP Activity O&M Forecasts by Workpaper**  
 24 **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

25 \* An RSE was not calculated for this activity

26 **2. Forecast Method**

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



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

### 6 **3. Cost Drivers**

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

#### 10 **Human Factors Engineering**

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

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

1                   **24/7 Watch Command Desk**

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

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

19                   **Advanced Emergency Response and Business Continuity Planning**

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

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

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<sup>43</sup> Cal. Code of Regulations §29300(a), 14 CCR § 29300.

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

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

#### 14 **Training and Exercise Expansion**

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

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

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

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

8           **Emergency Management Technology Solutions Expansion**

9           As described above, for the safety of its employees, contractors, and vendors, and to meet  
10 health guidance to mitigate the spread of COVID-19, SDG&E designed and established a virtual  
11 EOC beginning in 2020 to coordinate company-wide emergency response  
12 activities. This model was pressure tested by over a dozen successful virtual EOC activations in  
13 2020 and 2021. While SDG&E believes virtual EOC activations are viable response solutions,  
14 there continues to be an immediate need to fortify it with advanced technology designed  
15 specifically for the virtual environment and technical specialists to support it. Support staff must  
16 verify that all work-from-home EOC responders experience stable and  
17 redundant connectivity, communications, and information flow to support decision-making  
18 during both foreseeable and unexpected risks and hazards. The EMTS Div. will continuously  
19 assess the gaps in the virtual environment model and integrate the equipment, processes, and  
20 methods to reliably sustain and enhance the Emergency Management’s core delivery of  
21 services.

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

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

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

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

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

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

### 3 **Introduction to the Incident Command System (ICS)**

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

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

### 21 **Incident Command System Expansion**

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

1                    **Incident Support Team**

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

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

27                    **After-Action Review Program Expansion**

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



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

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

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





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

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

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

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

25 **a. RAMP Activities**

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

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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Activity</b>	<b>2021 Embedded- Recorded</b>	<b>TY 2024 Estimated Totals</b>	<b>Change</b>	<b>GRC RSE*</b>
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.

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

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

22 Non-labor costs to install air quality sensors are included in the forecast adjustments.  
23 Particulates contained in wildfire smoke are hazardous to employees and the public. In addition,  
24 the Division of Occupational Safety and Health (Cal/OSHA) Protection from Wildfire Smoke  
25 Program (Title 8 CCR Section 5141.1) requires employers to notify employees when the Air  
26 Quality Index (AQI) for Particulate Matter 2.5 microns or smaller in diameter (PM2.5) exceeds  
27 150 or exceeds 500 during wildfires. SDG&E will install air quality sensors to measure  
28 particulate matter and an automatic notification system to meet this requirement. This program  
29 is built on the backbone of SDG&E's existing best-in-class utility weather network. Upon  
30 installation of this technology, real-time AQI values for townships in San Diego County will be  
31 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**

<b>WILDFIRE MITIGATION (In 2021 \$)</b>			
<b>C. Grid Design &amp; System Hardening</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
1. Grid Design & System Hardening	26,041	25,399	642
<b>Total</b>	<b>26,041</b>	<b>25,399</b>	<b>642</b>

**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.<sup>44</sup>

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

<sup>44</sup> 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.

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

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

13           SDG&E's Resiliency Grant Programs focus on enhancing PSPS resiliency among  
14 vulnerable customer segments in SDG&E's territory. This program consists of several projects  
15 aimed at providing customers with renewable backup power options during PSPS events. The  
16 primary initiative in this category is the Generator Grant Program (GGP), which was launched in  
17 2019. The GGP offers portable battery units with solar charging capacity to customers, leveraging  
18 cleaner, renewable generator options to give vulnerable customers a means to keep small devices  
19 and appliances charged and powered during PSPS events. While these are not whole facility  
20 solutions, they allow vulnerable customers access to needed power to support life-saving devices  
21 and means of communication.

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

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<sup>45</sup> 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.

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

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

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

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



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

10                           **a.       RAMP Activities**

11           Table JW-14 provides the RAMP activities, their respective cost forecasts, and the RSEs  
12 for this workpaper. For additional details on these RAMP activities, please refer to my  
13 workpapers SDG&E-13-WP 1WM003.  
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**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	<u>2841</u>
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

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

5 **2. Forecast Method**

6 The forecast method developed for this cost category is 2021 base year. SDG&E has  
 7 expanded its efforts in the system hardening area in recent years, executing additional units in  
 8 2021 in almost all programs. Because of this expansion, historical costs prior to 2021 are not  
 9 representative of the costs SDG&E is forecasting to incur in Test Year 2024. Accordingly, base  
 10 year is the selected forecast method.

1                                   **3.       Cost Drivers**

2                   SDG&E forecasts a number of increases in activities related to grid design and system  
3 hardening as it continues to implement its WMP and improve wildfire mitigation strategies.  
4 These efforts meet the Legislative directive of AB 1054 to increase the hardening of the  
5 California grid. SDG&E is diverting efforts from traditional bare hardening, which is less  
6 efficacious than the use of covered conductor and strategic undergrounding in preventing  
7 ignitions. As SDG&E deploys increased use of covered conductor, it plans to install 60 miles in  
8 2024, an increase of 40 miles over 2021. O&M associated costs will increase \$74,000.  
9 Additionally, to respond to the dual need to reduce wildfire risk and PSPS impacts to customers,  
10 SDG&E designed its strategic undergrounding program. Undergrounding assets is the most  
11 effective way to prevent electrical line-related ignitions and the only way to significantly reduce  
12 the need for and impacts of PSPS for customers on the undergrounded circuit. SDG&E intends  
13 to underground 125 miles of electrical infrastructure in 2024, an increase of 100 miles over 2021.  
14 SDG&E forecasts an associated O&M cost increase of \$2,831,000.

15                   As the use of covered conductor and strategic undergrounding increases, SDG&E will  
16 decrease traditional bare hardening efforts in the coming years. SDG&E forecasts a decrease of  
17 95 miles as compared to 2021, with an associated cost reduction of \$2,674,469.

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

- 19                   • Hotline clamps are forecasted to have a reduction of 2,533 units in 2024 from the  
20                   2021 values which leads to a decrease in cost of \$3,283,596. The reduction in  
21                   units is driven by the program’s completion of these replacements within the  
22                   HFTD.
- 23                   • SDG&E has identified upward cost drivers to implement Cleveland National  
24                   Forest (CNF) and Bureau of Land Management (BLM) Operations and  
25                   Maintenance Plans. The Federal Land Policy and Management Act was amended  
26                   to establish requirements for the development, approval, and implementation of  
27                   vegetation management and facility inspection for electric utilities operation on  
28                   National Forest Service and BLM lands. These requirements became effective on  
29                   August 10, 2020, and SDG&E forecasts an increase of \$4,000 and \$134,000 for  
30                   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**

<b>WILDFIRE MITIGATION (In 2021 \$)</b>			
<b>D. Asset Management &amp; Inspections</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
1. Asset Management & Inspections	36,949	15,375	-21,574
<b>Total</b>	<b>36,949</b>	<b>15,375</b>	<b>-21,574</b>

**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

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

5 **Drone Inspections and Repair (DIAR)**

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

12 **Five-Year Detailed Inspections**

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

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

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

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

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

### 8 **Patrol Inspections**

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

### 21 **10-Year Intrusive Inspections**

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

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

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

### 10 **HFTD Tier 3 Inspections**

11 SDG&E has implemented an HFTD Tier 3 Inspection program to perform Quality  
12 Assurance/Quality Control (QA/QC) inspections within the HFTD Tier 3 prior to fire season.  
13 These additional proactive inspections are scheduled on a three-year cycle, in addition to the  
14 G.O. 165 five-year detailed inspections, exceeding the requirements of G.O. 165. These  
15 additional inspections are designed to identify potential structural and mechanical problems  
16 before they fail. SDG&E has performed HFTD Tier 3 Inspections of its overhead electric  
17 distribution poles in high-risk fire areas with a focus on identifying areas where maintenance  
18 would improve fire safety and reliability, with a goal of mitigating the probability that SDG&E's  
19 overhead electric system, facilities, and equipment would be the source of ignition for a fire.  
20 Corrective actions can include O&M repairs of minor equipment, which are included in this  
21 workpaper. Capital repairs associated with pole replacements are represented in Budget Code  
22 239.

23 These inspections were conducted from 2010 through 2016 as a result of a settlement  
24 agreement adopted in D.10-04-047. In 2017, SDG&E decided to proactively continue the HFTD  
25 Tier 3 Inspections as part of its normal program. In 2018, when the CPUC adopted the current  
26 statewide fire threat map, SDG&E began applying the QA/QC three-year inspection cycle to the  
27 newly defined HFTD Tier 3. SDG&E performs HFTD Tier 3 Inspections on an average of  
28 11,000 poles annually (approximately one-third of the distribution poles in the HFTD Tier 3.

### 29 **Distribution Infrared (IR) Inspections**

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

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

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

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

### 21 **LiDAR Inspections**

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

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



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

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

9 **a. RAMP Activities**

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

13 **TABLE JW-16**  
 14 **RAMP Activity O&M Forecasts by Workpaper**  
 15 **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	-

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







- 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

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

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

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

- 18 • Fuels Treatment activity – Increased clearances around select structures (poles)  
19 that carry hardware that could possibly spark and ignite a fire. The scope of this  
20 activity entails the removal of dead or dying fine fuels at ground level within a  
21 50-foot radius of selected poles. The Fuels Treatment activity was developed to  
22 reduce the risk of ignition in high fire risk areas that could occur from equipment  
23 or pole failure or a wire-down event. This activity is also intended to protect  
24 infrastructure in the event of a wildfire that originates beyond SDG&E facilities.
- 25 • Vegetation Abatement activity – Vegetation Abatement activity was implemented  
26 to maintain SDG&E-owned parcels in a fire-safe manner as required by various  
27 municipal compliance ordinances, Fire Marshal directives, and community safety  
28 expectations. This activity is intended to reduce the fuel loading from overgrown  
29 vegetation that may propagate a fire if an ignition were to occur and consists  
30 primarily of the removal of ground level, non-native flashy fuels and the thinning  
31 of tree branches (to 6-8 feet) above ground on SDG&E-owned properties and

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

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

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

### 21 **10,000 Trees Goal**

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

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

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

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

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

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<sup>46</sup> See SDG&E 2022 WMP Update at Attachment E.

