San Diego Gas & Electric Company

Wildfire Mitigation Plan

February 7, 2020
(Rev 1.) March 2, 2020

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Appendices

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Summary of Errata to SDG&E's WMP (as of March 2, 2020)

Section	Description of Errata/Change
Appendix A – Table 4	Corrected various cells to match WMP narrative
Appendix A – Table 13	Corrected "number of customers belonging to access and functional needs populations" – The HFTD Tiers 2 and 3 amounts were transposed; Also clarify that the data provided reflects SDG&E's medical baseline customer accounts.
Appendix A – Table 23	Initiative "Whole Home Generators" – Corrected the total per initiative spend amount.

Executive Summary

Catastrophic wildfires, driven by the change in climate and resulting extreme winds, have ignited in California with increased frequency and severity in recent years. While not the only source of ignitions, several of the recent wildfires have been attributed to electric utility equipment. San Diego Gas & Electric Company's (SDG&E or Company) top priority is the safety of its customers, communities, and workforce. SDG&E strives to be a leader in California and beyond in the prevention and mitigation of utility wildfires.

SDG&E's wildfire prevention and mitigation activities have been ongoing for more than a decade. In the aftermath of the catastrophic October 2007 wildfires in SDG&E's service territory and across Southern California, SDG&E's management dedicated itself to revamping and enhancing its wildfire prevention and mitigation measures across a wide spectrum of disciplines and activities. Many of the initiatives described in this 2020 Wildfire Mitigation Plan (WMP or Plan), such as fire hardening the overhead electric system, are an outgrowth of the efforts that began after the October 2007 wildfires. And many of those initiatives were undertaken without any precedent or road map for SDG&E to follow.

A prime example is SDG&E's ability to forecast fire danger. SDG&E developed an in-house meteorology team to forecast fire danger and enable the Company to undertake advanced preparations for severe weather events. SDG&E built the first of its kind network of dense, utility-owned weather stations to provide detailed weather data across the service territory, which informs day-to-day operational decision-making at all levels of the company. Additionally – and as a last resort when conditions warrant – SDG&E pioneered the use of de-energization (i.e., Public Safety Power Shutoff or PSPS) to ensure public safety. SDG&E has openly shared its experiences, lessons learned, and technological advancements in weather and wildfire mitigation with other investor-owned utilities, state agencies, and stakeholders in the fire community, with the objective of improving prevention across California.

An effective wildfire mitigation program includes a safe and fire-hardened electrical system that is rigorously inspected and maintained. It also utilizes the latest science and technology to create situational awareness tools that enables the utility to anticipate, prepare for, react to, and recover from extreme conditions. In addition, an effective program requires a culture that prioritizes safety over reliability, and partners with stakeholders in public safety, academia, and the private sector, to form a fire-safe community. Community collaboration and customer outreach are essential.

Accordingly, in recent years, SDG&E's wildfire mitigation programs have fallen into three categories:

- Operations and Engineering: includes actions to build, maintain and operate SDG&E's electric system to be fire safe.
- Situational Awareness and Weather Technology: focuses on SDG&E's ability to monitor and understand the fire environment.
- Customer Outreach and Education: includes SDG&E's communication and collaboration with regional stakeholders and customers.

Today, as a result of its efforts across these three categories, SDG&E is often cited as an industry leader in wildfire prevention and mitigation. In its June 2019 report to the Governor and Legislature, the Commission on Catastrophic Wildfire Cost and Recovery found that SDG&E "is widely recognized as a global leader on utility wildfire practices."[1] Similarly, Governor Newsom's Strike Force stated that "SDG&E engaged in a robust fire mitigation and safety program after experiencing devastating fires in its service territory in 2007 and has become a recognized leader in wildfire safety."[2]

But SDG&E does not intend to stand pat with respect to wildfire safety. Indeed, SDG&E remains committed to and focused on enhancing its wildfire prevention and mitigation. For instance, SDG&E has recently begun to incorporate data science into its vegetation management, developing a Vegetation Risk Index of the highest risk trees in its service territory. SDG&E has also been leveraging the historical weather data collected from its weather network to gain a deeper understanding of the severity of wind speeds in its service territory, particularly the 95th and 99th percentile wind speeds at certain locations. In 2019, SDG&E initiated a drone inspection program to obtain enhanced inspection data concerning its electric system. These and other new initiatives that will take shape over the coming three years (and beyond) are discussed in this 2020 WMP. SDG&E also continues to track its past performance, and the 2020 WMP contains detailed information regarding performance metrics.

[1] Commissioner Peterman, *et al.*, "Final Report of the Commission on Catastrophic Wildfire Cost and Recovery," Appendix II, p. 7 (June 17, 2019).

[2] Governor Newsom's Strike Force, "Wildfires and Climate Change: California's Energy Future," p. 11 (April 12, 2019).

Consistent with the California Public Utilities Commission's (Commission or CPUC) WMP Guidelines,[3] SDG&E has modified the structure of its Plan, organizing the information into the categories listed below:

1. Risk assessment and mapping
2. Situational awareness and forecasting
3. Grid design and system hardening
4. Asset management and inspections
5. Vegetation management and inspections
6. Grid operations and protocols
7. Data governance
8. Resource allocation methodology
9. Emergency planning and preparedness
10. Stakeholder cooperation and community engagement

The initiatives in each of these 10 categories are discussed in detail in this 2020 WMP. A constant element in SDG&E's approach to these initiatives, regardless of category, is continuous improvement in wildfire safety. Such improvement drives company-wide fire-awareness and vigilance of the fire environment, prioritizing safe work practices, and keeping SDG&E's neighbors and communities safe.

[3] 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.

1. Persons Responsible for Executing the WMP

Instructions:[4] *Provide an accounting of the responsibilities of the responsible person(s) executing the plan, including:*

1. *Executive level with overall responsibility*
2. *Program owners specific to each component of the plan*

Ensure that the plan components described in (2) include an accounting for each of the WMP sections and subsections.

Wildfire mitigation at SDG&E is a Company-wide, inter-departmental effort involving resources and programs across utility functions. The Vice President of Electric System Operations is the wildfire risk owner and has primary responsibility for owning, executing, and auditing SDG&E's WMP.

The following table outlines the program owners specific to each component of this Plan.

Table SDG&E 1: WMP Program Owners (as of March 2, 2020)

WMP Section	Program Owner
Section 1 – Persons Responsible for Executing the WMP	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 2.1 – Lessons Learned	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 2.2 – Recent Performance on Progress Metrics	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 2.3 – Recent Performance on Outcome Metrics	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 2.4 – Description of Additional Metrics	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 2.5 – Description of Program Targets	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 2.6 – Detailed Information Supporting Outcome Metrics	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam; Director of Safety, Ron Kiralla
Section 2.7 – Mapping Recent, Modelled, and Baseline Conditions	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam; Director of Asset Management, Ken Deremer
Section 3.1 – Recent Weather Patterns	Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 3.2 – Recent Drivers of Ignition Probability	Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 3.3 – Recent Use of PSPS	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam

[4] Text in green italics are instructions, prompts, and clarifications from the WMP Guidelines.

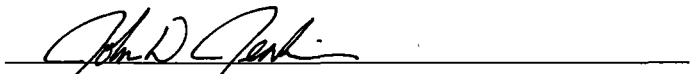
WMP Section	Program Owner
Section 3.4 – Baseline State of Equipment and Wildfire and PSPS Event Risk Reduction Plans	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam; Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 4.1 – Objectives of the Plan	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 4.2 – Understanding Major Trends Impacting Ignition Probability and Wildfire Consequence	Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 4.3 – Change in Ignition Probability Drivers	Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 4.4 – Directional Vision for Necessity of PSPS	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 5.1 – Wildfire Mitigation Strategy	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 5.2 – Wildfire Mitigation Plan Implementation	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 5.3.1 – Risk Assessment and Mapping	Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 5.3.2 – Situational Awareness and Forecasting	Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 5.3.3 – Grid Design and System Hardening	Director of Electrical Engineering, Nick Moran
Section 5.3.4 –Asset Management and Inspections	Director of Asset Management, Ken Deremer
Section 5.3.5 – Vegetation Management Plan	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 5.3.6 – Grid Operations and Protocols	Director of Electric Distribution Operations, Oliva Reyes; Director of Electric Grid Operations, S. Ali Yari
Section 5.3.7 – Data Governance	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam; Director of Fire Science and Climate Adaptation, Brian D'Agostino
Section 5.3.8 – Resource Allocation Methodology	Director of Asset Management, Ken Deremer
Section 5.3.9 – Emergency Planning and Preparedness	Director of Emergency Management, Augie Ghio; Director of Customer Operations, Steve Rahon; Director of Electric Regional Operations, Jorge DaSilva
Section 5.3.10 – Stakeholder Cooperation and Community Engagement	Director of Customer Programs, Alex Kim; Director of Marketing and Communications, Andrea Smith; Director of Emergency Management, Augie Ghio
Section 5.4 – Methodology for Enterprise-Wide Safety Risk and Wildfire-Related Risk Assessment	Director of Risk Management, Scott Pearson
Section 5.5 – Planning for Workforce and Other Limited Resources	Director of Emergency Management, Augie Ghio; Director of Customer Operations, Steve Rahon; Director of Electric Regional Operations, Jorge DaSilva
Section 5.6.1 – Planned Utility Infrastructure Construction and Upgrades	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 5.6.2 – Protocols on PSPS	Director of Wildfire Mitigation and Vegetation Management, Jonathan Woldemariam
Section 6 – GIS Attachments	Director of Asset Management, Ken Deremer

1.1. Verification

I am an officer of the applicant corporation herein, and am authorized to make this verification on its behalf. The statements in the foregoing document are true of my own knowledge, except as to matters which are therein stated on information or belief, and as to those matters I believe them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 7, 2020 at San Diego, California.



John D. Jenkins
Vice President – Electric System Operations
San Diego Gas & Electric Company

2. Metrics and Underlying Data

Instructions: *Report performance on the following progress and outcome metrics within the utility's service territory over the past five years. Where a utility does not collect its own data for a given metric, that utility shall work with the relevant sources to collect the information for its service territory, and clearly identify the owner and dataset used to provide the response in "Comments" column.*

Progress metrics, listed below, track how much utility wildfire mitigation activity has managed to change the conditions of utility wildfire risk exposure in terms of drivers of ignition probability.

Outcome metrics measure the performance of a utility and its service territory in terms of both leading and lagging indicators of wildfire risk, PSPS risk, and other direct and indirect consequences of wildfire and PSPS, including the potential unintended consequences of wildfire mitigation work.

In the 2019 WMPs, utilities proposed sets of "program targets" that enable tracking implementation of proposed wildfire mitigation activities against the scope of those activities as laid out in the WMPs but do not track the efficacy of those activities. Utilities shall continue to report program targets, however, the primary use of these will be to gauge follow-through on WMPs while recognizing that some WMP initiatives should be adjusted after plan submittal based on new information and lessons learned.

2.1. Lessons Learned: How Tracking Metrics on the 2019 Plan Has Informed the 2020 Plan

Instructions: *Describe how the utility's plan has evolved since the 2019 WMP submission. Outline any major themes and lessons learned from the 2019 plan and subsequent implementation of the initiatives. In particular, focus on how utility performance against the metrics used has informed the utility's 2020 WMP.*

Since submitting its 2019 WMP, SDG&E's wildfire risk mitigation strategy has continued to evolve. With the increasing impacts from a variety of factors such as climate change, and development and population growth in fire-prone areas, catastrophic wildfires continue to pose a threat throughout California and the San Diego region. SDG&E's 2019 WMP described the Company's wildfire mitigation strategies and programs that have been developed and implemented over the past decade, and it also expressed its commitment for continuous improvement. To this end, SDG&E has identified opportunities to refine and enhance existing programs and implement new ones.

Public Safety Power Shutoff

SDG&E has been utilizing PSPS since 2013 as a measure of last resort to prevent catastrophic wildfires and reduce wildfire risk. Over the past year, California has increased the level of focus on mitigating the impact of PSPS events. California faced severe fire potential weather conditions throughout October 2019. In SDG&E's service territory, there were numerous elevated or extreme fire potential index (FPI) days, and several Red Flag Warnings (RFW) issued by the National Weather Service. As a result, SDG&E impacted approximately 27,700

customers with PSPS events in 2019, affecting less than 2% of SDG&E's overall customer base, and less than 10% of customers within the high fire threat district (HFTD). Although the focus on the fire risk mitigation activities identified in its 2019 WMP continues, SDG&E is developing additional activities with the goal of reducing or eliminating to the extent feasible the impact of PSPS events.

Over the last ten years of wildfire mitigation, SDG&E's transmission system hardening initiatives in the HFTD have helped avoid widespread PSPS events impacting entire substations and therefore larger communities within SDG&E's service territory. To date, on the distribution system, the majority of system hardening work has targeted segments of electric circuits with the highest probability of equipment failure and potential for ignitions. In 2020, SDG&E is refining its approach to system hardening to include the goal of reducing PSPS impacts.

Vegetation and Fuels Management

SDG&E's Vegetation Management Program is an important and effective tool in reducing wildfire risk, as evidenced by the reduced number of trees causing outages and reduced number of tree related ignitions. Since the 2019 WMP, the Vegetation Management Program has evolved to include a vegetation risk index (VRI) and a fuels management program.

SDG&E developed the VRI, which identifies tree-related risk by considering the number of trees, height, species, and number of past outages associated with a segment of electric circuit. This index has been instrumental in identifying areas of risk to determine PSPS action. It was developed by integrating tree inventory metrics with SDG&E Meteorology data to identify species with the potential highest risk of impacting overhead electric infrastructure. Using this data, SDG&E created a circuit-based risk index to identify where additional and priority tree operations may be warranted. The VRI can be used to inform where SDG&E applies its enhanced pruning to achieve a 25-foot clearance or where to perform complete tree removals to reduce wildfire risk. SDG&E tracks and quantifies the number of high-risk species located within the HFTD that have been pruned to the expanded clearance and trees removed. As of January 31, 2020, SDG&E has performed enhanced pruning on approximately 4,800 targeted trees within the HFTD and removed approximately 3,700 trees.

In 2019, SDG&E launched a Fuels Management pilot program in close collaboration with environmental agencies and property owners. This pilot focused on thinning native vegetation, removing non-native and dead vegetation near and around electric power lines. This work was completed in select areas within Tier 3 of the HFTD, in some areas of the Cleveland National Forest, and much of the Bureau of Land Management (BLM) lands in SDG&E's service territory. Prior to any thinning or removal of the vegetation, baseline surveys were conducted by trained biologists to confirm there was no impact to sensitive species. SDG&E plans to continue the Fuels Management pilot program during 2020 and the coming years.

Drone Inspections

SDG&E implemented a new Drone Investigation Assessment and Repair (DIAR) program in 2019. This effort began with using drones to inspect distribution lines in the HFTD Tier 3 areas, resulting in the inspection of over 10,000 poles. This program will continue in 2020 and through 2023 as SDG&E continues to evaluate the impacts to customers and the benefits of the program, including with respect to wildfire risk reduction. SDG&E is leveraging the photos accumulated from this work to explore the potential for machine learning to detect issues on its electric facilities.

Weather Data

Weather data has been a key component of SDG&E's wildfire mitigation plan for over ten years. Wind speeds are a main factor when considering risk due to weather. In 2019, SDG&E began further leveraging the historical weather data collected from its weather network to better inform PSPS decision-making. Specifically, SDG&E used 95th and 99th percentile wind speed statistics to gain a deeper understanding of the severity of wind speeds in its service territory and the critical risk they present to specific electric line segments. The 95th percentile wind speed threshold is used to alert decision makers that only 5% of the historical wind speeds recorded at a particular weather station have exceeded the 95% recorded windspeeds. The same is true for the 99th percentile wind speeds, indicating only 1% of the historical wind speeds ever exceeded the 99th percentile threshold. Through its analysis, SDG&E found that wind speeds that exceeded the 95th and 99th percentile threshold were located in areas with a high exposure to vegetation and have historically caused issues on the circuits. This new analysis tool was successfully used during SDG&E's October 2019 PSPS events. These new metrics have helped inform PSPS decision-makers by providing improved localized wind speed data allowing them to better identify and mitigate the greatest wildfire risks during significant weather events.