<sup>47</sup> 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](https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf).

<sup>48</sup> 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](https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf).

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

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

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<sup>49</sup> SDG&E’s Sustainability Strategy is available at [https://www.sdge.com/sites/default/files/documents/SDG%26E%20Sustainability%20Report\\_0.pdf?id=18226](https://www.sdge.com/sites/default/files/documents/SDG%26E%20Sustainability%20Report_0.pdf?id=18226).

<sup>50</sup> 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/>.



1 **a. RAMP Activities**

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

5  
6 **TABLE JW-18**  
7 **RAMP Activity O&M Forecasts by Workpaper**  
8 **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

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

10 **2. Forecast Method**

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

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

20 **3. Cost Drivers**

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



1 rates. To support these efforts, SDG&E is also increasing internal resources, including a Fuels  
 2 Management Lead Forester.<sup>51</sup>

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

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

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

14 **TABLE JW-19**  
 15 **Tree Trimming O&M Costs**

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

16  
 17 **1. Description of Costs and Underlying Activities**

18 **a. SDG&E’s Vegetation Management Program**

19 SDG&E maintains a tree inventory database containing records for approximately  
 20 460,000 specific trees located near its electric power lines. This database and work management  
 21 system are referred to collectively as Powerworkz, which includes an Esri-based electronic  
 22 mapping mobile application, and a server-based workflow tool. Inventory trees are defined as  
 23 those with the potential of impacting the power lines by encroachment and/or tree failure within  
 24 three years of the inspection date. All trees in the database are monitored using known species  
 25 growth rates, with additional consideration of precipitation and past pruning practices. Each

<sup>51</sup> See Workpaper 1WM005.001 for details.

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

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

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

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

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

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

13 SDG&E has historically utilized a contracted workforce to perform its vegetation  
14 management program activities of tree pre-inspection, tree trimming, pole brushing, and quality  
15 assurance. The rapid increase in demand for vegetation work throughout the state in 2019 and  
16 2020 resulted in labor constraints and general concerns regarding the demand and availability of  
17 vegetation management contractors. In 2019 SDG&E began using subcontractors to augment its  
18 prime tree trim contract crews to address the increase in hazard tree work and the need to  
19 maintain schedule. SDG&E anticipates the possible future need to increase its contracted tree  
20 workforce and/or utilize outside tree crews to meet the high demand while at the same time  
21 maintaining safety compliance, and reliability.

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

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

3 **b. Enhanced Vegetation Management**

4 SDG&E introduced its Enhanced Vegetation Management (EVM) Program as an  
5 additional wildfire mitigation tool in the 2019 WMP. Within the HFTD, SDG&E’s EVM  
6 Program includes activities beyond those required by applicable General Orders and regulations  
7 by including additional tree inspections and enhanced post pruning clearances annually. The  
8 enhanced tree inspection activity is a second, incremental assessment of all trees located within  
9 the HFTD. The enhanced inspections are performed by ISA Certified Arborists and include a  
10 360-degree assessment of every tree within the “strike zone” of the power lines. The strike zone  
11 includes the area adjacent to power lines both inside and outside the rights-of-way with trees that  
12 are tall enough to potentially strike the overhead facilities. Work identified during the enhanced  
13 inspections is scheduled for completion prior to the start of the peak Santa Ana fire season  
14 (September 1).

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

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

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<sup>52</sup> See SDG&E 2022 WMP Update at Attachment E.

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

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

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

18 **c. RAMP Activities**

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

22 **TABLE JW-20**  
 23 **RAMP Activity O&M Forecasts by Workpaper**  
 24 **In 2021 Dollars (\$000)**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Activity</b>	<b>2021 Embedded-Recorded</b>	<b>TY 2024 Estimated Totals</b>	<b>Change</b>	<b>GRC RSE</b>
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
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\*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**

<b>WILDFIRE MITIGATION (In 2021 \$)</b>			
<b>G. Grid Operations &amp; Operating Protocols</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
1. Grid Operations & Operating Protocols	10,079	14,769	4,690
<b>Total</b>	<b>10,079</b>	<b>14,769</b>	<b>4,690</b>

1                   **1.       Description of Costs and Underlying Activities**

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

9                   **Aviation Firefighting Program**

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

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

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



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

3 **Wildfire Infrastructure Protection Teams**

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

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

20 **a. RAMP Activities**

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

24 **TABLE JW-22**  
 25 **RAMP Activity O&M Forecasts by Workpaper**  
 26 **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	-



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

2 **2. Forecast Method**

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

8 **3. Cost Drivers**

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

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



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

7 **a. RAMP Activities**

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

11 **TABLE JW-24**  
 12 **RAMP Activity O&M Forecasts by Workpaper**  
 13 **In 2021 Dollars (\$000)**  
 14

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

15 \* An RSE was not calculated for this activity

16 **2. Forecast Method**

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

22 **3. Cost Drivers**

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

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

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

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

22 The new PSPS department will be created to address the increasing focus on PSPS. This  
23 department will take the lead on the creation of the additional reporting around PSPS including  
24 the pre-season and post-season PSPS reports, while taking over the existing post-event reports.  
25 The PSPS department will also help to inform PSPS preparation so that SDG&E meets the  
26 applicable requirements and best practices for notifications, data gathering, and operations. The  
27 new department will also inform and track the various mitigation efforts that reduce the impact  
28 of PSPS to customers. The department will be led by a Director of PSPS. Reporting to the  
29 Director will be the managers of PSPS Compliance, PSPS Strategy, and PSPS Programs. Each  
30 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**

<b>WILDFIRE MITIGATION (In 2021 \$)</b>			
<b>I. Risk Assessment &amp; Mapping</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
1. Risk Assessment & Mapping	608	2,413	1,805
<b>Total</b>	<b>608</b>	<b>2,413</b>	<b>1,805</b>

**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

1 identify optimal solutions that target risk reduction of both elements across the system. Working  
2 with Technosylva and others, SDG&E is implementing innovative approaches to leverage these  
3 models for the evaluation of hardening projects and for the safe operation of the system.

4 Proposed grid hardening projects and emergency actions are also evaluated and prioritized from  
5 the standpoint of reducing or eliminating fire risk potential from overhead electric facilities and  
6 reducing the impact of PSPS on customers.

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

- 9 1. The WRRM model was developed in collaboration with fire behavior experts and  
10 leverages 30 years of high-resolution weather data to establish climate scenarios and  
11 failure rates of SDG&E's assets, establishing risk maps showing the overall ignition  
12 probability and estimated wildfire consequence along electric lines and equipment.

13 This model was further enhanced into an operational system, WRRM-Ops, by  
14 developing a fully-automated process to ingest daily weather and fuel moisture data  
15 and to re-calculate risk levels to support emergency operations.

16 SMEs, including fire coordinators and fire scientists, analyze the model's  
17 performance for all wildfires on the landscape, identifying deviations from the risk  
18 and propagation modeling. These findings drive future development of the model  
19 and will result in more specific quantifiable outcomes, allowing for better decision  
20 making in the overall hardening effort.

- 21 2. The WiNGS-Planning model was developed to aid with the allocation of grid  
22 hardening initiatives across HFTD segments based on an assessment of both wildfire  
23 risk and PSPS impacts. WiNGS-Planning is built upon the MAVF framework in  
24 RAMP and evaluates both wildfire and PSPS impacts at the sub-circuit/segment level.  
25 Information is used to inform investment decisions by determining and prioritizing  
26 mitigation based on RSEs, improving wildfire safety, and limiting the impact of PSPS  
27 on customers.

- 28 3. Additionally, WiNGS-Ops model, a real-time risk assessment model, helps quantify  
29 the wildfire risk and PSPS risk in real-time as a function of wind and provides a range  
30 of wind gusts where the fire risk is likely greater than the PSPS risk based on a wind

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

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

14 **a. RAMP Activities**

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

18 **TABLE JW-26**  
 19 **RAMP Activity O&M Forecasts by Workpaper**  
 20 **In 2021 Dollars (\$000)**

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

21 \* An RSE was not calculated for this activity

22 **2. Forecast Method**

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



1                                   **3.       Cost Drivers**

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

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

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

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

26



1           **J.       1WM007.002 – Data Governance**

2                                   **TABLE JW-27**  
3                                   **Data Governance O&M Costs**

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

4  
5                                   **1.       Description**

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

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

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

24                                   **a.       RAMP Activities**

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

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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Activity</b>	<b>2021 Embedded- Recorded</b>	<b>TY 2024 Estimated Totals</b>	<b>Change</b>	<b>GRC RSE*</b>
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**

<b>WILDFIRE MITIGATION (In 2021 \$)</b>			
<b>K. Stakeholder Cooperation &amp; Community Engagement</b>	<b>2021 Adjusted-Recorded (000s)</b>	<b>TY2024 Estimated (000s)</b>	<b>Change (000s)</b>
1. Stakeholder Cooperation & Community Engagement	10,985	11,565	580
<b>Total</b>	<b>10,985</b>	<b>11,565</b>	<b>580</b>

**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

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

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

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

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

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

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

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

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

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

#### 16 **Non-Conductive Balloon Alternatives**

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

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

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

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

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

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

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

23 **a. RAMP Activities**

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



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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Activity</b>	<b>2021 Embedded-Recorded</b>	<b>TY 2024 Estimated Totals</b>	<b>Change</b>	<b>GRC RSE*</b>
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



1 emerging PSPS, wildfire mitigation and emergency response regulations, with regulatory activity  
2 in those areas increasing over 280% since 2019. The impact to the business of this position not  
3 being filled makes SDG&E vulnerable to falling out of compliance, incurring penalties, and  
4 suffering reputational damage.