Program Target Metrics

Program target metrics continue to be used by SDG&E to track the progress of its 2019 wildfire mitigation activities.[5] These metrics help inform the teams working on the various programs and keep the focus on completing the goals for the year. Progress on system hardening and other wildfire mitigation activities goals for the year help drive fire risk reduction. Where applicable, these progress reports track how much work has been completed for the current year, as well as, progress made toward fire risk reduction over multiple years. This helps to better inform progress of overall fire mitigation.

In some cases, it is more informative for progress reports to track types of infrastructure or equipment in addition to programs. For example, SDG&E reports the number of poles completed, or miles of wires completed by program or by overall HFTD. Therefore, SDG&E's progress reports will sometimes reflect these types of metrics to provide a better indication of risk reduction.

[5] For program target metrics, please refer Appendix A, Table 4.

The metrics tracked in progress reports also help SDG&E understand how much work remains within its wildfire mitigation program. This provides insight into the amount of time needed to complete the work and provides context around potential risk. For example, the Expulsion Fuse Replacement program plans to replace all the expulsion fuses within the HFTD, over 10,000 fuses. In 2019, this program completed 2,490 fuses, or roughly 25%. To complete this program at the current rate, the projected completion is 2022.

The program progress reports also help inform the amount of resources needed to accomplish the wildfire mitigation work. The number of programs and the number of activities in those programs helps to indicate the materials and human resources required. It is especially informative when comparing between the different years. The program progress reports help to gauge the potential for success in meeting the goals.

2.2. Recent Performance on Progress Metrics, Last 5 Years

Instructions for Table 1:
Report performance on the following metrics within the utility's service territory over the past five years. Where the utility does not collect its own data on a given metric, the utility shall work with the relevant state agencies to collect the relevant information for its service territory, and clearly identify the owner and dataset used to provide the response in the "Comments" column.

Clarification provided for Table 1:
For Table 1: Recent performance on progress metrics, last 5 years, the utility may calculate the "Percent of data requested in SDR and WMP collected in initial submission" by dividing the total number of cells where the utility provides data in the SDR and the WMP by the total number of cells of data requested in both documents. If any narrative requirements are unmet (e.g., for a list and description), this shall be noted in the adjacent comments

Table 1 (Recent Performance on Progress Metrics, last 5 years) is provided in Appendix A.

2.3. Recent Performance on Outcome Metrics, Annual and Normalized for Weather, Last 5 Years

Instructions for Table 2:
Report performance on the following metrics within the utility's service territory over the past five years. Where the utility does not collect its own data on a given metric, the utility shall work with the relevant state agencies to collect the relevant information for its service territory, and clearly identify the owner and dataset used to provide the response in "Comments" column.
Provide a list of all types of findings and number of findings per type, in total and in number of findings per circuit mile.

Clarification provided for Table 2:
For Table 2: Recent performance on outcome metrics, last 5 years, Metric 7 "Value of assets destroyed by utility-ignited wildfire, listed by asset type" is intended to capture the dollar value of destruction caused by utility-ignited wildfire in its territory, including both 3rd party assets (including structures) and utility infrastructure. Include the total value of damage to all these assets and explain the sources of the

information used in the comments. The WSD recognizes that this will be an estimate. Each utility is expected to use the best available data in its possession, or accessible via third parties, for its utility-ignited wildfires. Sources and methods shall be cited such that the WSD can understand how the utility determined these summary figures.

For Table 2 Metric 8, "Number of structures destroyed by utility-ignited wildfire," include utility and non-utility (meaning belonging to a third party) structures. The term "structures" is one of the metrics that CAL FIRE already uses to report wildfire damage and refers to buildings (e.g., a dwelling, a place of business, etc.). These numbers shall be provided individually for utility and non-utility structures.

Table 2 (Recent Performance on Outcome Metrics, last 5 years) is provided in Appendix A.

2.4. Description of Additional Metrics

Instructions for Table 3:
In addition to the metrics specified above, list and describe all other metrics the utility uses to evaluate wildfire mitigation performance, the utility's performance on those metrics over the last five years, the units reported, the assumptions that underlie the use of those metrics, and how the performance reported could be validated by third parties outside the utility, such as analysts or academic researchers. Identified metrics must be of enough detail and scope to effectively inform the performance (i.e., reduction in ignition probability or wildfire consequence) of each preventive strategy and program.

Table 3 (List and Description of Additional Metrics, last 5 years) is provided in Appendix A.

2.5. Description of Program Targets

Instructions for Table 4:
In addition to the metrics specified above, list and describe all program targets the electrical corporation uses to track utility WMP implementation, the utility's performance on those metrics over the last five years, the units reported, the assumptions that underlie the use of those metrics, and how the performance reported could be validated by third parties outside the utility, such as analysts or academic researchers. Identified metrics must be of enough detail and scope to effectively inform the performance (i.e., reduction in ignition probability or wildfire consequence) of each preventive strategy and program.

Each program target shall be associated with a percent completeness and based upon the contents of the WMP.

Clarification provided for Table 4:
For Table 4: List and description of program targets, last 5 years, data should be only for 2019. Program Targets are targets for utility wildfire mitigation as expressed in the 2019 WMPs. Given that WMPs were new in 2019, this is only relevant over the past year. The 5-year horizon applies to the progress and outcome metrics.

Table 4 (List and Description of Program Targets, last 5 years) is provided in Appendix A.

2.6. Detailed Information Supporting Outcome Metrics

Instructions for Table 5:
Enclose detailed information as requested for the metrics below. Report numbers of accidental deaths attributed to any utility wildfire mitigation activities, as listed in the utility's 2019 WMP filing or otherwise, according to the type of activity in column one, and by the relationship to the utility, for each of the last five years. For fatalities caused by activities beyond these categories, add rows to specify accordingly. The relationship to the utility statuses of full-time employee, contractor, and member of public are mutually exclusive, such that no individual can be counted in more than one category, nor can any individual fatality be attributed to more than one activity.

Report subtotals calculated for each row and column.

Table 5 (Accidental Deaths Due to Utility Wildfire Mitigation Initiatives, last 5 years) is provided in Appendix A.

Instructions for Table 6:
Report numbers of OSHA-reportable injuries attributed to any utility wildfire mitigation initiatives, as listed in the utility's 2019 WMP filing or otherwise, according to the type of activity in column one, and by the identity of the victim, for each of the last five years. For members of the public, all injuries that meet OSHA-reportable standards of severity (i.e., injury or illness resulting in loss of consciousness or requiring medical treatment beyond first aid) shall be included, even if those incidents are not reported to OSHA due to the identity of the victims.

For OSHA-reportable injuries caused by activities beyond these categories, add rows to specify accordingly. The victim identities listed are mutually exclusive, such that no individual victim can be counted as more than one identity, nor can any individual OSHA-reportable injury be attributed to more than one activity. Report subtotals calculated for each row and column.

Table 6 (OSHA-Reportable Injuries Due to Utility Wildfire Mitigation Initiatives, last 5 years) is provided in Appendix A.

Instructions for Table 7:
Report details on methodology used to calculate or model potential impact of ignitions, including list of all input used in impact simulation; data selection and treatment methodologies; assumptions, including Subject Matter Expert (SME) input; equation(s), functions, or other algorithms used to obtain output; output type(s), e.g., wind speed model; and comments.

Table 7 (Methodology for Potential Impact of Ignitions) is provided in Appendix A.

2.7. Mapping Recent, Modelled, and Baseline Conditions

Instructions for Table 8:
Report underlying data for recent conditions (over the last five years) of the utility service territory in a downloadable shapefile GIS format, to include the following layers of data plotted on the utility service territory map as specified below, at a minimum. Provide information for each year; calculate and provide a five-year average. Name and attach files according to the table below.

Table 8 (Map File Requirements for Recent and Modelled Conditions of Utility Service Territory, last 5 years) is provided in Appendix A.

Instructions for Table 9:
Report underlying data for baseline conditions (projected for 2020) of the utility service territory in a downloadable shapefile GIS format and database, to include the following layers of data plotted on the utility service territory map as specified below, at a minimum. Report more granular resolutions where available (e.g., asset-level instead of by circuit mile).

Clarification provided for Table 9:
Table 9, Part 3 "Planned 2020 WMP initiative activity per year," when there is an estimate where a percentage of some asset type is assumed to need replacement (as part of a planned 2020 WMP activity), the planned replacement shall be included in the GIS file for Appendices 6.5 or 6.6, depending upon whether the asset is represented as a line or a point, for each quarter-mile segment of linear data or for each point location of that asset.

Table 9 (Map File Requirements for Baseline Condition of Utility Service Territory Projected for 2020) is provided in Appendix A.

3. Baseline Ignition Probability and Wildfire Risk Exposure

3.1. Recent Weather Patterns, Last 5 Years

Instructions for Table 10:
Report weather measurements based upon the duration and scope of NWS Red Flag Warnings and upon proprietary Fire Potential Index (or other similar fire risk potential measure) for each year. Calculate and report 5-year historical average. Ensure underlying data is provided per Section 2.7.

Table 10 (Weather Patterns, last 5 years) is provided in Appendix A.

3.2. Recent Drivers of Ignition Probability, Last 5 Years

Instructions for Table 11:
Report recent drivers of ignition probability according to whether or not near misses of that type are tracked, the number of incidents per year (e.g., all instances of animal contact regardless of whether they caused an outage, an ignition, or neither), the rate at which those incidents (e.g., object contact, equipment failure, etc.) cause an ignition in the column, and the number of ignitions that those incidents caused by category, for each of last five years.

Calculate and include 5-year historical averages. This requirement applies to all utilities, not only those required to submit annual ignition data. Any utility that does not have complete 2019 ignition data compiled by the WMP deadline shall indicate in the 2019 columns that said information is incomplete. List additional drivers tracked in the "other" row and add additional rows as needed. Ensure underlying data is provided per Section 2.7.

Clarification provided for Table 11:
Table 11: Key recent drivers of ignition probability, last 5 years, shall be completed for transmission lines and distribution lines separately, submitted as Table 11a and Table 11b, respectively.

With respect to identification of "ignition probability drivers," the rows within Table 11 are illustrative and, as explained in the introductory text, utilities are expected to include all ignition drivers that they track. At a minimum, "ignition probability drivers" shall include all permutations of the "Suspected Initiating Event," including two subsequent columns "Equipment/Facility Failure" and "Contact From Object" columns provided in the fire ignition data template provided on page C-8 of D.14-02-015 and reported annually on April 1. The baseline list of ignition probability drivers shall include all types of equipment, facilities, and objects. This page shall be referenced in lieu of the cited SDR Table 24, which does not exist.

Table 11a (Key Recent Drivers of Ignition Probability, last 5 years for transmission lines) and Table 11b (Key Recent Drivers of Ignition Probability, last 5 years for distribution lines) are provided in Appendix A.

3.3. Recent Use of PSPS, Last 5 Years

Instructions for Table 12:
Report use of PSPS according to the number and duration of PSPS events in total and normalized across weather conditions each year (by dividing by the number of RFW circuit mile days). List additional PSPS characteristics tracked in the "other" row and additional rows as needed.

Table 12 (Recent Use of PSPS, last 5 years) is provided in Appendix A.

3.4. Baseline State of Equipment and Wildfire and PSPS Event Risk Reduction Plans

3.4.1. Current baseline state of service territory and utility equipment

Instructions for Table 13:
Provide summary data for the current baseline state of HFTD and non-HFTD service territory in terms of circuit miles; overhead transmission lines, overhead distribution lines, substations, and critical facilities located within the territory; and customers by type, located in urban versus rural versus highly rural areas and including the subset within the Wildland-Urban Interface (WUI).
The totals of the cells for each category of information (e.g., "circuit miles" or "circuit miles in WUI") would be equal to the overall service territory total (e.g., the total of number of customers in urban, rural, and highly rural areas of HFTD plus those in urban, rural, and highly rural areas of non-HFTD would equal the total number of customers of the entire service territory). Ensure underlying data is provided per Section 2.7.

Table 13 (Current Baseline State of Service Territory and Utility Equipment) is provided in Appendix A.

Instructions for Table 14:
Input summary data on number of utility weather stations located in utility service territory by type.

Table 14 (Summary Data on Weather Station Count) is provided in Appendix A.

Instructions for Table 15:
Input summary data on number of utility fault indicators located in utility service territory by type.

Table 15 (Summary Data on Fault Indicator Count) is provided in Appendix A.

3.4.2. Planned additions, removal, and upgrade of utility equipment by end of three-year Plan term

Instructions for Table 16:
Input summary information for the planned additions or removal of utility equipment to be completed by the end of the 3-year plan term in 2022. Report net additions using positive numbers and net removals and undergrounding using negative numbers for circuit miles and numbers of substations.

Table 16 (Location of Planned Utility Equipment Additions or Removal by End of 3-Year Plan Term) is provided in Appendix A.

Instructions for Table 17:
Referring to the program targets discussed above, report plan for hardening upgrades in detail below. Report plan in terms of number of circuit miles or substations to be upgraded for each year, assuming complete implementation of wildfire mitigation activities, for HFTD and non-HFTD service territory for circuit miles of transmission lines, circuit miles of transmission lines located in Wildland-Urban Interface (WUI), circuit miles of distribution lines, circuit miles of distribution lines in WUI, number of substations, and number of substations in the WUI.

Include a list of the hardening initiatives included in the calculations for the below table.

Table 17 (Location of Planned Utility Infrastructure Upgrades) is provided in Appendix A.

3.4.3. Status quo ignition probability drivers by service territory

Instructions for Table 18:
Report 5-year historical average drivers of ignition probability according to:

- *the average number of incidents per year*
- *the likelihood of ignition per incident, meaning, the rate at which those incidents (e.g., object contact, equipment failure, etc.) would be expected to cause an ignition (e.g., if 50% of vegetation contacts result in ignition, then the value for the "Likelihood of ignition per incident" column would be "50%" in that row); and*
- *the 5-year historical average of the number of ignitions from this driver by location in non-HFTD, HFTD Zone 1, HFTD Tier 2, and HFTD Tier 3. List additional risk drivers tracked in the "other" row and additional rows as needed. If changes would be expected for plan years 2 and 3, describe.*

Clarification provided for Table 18:
Table 11: Key drivers of ignition probability, should be completed for transmission lines and distribution lines separately, submitted as Table 18a and Table 18b, respectively.

Table 18a (Key Drivers of Ignition Probability for transmission lines) and Table 18b (Key Drivers of Ignition Probability for distribution lines) are provided in Appendix A.

4. Inputs to the Plan and Directional Vision for Wildfire Risk Exposure

4.1. Objectives of the Plan

Instructions: *The objectives of the plan shall, at a minimum, be consistent with the requirements of California Public Utilities Code §8386(a). Describe utility WMP objectives, categorized by each of the following timeframes:*

1. *Before the upcoming wildfire season, as defined by the California Department of Forestry and Fire Protection (CAL FIRE),*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

In accordance with California Public Utilities Code (P.U. Code) § 8386(a), SDG&E constructs, maintains, and operates its electric system in a manner that minimizes the risk of catastrophic wildfire posed by its electric power lines and equipment. SDG&E's overarching WMP objective is to prevent and mitigate the risk of wildfires caused by utility equipment. Building upon over ten years of wildfire prevention and mitigation work, SDG&E's 2020 WMP continues to focus on reducing wildfire risk. Each year, SDG&E identifies ways to enhance its wildfire prevention and mitigation efforts through enhancing or expanding existing programs and developing and implementing new programs. A description of SDG&E's WMP objectives for each of the specified timeframes is provided below.