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

16 In 2021, SDG&E added a Tribal Relations Manager to provide dedicated and proactive  
17 engagement, education, and outreach for the tribal communities SDG&E serves. There are 18  
18 federally recognized tribal governments within SDG&E's service territory, all of which are  
19 located within high fire threat districts. The Tribal Relations Manager supports these tribal  
20 communities through listening sessions, providing information on SDG&E fire hardening efforts,  
21 programs, offerings and CPUC requirements, and by resolving inquiries and  
22 concerns. California, the CPUC and SDG&E have all increased focus on providing deeper  
23 engagement with tribal communities within the last few years. There have been a number of  
24 recent regulatory directives issued by the CPUC for SDG&E to increase engagement with tribal  
25 communities, including, but not limited to, directives in the de-energization Order Instituting  
26 Rulemaking (OIR), broadband OIR, microgrid OIR, tribal policy OIR, and low-income  
27 proceeding. In 2019, Governor Newsom passed two policies, a Tribal Consultation Policy and a  
28 Tribal Land Transfer Policy, in support of tribes. In 2020, Governor Newsom appointed the  
29 CPUC's Tribal Advisor to serve as its main point of contact with the Native American Tribes in  
30 California. This growing focus and policies may necessitate additional contractor support to  
31 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**

<b>WILDFIRE MITIGATION CAPITAL (In 2021 \$)</b>				
<b>Categories of Management</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022 (000s)</b>	<b>Estimated 2023 (000s)</b>	<b>Estimated 2024 (000s)</b>
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
<b>Total</b>	<b>381,854</b>	<b>451,455</b>	<b>528,538</b>	<b>518,507</b>

**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 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**

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

**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

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

3 Further refinement of fire modeling technologies, geospatial data, and computer  
4 capabilities allowed WRRM to evolve into WRRM-Ops, a tool with more granular fire weather  
5 forecasting instead of a single aggregated simulation model. WRRM-Ops was developed using  
6 30 years of historical weather data. The purpose of the WRRM-Ops model is to leverage the  
7 latest fire science available to help anticipate, prepare for, react to, and recover from wildfire  
8 activity during emergency operations, including PSPS. The model uses the latest available fuels  
9 and weather information to model wildfire consequence, anticipate where risk is highest across  
10 the service territory, and predict how a wildfire may grow and impact the community once  
11 ignited.

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

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

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

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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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.

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

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

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

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

28           Finally, SDG&E will continue its partnership with Technosylva to enhance fire behavior  
29 modeling and Wildfire Risk modeling. This will be accomplished through data analytics  
30 enhancements, software enhancements, and integration with SDG&E modeling such as WiNGS  
31 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>B. Situational Awareness and Forecasting</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022(000s)</b>	<b>Estimated 2023(000s)</b>	<b>Estimated 2024(000s)</b>
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
<b>Total</b>	<b>1,550</b>	<b>7,803</b>	<b>800</b>	<b>1,864</b>

**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



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

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

12 **TABLE JW-35**  
 13 **RAMP Activity Capital Forecasts by Workpaper**  
 14 **In 2021 Dollars (\$000s)**

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

15 \* An RSE was not calculated for this capital activity

16 **b. Forecast Method**

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

21 **c. Cost Drivers**

22 SDG&E’s weather network was originally developed and deployed in 2009. Some  
 23 weather stations are now reaching end of life. Improvements to the network of weather station  
 24 are necessary to maintain continued operations of critical fire weather infrastructure.

25 Additionally, SDG&E is integrating multi-spectral cameras, fuel moisture sensors, and Air

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

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

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

## 18 **2. 112530 – Wireless Fault Indicators**

### 19 **a. Description**

20 Wireless Fault Indicators (WFIS) are used to monitor overhead and underground lines  
21 and locate faults more efficiently and accurately. SDG&E plans to build and place in service  
22 1,300 WFIs in HFTD Tiers 2 and 3 by the end of the Test Year. The forecast for Wireless Fault  
23 Indicators for 2022, 2023, and 2024 are \$666,000, \$0, and \$1,064,000, respectively.

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

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

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

11 **TABLE JW-36**  
 12 **RAMP Activity Capital Forecasts by Workpaper**  
 13 **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

14  
 15 **b. Forecast Method**

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

21 **c. Cost Drivers**

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

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

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

### 9 **3. 208770 – Circuit Risk Index**

#### 10 **a. Description**

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

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

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

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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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.

1                                   **4.      202400 – Meteorology Super Computer Replacements**

2                                   **a.      Description**

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

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

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

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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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



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

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

12 **C. Grid Design and System Hardening**

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

19 **TABLE JW-39**  
 20 **Capital Expenditures Summary of Costs**

<b>C. Grid Design and System Hardening</b>	<b>2021 Adjusted- Recorded</b>	<b>Estimated 2022(000s)</b>	<b>Estimated 2023(000s)</b>	<b>Estimated 2024(000s)</b>
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
<b>Total</b>	<b>312,290</b>	<b>343,110</b>	<b>405,162</b>	<b>471,146</b>

1                   **1.     202580 – HFTD SCADA Capacitor Replacement**

2                   **a.     Description**

3                   The SCADA Capacitor Replacement program will remove and/or replace existing non-  
4 SCADA capacitors with more modern SCADA switchable capacitors and remove the non-  
5 SCADA devices. The forecast for HFTD SCADA Capacitor Replacement for 2022, 2023, and  
6 2024 are \$2,010,000, \$1,378,000, and \$1,427,000, respectively. SDG&E plans to build and  
7 place in service 83 SCADA capacitors by the Test Year.

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

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

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

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

7 **TABLE JW-40**  
 8 **RAMP Activity Capital Forecasts by Workpaper**  
 9 **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	<del>2,623</del> 1,546

10 **b. Forecast Method**

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

16 **c. Cost Drivers**

17 The underlying cost drivers for this capital project relate to construction labor rates,  
 18 material costs, and contract pricing/quotes. The costs will scale depending on the number of  
 19 SCADA Capacitors to be replaced each year. SDG&E has forecasted replacement of 36, 23, and  
 20 24 SCADA Capacitors in 2022, 2023, and 2024, respectively. An overall reduction of 11  
 21 SCADA Capacitors from Base Year 2021 results in a reduction of \$518,000 in Test Year 2024.  
 22 Documentation of these cost drivers are included as supplemental capital workpapers. See  
 23 SDG&E-13-CWP, budget code 202580.

1                   **2.     202850 – Overhead System Covered Conductor**

2                   **a.     Description**

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

8                   SDG&E operates and maintains nearly 3,500 miles of overhead distribution circuit miles  
9 within the HFTD. This infrastructure was originally designed to meet GO 95 requirements of an  
10 8 pounds-per-square-foot (psf) or 55 mph transverse wind load for elevations below 3,000 ft and  
11 6 psf or 48 mph transverse wind load with a half inch of radial ice on conductor for elevations  
12 above 3,000 feet. With the effects of climate change and changing conditions in the service  
13 territory, wind speeds can reach 85 mph to 111 mph in certain areas of the HFTD during extreme  
14 Santa Ana conditions. Aging infrastructure, combined with these extreme weather conditions,  
15 can increase the possibility of equipment failure on these lines. Further, high winds and outdated  
16 design techniques make these lines more vulnerable to foreign object in line contacts, both risk  
17 events that could lead to ignitions.

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

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

1 circuit segments that have covered conductor installed, an improvement over the approximate  
2 45% reduction in risk events and ignitions SDG&E has seen with its traditional hardening  
3 installations.<sup>53</sup>

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

17 Covered conductor acts as a tool to cost effectively mitigate the risk of ignition from  
18 object-line contact and increase wind speed thresholds when compared to bare conductor. For  
19 this reason, SDG&E has shifted its efforts to increase the use of covered conductor beginning in  
20 2021. SDG&E projects deploying 60 miles of covered conductor in 2022, 2023, and 2024.

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

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<sup>53</sup> For additional information regarding covered conductor effectiveness, see Appendix C.

<sup>54</sup> SDG&E 2022 WMP Update, Attachment H at 37-38.

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

5 **TABLE JW-41**  
 6 **RAMP Activity Capital Forecasts by Workpaper**  
 7 **In 2021 Dollars (\$000s)**

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

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

9 **b. Forecast Method**

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

15 **c. Cost Drivers**

16 The underlying cost drivers for this capital project relate to the circuit miles of work  
 17 being performed to design and install covered conductor. To efficiently maximize risk reduction,  
 18 SDG&E is increasing the amount of covered conductor being installed per year. An increase of  
 19 40 miles of covered conductor installation over Base Year 2021 results in an associated cost  
 20 increase of \$20,485,000. Installing covered conductor provides a safer, more reliable system  
 21 aimed both at reducing ignitions and PSPS impacts, which benefits the public and SDG&E alike.  
 22 Documentation of these cost drivers are included as supplemental capital workpapers. *See*  
 23 SDG&E-13-CWP, budget code 202850.

1                   **3.     198730 – WMP Private LTE**

2                   **a.     Description**

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

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

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

- 24                  • Enable Falling Conductor Protection and other Advanced Protection initiatives.
- 25                  • Allow for reliable communication with sectionalizing devices utilized during  
26                  PSPS events.
- 27                  • Provide enhanced cybersecurity capabilities.
- 28                  • Reduce cybersecurity risk.
- 29                  • Apply enhanced failover and redundancy capabilities and yield high availability  
30                  and reliability.
- 31                  • 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)**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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

1 2024, and an associated cost increase of \$20,364,000. The Spectrum License costs are expected  
2 to occur only in 2022 and 2023 and do not contribute to the Test Year 2024 forecast.  
3 Documentation of these cost drivers are included as supplemental capital workpapers. *See*  
4 SDG&E-13-CWP, budget code 198730.