Before the upcoming wildfire season
Wildfire season has expanded in recent years. Traditionally, wildfire season took place in the Fall. In more recent years, however, it has arrived earlier and has become a year-long season in some years. SDG&E's long-standing approach to minimizing the risk of its equipment causing catastrophic wildfires involves a three-pronged approach, integrating activities in: (1) Operations and Engineering, (2) Situational Awareness and Weather Technology, and (3) Customer Outreach and Communication. The activities include, among other things, inspections and maintenance; follow up for findings from inspections; operational adjustments on the electric system; proactive system hardening; situational awareness; training; and outreach and education of customers. In preparation for the upcoming 2020 wildfire season, SDG&E is focusing on reducing PSPS impacts by identifying various near-term mitigations, such as installing additional switching capabilities, and expanding its microgrids and customer generator programs to support customers during PSPS events.

Before the next annual update

The annual WMP updates allow for new activities to be identified and added or for existing activities to be modified. In this 2020 WMP, SDG&E has introduced numerous initiatives, which will have better defined scope later in 2020. SDG&E's WMP annual update would include information regarding how such initiatives have been refined since the date of this submittal. A key update to the WMP in 2021 will be the PSPS mitigation activities currently under development. PSPS mitigation is focused on reducing power shutoffs for customers that frequently experience PSPS events. The specific mitigation measures will be updated in the next annual update.

Within the next three years

SDG&E has an established practice of continuously looking for opportunities to improve its wildfire mitigation efforts. The Commission has developed a Utility Wildfire Mitigation Maturity Model (Maturity Model) as a method to assess utility wildfire risk reduction capabilities and examine the relative maturity of the wildfire mitigation programs. The Commission believes that the maturity assessment can be used to drive continuous improvement in utility wildfire mitigation when leveraged with requirements to increase maturity over time. While SDG&E will refer to the Maturity Model as a guide towards improving each area of mitigation, it is important to note that the Maturity Model does not represent an absolute assessment of a utility's ability to mitigate and prevent wildfire. The Maturity Model should be part of an iterative process to improve utility wildfire mitigation and prevention efforts over time. The Maturity Model generally highlights maturity to progress in the areas of further automation, review from external stakeholders, and granularity of the initiatives. Along with other areas of improvement, these will be major areas of progress for many of SDG&E's wildfire initiatives.

Within the next 10 years

The WMP is an opportunity to demonstrate how SDG&E has advanced wildfire mitigation in each of the ten categories identified in the Maturity Model. SDG&E generally agrees that capability advancements should be a major focus in each category, however, the specific direction the Maturity Model seems to indicate for some capabilities should be examined further. For example, fully automated systems to inform utilities regarding the risk associated with each asset from flying debris, vegetation, and weather patterns may seem desirable but may take away from sound judgment based on human experience and on-the-ground intelligence. With this in mind, SDG&E sets forth its general plan for each of the ten categories in the table below.

Table SDG&E 2: SDG&E's 10 Year Vision for Wildfire Risk Mitigation

Category	2023	2030
Risk Assessment and Mapping	• Expansion of the Ignition Management Program • Wildfire Risk Reduction Model Enhancements • Creation of the SDG&E Fire Science and Innovation Lab • Upgrading High-Performance Computing Infrastructure	• Increased granularity in risk assessments • Incorporation of broader range of inputs in risk assessment • Increased automation of risk modeling • More real-time updates of risk models
Situational Awareness and Forecasting	• Integration of weather data into NMS for more automated and real-time operational decision-making • Integration and increased automation of broader datasets such as the Vegetation Risk Index, Circuit Risk Index and historical wind conditions into the PSPS Situational Awareness Dashboard • Enhanced fault detection via wireless fault indicators • Weather network modernization and expansion • Fire Science and Innovation Lab	• Increased scope of reliable weather data and improved processes for validating readings • Increased resolution of weather data across the grid • Increased accuracy of weather forecasts • Increased use of external weather data for validation • Greater automation in fire detection capabilities
Grid Design and System Hardening	• Continuation of overhead fire-hardening infrastructure programs • Increased scope of strategic undergrounding • Expansion of covered conductor installation across the system • Enhanced Advanced Protection capabilities • Private LTE Communication Network • Public Safety Power Shutoff Sectionalizing Enhancements • Expansion of the Generator Grant Program to mitigate PSPS impacts • Expansion of microgrid solutions in the new Backup Power for Resilience Program	• Higher granularity in prioritizing initiatives across the grid • Strategic grid design and localization that includes microgrid solutions and location of lines away from highest risk areas • More redundant grid topology and greater sectionalizing capabilities • Increased investment in ignition-preventing equipment and advanced technologies

Category	2023	2030
Asset Management and Inspections	• Continuation of infrastructure inspections per regulatory requirements while exceeding requirements in certain high-risk areas (Tier 3 of HFTD) • Expanded deployment of enhanced inspection technologies such as Infrared inspections of OH distribution and drone assessments • Deployment of new mobile application to enable field employees to submit circuit vulnerabilities (Circuit Ownership)	• Enhanced data collection of wildfire-related attributes at more granular asset levels with greater frequency • Optimized inspection cycles based on risk mitigation efficacy • Enhanced inspection capabilities to identify high risk assets • More robust processes, training and technologies to monitor and validate work performed
Vegetation Management Plan	• Continuation of tree-trimming program • Continued development of SDG&E's robust tree database • Continued implementation of the vegetation management work plan with enhanced clearances in high risk areas (going above regulatory requirements) • Continued testing and deployment of LIDAR technology to enhance vegetation management • Continued development of the Vegetation Risk Index (VRI) to further support risk-informed optimization of vegetation management efforts • Continuation of pole-brushing activates • Establishment of new Fuels Management program	• Increased granularity in vegetation database • Enhanced modeling capabilities to better predict vegetation growth patterns and probability of failure • Optimized vegetation inspection cycles based on risk mitigation efficacy • Enhanced vegetation inspection capabilities to identify high risk areas • Enhanced understanding of individual vegetation strike potential • More robust processes, training and technologies to monitor and validate work performed
Grid Operations and Protocols	• Continued use of various inputs for operational decision-making such as the Fire Potential Index and the Santa Ana Wildfire Threat Index • Continued use of enhanced recloser protocols with more sensitive relay settings to minimize safety risks and potential fire ignitions • Continued use of special work procedures during high risk conditions	• Increased automation in adjusting grid operations based on risk • Enhanced protocols for grid operations and better understanding of associated wildfire risk • Significant decrease in use of PSPS • Enhanced prediction, communication and mitigation of PSPS consequences • Use of advanced technologies to increase efficiency in post-PSPS inspections • Enhanced training, tools and policies to prevent and suppress ignitions related to grid activities

Category	2023	2030
Data Governance	• Increased collaboration with agency stakeholders to provide data in a timely manner by developing an ESRI Cloud Managed Service infrastructure for controlled sharing of information	• Enhanced data analytics capabilities to process large amounts of data and conduct real-time reporting • Establishment of more comprehensive databases, analyses and algorithms with advanced sharing capabilities • Enhanced tracking of near-misses and increased accuracy in estimating potential ignitions • Increased participation in utility-ignited wildfires research
Resource Allocation Methodology	• Establishment of new organization dedicated to overseeing portfolio of wildfire mitigations • Development of more holistic methodologies to optimize wildfire mitigation investments across the system • More granular assessment of risk across the system to determine most appropriate risk reduction efforts	• Increased granularity in estimating risk reduction potential of wildfire mitigation efforts (risk spend efficiencies) • More real-time updates of risk spend efficiencies • Enhanced methodology and process for portfolio-wide assessment of wildfire mitigations • Established process for evaluating and developing new technologies
Emergency Planning and Preparedness	• Continued maintenance of emergency response plans • Enhanced community outreach • Expansion of Emergency Management Operations to include additional personnel dedicated to enhanced after-action review program, coordination of PSPS events and enhancement of technology solutions to support emergency operations • Continued engagement with local stakeholders to prepare for and respond to fire-related events	• Increased stakeholder engagement and use of simulations to stress-test response plans • Increased granularity and customization of response plans • Enhanced customer communication and ability to reach vulnerable populations during emergencies • Enhanced documentation and use of lessons learned to update plans • More formalized review of procedures, benchmarking and stakeholder engagement
Stakeholder Cooperation and Community Engagement	• Continued community outreach and public awareness efforts with year-round wildfire safety education and communication campaign • Continued deployment of Community Resource Centers (CRCs)	• More formalized processes of learning from peers in and outside the State • More successful engagement with communities • Ability to utilize enhanced partnerships with LEP and AFN populations to reduce impacts of PSPS and wildfire mitigation measures to those populations • Broader engagement and deeper planning with emergency and non-emergency planning agencies

4.2. Understanding Major Trends Impacting Ignition Probability and Wildfire Consequence

Instructions: *Describe how the utility assesses wildfire risk in terms of ignition probability and estimated wildfire consequence, including use of Multi-Attribute Risk Score (MARS) and Multi-Attribute Value Function (MAVF) as in the Safety Model and Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Phase (RAMP). Include description of how the utility distinguishes between these risks and the risks to safety and reliability. List and describe each "known local condition" that the utility monitors per GO 95, Rule 31.1, including how the condition is monitored and evaluated.*

Wildfire Risk Assessment

SDG&E assessed its wildfire risk for this WMP consistent with the framework approved in the Safety Model Assessment Proceeding (S-MAP) Decision (D.) 18-12-014 and presented its Risk Assessment Mitigation Phase (RAMP) submission, filed on November 27, 2019 in Investigation (I.) 19-11-011 (2019 RAMP). As discussed in the 2019 RAMP, "[t]he Risk Quantification Framework (or MAVF) is a tool for combining all potential consequences of the occurrence of a risk event to create a measurement of value."[6] SDG&E's Risk Quantification Framework, presented in its 2019 RAMP, utilized three attributes – Safety, Reliability, and Financial. Using these three attributes as well as scales and weights, SDG&E calculated a risk score.[7] At a high level, the risk score is determined based on the frequency of a risk event occurring in a given year (e.g., a wildfire) multiplied by average consequences applied to the Risk Quantification Framework.

For the wildfire risk specifically, SDG&E's risk quantification includes those that meet the CPUC Fire Incident Data Collection requirement for wildfire reporting. A wildfire must be reported if all three of the following criteria are met:

- A self-propagating fire of material other than electrical and/or communication facilities;
- The resulting fire traveled greater than one linear meter from the ignition point; and
- The utility has knowledge that the fire occurred.[8]

Based on this definition, SDG&E uses its data to determine the appropriate risk score. Generally, SDG&E does not categorize its risks in terms of attributes (i.e., a safety or reliability risk). Rather, SDG&E uses all its attributes (and the scales and weights) to determine a risk score for each risk on its Enterprise Risk Registry, wildfire being of them.

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[6] 2019 RAMP (Chapter RAMP-C at RAMP-C-3.)

[7] The risk score SDG&E calculates uses multiple attributes (e.g., safety, reliability), as discussed above. While SDG&E does not use the term "Multi-Attribute Risk Score" or MARS, the concept is applied.

[8] *See* California Public Utilities Commission, 2014-2016 Fire Incident Data Collection, available at https://www.cpuc.ca.gov/fireincidentsdata/.

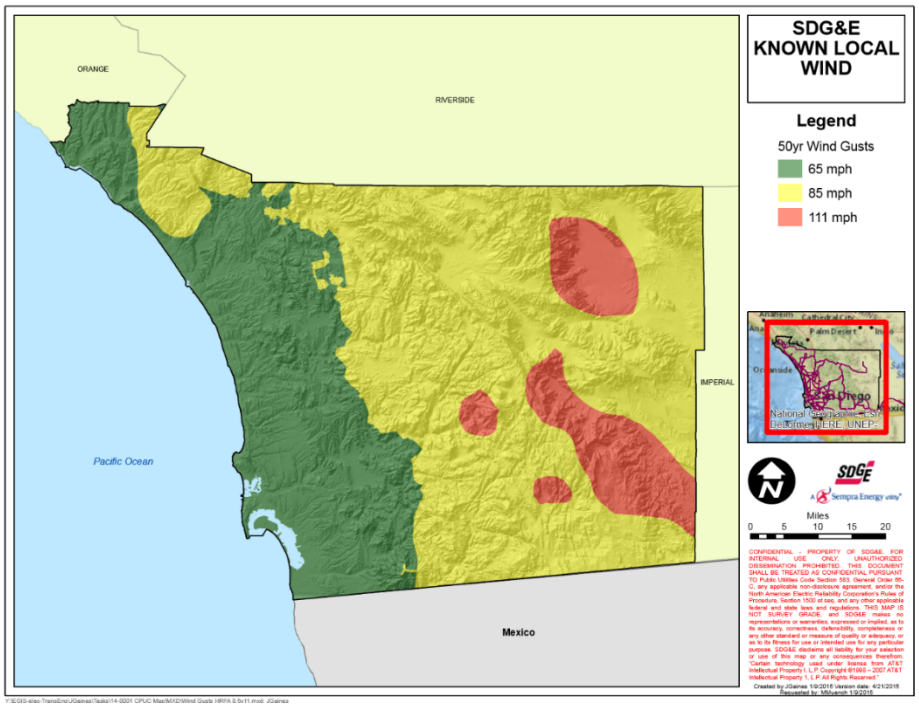
Known Local Conditions

SDG&E leverages its weather network to closely monitor winds throughout its service territory and integrates this information into its local known conditions per Commission General Order (GO) 95, Rule 31.1. SDG&E has also conducted a detailed analysis of potential wind gusts across its service territory to support wildfire hardening efforts. The following explains how these known local conditions were created and evaluated.

In an effort to create the most accurate known local wind conditions map possible, SDG&E's Meteorology department uses a Weather Forecasting and Research (WRF) Atmospheric Model to recreate hourly weather conditions on a 3 kilometer (km) grid for the last 30 years. This is possible through using government datasets to initialize WRF to create what is known as a reanalysis dataset. SDG&E created 30 years of data for a few different purposes. First, data quality degrades beyond 30 years and this was also the extent of the computing power that was available. This reanalysis dataset took approximately 1 million compute core hours on SDG&E's meteorology computing cluster. Once the dataset was created, SDG&E was able to take the highest projected wind gusts for each point on the 3 km grid for each year going back to 1984. This provided a preliminary value, but SDG&E also wanted to add a bias correction to these values based upon the real time data received from the SDG&E Weather Network.

To achieve this, two years of data from every station in SDG&E's weather network was compared to the output from the WRF Model over the same two-year period. This enabled SDG&E to determine model biases for every grid cell on the map, which was then applied to the entire 30-year dataset. Once the full 30 years of bias corrected data was compiled, the 30 years of data was extended to create a 50-year wind. This was achieved by determining the peak wind gusts for each year going back to 1984 and then applying a Generalized Extreme Value Probability Distribution Function (GEV PDF) to the data. This enabled SDG&E's Meteorology team to extend the 30-year wind to a 50-year wind for each grid cell in the map. Once this step was complete, the Meteorology team was then able to conduct analysis on the map to make refinements based upon their subject matter expertise. Having an understanding of the model's tendencies in resolving winds around certain terrain features, the meteorologists were able to refine details of the wind map to bring added value and accuracy to the final version which exists today. The following figure depicts SDG&E's known local wind conditions map as of February 2020.

Figure 1: SDG&E Known Local Wind Conditions Map



In addition:

A. *Describe how the utility monitors and accounts for the contribution of weather to ignition probability and estimated wildfire consequence in its decision-making, including describing any utility-generated Fire Potential Index or other measure (including input variables, equations, the scale or rating system, an explanation of how uncertainties are accounted for, an explanation of how this index is used to inform operational decisions, and an explanation of how trends in index ratings impact medium-term decisions such as maintenance and longer-term decisions such as capital investments, etc.).*

Monitoring Contribution of Weather to Ignition Probability and Estimated Wildfire Consequence

SDG&E focuses on monitoring and understanding the fire environment throughout its service territory and providing specific knowledge for emergency preparedness, emergency response, and risk mitigation efforts across its service territory through situational awareness and development of weather technology, including the continuous development of tools such as the Fire Potential Index (FPI) and Santa Ana Wildfire Threat Index (SAWTI).

The FPI was developed by SDG&E subject matter experts to communicate the wildfire potential on any given day to promote safe and reliable operations. This seven-day forecast product, which is produced daily, classifies the fire potential based on weather and fuels conditions and historical fire occurrences within each of SDG&E's eight operating districts. This is also shared with local fire agencies, emergency responders, and the National Weather Service. The FPI reflects key input variables, such as the state of seasonal grasses across the service territory

(green-up), fuels (ratio of 10-hour dead fuel moisture component to live fuel moisture component), and weather (sustained wind speed and dew point depression). Each of these variables is assigned a numeric value and those individual numeric values are summed to generate a fire potential value from zero (0) to seventeen (17), each of which expresses the degree of fire threat expected for each of the seven days included in the forecast. The numeric values are classified as "normal," "elevated," and "extreme."

The FPI development team, consisting of SDG&E meteorologists and fire coordinators, use a combination of weather stations and external weather data to make accurate fire potential forecasts. The FPI values have been validated by recreating historical values dating back to 2002. The historical results bore a very strong correlation to actual fire events in terms of the severity of past fires. In particular, it provided very accurate information as to when the risks of uncontrolled and large-scale fires were high.

SDG&E expects to tie proactive and reactive operational practices and measures to the FPI values, with the further expectation that SDG&E will be able to reduce the likelihood its facilities and operations will be the source of ignition for a fire during times when the risk of fire as measured by the FPI elevated or extreme. Moving forward, SDG&E will continue enhancing the predictors that contribute to the FPI, including live fuel moisture and green-up, to modernize the data inputs and better leverage the high-performance computing environment.

Fire Potential Index Components

The FPI is comprised of three components (FPI Green-Up, FPI Fuels, FPI Weather), which are computed into a final FPI. These components and the final computation are described below.

FPI Green-Up Component

The state of native grasses, or Green- Up Component, of the FPI is determined using satellite data for various locations. This component is rated on a 0-to-5 scale ranging from very wet (or "lush") to very dry (or "cured"). The scale is tied to the Normalized Difference Vegetation Index (NDVI), which ranges from 0 to 1, as follows:

Very Wet/Lush: 0.65 to 1.00	0.60 to 0.64	0.55 to 0.59	0.50 to 0.54	0.40 to 0.49	Very Dry/Cured 0 to 0.39
0	1	2	3	4	5

FPI Fuels Component

The Fuels Component of the FPI measures the overall state of potential fuels which could support a wildfire. Values are assigned based on the overall state of available fuels (dead or live) for a fire using the following equation: FC = FD / LFM. Where FC represents Fuels Component in the scale below, FD represents 10-hour Dead Fuel Moisture (using a 1-to-3 scale), and LFM represents Live Fuel Moisture (percentage). The product of this equation represents the fuels component that is reflected in the FPI as follows:

Very Wet					Very Dry
1	2	3	4	5	6

FPI Weather Component

The weather component of the FPI represents a combination of sustained wind speeds and dew - point depression as determined using the following scale:

Dewpoint/Wind	≤5 knots	6 to 10	11 to 16	17 to 22	23 to 28	≥29 knots
≥50ºF	4	4	4	5	5	6
40ºF to 49ºF	3	3	4	4	5	5
30ºF to 39ºF	3	3	3	4	4	5
20ºF to 29ºF	3	3	3	3	3	4
10ºF to 19ºF	2	2	2	2	2	3
<10ºF	0	1	1	1	1	2

Final Computed Fire Potential Index

The individual numeric values representing the three variables reflected in the FPI, shown above, are combined and placed on the following scale:

Normal	Elevated	Extreme
≤ 11	12 to 14	≥ 15

SDG&E continually improves the FPI through verification and product enhancement with its team of subject matter experts. In 2020, SDG&E plans to operationalize and release an enhanced version of the FPI which further leverages the analytical capabilities of its high performing computing cluster, incorporating artificial intelligence into the Live Fuel Moisture

Model and adding additional spatial and temporal resolution to the weather components. The figure below provides a view of the updated forecaster interface to generate the enhanced FPI, highlighting forecasting components.

Figure 2: FPI – Updated Forecaster Interface

Fire Potential Index

ME RA EA NE OC NC BC CM

Show Fire Potential JSON:

	Fri (day)	Fri (night)	Sat	Sun	Mon	Tue	Wed	Thu
Max Ws (Avg.)	12.5	15.9	10.0	16.5	13.8	10.2	13.9	11.4
Max Wg (Avg.)	24.3	29.2	18.8	31.4	27.7	20.7	25.5	17.9
Tier 3 Max Wind	10.7	14.2	10.8	18.2	14.4	9.2	11.9	12.0
Max DD (Avg.)	34.9	0.7	35.0	44.3	44.6	32.8	19.9	28.7
Min 10hr DFM	10.7	11.4	13.3	8.9	8.3	24.8	43.5	15.8
Max 10hr DFM	13.8	18.7	30.4	12.8	16.3	59.9	60.0	37.2
Min RH (Avg.)	24.6	97.3	25.4	17.3	17.2	27.8	46.1	30.6
Max RH (Avg.)	97.2	98.5	67.2	29.8	32.1	79.1	98.4	43.5
RH < 3k ft (6am)	98.3	98.3	34.5	17.3	25.8	58.6	97.8	
RH > 3k ft (6am)	98.5	98.5	37.4	21.6	27.1	80.3	86.6	
RH < 3k ft (2pm)	60.8	60.8	56.3	22.1	17.9	50.0	90.8	53.3
RH > 3k ft (2pm)	58.4	58.4	60.8	24.8	20.7	45.1	97.6	35.3
Min 850 RH	7.4	78.7	16.3	8.7	11.3	25.8	37.9	20.4
Max T (Avg.)	53.6	41.7	55.1	58.2	59.7	56.4	50.0	51.4

Additionally, SDG&E, the U. S. Department of Agriculture, the U.S. Forest Service, and the University of California Los Angeles (UCLA), in collaboration with CAL FIRE, the Desert Research Institute, and the National Weather Service unveiled a web-based tool in September 2014 to classify the fire threat potential associated with the Santa Ana winds that are directly linked to the largest and most destructive wildfires in Southern California. The SAWTI categorizes Santa Ana winds based on anticipated fire potential and uses several meteorological and fuel

moisture variables generated from the Weather Research and Forecasting (WRF) Model to forecast the index out to 6 days. In addition to the index, a 30-year climatology of weather and fuels has been developed to help put current and future events into perspective.

The SAWTI calculates the potential for large wildfire activity based on the strength, extent, and duration of the wind, dryness of the air, dryness of the vegetation, and greenness of the grasses. Similar to the hurricane-rating system (category 1-5), the SAWTI compares current environmental data to climatological data and correlates it with historical wildfires to rate the Santa Ana wind event on a scale from "marginal" to "extreme." To help the region prepare for hazardous conditions, information from the SAWTI is issued daily to fire agencies and other first-responders, which has led to specific preparedness and operational decisions based on the likelihood of a catastrophic wildfire fueled by Santa Ana winds. The public also has access to SAWTI to make personal safety decisions.

SDG&E is committed to maintaining the data flow used in SAWTI production for the U.S. Forest Service, which now issues this product daily. As technologies in weather forecasting and fuels predictions evolve, they will be integrated into operations to support the ongoing production of SAWTI.

Additional details on how the Fire Potential Index and Santa Ana Wildfire Threat Index are leveraged in operational decisions is included in detail in Section 5.3.6 below.

B. Describe how the utility monitors and accounts for the contribution of fuel conditions to ignition probability and estimated wildfire consequence in its decision-making, including describing any proprietary fuel condition index (or other measures tracked), the outputs of said index or other measures, and the methodology used for projecting future fuel conditions. Include discussion of measurements and units for live fuel moisture content, dead fuel moisture content, density of each fuel type, and any other variables tracked. Describe the measures and thresholds the utility uses to determine extreme fuel conditions, including what fuel moisture measurements and threshold values the utility considers "extreme" and its strategy for how fuel conditions inform operational decision-making.

Monitoring Contribution of Fuel Conditions to Ignition Probability and Estimated Wildfire Consequence

In addition to the meteorological conditions, the fire potential is also highly dependent on the state of the fuels. Given the complexity of the fuel environment (i.e., fuel type, continuity, loading, etc.), through the development of the SAWTI and FPI, SDG&E worked with the U.S. Forest Service and UCLA to focus more specifically on fuel moisture since that aspect plays a critical role in the spread of wildfires.[9] For the purposes of the FPI and SAWTI, SDG&E has condensed fuel moisture into three parameters: 1) dead fuel moisture, 2) live fuel moisture,

[9] Chuvieco, Emilio, et al. (2004). Combining NDVI and surface temperature for the estimation of live fuel moisture content in forest fire danger rating. Remote Sensing of Environment. 92. 322-331. 10.1016/j.rse.2004.01.019.

and 3) the state of green-up of the annual grasses. Each of these aspects of fuel moisture is complex and is described in detail below and is also published in *The Santa Ana Wildfire Threat Index: Methodology and Operational Implementation*.[10] As part of the development of SDG&E's Fire Potential Modeling, the moisture variables were combined into one term, which is referred to as the fuel moisture component (FMC). While the variables within the FMC often act in concert with each other, there are times when they are out of phase with one another as a result of the variability in precipitation (frequency and amount) that occurs across Southern California during the winter. Through a comprehensive empirical investigation, the governing equation for FMC can be expressed as, or a comparable variation of:

$$\mathrm{FMC} = \left\{0.1\left[\left(\frac{\mathrm{DL}}{\mathrm{LFM}} - 1\right) + G_{\mathrm{ag}}\right]\right\}^{1.7}$$

where DL is the dryness level consisting of the energy release component (ERC) and/or the 10-h dead fuel moisture time lag DFM10hr. Dead fuel refers to nonliving plant material whose moisture content responds only to ambient moisture. Dead fuel is typically grouped into ''time lag'' classes according to diameter as follows: 0.20cm, DFM1hr; 0.64cm, DFM10hr; 2.00cm, DFM100hr; and 6.40cm, DFM1000hr. Live fuel moisture (LFM) is a sampling of the moisture content of the live fuels indigenous to the local region, and G_{ag} is the degree of green-up of the annual grasses. Currently, SDG&E is assuming that all the terms in the FMC have equal weight, but further study may lead to future modifications.

The following describes the components for the FMC in further detail.

Dryness Level (DL)

The DL is a function of ERC and/or DFM10hr calibrated to historical fire occurrence across Southern California with unitless values ranging from 1 to 3. ERC is a relative index of the amount of heat released per unit area in the flaming zone of an initiating fire and is composed of live and dead fuel moisture as well as temperature, humidity, and precipitation.[11] While ERC is a measure of potential energy, it also serves to capture the intermediate- to long-term dryness of the fuels with unitless values generally ranging from 0 to 100 (using NFDRS fuel model G). The DFM10hr, which serves as the primary driver of the dead fuel moisture component in the FPI, represents fuels in which the moisture content is exclusively controlled by environmental conditions.[12] Output values of DFM10hr are in grams per gram expressed as a percentage ranging from 0 to 60. In the case of the DFM10hr, this is the time required for

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[10] Rolinski, T., S. B. Capps, R. G. Fovell, Y. Cao, B. J. D'Agostino, and S. Vanderburg, 2016: The Santa Ana wildfire threat index: Methodology and operational implementation. Wea. Forecasting, 31, 1881–1897, https://doi.org/10.1175/WAF-D-15-0141.1.

[11] Bradshaw, L. S., R. E. Burgan, J. D. Cohen, and J. E. Deeming, 1983: The 1978 National Fire Danger Rating System: Technical documentation. General Tech. Rep. INT-169, Intermountain Forest and Range Experiment Station, U.S. Forest Service, 44 pp.

[12] *See* Bradshaw, et al., above.

dead fuels (0.64–2.54cm in diameter) to lose approximately two-thirds of their initial moisture content.[13] Thus, a DL of 1 indicates that dead fuels are moist, 2 represents average dead fuel dryness, and a 3 indicates that the dead fuels are drier than normal.

Live Fuel Moisture (LFM)

The observed LFM is the moisture content of live fuels (e.g., grasses, shrubs, and trees) expressed as a ratio of the weight of water in the fuel sample to the oven dry weight of the fuel sample.[14] Soil moisture as well as soil and air temperature govern the physiological activity, which results in changes in fuel moisture.[15] LFM is a difficult parameter to evaluate because of the irregularities associated with observed values. For instance, samples of different species of native shrubs are normally taken twice a month by various fire agencies across Southern California and SDG&E has historically provided the responsible fire agencies with the equipment to support this effort. The sample times, however, often differ between agencies, and the equipment used to dry and weigh the samples may vary from place to place.

In addition, sample site locations are irregular in their distribution and observations from these sites may be taken sporadically. This presents a problem when attempting to assess LFM over the SDG&E service territory. Apart from taking fuel samples, there are several ways of estimating LFM using meteorological variables, soil water reserves, solar radiation, etc.[16] In particular, SDG&E developed an approach to modeling the LFM of chamise or greasewood (Adenostoma fasciculatum), a common shrub that grows within the chaparral biome in Southern California and is particularly flammable because of its fine, needlelike leaves and other characteristics.

This strategy makes use of historically observed LFM data from 10 sampling sites across Southern California and soil moisture from the 40–100-cm layer ($SMOIS_{40\text{-}100cm}$) from the North American Land Data Assimilation System, phase 2 (NLDAS-2). At each sampling site, LFM deviations from climatology are predicted using $SMOIS_{40\text{-}100cm}$ departures from its own annual cycle. A key element of the model is the incorporation of a 22-day lag between $SMOIS_{40\text{-}100cm}$ and LFM that improved the model fits. This is because a certain period of time elapses during which water percolates downward through the soil layers and then is drawn back up through the root system of the plant. This time can vary between 4 and 43 days depending on the evaporative conditions, soil structure, and site elevation. An average of this time lag over all the stations equated to 22 days. Current LFM values observed are relatable to gridded NLDAS-2 soil moisture anomalies from about 3 weeks earlier. That approach, although quite skillful, results in site specific equations not easily generalized across Southern California. The SAWTI

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13 *See* Bradshaw, et al., above.

14 Pollet, J., and A. Brown, 2007: Fuel moisture sampling guide. Utah State Office, Bureau of Land Management, Salt Lake City, UT, 32 pp.

15 *See* Pollet and Brown, 2007, above.

16 Castro, F. X., A. Tudela, and M. Sebastiá, 2003: Modeling moisture content in shrubs to predict fire risk in Catalonia (Spain). Agric. For. Meteor., 116, 49–59, doi:https://doi.org/10.1016/S0168-1923(02)00248-4.

index presently makes use of a simplified version of this strategy, applied to all grid points in the domain. For a given day, the model can be expressed as:

$$\mathrm{LFM} = (\mathrm{SMOIS}_{40-100\mathrm{cm22days}} - \mathrm{SMOIS}_{m}) + 82,$$

where $SMOIS_{40\text{-}100cm22days}$ is the soil moisture of the 40–100-cm layer from 22 days earlier and $SMOIS_m$ is the mean soil moisture from 2009 to 2012 for that same date. The empirically selected constant of 82 roughly approximates the annual mean LFM over a large variety of sites.

In 2019, SDG&E updated the LFM model that is leveraged in the Fire Potential Index, though the Santa Ana Wildfire Threat Index continues to leverage the methodology noted above. The LFM model more recently developed leverages the high-resolution weather data generated by the SDG&E high-performance computing cluster and using an artificial intelligence-based model, correlated the currently weather conditions to that of the past, generating a forecast for LFM across the region on a 2-km grid. Through testing, this methodology has proven more accurate when compared to historically measured values.