5 **4. 191340 – HFTD Transmission Fiber Optics**

6 **a. Description**

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

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

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

24 The HFTD Trans Fiber Link Infrastructure project mitigates safety risks identified in the  
25 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.  
26 Table JW-43 below shows the TY 2024 forecast dollars and RSE associated with the activities in  
27 the 2021 RAMP Report.

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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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.

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

16 SDG&E's Distribution Overhead System Hardening program combines SDG&E's  
17 overhead hardening programs, formerly known as Fire Risk Mitigation (FiRM), Pole Risk  
18 Mitigation Engineering (PRiME), and Wire Safety Enhancement (WiSE) into one program. The  
19 consolidation of these hardening programs involves a strategy evolution compared to SDG&E's  
20 2019 GRC and is consistent with SDG&E's 2022 WMP Update.<sup>55</sup> It will result in the execution  
21 of projects based on a circuit-by-circuit approach that weighs risk inputs alongside the need to  
22 reduce PSPS impacts, rather than scoping projects based on specific wire or at-risk poles.  
23 Ultimately combining overhead distribution hardening programs into one program has made the  
24 engineering, design, construction, and management of the projects more efficient and has  
25 minimized impacts to customers during job walks, construction, and post-construction close-out  
26 activities.

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

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<sup>55</sup> 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)**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
202840.001	SDG&E-Risk-1 - C17/M12 T1	OH Dist Fire Hardening – Bare Conductor	16,311	5,479	5,479	<u>2841</u>

\*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.

1                   **6.     192420 – HFTD Expulsion Fuse Replacement**

2                   **a.     Description**

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

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

15                  The HFTD Expulsion Fuse Replacement project mitigates safety risks identified in the  
16 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.  
17 Table JW-45 below shows the TY 2024 forecast dollars and RSE associated with the activities in  
18 the 2021 RAMP Report.

19   **TABLE JW-45**  
20   **RAMP Activity Capital Forecasts by Workpaper**  
21   **In 2021 Dollars (\$000s)**

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

22 \* An RSE was not calculated for this activity

23                   **b.     Forecast Method**

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

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

4 **c. Cost Drivers**

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

11 **7. 152590 – Advanced Protection**

12 **a. Description**

13 The Advanced Protection Program (APP) develops and implements advanced protection  
14 technologies within electric substations and on the electric distribution system. It aims to  
15 prevent and mitigate the risks of fire incidents, provide better distribution sectionalization, create  
16 higher visibility and situational awareness in fire-prone areas, and allow for the implementation  
17 of new relay standards in locations where protection coordination is difficult due to lower fault  
18 currents attributed to high impedance faults. The APP forecast for 2022, 2023, and 2024 are  
19 \$12,783,000, \$11,562,000, and \$5,540,000, respectively. SDG&E plans to build and place in  
20 service advanced protection on 38 circuits by the Test Year.

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

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



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

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

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

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

26 The APP has a goal of completing all 2876 HFTD Tier 3 circuits by 2026. Improvements  
27 to APP technology include expanding FCP to include two-phase and single-phase distribution  
28 circuits, further extending branch circuit protection for improved reliability. The program will  
29 also begin migrating new FCP communication designs to leverage the Company's private LTE  
30 communication initiative to improve wireless network coverage, increase path resiliency and  
31 optimize deployment cost.

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

5 **TABLE JW-46**  
 6 **RAMP Activity Capital Forecasts by Workpaper**  
 7 **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	<u>564832</u>

8 **b. Forecast Method**

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

15 **c. Cost Drivers**

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

1                   **8.     202820 – Lightning Arrestor Replacement Program**

2                   **a.     Description**

3                   This budget code contains the work of two projects that are often bundled together for  
4 efficiency into program: lightning arrestor replacements and avian protection. The forecast for  
5 budget code 202820 for 2022, 2023, and 2024 is \$4,213,000, \$3,603,000, and \$3,557,000,  
6 respectively. SDG&E plans to build and place in service 5,544 lightning arrestors and protect  
7 1,101 poles with avian protection equipment by the Test Year.

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

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

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

30                  The Lightning Arrestor Replacement program mitigates safety risks identified in the  
31 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.

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

3 **TABLE JW-47**  
 4 **RAMP Activity Capital Forecasts by Workpaper**  
 5 **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	-

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

7 **b. Forecast Method**

8 The forecast method used is zero-based. This budget code has minimal historical costs  
 9 prior to 2021. The historical costs do not contain the avian protection work as this work was  
 10 previously recorded to another budget code. The forecast is based on cost estimates that were  
 11 developed based on the specific scope of work for the project. Cost estimates are based on  
 12 current construction labor rates, material costs, contract pricing/quotes, and other project-specific  
 13 details. The forecast is based on the number of lightning arrestors being replaced and number of  
 14 avian protection installations being completed each year, and this work has been scoped through  
 15 2024.

16 **c. Cost Drivers**

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

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

4 **9. 192490 – WMP Microgrids**

5 **a. Description**

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

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

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

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

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

- 3 • *Butterfield*: a solar and battery storage yard to enable the local critical  
4 infrastructure to stay energized during PSPS events. Communications equipment  
5 installations are included in the site scope allowing for enhanced network and line  
6 monitoring. The microgrid will be powered by 2,100 kW of solar generation and  
7 a 4,800 kWh Battery Energy Storage System designed to support 119 residential  
8 customers.
- 9 • *Shelter Valley*: a solar and battery storage yard to enable the local critical  
10 infrastructure to stay energized during PSPS events. Communications equipment  
11 installations are included in the site scope allowing for enhanced network and line  
12 monitoring. The microgrid will be powered by 2,100 kW of solar generation and a  
13 4,800 kWh Battery Energy Storage System designed to support 218 residential  
14 customers and critical customers (San Diego Country Fire Station and  
15 Community Center).
- 16 • *Off-Grid Solutions*: enables the temporary islanding of critical infrastructure to  
17 stay energized during PSPS events. The systems may consist of energy storage  
18 and other distributed generation. Approximate sizing of these systems will be  
19 determined by the load it is serving.

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

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

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE</b>
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.



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

7 **10. 141400 – Overhead Transmission Fire Hardening (Distribution**  
8 **Underbuild)**

9 **a. Description**

10 The forecast for Overhead Transmission Fire Hardening (Distribution Underbuild) for  
11 2022, 2023, and 2024 is \$4,729,000, \$8,635,000, and \$14,464,000, respectively. SDG&E plans  
12 to build and place in service 25.4 miles of Distribution Underbuild by the Test Year.

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

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

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<sup>56</sup> 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)**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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.

1 **11. 192450 – PSPS Sectionalizing Enhancements**

2 **a. Description**

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

11 The forecast for PSPS Sectionalizing Enhancements for 2022, 2023, and 2024 is  
12 \$1,567,000, \$1,567,000, and \$1,567,000, respectively. SDG&E plans to build and place in  
13 service 30 new PSPS sectionalizing devices by the Test Year. These forecasted capital  
14 expenditures will increase reliability and enhance service. Adding sectionalizing enhancements  
15 will minimize service interruptions resulting from PSPS events caused by adverse fire weather  
16 conditions, minimize the number of customers affected by PSPS events, decrease required patrol  
17 times, and ultimately restore service faster.

18 The PSPS Sectionalizing Enhancements project mitigates safety risks identified in the  
19 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.  
20 Table JW-50 below shows the TY 2024 forecast dollars and RSE associated with the activities in  
21 the 2021 RAMP Report.

22 **TABLE JW-50**  
23 **RAMP Activity Capital Forecasts by Workpaper**  
24 **In 2021 Dollars (\$000s)**

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

1                                   **b.      Forecast Method**

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

6                                   **c.      Cost Drivers**

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

11                  By continuing to add sectionalizing devices within the HFTD, SDG&E is able to reduce  
12 the number of impacted customers based on past weather events, and improve the restoration  
13 times for the smaller circuit segments that will still be impacted. SDG&E utilizes lessons  
14 learned from historical PSPS events to identify and prioritize locations for switches. This  
15 typically means installing switches in the HFTD, and SDG&E has made significant progress in  
16 this area. But as recent weather patterns have become more extreme and widespread, as  
17 experienced in October 2019 and December 2020, SDG&E is utilizing the lessons learned from  
18 those events to place switches with the goal of limiting PSPS exposure in future years, which  
19 includes locations in the HFTD and the wildland urban interface. Documentation of these cost  
20 drivers are included as supplemental capital workpapers. *See* SDG&E-13-CWP, budget code  
21 192450.001.

22                                   **12.     081650 – CNF Fire Hardening**

23                                   **a.      Description**

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

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

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

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

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

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

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

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**TABLE JW-51**  
**RAMP Activity Capital Forecasts by Workpaper**

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

3 \* An RSE was not calculated for this activity

4 **b. Forecast Method**

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

9 **c. Cost Drivers**

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

18 **13. 192460 – Strategic Undergrounding**

19 **a. Description**

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

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

3         These forecasted capital expenditures support the company’s goals of reducing the risk of  
4 wildfire and the impacts of PSPS. The forecast for Strategic Undergrounding for 2022, 2023, and  
5 2024 is \$125,981,000, \$191,143,000, and \$292,062,000, respectively. SDG&E plans to build  
6 and place in service 270 miles of underground infrastructure in the SDG&E HFTD area.

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

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

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



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

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

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

16 **TABLE JW-52**  
 17 **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	-

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

19 **b. Forecast Method**

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

1 **c. Cost Drivers**

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

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

17 SDG&E expects to complete the installation of 125 miles of strategic undergrounding in  
18 2024, an increase of 99 miles over 2021. SDG&E forecasts an associated cost increase of  
19 \$222,524,000. Documentation of these cost drivers are included as supplemental capital  
20 workpapers. *See* SDG&E-13-CWP, budget code 192460.001.