Annual Grasses (G_{ag})

Following the onset of significant wetting rains, new grasses will begin to emerge in a process called green-up. While the timing and duration of this process fluctuate from year to year, some degree of green-up usually occurs by December across Southern California. During the green-up phase, grasses will begin to act as a heat sink, thereby preventing new ignitions and/or significantly reducing the rate of spread among new fires. By late spring these grasses begin to cure with the curing phase normally completed by mid-June. G_{ag} is a value that quantifies the said green-up and curing cycles of annual grasses. The value of G_{ag} is observed from the Moderate Resolution Imaging Spectroradiometer (MODIS) Normalized Difference Vegetation Index (NDVI) dataset at a resolution of 250m for select pixels consisting solely of grasslands for input into the FPI and is derived from the same source for the SAWTI. NDVI is further defined by red and near-infrared (NIR) bands in the following equation:

$$\mathrm{NDVI} = \frac{\rho_{\mathrm{NIR}} - \rho_b}{\rho_{\mathrm{NIR}} + \rho_b},$$

where b is the reflectance in band b.[17] It can be shown that NDVI values for Southern California grasslands generally range from about 0.25 to 0.75 for an average rainfall year. There is evidence that NDVI is affected by soil color,[18] which may explain the NDVI differences seen

[17] Clinton, N. E., C. Potter, B. Crabtree, V. Genovese, P. Gross, and P. Gong, 2010: Remote sensing–based time-series analysis of cheatgrass (bromus tectorum L.) phenology. J. Environ. Qual., 39, 955–963, doi:https://doi.org/10.2134/jeq2009.0158.

[18] Elmore, A. J., J. F. Mustard, S. J. Manning, and D. B. Lobell, 2000: Quantifying vegetation change in semiarid environments: Precision and accuracy of spectral mixture analysis and the normalized difference vegetation index. Remote Sens. Environ., 73, 87–102, doi:https://doi.org/10.1016/S0034-4257(00)00100-0.

among the selected Southern California grassland locations. In both the FPI and SAWTI, G_{ag} is given a rating from 0 to 5 based on NDVI data, where 0 is green and 5 is fully cured. When applying the methodology discussed by White et al. (1997) to the general range of Southern California grasslands, green-up is estimated to have occurred when NDVI exceeds 0.50. However, SDG&E has found that this value can be closer to 0.64 for some sites, and therefore NDVI values greater than 0.64 are assigned a value of 0, or green. Furthermore, NDVI values less than or equal to 0.39 are assigned a value of 5. This is because NDVI values are observed to be below 0.39 for all grassland sites during the dry season when grasses are known to be fully cured. A linear relationship exists between NDVI derived values of G_{ag} and fire occurrence in Southern California. For this reason, the transition between green and fully cured (or vice versa) was given a rating of from 1 to 4 in NDVI increments of 0.05. To model NDVI, SDG&E used MODIS-derived NDVI biweekly data observed at 21 stations across Southern California, interpolated to daily frequency using cubic splines. The data availability period was January 2004–June 2012. For ease of implementation, the goal was to create a simple, yet skillful equation to capture the temporal variation of NDVI:

$$\mathrm{NDVI} = \alpha + \beta_1 \cos(2\pi \mathrm{DOY/LOY}) + \beta_2 \mathrm{PRECIP}_{\mathrm{accum}} + \beta_3 \mathrm{RH}_{\mathrm{avg}} + \beta_4 \mathrm{VEG}_{\mathrm{frac}} + \beta_5 \mathrm{SMOIS}_{40-100\mathrm{cm}},$$

where DOY is the 1 January–based day of the year and LOY is the length of the year in days. The regressor $\mathrm{PRECIP}_{\mathrm{accum}}$ is the 1 September–based annually accumulated precipitation (mm), $\mathrm{RH}_{\mathrm{avg}}$ is the 30-day running averaged relative humidity, $\mathrm{VEG}_{\mathrm{frac}}$ is the surface vegetation fraction (0–1), and $\mathrm{SMOIS}_{40\text{-}100\mathrm{cm}}$ is the soil moisture content of the 40–100-cm depth (kgm^{-3}). This equation was the result of the ''random forest'' selection and stepwise regression applied to a large number of meteorological candidate regressors.[19] However, considering the fact that this is a simple universal model with only five regressors applied across Southern California, SDG&E believes it has shown adequate skill overall.[20]

In 2020, SDG&E is planning to further develop the G_{ag} layer that is currently integrated into the FPI. Like the LFM, SDG&E will leverage the high-resolution weather data generated by the SDG&E high-performance computing cluster and, using an artificial intelligence-based model, correlate the current weather conditions to that of the past, generating a forecast for G_{ag} across the region on a 2-km grid.

When SDG&E determines whether fuel conditions are at extreme levels, historical analysis of wildfire conditions are leveraged to determine potential wildfire behavior. Detailed analysis has been conducted through the creation of the FPI and the SAWTI analyzing wildfire behavior under each rating. This information is used to determine the potential for the fuels to contribute to extreme wildfire behavior when preparing for an approaching Santa Ana Wind event.

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19 Cao, Y., 2015: The Santa Ana winds of Southern California in the context of fire weather. Ph.D. thesis, University of California, Los Angeles, 172 pp.

20 *See* Cao, 2015, above.

4.2.1. Service territory fire-threat evaluation and ignition risk trends

Instructions: *Discuss fire-threat evaluation of the service territory to determine whether an expanded High Fire Threat District (HFTD) is warranted (i.e., beyond existing Tier 2 and Tier 3 areas). This section shall include a discussion of any fire threat assessment of its service territory performed by the electrical corporation. In the event that the electrical corporation's assessment determines the fire threat rating for any part of its service territory is insufficient (i.e., the actual fire threat is greater than what is indicated in the CPUC Fire Threat Map and High Fire Threat District designations), the corporation shall identify those areas for consideration of HFTD modification, based on the new information or environmental changes. To the extent this identification relies upon a meteorological or climatological study, a thorough explanation and copy of the study shall be included.*

SDG&E historically identified geographic boundaries that were used for wildfire projects, programs, and operations. In 2008, the CPUC initiated a proceeding that focused on the creation of new statewide fire safety maps.[21] SDG&E participated in these proceedings, which led to the development of what would become known as the HFTD map.[22] The geographic areas delineated by that map allow utilities to prioritize their efforts. The CPUC hosts a webpage that communicates the purpose of the HFTD development and that serves as the official repository of the actual map data.[23]

Since the adoption of those maps by the CPUC in early 2018, SDG&E has modified relevant operational practices to be consistent with the new maps. State law requires each utility to re-evaluate its service territory and identify areas that may pose elevated risk that are not currently identified in the CPUC's existing fire threat map, and where the CPUC should consider expanding the HFTD based on new information or changes in the environment.[24] SDG&E has identified certain wildland urban interface (WUI) and coastal areas that possess higher amounts of native and non-native vegetation, which under certain circumstance, could contribute to a wildfire if an ignition took place under extreme weather conditions. SDG&E continues to assess these areas using historic fire behavior and predictive modeling to determine if these areas warrant inclusion in the HFTD.

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21 R.08-11-005 and R.15-05-006.

22 The CPUC led the development of a statewide fire threat map to designate areas where there is an elevated risk for powerline fires, and where enhanced fire safety regulations would apply. The CPUC fire map, which depicts the HFTD is available here: https://ia.cpuc.ca.gov/firemap/. These high fire threat areas are referred to the HFTD. Tier 2 fire threat areas depict areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires. Tier 3 fire threat areas depict areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires. SDG&E implemented the HFTD as required by D.17-12-024. Tiers 2 and 3 of the HFTD are roughly analogous to and replace SDG&E's Fire Threat Zone (FTZ) and High Fire Threat Area (HFRA), respectively.

23 http://www.cpuc.ca.gov/firethreatmaps/

24 P.U. Code § 8386(c)(14).

Instructions for Table 19:
In the "Rank" column, numerically rank the trends anticipated to exhibit the greatest change and have the greatest impact on ignition probability and estimated wildfire consequence (be it to increase or decrease ignition probability and estimated wildfire consequence) in ten years. Rank in order from 1 to 8, where 1 represents the greatest anticipated change or impact on ignition probability and estimated wildfire consequence and 8 is the least anticipated change or impact.

In the "Comments" column, provide a narrative to describe the expected change and expected impact on the utility's network, including whether the trend is expected to significantly increase risk, moderately increase risk, have limited or no impact, moderately decrease risk, or significantly decrease risk. Use quantitative estimates wherever possible. Also outline any programs being implemented to specifically address this trend.

Clarification provided for Table 19:
For Table 19, rows 4-6, the intent is to understand the utility's perspective on how changes in the characteristics and distribution of population that could be impacted by utility ignition will increase or decrease risk, in terms of ignition probability and estimated wildfire consequence given the long-lasting investments in utility infrastructure. This shall be based on the utility's projection for how its service territory will evolve over time. For example, if the utility expects the population in the WUI areas of its service territory (as reported in the appendices) to increase substantially, the consequences of potential wildfires in those areas would increase in terms of community impact.

Table 19 (Macro Trends Impacting Ignition Probability and/or Wildfire Consequence) is provided in Appendix A.

List and describe any additional macro trends impacting ignition probability and estimated wildfire consequence within utility service territory, including trends within the control of the utility, trends within the utility's ability to influence, and externalities (i.e., trends beyond the utility's control, such as population changes within the utility's territory).

Table 19 provides a comprehensive list of macro trends that impact ignition probability and the resulting possibility of wildfires. Climate change impacts are the most significant macro trend, showing that ignitions are resulting in larger and more destructive wildfire across the state. Another macro trend noted in Table 19 is the amount of utility infrastructure in high fire risk areas and population changes in the WUI and HFTD. These related trends increase the probability of ignition and the potential wildfire consequence. With respect to the macro trend of wildfire consequence within the SDG&E's service territory, most significant trends of wildfire consequence are related to the wildfire environment and climate change, coupled with increased population and the resulting structures encroaching into the wildland urban interface. SDG&E is working to mitigate the impacts of these macro trends though enhanced weather technology and situational awareness, aggressive system hardening and community outreach and education, as described in this WMP.

SDG&E identified additional potential ignition drivers in its 2019 RAMP filing, which are listed and discussed in greater detail in the section below.

List and describe all relevant drivers of ignition probability and estimated wildfire consequences and the mitigations that are identified in the Risk Assessment Mitigation Phase (RAMP) and not included in the above, including how these are expected to evolve. Rank these drivers from highest to lowest risk and describe how they are expected to evolve.

The following is a list of relevant drivers of ignition probability and estimated wildfire consequences, which were identified in SDG&E's 2019 RAMP (and not included in Table 19 above), including how these drivers are expected to evolve, ranked from highest to lowest.

- **Contact by Foreign Object:** Foreign objects coming into contact with SDG&E's facilities can present sources of ignition. For example, Mylar balloons are highly conductive and can cause phase-to-phase faulting, on contact. In the worst-case, this can cause the conductor to fail and land in an energized mode, causing arcing and sparking in dry conditions. In addition, vehicular contact can bring down conductors, and sometimes the entire pole, resulting in conductors laying on the ground in an energized mode. Mitigating third party and foreign object contacts is largely out of the control of SDG&E, though in the highest risk fire areas this is being addressed though hardening efforts including strategic undergrounding and the installation of covered conductor.

- **Downed Conductor:** A downed conductor (or "wire down") occurs when a conductor drops or breaks from its designed location on a pole and cross arm and ends up on the ground, sometimes in an energized mode. A wire down can result from a variety of factors, many of which are outside of SDG&E's control. SDG&E has implemented a system hardening program targeting the wire most prone to potential wire down events to decrease this risk.

- **Vegetation Contact:** During storms and severe wind events, branches are shed by trees in the vicinity of SDG&E facilities. These can fall on conductors, leading to conductor failure or, in the case of palm fronds, phase-to-phase contact and a cascade of sparks. In addition, trees that are many feet away from an energized conductor sometimes uproot and fall on the conductor, causing failure or sparking. SDG&E has been expanding upon already aggressive vegetation management practices, leveraging data to support strategic clearance increases in high risk areas.

- **Failure of Third-Party Attachments:** As mandated by the CPUC, SDG&E must allow communication infrastructure providers to attach to utility poles when space is available. These providers may not properly install or inspect their equipment. This has led to contact of these attachments with the electrical facilities, leading to fire-related incidents. SDG&E has implemented an aggressive pole loading program and increased collaboration with telecommunication companies.

- **Lack of Internal or External Coordinated Response:** A well-coordinated response to a downed conductor aids in the suppression of a fire as well as the de-energization of the conductor in a safe manner. Lack of coordination could lead to uncontrolled fire,

electrical exposure to first responders, and possibly injury or death. SDG&E continues to formalize its emergency preparedness and response and expand collaboration with first responders as a mitigation.

- **Not Observing Operational Procedures:** SDG&E revises its operational protocols and procedures based on certain conditions. For example, during fire weather watch or red flag warnings, SDG&E and its contractors may not perform welding or other activities that may generate potential ignition sources. If an employee or contractor does not adhere to the operational procedure, it may cause an adverse consequence. As a mitigation, SDG&E conducts comprehensive trainings and exercises annually to practice procedures related to wildfire mitigations.

4.3. Change in Ignition Probability Drivers

Instructions: *Based on the implementation of the above wildfire mitigation initiatives, explain how the utility sees its ignition probability drivers evolving over the 3 year term of the WMP. Focus on ignition probability and estimated wildfire consequence reduction by ignition probability driver, detailed risk driver, and include a description of how the utility expects to see incidents evolve over the same period, both in total number (of occurrence of a given incident type, whether resulting in a near miss or in an ignition) and in likelihood of causing an ignition by type. Outline methodology for determining ignition probability from events, including data used to determine likelihood of ignition probability, such as past ignition events, number of near misses, and description of events (including vegetation and equipment condition).*

Wildfire mitigation activities begin with assessing the three elements that a fire needs to burn: heat, oxygen, and fuel. To mitigate the risk of ignition and the consequence of ignition, a wildfire mitigation activity must address or enable an educated decision addressing one or more of those elements. All of SDG&E's WMP programs work to address these elements. The fire landscape and threats to customers within SDG&E's service territory are dynamic, and as a result, SDG&E's WMP programs will continue to evolve to remain effective.

The latest fire science forecasts trend towards the continuation of warmer and dryer conditions, which results in a macro trend of fuels being more receptive to ignition and fire growth. If not mitigated, this trend is likely to lead to an increase in ignition from all sources. SDG&E's wildfire mitigation initiatives attempt to address both the likelihood of an ignition and reduction of the consequences of an ignition should one occur. Over the next three years, SDG&E intends to use data gathered through its mitigation initiatives to identify increased areas of risk and educate mitigation activities.

Over the past five years in SDG&E's service territory, the two primary groups of ignition drivers that impact the ignition probability and the consequence of ignition are contact from an outside force on utility infrastructure and equipment failure. Outside forces leading to ignitions comprise items ranging from vegetation to flying patio umbrellas. Electric equipment also has a wide range of ignition sources. Both the ignition probability and the consequence of a fire are impacted by the fuel loading near the ignition point.

To reduce the probability of equipment failure leading to an ignition, SDG&E has, over the past decade, focused on hardening its electric system with programs like FiRM and CNF. Recently, these system hardening efforts expanded to include the replacement of hotline clamps, expulsion fuses, and SCADA capacitors. SDG&E monitors for new emerging ignition concerns using its Ignition Management Program. In addition to all these mitigation activities SDG&E has developed, maintained, and continues to expand its extensive Vegetation Management Program, which inspects and maintains clearances between electric facilities and vegetation. SDG&E also partners with fire agencies, community groups, and landowners to implement fuels management projects in areas that will reduce the likelihood of an ignition becoming a wildfire.

4.4. Directional Vision for Necessity of PSPS

Instructions: *Describe any lessons learned from PSPS since the utility's last WMP submission and expectations for how the utility's PSPS program will evolve over the coming 1, 3, and 10 years. Be specific by including a description of the utility's protocols and thresholds for PSPS implementation. Include a quantitative description of how the circuits and numbers of customers that the utility expects will be impacted by any necessary PSPS events is expected to evolve over time. The description of protocols must be sufficiently detailed and clear to enable a skilled operator to follow the same protocols.*

When calculating anticipated PSPS, consider recent weather extremes, including peak weather conditions over the past 10 years as well as recent weather years and how the utility's current PSPS protocols would be applied to those years.

Safety is SDG&E's top priority and drives its wildfire mitigation efforts. To that end, SDG&E continuously evaluates its wildfire risk management efforts to identify new ways to further mitigate risks and opportunities for improving its overall approach to wildfire mitigation.

SDG&E takes great pride in the reliable service it provides to its customers. SDG&E also has an obligation to operate its system safely. This obligation requires SDG&E to de-energize circuits (i.e., turn off power) when necessary to protect public safety (PSPS). SDG&E is statutorily authorized to do so under P.U. Code §§ 399.2(a) and 451. Further, the Commission has recognized this authority and provided PSPS guidance in D.12-04-024, Commission Resolution ESRB-8, and D.19-05-042. Any decision to de-energize circuits for public safety involves SDG&E's Emergency Operations Center (EOC), Meteorology, Electric System Operations leadership, and field observers.

At its inception, PSPS was identified as a core element of SDG&E's approach to preventing and mitigating wildfire, and this element goes hand-in-hand with the Company's investments in system hardening efforts. SDG&E's system hardening efforts focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. PSPS mitigates the risk of debris contacting electric infrastructure during such conditions and causing a wildfire.

SDG&E's utilization of PSPS as a measure of last resort to reduce wildfire risk has evolved significantly over time. In October 2013, SDG&E was in the second year of leveraging its newly operationalized FPI. During the first week of the month, SDG&E was tracking an approaching Santa Ana Wind event which was forecast to be a "16 Extreme" rating based on FPI, the highest rating since the tool had been created. The forecast was verified and SDG&E de-energized a portion of a circuit in unincorporated areas of San Diego County that were experiencing winds above the design limits of the system. There were no utility ignited wildfires during that event, though there was a rapidly growing wildfire that developed in the northwestern portions of SDG&E's service territory referred to as the Deluz Fire. SDG&E spent the following years working closely with academia and the fire agencies, refining its weather models, expanding its weather network, and creating the Santa Ana Wildfire Threat Index. During this time, SDG&E was also developing the initial iterations of its Wildfire Risk Reduction Model to help support future PSPS decision making.

In May 2014, during a time that San Diego is traditionally not climatologically prone to large wildfire, SDG&E implemented what became its largest PSPS to date at that time. A very unusual weather pattern occurred during the second week in May 2014, resulting in temperatures over 100 degrees across the coastal regions of San Diego for several days. This heat wave followed a winter with near record low precipitation. These factors combined with abnormally strong Santa Ana conditions across the San Diego region. SDG&E proactively shut off several areas experiencing winds above the design limits of the electric system. There were no utility caused wildfires during this event, though several large fires erupted in San Diego County.

In December 2017, SDG&E experienced the strongest and most widespread Santa Ana Wind event since the development of its weather network. During this event, there were occurrences of near-misses, where vegetation and other flying debris impacted the electric system, initiating faults at wind speeds below the design criteria of the electric system. Fortunately, none of these faults led to ignitions under the extreme weather conditions. This event served as a catalyst for SDG&E's subject matter experts to take a close look at historical wind speeds and ultimately calculate the 95th and 99th percentile wind speeds for each of its weather stations. Through this work, SDG&E found that there was a wide variation in the 95th and 99th percentile winds across its service territory. Of note, SDG&E learned that all near misses and wind driven faults on its electric system were associated with these high percentiles. This analysis lead to the integration of 95th and 99th percentile wind information as a consideration when determining if PSPS is warranted for a particular circuit or sub circuit.

In 2019, SDG&E's meteorologists, arborists, and data scientists – in an effort to further refine its analytical approach to safely operating the electric system during PSPS – started the process of analyzing all 465,000 trees tracked annually by SDG&E. The result of this analysis was the development and implementation of a Vegetation Risk Index (VRI). Through GIS-based spatial analysis, this new tool considers how many trees have the potential to impact power lines, including the species and height of these trees. This information is combined with outage history, to create a risk index for each circuit/sub-circuit SDG&E operates. This information is

also developed to help inform and determine if a PSPS is warranted for a particular circuit or sub circuit.

The development of the 95th and 99th percentile winds alongside the development of the VRI has significantly increased SDG&E's understanding of risk during extreme weather events. In 2019 SDG&E implemented PSPS using the new tools developed and discovered the net impact is double-edged. From a risk reduction perspective, it was a major success, with no ignitions of consequence and reduced near misses in areas of consequence which is an improvement over SDG&E's 2017 performance. But the new criteria expanded the customers impacted by PSPS to approximately 27,700, SDG&E's largest single PSPS event to date, although still affecting less than 2% of SDG&E's overall customer base, and less than 10% of customers within the HFTD. Going forward, SDG&E will use the lessons learned from the October 2019 PSPS events to develop new strategies with the intent of reducing both wildfire risk and PSPS impacts.

SDG&E considers a wide variety of inputs to determine whether to de-energize portions of its system. SDG&E leverages a multitude of situational awareness data and input from its subject matter experts when considering the need for a PSPS event, though experience with this program has indicated that it is not appropriate to use a prescriptive technique to determine when to use PSPS as wildfire conditions are dynamic and not every situation is the same. In determining whether to employ a PSPS in a given area of its system, SDG&E considers a variety of factors such as:

- Weather conditions
- Vegetation conditions and Vegetation Risk Index
- Field observations and flying/falling debris
- Information from first responders
- Meteorology, including 10 years of history, 99th and 95th percentile winds
- Expected duration of conditions
- Location of any existing fires
- Wildfire activity in other parts of the state affecting resource availability
- Information on temporary construction

Utility operating experience is required to analyze all the various inputs and make the decision on how to manage risk to the communities affected.

As discussed above, over the last few years SDG&E has continued to integrate lessons learned into its PSPS protocols including an understanding of specific climatology in SDG&E's PSPS regions as it relates to possible impacts to the system during RFW/Extreme conditions. SDG&E has seen more significant impacts as a specific region reaches its top wind speeds (i.e., 95th and 99th percentile) and has incorporated that into its PSPS protocols as of the 2019 fire season.

Since PSPS continues to be a key component of the Company's wildfire risk management, SDG&E is examining areas with a high probability to be impacted by PSPS during fire prone

conditions with the intention of reducing the impacts of PSPS to customers. To that end, SDG&E recently formed a dedicated team of internal experts with a diverse background in engineering, meteorology, and risk management to examine the Company's infrastructure in the areas of highest wildfire risk, with the objective of identifying short and long-term strategies to minimize both wildfire risk and the customer impacts of PSPS. The team's analysis will incorporate a variety of risk factors including tree strike potential, customer density, ingress/egress issues, and critical infrastructure among other factors to identify the most appropriate portfolio of mitigations across the high wildfire risk areas. The portfolio of mitigations that the team is looking at scoping includes but is not limited to:

- Strategic undergrounding
- Overhead system hardening, including:
  - Expanded use of covered conductors
  - Additional sectionalizing or circuit reconfigurations
  - Falling conductor protection
- Enhanced vegetation management
- Fuels management
- Providing backup generation either in the form of individual customer generators or microgrid solutions

As the team conducts its assessment and scopes these various mitigation options, the scope of other programs within this WMP will likely be adjusted to balance short and long-term strategies for mitigating wildfire risk. In addition to this team's effort to identify engineering solutions to PSPS impacts, SDG&E formed another team to focus on identifying and establishing customer programs to support the reduction of PSPS impacts. This second team will focus on customer outreach efforts, obtaining feedback from communities, standing up broader grant generator programs among other efforts that focus on mitigating overall customer impacts.

Instructions for Table 20:
Rank order the characteristic of PSPS events (in terms of numbers of customers affected, frequency, scope, and duration) anticipated to change the most and have the greatest impact on reliability (be it to increase or decrease) over the next ten years. Rank in order from 1 to 9, where 1 means greatest anticipated change or impact and 9 means minimal change or impact on ignition probability and estimated wildfire consequence. To the right of the ranked magnitude of impact, indicate whether the impact is to significantly increase reliability, moderately increase reliability, have limited or no impact, moderately decrease reliability, or significantly decrease reliability. For each, include comments describing expected change and expected impact, using quantitative estimates wherever possible.

Table 20 – Anticipated Characteristics of PSPS Use Over Next 10 Years is provided in Appendix A.

5. Wildfire Mitigation Strategy and Programs for 2019 and For Each Year of the Three-Year WMP Term

5.1. Wildfire Mitigation Strategy

Describe organization-wide wildfire mitigation strategy and goals for each of the following time periods:

1. *Before the upcoming wildfire season, as defined by the California Department of Forestry and Fire Protection (CAL FIRE),*
2. *Before the next annual update,*
3. *Within the next 3 years, and*
4. *Within the next 10 years.*

Please refer to Section 4.1 above for a description of SDG&E's overall wildfire mitigation strategy and goals for: before the 2020 wildfire season, before the next annual update, within the next three years, and within the next 10 years.

The description of utility wildfire mitigation strategy shall:

A. *Discuss the utility's approach to determining how to manage wildfire risk (in terms of ignition probability and estimated wildfire consequence) as distinct from managing risks to safety and/or reliability. Describe how this determination is made both for (1) the types of activities needed and (2) the extent of those activities needed to mitigate these two different groups of risks. Describe to what degree the activities needed to manage wildfire risk may be incremental to those needed to address safety and/or reliability risks.*

Determining How to Manage Wildfire Risk

Over the years, SDG&E has fostered a safety culture where wildfire mitigation activities are a prominent focus. Wildfire is the top risk in SDG&E's Enterprise Risk Management assessment. As such, SDG&E's wildfire prevention and mitigation activities are a key component in keeping customers, employees and communities safe. Generally, wildfire mitigation activities are focused on electrical assets which have the potential to cause fires as opposed to those causing a safety or reliability issue unrelated to wildfires. Improved reliability is often a collateral benefit of wildfire mitigation work because the system hardening, fire science, and weather technology prevent more forced outages.

In order to reduce the risk of catastrophic wildfires caused by its electric power lines, SDG&E's mitigation activities encompass infrastructure hardening, undergrounding, vegetation management, fuels management, inspections and patrols focused on high risk fire areas, and customer outreach and education, in conjunction with leveraging the fire science and weather technology SDG&E has developed since 2007.

SDG&E's wildfire mitigation activities are focused mostly within the HFTD and WUI and are often complimentary to the activities associated with safety and reliability outside of HFTD. Some of these activities include increased inspections; infrastructure hardening; undergrounding; operational measures such as patrols prior to RFW days; post PSPS patrols

prior to restoration of outages; additional vegetation management inspections as well as increased clearance of tree pruning.

SDG&E's situational awareness related activities are also mostly focused in the HFTD and WUI. These activities include: forecasting weather; monitoring the wind, fuel, and relative humidity to understand the wildfire risk; monitoring fire cameras; and collaborating with the National Weather Service and others. SDG&E's public outreach and collaboration with its public service partners are another aspect where the activities in the HFTD and WUI are different. Each year, SDG&E spends much time organizing and conducting community outreach and education events to better prepare customers for PSPS events and raise awareness of wildfire risk. Throughout the year, SDG&E diligently works to strengthen collaboration with its public service partners and to determine additional ways to its support customers. The wildfire mitigation measures mentioned here are designed to reduce the risk of ignition and wildfire consequence.

Wildfire mitigation related activities are quite separate from activities outside this scope. Much of SDG&E's safety and reliability related work outside the HFTD is very important and contributes greatly to the Company's mission, however, it has a different focus. For example, SDG&E's outreach and communication with customers is focused on customer satisfaction and mitigating the impacts of outages. Outside the HFTD and WUI, system upgrades are not driven by wildfire risk but are driven by improving the impacts of outages to customers and reducing risk not related to wildfires. An example of an activity is the underground cable replacement program SDG&E runs every year to improve reliability for customers. Over the years, the situational awareness of weather impacts outside HFTD has increased and is monitored for any potential weather impacts especially when forecasted. There are fewer weather stations outside the HFTD and WUI areas as the weather severity is much reduced in those areas.

B. Include a summary of what major investments and implementation of wildfire mitigation initiatives achieved over the past year, any lessons learned, any changed circumstances for the 2020 WMP term (i.e., 2020-2022), and any corresponding adjustment in priorities for the upcoming plan term. Organize summaries of initiatives by the wildfire mitigation categories listed in Section 5.3.

Summary of Major Investments and Implementation of Wildfire Mitigation Initiatives
In the years following the 2007 wildfires in Southern California, SDG&E has made significant investments to address its wildfire risk. As discussed throughout this WMP, these investments have resulted in a number of advancements in the categories of mitigation efforts. The following summarizes the major investments and implementation of wildfire mitigation initiatives achieved over the past year and notes priorities for the upcoming Plan term.

1. **Risk assessment and mapping**
   The Operational Wildfire Risk Reduction Model (WRRM-Ops) was leveraged heavily in 2019 to inform operational decision-making by providing a better understanding of ignition probability and estimations of wildfire consequences along electric lines and equipment. SDG&E plans to further update and evolve the WRRM-Ops platform into a

single visual and configurable live map that can be used to help make operational decisions, including with respect to Public Safety Power Shutoff.

2. **Situational awareness and forecasting**
   Utilization of situational awareness tools such as weather stations, cameras, wireless fault indicators, and the Fire Potential Index have proven beneficial to system planning, emergency operations, and the safe implementation of PSPS. Based on these successes, SDG&E situational awareness networks will be expanded into areas where they can be used to minimize the impacts of PSPS and make communities safer.

3. **Grid design and system hardening**
   In 2019, SDG&E's hardened approximately 150 miles of distribution overhead, 11 miles of distribution underground, 10 miles of transmission overhead, as well as replaced approximately 2,500 fuses, 660 hotline clamps, and provided 65 medical baseline customers on life support with backup generators. In 2020, SDG&E is refining the focus of its system hardening efforts to include reducing the customer impacts of PSPS events. SDG&E's PSPS Mitigation Engineering team will perform a segment-by-segment analysis of circuits prone to PSPS, to identify the highest risk areas within the circuit to apply specific mitigation efforts that can reduce the impacts of shutoffs. This strategy will result in an increase in mitigation strategies such as: strategic undergrounding; overhead system hardening such as covered conductors, sectionalizing or circuit reconfigurations; enhanced vegetation management, and fuels management; and backup generators and microgrid solutions. Previous hardening efforts such as high-risk asset replacement will continue in parallel but will be completed over an extended timeframe.

4. **Asset management and inspections**
   In 2019, SDG&E met or exceeded the requirements of the inspections mandated by GO 165, GO 95, GO 128, and GO 174, and also started a pilot distribution drone assessment program. In 2020, SDG&E will enhance existing inspections by introducing distribution infrared inspections, which allow for the detection of issues invisible to the human eye. SDG&E will also include an expanded distribution and transmission drone inspection program within the HFTD to identify potential issues not visible by traditional ground inspections.

5. **Vegetation management and inspections**
   In 2019, SDG&E's Vegetation Management department inspected approximately 453,000 trees and piloted a 25-foot post-prune clearance where feasible. As of January 31, 2020, SDG&E has performed enhanced pruning on approximately 4,800 targeted trees within the HFTD and removed approximately 3,700 trees. In 2020, SDG&E will continue to increase its tree-trim scope to achieve a 25-foot post-prune clearance for approximately 17,000 of the 81,000 trees that meet the criteria within the HFTD. In addition, SDG&E will expand upon its existing fuel management

program by continuing to develop relationships and collaboration efforts within the fuel management community.