21 **14. 222420 – High Risk Pole Replacement Program HFTD**

22 **a. Description**

23 The forecast for High Risk Pole Replacement Program HFTD for 2022, 2023, and 2024  
24 are \$0, \$1,620,000, and \$6,348,000, respectively. The purpose of this project is to target high-  
25 risk poles located throughout SDG&E service territory for replacement. This will continue  
26 SDG&E's efforts in hardening the system within the HFTD. Examples of poles this program  
27 will focus on will include but not be limited to, gas-treated poles (may be known as Cellon  
28 treatment), steel reinforced and poles that are set in concrete. These identified poles are also  
29 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**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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

1 **b. Forecast Method**

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

7 **c. Cost Drivers**

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

14 **D. Asset Management and Inspections**

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

21 **TABLE JW-54**  
22 **Capital Expenditures Summary of Costs**

<b>D. Asset Management and Inspections</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022(000s)</b>	<b>Estimated 2023(000s)</b>	<b>Estimated 2024(000s)</b>
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
<b>Total</b>	<b>26,181</b>	<b>45,152</b>	<b>66,130</b>	<b>17,423</b>



1  
2

**TABLE JW-55**  
**RAMP Activity Capital Forecasts by Workpaper**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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	-

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

4 **b. Forecast Method**

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

11 **c. Cost Drivers**

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

1                   **2.     201270 – Corrective Maintenance Program Tier 2 & 3**

2                   **a.     Description**

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

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

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

17   **TABLE JW-56**  
18   **RAMP Activity Capital Forecasts by Workpaper**

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

19 \* An RSE was not calculated for this activity

20                   **b.     Forecast Method**

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

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<sup>57</sup> Costs related to transmission infrastructure are subject to FERC jurisdiction.



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

3 **c. Cost Drivers**

4 The project is needed to mitigate the risk of aging and/or damaged poles that are at an  
5 increased risk of failure which may cause an ignition. The underlying cost drivers for this capital  
6 project relate to the quantity of wooden poles replaced with steel poles each year in HFTD (Tier  
7 2 and Tier 3) areas. The costs fluctuate slightly as SDG&E expects to replace 28 poles in 2022,  
8 38 poles in 2023, and 33 poles in 2024. SDG&E forecasts an associated cost increase in 2024 of  
9 \$74,000 over 2021.

10 **3. 202480 – Drone Investigation Assessment and Repair**

11 **a. Description**

12 Inspecting electrical infrastructure to identify potential deficiencies, aging components,  
13 or defects is critical to preventing potential risk events. To better identify these conditions,  
14 SDG&E explored the use of drones to inspect infrastructure difficult to observe using traditional  
15 inspection methods. The forecast for Drone Investigation Assessment and Repair (DIAR) for  
16 2022, 2023, and 2024 is \$33,445,000, \$55,320,000, and \$6,981,000, respectively.

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

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

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<sup>58</sup> 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

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

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

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

25 For the intelligent image processing effort, SDG&E prioritized the types of models it  
26 developed to focus on the highest risk items and highest frequency issues. As SDG&E gained  
27 experience through the pilot program, efficiencies in flight planning, customer outreach, and  
28 image collection and review were gained over the approximate 15-month schedule for  
29 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**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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,

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

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

11 Reducing the number of images taken will allow the field teams to complete flights on  
12 more poles per day and decrease the time it takes the QEW to review all images and perform the  
13 assessment. This will ultimately reduce the cost to perform the flights and assessments on a per  
14 pole basis. SDG&E based this change on an analysis of which images were used by the  
15 assessment team were most effective in identifying issues. The results indicated that more than  
16 65% of the issues were identified using the level 2 image, which is taken from an angle above  
17 the pole and at a close distance from the pole. While only approximately 13% of issues were  
18 identified using the level 1 image, this photograph was useful in executing the repair and  
19 providing context to the assessment team when performing their reviews. Thus, SDG&E will be  
20 eliminating the level 3 image capture, which is taken below the crossarm and presents the highest  
21 risk of collision when flying the drone. While this image offers additional angles and views of  
22 hardware and connections, it represents what can generally be seen from the ground.

23 Next, the drone teams consisted of a two-person crew with a drone pilot and the visual  
24 observer, both of which were not QEWs. By pairing the drone pilot with a QEW, SDG&E can  
25 achieve more efficiencies and promote cost savings by reducing manpower and the benefit of  
26 having a trained and qualified individual to observe the pole in the field. This change will help  
27 better determine the advantages and disadvantages between ground-based and drone-based  
28 inspections and better inform decisions about how to incorporate drone technology into its  
29 inspection programs in the future. Finally, SDG&E will continue to enhance the intelligent  
30 image processing models to reduce future costs associated with inspections and provide the  
31 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**

<b>E. Grid Operations and Protocols</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022(000s)</b>	<b>Estimated 2023(000s)</b>	<b>Estimated 2024(000s)</b>
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
<b>Total</b>	<b>13,460</b>	<b>14,749</b>	<b>9,185</b>	<b>8,100</b>

**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

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

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

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

21 **TABLE JW-59**  
 22 **RAMP Activity Capital Forecasts by Workpaper**

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

23 \* Tranche level RSEs and additional details are available in SDG&E-13-CWP 202770  
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1                                   **b.      Forecast Method**

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

7                                   **c.      Cost Drivers**

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

11                   **Aviation Training Center**

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

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

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



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

### 6 **Unmanned Aerial System Program Expansion**

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

### 20 **Aerial Firefighting Assets**

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

27 Over the last decade, SDG&E has heavily invested in hardening its infrastructure to  
28 reduce utility-related wildfire risk. Wildfire Mitigation Plan construction projects have increased  
29 construction load requirements, which call for additional lift capacity. To meet this growing  
30 need, SDG&E proposes to acquire the twin-engine Sikorsky S-70M Firehawk. This heavy-lift  
31 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**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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

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

4 **c. Cost Drivers**

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

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

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

21 **3. 212560 – Twin Engine Medium Lift Helicopter**

22 **a. Description**

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

25 The Twin Engine Medium Lift Helicopter project mitigates safety risks identified in the  
26 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.  
27 Table JW-61 below shows the TY 2024 forecast dollars and RSE associated with the activities in  
28 the 2021 RAMP Report.

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**TABLE JW-61**  
**RAMP Activity Capital Forecasts by Workpaper**

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

3 \* An RSE was not calculated for this activity

4 **b. Forecast Method**

5 The forecast method used is zero-based. This budget code has no historical costs prior to  
6 2021. The costs in 2022 are specific to the purchase of the helicopter and are forecasted  
7 separately from historical costs. The forecast is based on cost estimates that were developed  
8 based on the specific scope of work for the project. Cost estimates are based on current  
9 construction labor rates, material costs, contract pricing/quotes, and other project-specific details.

10 **c. Cost Drivers**

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

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

18 Over the last decade, SDG&E has heavily invested in hardening its infrastructure to  
19 reduce utility-related wildfire risk. Wildfire Mitigation Plan construction projects have increased  
20 construction load requirements. The purchase this Bell 412 EPX standard category medium-lift  
21 utility helicopter will meet the increasing need for construction loads in the HFTD. For example,  
22 the lift capacity of the Bell 412 EPX is about 6,000 lbs. The new, larger poles SDG&E utilizes is  
23 beyond the lift capacity of SDG&E’s H145 helicopter (approximately 2,000 lbs). The Bell 412  
24 EPX is also equipped with a 750 gallon “Bambi Bucket” to conduct secondary missions for  
25 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**

<b>F. Data Governance</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022(000s)</b>	<b>Estimated 2023(000s)</b>	<b>Estimated 2024(000s)</b>
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
<b>Total</b>	<b>19,983</b>	<b>24,255</b>	<b>17,566</b>	<b>11,685</b>

**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**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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

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

## 6 **2. 218840 – WMP Advanced Analytics**

### 7 **a. Description**

8 The forecast for WMP Advanced Analytics for 2022, 2023, and 2024 are \$6,068,000,  
9 \$3,995,000, and \$3,994,000, respectively.

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

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

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

**TABLE JW-64**  
**RAMP Activity Capital Forecasts by Workpaper**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
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.



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

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

9 **TABLE JW-65**  
 10 **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

11 \* An RSE was not calculated for this activity

12 **b. Forecast Method**

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

17 **c. Cost Drivers**

18 This capital project enables an improved method to prioritize and optimize asset  
 19 investments to improve asset reliability and integrity in support of wildfire safety and safety of  
 20 the public. Cost drivers include procuring a new Asset Investment Planning application and  
 21 assembling a project team to implement the solution for SDG&E business units. SDG&E  
 22 researched various best of breed asset investment planning application and selected Copperleaf  
 23 Technologies Asset Prioritization and Optimization application particularly since it is the  
 24 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**

<b>G. Emergency Planning and Preparedness</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022(000s)</b>	<b>Estimated 2023(000s)</b>	<b>Estimated 2024(000s)</b>
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
<b>Total</b>	<b>1,929</b>	<b>7,302</b>	<b>23,914</b>	<b>2,496</b>

**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

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

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

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

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

17 The Emergency Management Operations project mitigates safety risks identified in the  
 18 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.  
 19 Table JW-67 below shows the TY 2024 forecast dollars and RSE associated with the activities in  
 20 the 2021 RAMP Report.

21 **TABLE JW-67**  
 22 **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

23 \* An RSE was not calculated for this activity

1                                   **b.      Forecast Method**

2                   The forecast method used is zero-based. This budget code has minimal costs prior to  
3 2020. The forecast is based on cost estimates that were developed based on the specific scope of  
4 work for the project. Cost estimates are based on current construction labor rates, material costs,  
5 contract pricing/quotes, and other project-specific details.