6. **Grid operations and protocols**

SDG&E previously completed a large deployment of remote distribution sectionalizing devices, focusing heavily on the HFTD. This equipment allows SDG&E to sectionalize various elements of its distribution system to efficiently manage system operations and reliability, which results in quicker restoration times for customers. In 2020, SDG&E plans to continue to validate the internal operating procedures annually prior to fire season and look for innovation in system protection settings for its automated reclosers and other automated sectionalizing devices.

In 2019, SDG&E started the process of analyzing all 465,000 trees tracked annually to further analyze the approach to safely operate the electric system during PSPS, which resulted in development of the VRI. For 2020, SDG&E has created a PSPS mitigation engineering team that is developing mitigation strategies that will reduce impacts to customers that have been exposed to PSPS in the past. For the work planned in 2020, SDG&E will utilize a combination of strategic undergrounding, remote sectionalizing, covered conductor, overhead hardening, microgrids, and SDG&E provided customer generation to reduce customer impacts.

Currently, SDG&E has two aerial assets available for the purpose of helping fight fires. SDG&E is in negotiations to purchase a replacement asset.

7. **Data governance**

Late in 2019, SDG&E started developing an Enterprise Asset Management Platform. This centralized repository for asset data will enable SDG&E to predict and assign asset health indexes on its critical electric assets to identify and compare assets based on their likelihood of failure. For 2020, SDG&E plans to continue this effort and develop a multi-attribute value framework for evaluating capital investments through a data-driven, quantitative risk- and safety-based lens.

8. **Resource allocation methodology**

Over the past few years, SDG&E established the Asset Integrity Management program and its centralized group, to develop and implement a holistic and sustainable asset management system (people, process and technology) for electric assets with an integrative approach for governance, strategy, analytics and continuous improvement. In 2020, SDG&E will continue with a phased approach on developing the asset management system with a focus on electric transmission, substation and distribution business segments.

9. **Emergency planning and preparedness**

SDG&E developed its emergency preparedness plan in collaboration with key internal and external stakeholders and lessons learned from past incidents, trainings, and

exercises are incorporated as appropriate. SDG&E updates the emergency plans in a three-year cycle; 2020 is the next scheduled update. SDG&E will update and validate the plan prior to the 2020 wildfire season. Each update of the plan will be developed in collaboration with key internal business units and external public safety partners. SDG&E also plans to install Distribution Communications Reliability Improvements, which include a private long-term evolution (LTE) network that will enhance system protection capability and drive more automation of electric system awareness and reporting of events. This new LTE network will also enhance the push-to-talk radio capabilities in some of the more remote areas in HFTD and enhance the speed and data throughput of SDG&E's fire cameras. The improved communication network and system protection may also allow for more automation of PSPS initiation and PSPS re-energization data gathering and processes.

10. **Stakeholder cooperation and community engagement**
    When mitigating the risk of wildfires and impacts of PSPS events, SDG&E works with customers, elected officials, non-profit support organizations, and first responders as they all play a vital role in achieving wildfire prevention and mitigation. SDG&E works with almost 98 nonprofit readiness and response organizations, as well as close to 260 community-based organizations. As the wildfire mitigation program evolves in 2020, SDG&E will continue to work and build relationships with emergency response agencies, strategic partner organizations and fire suppression agencies. SDG&E will remain open to fostering new, strategic relationships aimed to improve collaboration and public messaging with the foundational goal of keeping our communities safe.

C. List and describe all challenges associated with limited resources and how these challenges are expected to evolve over the next 3 years.

Resource Challenges and Constraints

SDG&E was challenged to acquire sufficient resources to accomplish its 2019 wildfire mitigation goals. Specifically, SDG&E notes that it experienced some resource constraints in some specialized areas of expertise such as qualified electrical workers; certified foresters for vegetation management; GIS experts to analyze data and provide mapping solutions; engineers and designers to produce designs for construction related to system hardening; information technology resources to support data analytics; and operators to support the distribution system switching plans and support PSPS events. These resource challenges were significant due to increased demand across the state, which in turn caused some delays and made SDG&E's WMP goals harder to achieve. Ultimately, SDG&E was able to make adjustments to overcome these challenges and meet its 2019 WMP goals.

Looking forward over the next three years, SDG&E projects that the same or similar resource constraints will continue pose challenges. These constraints may be further exacerbated as a result of the ramp up in wildfire mitigation activities by utilities across California. SDG&E expects to resolve most of the challenges through proper planning and contingency plans should the challenges persist. SDG&E projects resource constraints in the areas of tree trim

crews as the electric utilities ramp up their vegetation management programs. Distribution system operators are also a concern; however, SDG&E has a robust training program and plans to onboard more resources to help meet the Company's needs. Experienced engineering and design resources are limiting factors to completing system hardening in a timely manner.

As described in Section 5.3.3.16 below, SDG&E anticipates it will increase undergrounding of its power lines in the HFTD. This has limitations and challenges because undergrounding in the HFTD generally differs from undergrounding in the non-HFTD in that HFTD areas tend to be more rural, and the roads where the undergrounding would occur are not owned by the City where SDG&E can rely on franchise agreements to place electric circuits underground. SDG&E anticipates the need to acquire underground easements on private roads, tribal lands, and other jurisdictional territory; the need to trench through environmentally sensitive areas; and other permitting delays. Some regulatory or statutory assistance may be required to expedite these resolutions if SDG&E is to meet its undergrounding goals.

There is also an additional challenge of undergrounding service lines from the main road to the house. Through this 2020 WMP, SDG&E seeks to underground such service lines by working directly with customers to determine the best possible routing for the underground service and attachment point to the building. This would involve both the need to underground customer services as well as the customer access point, converting from a weatherhead connection to an underground-fed electrical panel. While there is a model on how this could be accomplished through the Rule 20A tariff and the City of San Diego Surcharge 20SD program, these regulatory mechanisms do not sufficiently address the complexities associated with the conversion of individual services since they each derive their funding to convert services through collaboration between SDG&E and the governing jurisdiction.

SDG&E will need to work with its regulators to develop a mechanism to better address these complexities associated with work on individual customer-owned equipment. Issues which need to be studied include but are not limited to the possible environmental issues, access and land-use issues, jurisdictional panel inspection and permitting issues, and equitable cost sharing amongst all customers. SDG&E ultimately seeks to reduce wildfire risk and mitigate PSPS impacts to customers as much and as quickly as possible but must prudently review all perspectives to best protect all stakeholders involved. The PSPS Mitigation Engineering team is developing criteria for which service lines would qualify for undergrounding.

D. Outline how the utility expects new technologies and innovations to impact the utility's strategy and implementation approach over the next 3 years, including the utility's program for integrating new technologies into the utility's grid.

Technology and Innovations

Technology will continue to play a part in wildfire mitigation in the next three years and beyond. SDG&E's various technology enhancements are explained in greater detail in the following sections, and a few examples are summarized as follows:

- In order to have a more reliable and resilient communication technology, SDG&E is installing a private LTE network under the Distribution Communication Reliability Improvement program. This will enable a faster and more reliable communication network for devices on SDG&E's electric system to detect issues, enhance monitoring tools, and improve communication for employees in the field.
- Advanced system protection solutions will leverage new relays, phasor measurement units, wide area situational awareness tools, and better event reporting methodologies.
- Advanced system protection will implement falling conductor protection, a protection that detects changes in phasor measurements to de-energize broken conductors before they fall to the ground.
- Although it is in its early stages, it is expected for the artificial intelligence capabilities to progress in the areas of change detection to spot issues on the electric system from photos taken of assets. Application of artificial intelligence is also being developed to assist with situational awareness in SDG&E's Fire Science and Climate Adaptation department.
- LiDAR technology is already used in the engineering and post-construction aspects of system hardening. SDG&E is further developing usage of LiDAR in vegetation management having leveraged it in inspection of vegetation near transmission lines.

5.2. Wildfire Mitigation Plan Implementation

Describe the processes and procedures the electrical corporation will use to do all the following:

A. Monitor and audit the implementation of the plan. Include what is being audited, who conducts the audits, what type of data is being collected, and how the data undergoes quality assurance and qualitycontrol.

Monitoring and Auditing the Implementation of WMP
SDG&E's current monitoring process for the WMP occurs at various levels across the Company. At an enterprise level, the Company undergoes an annual risk management process where risk owners and managers update their risk assessments and report to senior leadership and SDG&E's Board of Directors, particularly the Safety Committee of the Board, on the Company's wildfire mitigation activities. As part of that process, the data collected and reported includes risk scores, metrics related to the risk drivers and consequences as well as various other metrics related to the execution progress of the mitigation activities. In addition to this established enterprise process, the Company conducts QA/QC audits within its various programs including the vegetation management program, CMP and construction associated with material change.

In 2019, SDG&E implemented a weekly executive WMP dashboard that monitors and reports on the overall progress of SDG&E's WMP completion efforts. The report begins with the depiction of the seven key WMP metrics proffered to the CPUC as an overall measure as to the effectiveness of SDG&E's WMP. The metrics display data from 2015 through the current year in order to assess trends over time. Next, the report provides completion data (versus planned)

on key programs, which enables leadership oversight on the WMP effort as a whole, while providing the opportunity to identify gaps or deficiencies in implementing the Plan. Finally, the dashboard discusses the progress on newer initiatives such as the pilot Fuels Management Program.

Also, in 2019, SDG&E began the development of a Company-wide data collection program geared to regularly collect progress data for each of the programs and initiatives. This system utilizes an enterprise wide IT solution that has been customized to electronically query program owners about the progress of each WMP program and initiative. Depending on the complexity of program, this query will then be sent to program owners on a weekly, monthly, quarterly or annual basis. Once the data is collected, it will then be articulated in written and graphical forms for leadership review and oversight so that gaps and deficiencies in the programs can be redirected or altered as required.

B. Identify any deficiencies in the plan or the plan's implementation and correct those deficiencies.

2019 WMP Deficiencies

In 2019, SDG&E complied with its filed 2019 Wildfire Mitigation Plan. Only one activity, Electric Equipment Training, did not meet the 2019 SDG&E program goal. This program involves joint inspections of SDG&E facilities with CAL FIRE to increase the understanding of wildfire risks and site-specific hazards. SDG&E offered to train CAL FIRE employees on electrical equipment at the beginning of 2019, but CAL FIRE did not have the resources available to complete the training. CAL FIRE confirmed there was a County staffing issue, and that the County will provide additional staffing in 2020. SDG&E plans to resume joint inspections with CAL FIRE in 2020.

C. Monitor and audit the effectiveness of inspections, including inspections performed by contractors, carried out under the plan and other applicable statutes and commission rules.

Monitoring and Auditing the Effectiveness of Inspections

SDG&E regularly monitors all of its inspection programs and ensures all inspection goals are met. In addition, SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's operational and engineering managers, who are responsible for each of SDG&E's electric operations districts. They randomly select 1.5% of the combined (overhead and underground) inspections and assess their conditions to determine if the inspections were properly performed.

The majority of SDG&E's inspection programs are performed internally. Transmission and Distribution patrols and detailed inspections are performed internally. SDG&E's additional inspections within Tier 3 of the HFTD as well as the new infrared are performed internally. The inspections performed by contractors are limited to vegetation management inspections, the wood pole intrusive inspections, and drone inspections (both the flying and photos as well as the qualified electrical worker inspection of the photos).

For vegetation management and the wood pole intrusive inspections, Vegetation Management performs a QA/QC audit on a percentage of all completed work activities including pre-inspection, tree trim, pole brush, and wood pole intrusive inspection. These audits are performed by a third-party contractor. Audits are timed to occur after the activity is completed and include a random sample population of work. Auditing uses the Powerworkz work management system to generate the QA/QC scheduling work orders. Findings are recorded in this system and any required follow-on work is submitted to the respective contractor for corrective action. Audit results are tracked via reporting and provided to the contractor. Recurring meetings are held with the contractors to discuss results and contract performance. The percentage of work activities performed include:

- Pre-inspection – 12%
- Tree trim – 12%
- Pole brush – 20%
- Wood pole intrusive inspections – 10%

In addition, for tree trimming 100% of all off-cycle completed tree work within the HFTD is audited for proper clearances and pruning practices; and 100% of all reliability (hazard) tree work completed within the routine tree activity is audited.

The drone program QA/QC process was described in detail in Section 5.3.4.9.2 below.

D. For all data that is used to drive wildfire-related decisions, including grid operations, capital allocation, community engagement, and other areas, provide a thorough description of the utility's data architecture and flows. List and describe 1) all dashboards and reports directly or indirectly related to ignition probability and estimated wildfire consequences and reduction, and 2) all available GIS data and products. For each, include metadata and a data dictionary that defines all information about the data. For each, also describe how the utility collects data, including a list of all wildfire-related data elements, where it is stored, how it is accessed, and by whom. Explain processes for QA/QC, cleaning and analyzing, normalizing, and utilizing data to drive internal decisions. Include list of internal data standards and cross-reference for they datasets or map products to which the standards apply.

Data Architecture and Flows

SDG&E collects and maintains several databases and datasets that are useful in assessing the effectiveness of its wildfire mitigation activities and programs at reducing the risk of catastrophic wildfires. SDG&E has documented the data it utilizes to inform resource decisions and measure the effectiveness of its wildfire mitigation programs in its July 30, 2019 Data Collection for WMPs Report.[25] These include databases and datasets related to electric reliability; transmission outages; ignitions; wire downs; corrective maintenance program and intrusive inspections; weather and situational awareness; and vegetation management. The

[25] *See* R.18-10-007, SDG&E Data Collection for WMP Report (July 30, 2019).

Data Collection Report contains the descriptions of these databases as well as provides a data dictionary for each database. A data flow for SDG&E's weather network data and supercomputer simulations is available in Appendix B to this Plan.

5.3. Detailed Wildfire Mitigation Programs

Instructions: *In this section, describe how the utility's specific programs and initiatives plan to execute the strategy set out in Section 5.1. The specific programs and initiatives are divided into 10 categories, with each providing a space for a narrative description of the utility's initiatives and a summary table for numeric input in the subsequent tables in this section. The initiatives are organized by the following categories provided in this section:*

1. *Risk assessment and mapping*
2. *Situational awareness and forecasting*
3. *Grid design and system hardening*
4. *Asset management and inspections*
5. *Vegetation management and inspections*
6. *Grid operations and protocols*
7. *Data governance*
8. *Resource allocation methodology*
9. *Emergency planning and preparedness*
10. *Stakeholder cooperation and community engagement*

To the extent applicable and relevant, if an electric utility has completed a Safety Model and Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Phase (RAMP) as part of its General Rate Case that identifies safety models or programs the electrical corporation has implemented to mitigate ignition probability and estimated wildfire consequence, then the models or programs identified pursuant to this section must comport with those identified in the S-MAP proceeding. Describe any differences with S-MAP and RAMP and provide rationale.

Instructions for Table 21 through Table 30:
List and summarize each initiative using the tables below for each corresponding category. Provide a separate line item for each initiative within each category. Use the initiative rows provided for these initiatives undertaken by the utility and create new rows for initiatives only when absolutely necessary. Where the utility plans to conduct additional activities that cannot be categorized into the initiatives below, add a corresponding row to the table in the relevant category and add details on each activity to complete the row according to instructions before.