6                                   **c.      Cost Drivers**

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

19                                   **2.      218820 – Digital Fortress**

20                                   **a.      Description**

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

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

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

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

11 **TABLE JW-68**  
 12 **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

13 \* An RSE was not calculated for this activity

14 **b. Forecast Method**

15 The forecast method used is zero-based. This budget code has no historical costs prior to  
 16 2021. The forecast is based on cost estimates that were developed based on the specific scope of  
 17 work for the project. Cost estimates are based on current construction labor rates, material costs,  
 18 contract pricing/quotes, and other project-specific details.

19 **c. Cost Drivers**

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

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

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

4 **a. Description**

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

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

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

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**TABLE JW-69**  
**RAMP Activity Capital Forecasts by Workpaper**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
197800.001	SDG&E-Risk-1 - C41	Emergency Management Operations	721	17,414	0	0

3 \* An RSE was not calculated for this activity

4 **b. Forecast Method**

5 The forecast method used is zero-based. The minimal historical costs 2019 through 2021  
6 associated with preliminary design do not accurately represent the expected construction costs in  
7 2023. The forecast is based on cost estimates that were developed based on the specific scope of  
8 work for the project. Cost estimates are based on current construction labor rates, material costs,  
9 contract pricing/quotes, and other project-specific details.

10 **c. Cost Drivers**

11 The underlying cost drivers for this capital project relate to the design, construction,  
12 move management and project management for the buildout of the new Emergency Operations  
13 Center. Design includes all costs from programming through closeouts. Construction includes  
14 pre-construction, demolition, installation of furniture, Audio/Visual such as a direct view LED  
15 wall in the “Situation Room,” branding, graphics, security systems, and a green wall. Move  
16 management includes the move-out and reoccupation post construction. This space will provide  
17 an updated Situation Room that organizes the room based on EOC response teams, providing a  
18 more collaborative and innovative environment. A larger policy room with a connected Risk  
19 Management Center (RMC) will allow for faster decisions with the critical company leaders.  
20 The meteorology room has expanded and grown into an Innovation Lab that will support  
21 meteorologists and fire coordinators along with space for Wildfire Mitigation and academic  
22 partners to have touchdown locations for better efficiencies. The overall space will provide  
23 workstations and offices for team members that require direct adjacencies to the Situation Room.  
24 The space will also provide branding and communications to illustrate the work of the EOC as  
25 partners within the larger San Diego and California community. Documentation of these cost



1 drivers are included as supplemental capital workpapers. See SDG&E-13-CWP, budget code  
 2 197800.001.

3 **H. Stakeholder Cooperation and Community Engagement**

4 SDG&E recognizes that collaboration, the sharing of best practices, and the exchange of  
 5 lessons learned are of the utmost importance to protect public safety. SDG&E remains dedicated  
 6 to partnering with utility customers, elected officials, AFN partners, tribal nations, nonprofit  
 7 support organizations, first responders, and all other public safety and community partners,  
 8 understanding they all play a unique and significant role in achieving wildfire prevention and  
 9 mitigation in the service territory. SDG&E regularly solicits feedback from communities it  
 10 serves in an effort to identify gaps in processes, communications, and partnerships. This  
 11 feedback is analyzed as part of an iterative improvement process.

12 **TABLE JW-70**  
 13 **Capital Expenditures Summary of Costs**

<b>WILDFIRE MITIGATION CAPITAL (In 2021 \$)</b>				
<b>H. Stakeholder Cooperation and Community Engagement</b>	<b>2021 Adjusted-Recorded</b>	<b>Estimated 2022(000s)</b>	<b>Estimated 2023(000s)</b>	<b>Estimated 2024(000s)</b>
1. PSPS Mobile and ENS Enhancements	4,488	5,627	3,361	3,131
2. PSPP Enhancements	527	1,247	0	0
<b>Total</b>	<b>5,015</b>	<b>6,874</b>	<b>3,361</b>	<b>3,131</b>

14 **1. 208900 – WMP PSPP Mobile and ENS Enhancements**

15 **a. Description**

16 The forecast for WMP PSPP Mobile and ENS Enhancements for 2022, 2023, and 2024  
 17 are \$5,627,000, \$3,361,000, and \$3,131,000, respectively. This budget code contains the costs  
 18 associated with enhancing the Emergency Notification System (ENS) and developing a mobile  
 19 application for the Public Safety Partner Portal (PSPP).

20 ENS is a critical business application used in notifying customers of both planned and  
 21 unplanned outages across the SDG&E service territory. Customers can be notified of events that  
 22 may impact their electric service via email, text, and voice messages. During wildfire or PSPS  
 23 events, these notifications are required to meet statutory requirements.<sup>59</sup> Regular maintenance

<sup>59</sup> Pub. Util. Code § 8387(b)(2)(G).



1 and improvements to the ENS system are required to keep the system up-to-date, integrate with  
2 other internal systems, support mass customer communications, and support internal and external  
3 reporting requirements.

4 Included within the ENS project is the Alerts by SDG&E mobile application. At the  
5 beginning of September 2020, the Alerts by SDG&E app was launched and its capabilities were  
6 expanded in 2021. This tool enables customers to receive information including, notifications,  
7 Community Resource Center information with GPS directions, and other real-time updates and  
8 safety information related to PSPS activities. Awareness of the app is included in SDG&E's  
9 PSPS public education campaign that primarily enlists digital tactics to reach customers and the  
10 public with direct links to app stores on available mobile platforms. PSPS notifications for up to  
11 five customizable addresses are pushed directly to the app concurrently with other PSPS phone,  
12 text, and email alerts. The app also provides real-time updates about each PSPS and information  
13 for the user about what stage of the PSPS process they are currently in. Users can also get  
14 information about any Community Resource Centers and 211 resources.

15 The PSPP mobile application will be created to meet additional functionality and  
16 accessibility requests made by external public safety partners. The application will allow for  
17 push notifications and enhanced accessibility for field-centric partners. Further details regarding  
18 the PSPP are provided in the description of budget code 218860.

19 These forecasted capital expenditures support the company's goal of safety by providing  
20 a portal to its partners, effectively providing essential information for dissemination to  
21 customers. This information allows customers to safely prepare for a Public Safety Power  
22 Shutoff event.

23 The PSPS mobile and ENS Enhancements project mitigates safety risks identified in the  
24 2021 RAMP Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity.  
25 Table JW-71 below shows the TY 2024 forecast dollars and RSE associated with the activities in  
26 the 2021 RAMP Report.

27

1  
2

**TABLE JW-71**  
**RAMP Activity Capital Forecasts by Workpaper**

<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE*</b>
208900.001	SDG&E- Risk-1 - C42	Communication Practices	5,627	3,361	3,131	0

3 \* An RSE was not calculated for this activity

4 **b. Forecast Method**

5 The forecast method used is zero-based. This budget code has minimal costs prior to  
6 2020. Rather than relying on a forecast method that uses historical information, the forecast is  
7 based on cost estimates that were developed based on the specific scope of work for the project.  
8 Cost estimates are based on current construction labor rates, material costs, contract  
9 pricing/quotes, and other project-specific details.

10 **c. Cost Drivers**

11 Cost drivers for the ENS Enhancements project include labor costs related to two FTEs,  
12 an Infrastructure Technologist and Senior Infrastructure Technologist, to develop and implement  
13 planned enhancements to the systems. The non-labor portion is related to contracted costs for  
14 enhancements to the Alerts by SDG&E app and ENS. Enhancements to the Alerts by SDG&E  
15 app include integration with third-party weather data and threat indices, display of Electric  
16 Vehicle charging stations, the ability to report an outage, information on safety threats beyond  
17 wildfires (earthquake, winds, etc.), and bi-directional communication such as the ability to report  
18 unsafe conditions. Enhancements to the ENS include reporting on SMS and email  
19 confirmations, integration with weather stations, enhanced reporting capabilities, and integration  
20 with other internal systems to provide additional information.

21 Cost drivers for the PSPP Mobile App include the labor costs of an IT Project Manager,  
22 IT Architect, and Senior Software Developer to manage the development of the app. As the app  
23 expands its capabilities, additional personnel are needed to manage the app. Non-labor cost  
24 drivers include contract costs related to the design, implementation, and testing of the PSPP

1 Mobile App. Documentation of these cost drivers are included as supplemental capital  
 2 workpapers. See SDG&E-13-CWP, budget code 208900.001.

3 **2. 218860 – PSPP Enhancement**

4 **a. Description**

5 The PSPP Enhancement project encapsulates the enhancements to the PSPP web portal.  
 6 The forecast for PSPP Enhancement for 2022 is \$1,247,000.

7 The SDG&E PSPP project directly supports stakeholder cooperation and community  
 8 engagement by enabling third-party access to real-time PSPS event resources, as defined by the  
 9 CPUC’s PSPS Phase III decision.<sup>60</sup> Resources for the PSPP Portal include near real-time PSPS  
 10 event information such as GIS maps, the number of customers potentially impacted, and  
 11 supplemental resources to help facilitate efficient cross-agency collaboration. Public Safety  
 12 Partners are then able to provide targeted messaging and resources to communities in need  
 13 through various support networks.

14 The PSPP Enhancement project mitigates safety risks identified in the 2021 RAMP  
 15 Report. Accordingly, this workpaper in its entirety, aligns with a RAMP activity. Table JW-72  
 16 below shows the TY 2024 forecast dollars and RSE associated with the activities in the 2021  
 17 RAMP Report.

18 **TABLE JW-72**  
 19 **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

20 \* An RSE was not calculated for this activity

21 **b. Forecast Method**

22 The forecast method used is zero-based. This budget code has no historical costs prior to  
 23 2021. The forecast is based on cost estimates that were developed based on the specific scope of

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<sup>60</sup> D.21-06-034 at 37-38.

1 work for the project. Cost estimates are based on current construction labor rates, material costs,  
2 contract pricing/quotes, and other project-specific details.

3 **c. Cost Drivers**

4 The underlying cost drivers for the PSPP capital project relate to implementing and  
5 enhancing the PSPP web portal. Enhancement to the PSPP Web Portal will include an “Urgent  
6 News Module,” community resource center information, an outage map, critical facility  
7 information, and community status during the PSPS event. SDG&E will assemble a project team  
8 to implement the PSPP web portal enhancements with expertise specific to the web application  
9 and cloud technologies. SDG&E will assign a Project Manager, Business System Analyst, and  
10 IT Architect for project management, business input, and decision making but will require  
11 external support with the required expertise from Vendor Partners to design and configure the  
12 solution, conduct testing, and implement solutions as well as provide support as needed.  
13 Documentation of these cost drivers are included as supplemental capital workpapers. *See*  
14 SDG&E-13-CWP, budget code 218860.001.

15 **I. IT Sponsored Costs**

16 Capital costs for the forecast years 2022, 2023, and 2024 for IT projects that support  
17 Wildfire Mitigation, are sponsored by Mr. Exon (Ex. SDG&E-25, Chapter 2). The purpose of  
18 this section of my testimony is to describe the business rationale for these projects. Please refer  
19 to Mr. Exon’s workpapers (Exhibit SDG&E-25-CWP) for the basis of the costs. Table JW-73  
20 captures the capital project forecast for 2022, 2023, and 2024.

**TABLE JW-73**  
**Capital Expenditures Summary of Costs**  
**Summary of IT Capital Expenditures**

<b>Wildfire Mitigation IT CAPITAL COSTS In 2021 \$ (000s)</b>				
<b>IT Capital Workpaper Number</b>	<b>Project Name</b>	<b>2022 Estimated</b>	<b>2023 Estimated</b>	<b>2024 Estimated</b>
00920AN	Geospatial Field Improvement	\$1,884	\$792	\$0
00920R	Vegetation Management – Work Management	\$0	\$5,753	\$1,678
	<b>Total</b>	<b>\$1,884</b>	<b>\$6,545</b>	<b>\$1,678</b>

**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

1 used for work management, and a homegrown system (VETS) is used for the intake of requests  
2 and communication with vendors. This project will utilize various SAP products to meet  
3 vegetation management's overall work management needs in a more holistic single system  
4 solution.

5 The project will replace both the three disparate systems with an SAP Work Management  
6 solution. This solution would utilize existing SAP and ESRI Geographic Information Systems  
7 (GIS) allowing the vegetation management personnel to visualize their work, and manage the  
8 creation, editing, or viewing of data in a geographical view linked to GIS. SAP Analytics Cloud  
9 will also be incorporated allowing the Vegetation Management department to explore data by  
10 forecasting work, tracking progress, and analyzing resource capacity. The new system will  
11 holistically allow vegetation management to review planned inspections, prepare for additional  
12 planned work, and track corrective work. The specific details regarding the Vegetation  
13 Management – Work Management project costs can be found in Mr. Exon's capital workpapers  
14 (Ex. SDG&E-25-CWP, 00920R).

## 15 **VII. POST-TEST YEAR**

16 As described in the Post-Test Year Ratemaking testimony of Melanie Hancock (Ex.  
17 SDG&E-45), in this GRC, SDG&E is requesting a revenue requirement for 2025-2027. Ms.  
18 Hancock proposes a mechanism to determine the level of revenue requirement for those years.  
19 The mechanism proposed by Ms. Hancock for capital-related costs will not provide SDG&E  
20 with adequate funding to make the necessary investments in wildfire mitigation. Accordingly, I  
21 sponsor forecasts for 2025-2027 that will enable SDG&E to continue to invest in wildfire  
22 mitigation activities utilizing the planned work for 2024.

23 As described in Section II of my testimony, WMP-related efforts were initiated in 2019  
24 and have ramped up to meet SDG&E's and the state's goals of reducing the risk of catastrophic  
25 wildfires. Since 2019, SDG&E has accelerated its efforts and invested in innovative, emerging  
26 technologies to mitigate the wildfire risk. Many of the projects and programs discussed in this  
27 testimony and in SDG&E's 2022 WMP were either not in place prior to 2019 or not being  
28 performed at the level as they are today. Relying on historical averages, therefore, is not  
29 representative of the work nor the investment SDG&E intends to make in wildfire mitigation in  
30 the future. SDG&E is still increasing its units of work in the 2022-2024 period. However,  
31 SDG&E expects to maintain its critical wildfire mitigation work at or around 2024 levels for the

1 remainder of this GRC cycle, with the exceptions of Strategic Undergrounding, Covered  
 2 Conductor, and the Generator Grant Program as noted in the next section of my testimony.  
 3 Accordingly, rather than applying the capital-related part of the post-test year mechanism  
 4 proposed by Ms. Hancock to wildfire mitigation capital, which is based on a historical average,  
 5 SDG&E proposes to use the capital-related costs associated with TY 2024 as the starting point to  
 6 establish revenue requirement for years 2025-2027 and escalate those costs consistent with all of  
 7 capital costs in Ms. Hancock’s proposed mechanism. Because SDG&E is proposing miles for  
 8 Strategic Undergrounding and Covered Conductor in the post-test years that differ from the  
 9 miles proposed in 2024, SDG&E has adjusted its forecast to reflect these discrete mile requests.  
 10 The mileage requests and the corresponding cost reductions from the original filing are provided  
 11 below in Table JW-75. The direct costs for SDG&E’s proposal for all wildfire-related capital are  
 12 provided in Table JW-74. Escalation is not included in the figures in the table below and would  
 13 be applied to the forecasts.

14 **Table JW-74**

<b>WILDFIRE MITIGATION CAPITAL (In 2021 \$)</b>				
	<b>Estimated TY 2024 (\$000)</b>	<b>Estimated 2025 (\$000)</b>	<b>Estimated 2026 (\$000)</b>	<b>Estimated TY 2027 (\$000)</b>
<b>Total CAPITAL</b>	<b>518,507</b>	<b>557,181</b>	<b>580,546</b>	<b>603,911</b>

15 The post-test year proposal herein is limited to capital treatment in the post-test years. The  
 16 O&M costs associated with wildfire mitigation are included in Ms. Hancock’s post-test year  
 17 mechanism proposal.

18 In addition to the post-test year mechanism not resulting in adequate revenue for wildfire  
 19 mitigation, revenue requirement specifically for wildfire mitigation is needed for each year of the  
 20 GRC cycle in order to effectively operate the balancing account proposed by SDG&E in this  
 21 Application. If SDG&E’s proposal to balance WMP-related costs in a Wildfire Mitigation Plan  
 22 Balancing Account is adopted, this proceeding would establish revenues for which incurred costs  
 23 are “balanced” against in that account. The balancing account would begin in 2024 and be  
 24 effective through the GRC cycle, 2027. To know what revenues are being authorized by the  
 25 CPUC for 2024 through 2027 for WMP, SDG&E is proposing that the CPUC authorize discrete  
 26 figures for WMP. This will allow SDG&E to accurately operate the mechanics of the balancing

1 account and match the revenues to expenses, rather than needing to impute what is adopted by  
2 the CPUC for the post-test years.

3         SDG&E requests the CPUC adopt a post-test year capital forecasts, as shown in Table  
4 JW-74 above, for years 2025, 2026, and 2027. Ms. Hancock provides the revenue requirement  
5 associated with the figures in Table JW-74, which incorporates escalation and loading  
6 considerations.<sup>61</sup>

## 7 **VIII. SDG&E UPDATE RELATED TO PLANNED GRID DESIGN AND SYSTEM** 8 **HARDENING**

### 9 **A. WiNGS Modeling Changes**

10         An integral component of SDG&E’s ongoing commitment to innovation and enhancing  
11 its wildfire mitigation program involves ongoing reassessment of its risk modeling to address  
12 changes in data, science, and technology. SDG&E has worked to ensure the current version of its  
13 risk modeling tool, WiNGS Planning, remains up to date with the latest information and industry  
14 best practices. In preparation for the submission of its 2023-2025 WMP, SDG&E has been  
15 engaged in reassessment of both its wildfire mitigation initiatives as well as its risk assessment  
16 and risk modeling. Through its participation in Energy Safety led joint IOU risk modeling  
17 working groups and internally driven improvements, SDG&E has incorporated several updates  
18 and enhancements to the WiNGS Planning model, referred to as version 2.0. In version 2.0,  
19 SDG&E has advanced the data quality by more accurately capturing hardening miles within the  
20 HFTD, adjusted the overhead to underground mileage conversion contingency factor, and  
21 updated the data incorporated from WRRM.

22         SDG&E is constantly evolving its risk models by improving data quality and integrating  
23 new methods for analysis. These improvements lead to more accurate wildfire risk assessment  
24 and increased effectiveness of proposed mitigations. SDG&E has incorporated updated data,  
25 such as the effectiveness of different mitigations at reducing wildfire risk and refreshing  
26 historical ignition counts to enhance the model’s estimated ignition rates. A data refresh  
27 between models now allows SDG&E to use the most up to date and accurate information to  
28 inform decisions regarding grid hardening strategy. Components like historical wind, weather

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<sup>61</sup> 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.



1 station additions, PSPS history, system assets, information regarding vulnerable customers  
2 (including AFN), and vegetation data have all been updated. SDG&E is constantly evolving its  
3 risk models by improving data quality and integrating new methods for analysis. These  
4 improvements lead to more accurate wildfire risk assessment and increased effectiveness of  
5 proposed mitigations.

6 SDG&E has also incorporated updated data to reflect additional information gained  
7 through implementation of its wildfire mitigation plans. For instance, SDG&E now includes  
8 additional data associated with Strategic Undergrounding, such as avoided costs associated with  
9 fewer vegetation management activities, reduced PSPS scope, and reduced maintenance costs  
10 which allow for life cycle costs to be modeled. In addition, SDG&E's undergrounding cost per  
11 mile has decreased by approximately 12% since the filing of its GRC Application, resulting in an  
12 increased Risk Spend Efficiency associated with undergrounding.

13 As a result of the WiNGS model updates, SDG&E is revising its original GRC forecasts  
14 in this second revised version of my testimony. SDG&E's aim is for both its GRC and its 2023  
15 WMP filing to reflect the revised scope of both Covered Conductor and Strategic  
16 Undergrounding work. Approximately 110 miles of Covered Conductor hardening scope that  
17 was originally slated for 2023 and 2024 is now being converted to Strategic Undergrounding  
18 scope. SDG&E will continue to install covered conductor in areas where both the risk level and  
19 cost warrant this mitigation strategy. But, as addressed below, additional implementation of  
20 strategic undergrounding is better poised to both reduce the risk of catastrophic wildfire and  
21 substantially reduce PSPS impacts both over the GRC cycle and over the next ten years. Due to  
22 this revision, SDG&E's target miles of hardening for covered conductor have been reduced from  
23 100 to 60 miles in 2023, and from 100 to 60 miles in 2024.<sup>62</sup> From 2025 through 2027, SDG&E  
24 forecasts completion of 40 miles of covered conductor installation each year.

25 This reduction in the planned scope of covered conductor in 2023 and 2024 will also  
26 relieve the pressure on the various workstreams that support the lifecycle of covered conductor  
27 projects and allow for reallocation of resources to support the transition to increased strategic  
28 undergrounding as it continues to ramp-up. This includes, but is not limited to, project

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<sup>62</sup> 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.

1 management, engineering, design, land services, environmental, permitting, construction, and  
 2 material management.

3  
 4 **B. Strategic Undergrounding**

5  
 6 As discussed above, SDG&E’s enhanced data and risk models demonstrate that, given  
 7 the ongoing risk associated with climate change and the need to reduce PSPS impacts and  
 8 improve reliability, implementation of additional strategic undergrounding is necessary. SDG&E  
 9 continues to implement a balanced approach between covered conductor and undergrounding in  
 10 areas where risk and conditions warrant to provide a value and risk-based approach to grid  
 11 hardening. But given the data enhancements available, and through the implementation of  
 12 lessons learned to reduce costs associated with undergrounding—both in construction and in  
 13 realized lifecycle costs—SDG&E is able to meet a higher level of risk reduction and provide a  
 14 better value to customers through a reallocation of the amounts of strategic undergrounding and  
 15 covered conductor installed. The overall change in allocation between initiatives and the  
 16 associated direct costs by year are summarized as follows:

17 **Table JW-75**

	2023 <sup>63</sup>	2024	2025	2026	2027	Total
<b>Original Covered Conductor</b>	100 mi.	100 mi.	100 mi.	100 mi.	100 mi.	500 mi.
<b>Revised Covered Conductor</b>	60 mi.	60 mi.	40 mi.	40 mi.	40 mi.	240 mi.
<b>Change in Direct Costs (\$000)</b>	-\$81,650	-\$100,402	-\$120,141	-\$120,141	-\$120,141	-\$542,475
<b>Original Undergrounding</b>	125 mi.	150 mi.	150 mi.	150 mi.	150 mi.	725 mi.
<b>Revised Undergrounding</b>	80 mi.	125 mi.	150 mi.	160 mi.	170 mi.	685 mi.
<b>Change in Direct Costs (\$000)</b>	-\$163,059	-\$119,439	-\$61,026	-\$37,661	-\$14,296	-\$395,481

18  
 19 Overall, over the next ten years the amount of covered conductor SDG&E proposes to  
 20 install decreases from approximately 880 miles to approximately 370 miles, and the amount of  
 21 strategic undergrounding recommended increases from approximately 880 miles to

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<sup>63</sup> 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.

1 approximately 1,500 miles. The shift of grid hardening scope from covered conductor to more  
2 undergrounding helps to reduce wildfire risk at a greater rate. SDG&E expects to decrease  
3 wildfire risk by over 80% in the next ten years, and by nearly 60% over the course of the GRC.  
4 The previous scope of 880 miles each of covered conductor and undergrounding when run  
5 through SDG&E's updated WiNGS-Planning model provides only a 64% reduction in wildfire  
6 risk over the same ten-year timeframe. The increase in strategic undergrounding also accelerates  
7 the reduction of PSPS impacts and risks to customers. SDG&E expects to substantially reduce  
8 PSPS impacts to approximately 35,000 customers and reduce PSPS across the most frequently  
9 impacted circuits by 93% over the next ten years.

10 Strategic undergrounding remains one of the costliest wildfire mitigations available, but  
11 when viewed against the long-term benefits, wildfire risk reduction, and PSPS impact reduction  
12 that result from additional use of undergrounding targeted to the highest risk areas, it is apparent  
13 that it is a prudent investment in the future of the regions electrical grid. SDG&E's models also  
14 indicate a long-term offset of the investment associated with undergrounding through a reduction  
15 in numerous lifecycle costs that will be substantially reduced for underground infrastructure.  
16 These include costs such as vegetation management, PSPS related operations, inspections, and  
17 repairs. Moreover, as further discussed in the testimony of Kevin C. Geraghty (Ex. SDG&E-49),  
18 there are numerous societal and environmental benefits associated with undergrounded  
19 infrastructure, including safer ingress/egress during emergencies, improved sustainability and  
20 reduced GHG impacts due to the reduced need for tree trimming and removal, improved overall  
21 reliability, and fewer customer inconveniences associated with inspections and maintenance of  
22 overhead lines. As climate change renders the region's weather and environment increasingly  
23 unpredictable, further undergrounding is best poised to promote both the safety and reliability of  
24 SDG&E's distribution system.

25 SDG&E is working to increase the overall mileage of undergrounding installed over the  
26 next ten years. This involves an onramp approach to slowly increase undergrounding over time,  
27 and a proposed revision to lower the initial mileage of strategic underground originally proposed  
28 at the time of SDG&E's application. In the short term, there are two main issues that are driving  
29 a longer ramp up to completing 150 miles or more of undergrounding per year. The main drivers  
30 for this short-term reduction are permitting delays and material shortages.



1 that will not reduce proportionally, including those related to program administration, reporting,  
2 marketing, customer support, product evaluation, delivery logistics, and unit replacements. This  
3 results in a reduction in 2024 O&M costs of approximately \$2.8M.  
4

5 **IX. CONCLUSION**

6 SDG&E requests that the CPUC approve the Test Year 2024 forecasts for wildfire  
7 mitigation and vegetation management and IT capital projects presented in this testimony. This  
8 funding request will enable SDG&E to continue to invest in activities that reduce the risk of  
9 wildfire and PSPS impacts.

10 This concludes my second revised prepared direct testimony.

1 **X. WITNESS QUALIFICATIONS**

2 My name is Jonathan T. Woldemariam. My business address is 8330 Century Park  
3 Court, San Diego, California, 92123. I am employed by SDG&E as the Director of Wildfire  
4 Mitigation. I am responsible for developing and overseeing the execution of the Company's  
5 Wildfire Mitigation Plan, which includes the vegetation management program. I work to  
6 optimize a portfolio of initiatives to help decrease wildfire risk.

7 I joined SDG&E in 1994 and have served as a director for Transmission and Substation  
8 Operations, Electric Transmission and Distribution Engineering, and Construction Services. I  
9 have over 28 years of experience in the electric utility industry. I am currently serving on the  
10 Board of Directors 2-1-1 San Diego, a local non-profit which is the region's trusted source for  
11 access to community, health, social, and disaster services.

12 I have a bachelor's degree in electrical engineering, with a major field of study in  
13 Electrical Power and am a licensed Professional Engineer in California.

14 I have previously testified before this Commission.

## APPENDIX A – Glossary of Terms

<b>ACRONYM</b>	<b>DEFINITION</b>
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 Forest 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**

<b>WILDFIRE MITIGATION RAMP Activity by Workpaper</b>			
<b>Workpaper</b>	<b>RAMP ID</b>	<b>Activity</b>	<b>Description</b>
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 Forest 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**

<b>WILDFIRE MITIGATION &amp; VEGETATION MANAGEMENT RAMP Activity O&amp;M Forecasts by Workpaper (In 2021 \$)</b>						
<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>BY2021 Embedded Base Costs (000s)</b>	<b>TY2024 Estimated Total (000s)</b>	<b>TY2024 Estimated Incrementa l (000s)</b>	<b>GRC RSE</b>
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	<u>2841.000</u>



	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
<b>Total</b>			<b>167,500</b>	<b>168,955</b>	<b>1,455</b>	

<b>WILDFIRE MITIGATION &amp; VEGETATION MANAGEMENT</b>						
<b>RAMP Activity Capital Forecasts by Workpaper (In 2021 \$)</b>						
<b>Workpaper</b>	<b>RAMP ID</b>	<b>Description</b>	<b>2022 Estimated RAMP Total (000s)</b>	<b>2023 Estimated RAMP Total (000s)</b>	<b>2024 Estimated RAMP Total (000s)</b>	<b>GRC RSE</b>
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	<del>564832</del> .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	<del>2623</del> 1546.000
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	<del>2841</del> .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	-
<b>Total</b>			<b>451,445</b>	<b>528,538</b>	<b>518,507</b>	

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**

<b>Fault/Ignition Cause</b>	<b>Number of Ignitions</b>	<b>SME Effectiveness</b>	<b>Post-Mitigation Ignitions</b>
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

<b>Fault/Ignition Cause</b>	<b>Number of Ignitions</b>	<b>SME Effectiveness</b>	<b>Post-Mitigation Ignitions</b>
<b>Total</b>	<b>80</b>	<b>64.5%</b>	<b>28.4</b>