For each wildfire mitigation activity, report information on:

1. *total per-initiative spend in dollars ($);*
2. *line miles to be treated (as applicable) in miles (mi);*
3. *spend per treated line mile (or, where initiative is not implemented on a per-line-mile basis, per total line miles of the system);*
4. *ignition probability drivers targeted (from the list of ignition probability drivers indicated in utility SDR Table 24 Key drivers of ignition probability, or other as needed);*
5. *risk reduction of the activity according to utility multi-attribute value function (MAVF); and*
6. *risk-spend efficiency in dollars per unit of risk reduction; and*

7. *other risk drivers addressed.*

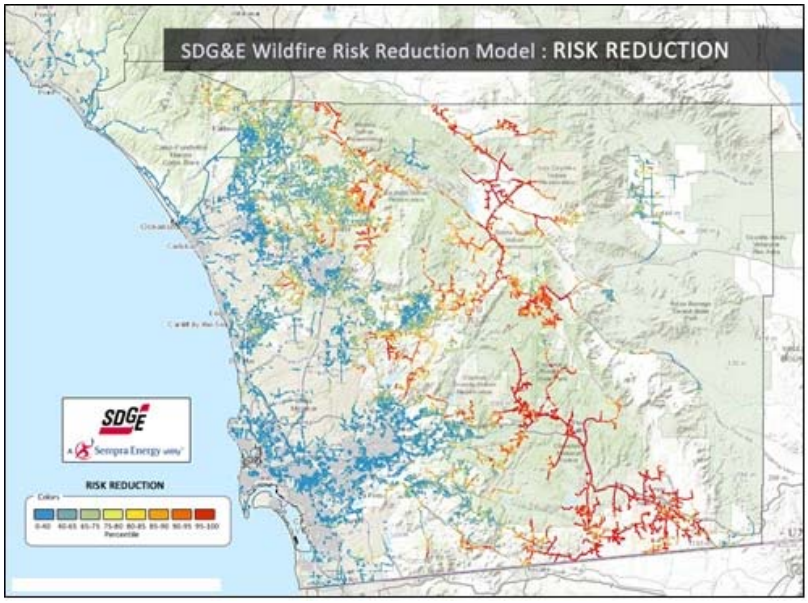
For the quantitative characteristics of the activities, six values shall be reported for each activity. These include numbers for the plan for 2019, actual activity spending and other calculations for the activity as actually implemented in 2019, the plan for year 1 of this WMP, estimates for years 2 and 3 of this WMP, and a subtotal for the 3-year WMP term ("2020-2022 plan total").
For each activity, also:

1. *identify whether the program/strategy is existing or new;*
2. *if existing, identify the proceeding where the program/strategy costs have been subjected to Commission review;*
3. *if new, identify any memorandum account where related costs are being tracked and provide an explanation of how double tracking is prevented in the comments;*
4. *indicate whether the program/strategy is implemented in compliance with existing regulations or exceeds current regulatory requirements;*
5. *if a program/strategy is identified as meeting a current regulatory requirement, cite the associated order, rule, or code; include comments as needed to clarify or explain the data provided*

5.3.1. Risk assessment and mapping

Over the last several years, SDG&E has developed and continues to refine a primarily automated risk assessment and mapping methodology referred to as the Wildfire Risk Reduction Model (WRRM). The WRRM project is a collaboration between SDG&E and Technosylva Inc.,[26] who was selected as SDG&E's consultant following an extensive and detailed request for proposals (RFP). There are two versions of WRRM, one focused on long term planning, and another that provides an operational version to support emergency activities. Both versions involve the design, development and implementation of a scientific model and a resulting application software program to allow SDG&E's engineers and emergency operations to analytically evaluate and prioritize proposed fire hardening projects and emergency actions from the standpoint of reducing or eliminating fire risk potential from overhead electric facilities. This effort began almost six years ago and involves over two terabytes (TB) of data, many man-hours of review and analysis, and billions of computer simulations over the last few years.

[26] www.Technosylva.com.



SDG&E's innovative approach drove the development of this modeling. While these efforts are now being duplicated within the electric utility industry, at the project's outset, similar models had not been established within the utility space. The outputs of the model, along with other factors that include environmental variables, allow SDG&E engineers and operators to determine which projects will provide SDG&E with the best value in regard to cost and reduction of fire risk, while also identifying circuits that pose the greatest risk of wildfire during periods of high fire danger, resulting in a safer electric system for the public at large.

The model incorporates a range of data and resulting risk factors, including:

- Vegetation and fuels data
- Weather and predictive data
- Historical fire occurrence
- Outage history
- Equipment failures (RIRAT & FiRM data)
- Fire behavior analysis
- Fire simulation modeling
- The SDG&E electric distribution network assets
- Electric system conditions and characteristics
- Subjective "values at risk" parameters
- Risk reduction projects

The outcome of the model provides a relative ranking of current risk as well as the expected absolute and percentage of risk reduction following the individual hardening project completion. The actual risk reduction of PSPS has not been directly calculated, though these values could be derived from the available data.

WRRM represents SDG&E's continued commitment to the ongoing development and further refinement of risk related models for the evaluation of hardening projects and the safe operation of the SDG&E system. To date, SDG&E subject matter experts, including fire coordinators and fire scientists analyze the model's performance for all wildfires on the landscape, identifying deviations from the risk and propagation modeling. These findings help drive the future development of the model and refining the model will result in improved and more specific quantifiable outcomes allowing for better decision making in the overall hardening effort. SDG&E stands at the forefront of the development of this important risk related model and leads the industry in the creation of such a model.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Risk Assessment and Mapping initiatives in Sections 5.3.1.1 through 5.3.1.7 below. Table 21 – Risk Assessment and Mapping initiatives is provided in Appendix A.

5.3.1.1. Summarized risk map: Operational Wildfire Risk Reduction Model

SDG&E's WRRM prioritizes long-term system hardening efforts. In developing this model, in collaboration with fire behavior experts, SDG&E leveraged 30 years of high-resolution weather data to establish a climate scenario and failure rates of its assets. SDG&E then simulated virtual wildfires to assess, quantify and prioritize risk mitigation efforts. SDG&E also updated risk algorithms to better capture weather effects on failure modes, and how existing hardware is impacted through the integration of wind factors that are applied at higher wind speeds.

SDG&E has further enhanced this model into an operational system (WRRM-Ops) by developing a fully automated process to ingest daily weather and fuel moisture data from its supercomputers, and to re-calculate risk levels to support emergency operations. This information is now leveraged by SDG&E's subject matter experts to gather intelligence and communicate potential impacts and risk for every potential fire of consequence that occurs in SDG&E's service territory. WRRM-Ops assesses the areas of highest fire danger before a wildfire begins so that preventative measures may be taken to enhance public safety and reliably operate the electric system. This model uses simulations generated from weather conditions, historical fire, and vegetation data to evaluate wildfire risk within SDG&E's service territory.

Lessons learned from this process inform the ongoing development of the modeling system. Most recent enhancements to the system include the integration of vegetation management data and real-time data into the system from the SDG&E weather network and camera network. The system that has been developed here in San Diego is now being deployed broadly across the state of California, enhancing the information available when making decisions on whether and how to update the model.

SDG&E's Wildfire Risk Reduction Model has many capabilities, including production of a summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment. Over the last several years, SDG&E has

worked with fire science experts at Technosylva to validate model performance and make updates to the model.

SDG&E gathers significant intelligence related to wildfire potential from SDG&E's WRRM-Ops model. This model integrates the fire modeling and years of firefighter experience with the latest weather and GIS technology to understand wildfire growth patterns across the region (running 6,000 fire growth simulations per second, simulating 10 million fires in a single night).

WRRM-Ops is also capable of simulating the growth and potential impact of a wildfire anywhere in SDG&E's service territory should an ignition begin. Integrating all of the aforementioned weather data developed by SDG&E, the WRRM-Ops model can conduct an analysis to determine the immediate threats, enabling quick decision-making to help decrease the impacts of wildfire. Because WRRM-Ops has proven to be a beneficial tool for SDG&E, it is now being utilized by utilities, regulators and emergency responders across the state. SDG&E intends to continue prioritizing the ongoing development of WRRM and WRRM-Ops moving forward. This modeling has proven beneficial to both system planning as well as operations. SDG&E established a management team consisting of a fire science meteorologist and a fire science coordinator who are responsible for the ongoing development and quality checks on the model. In particular, the team ensures that the intelligence generated by the model, which is then delivered to SDG&E's engineering teams and operators, is rooted in leading science.

SDG&E has a process in place to validate all wildfire modeling through the experience of its subject matter experts. Through this process, all components of the model will be analyzed to help determine focus areas for future development and enhancement.

SDG&E intends to expand WRRM-Ops beyond the levels described in the 2019 WMP[27] to provide significant enhancements for this technology. These enhancements will include:

- Integration of a tree database, with approximately 500,000 trees that are monitored near SDG&E equipment.
- The ability to adjust weather and fuel related data within the model to improve simulation of real time conditions and assessment of risk.
- Addition of new layers including historical fire perimeters, Alert SDG&E Cameras, granular weather data, weather station locations, and new view options.
- Automatically pulling information from participating agencies when vegetation fires are dispatched and running a simulation to enhance situational awareness.
- The ability to efficiently export information from the program to enhance SDG&E's ability to collaborate pre-incident, during a fire, and post incident.

[27] SDG&E's 2019 WMP at Attachment A, p. 50.

To effectively enhance the state of global fire science in 2020, SDG&E's Fire Science, Fire Coordination, and Meteorology teams will collaborate closely with leading scientists and share all the work that SDG&E has performed over the last decade to better understand Santa Ana Winds and the impacts that they have on utility operations. To that end, SDG&E plans to expand partnerships with academia and fire agencies to further accelerate and share fire modeling capabilities. SDG&E will invest in the development of a data sharing platform, which will enable researchers to access all of SDG&E's weather data.

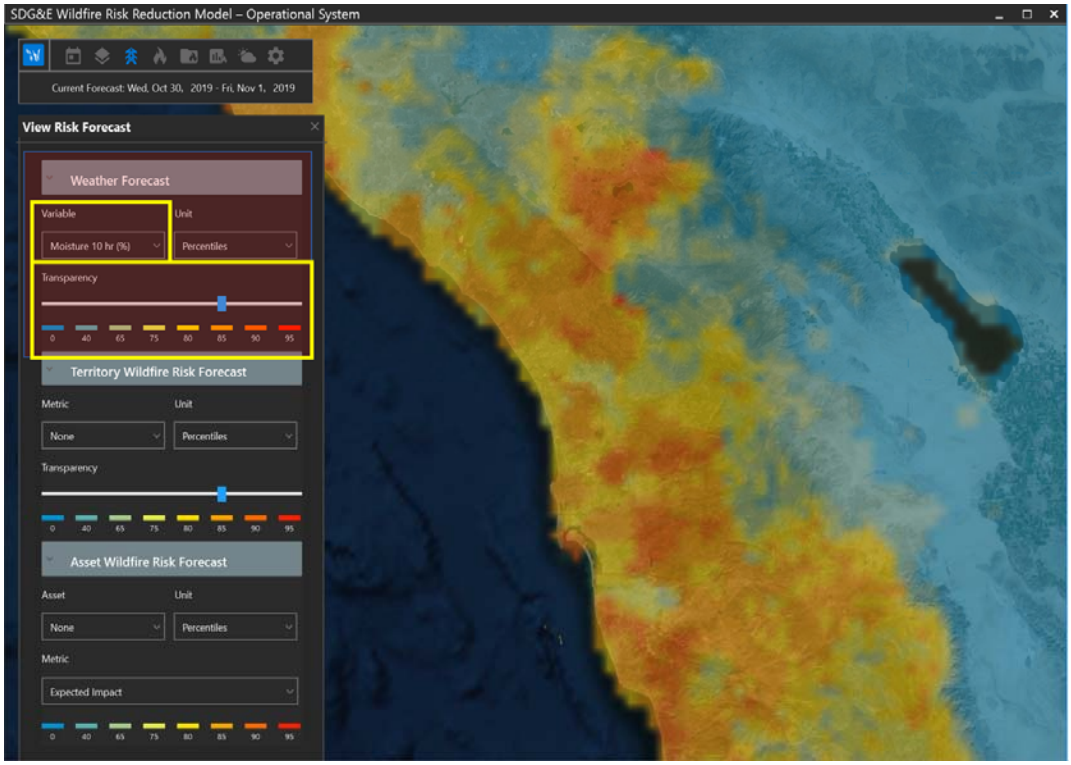
SDG&E strives to further this program by 2021 through continued collaboration with leading scientists as well as the creation of SDG&E's Fire Science and Innovation Lab (discussed in further detail in Section 5.3.7.2 below), which will foster the continued evolution of fuel moisture modeling, weather data, cameras, vegetation management data and LiDAR data and combine these data sources with years of firefighting experience to continuously improve our situational awareness.

Over the next three years, SDG&E plans to further update and evolve the WRRM-Ops platform into a single visual and configurable live map that can be used to help make operational decisions, including PSPS decisions. SDG&E also plans to expand partnerships with academia and fire agencies to further accelerate and share fire modeling capabilities while investing in the development of a data sharing platform which will enable researchers' access to all SDG&E weather data. The successful evolution of this program over the next ten years will depend on SDG&E's collaborations and partnerships. Accordingly, SDG&E will continue to expand partnerships with academia and fire agencies to further accelerate and share fire modeling capabilities.

5.3.1.2. Climate-driven risk map and modelling

For a climate-driven risk map and modelling based on various relevant weather scenarios, please refer to Section 5.3.1.1 above. The figure below is an example of an output from SDG&E's WRRM Model showing a climate-driven risk map.

Figure 3: Example of Climate-Driven Risk Map

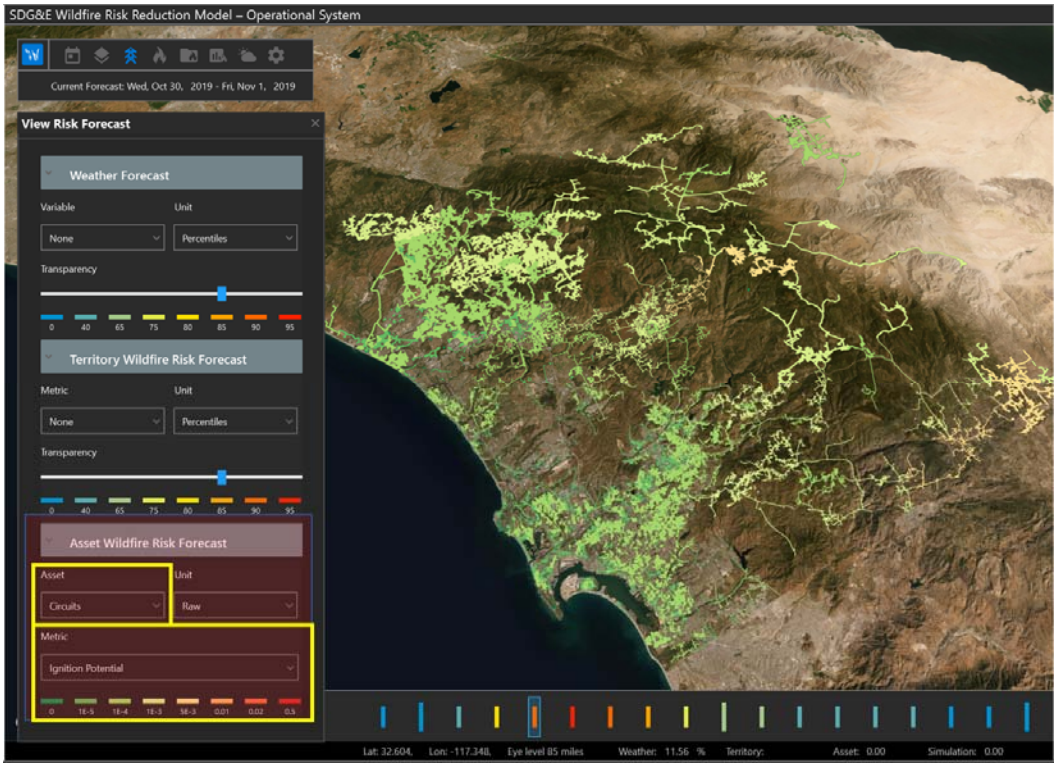


In the image above, SDG&E provides the 10-hour fuel moisture levels that were incorporated into all of its risk calculations for one of the PSPS events that occurred in October 2019. This, along with several other variables that are used to determine environmental conditions are all generated on SDG&E's supercomputers and are integrated into the daily risk calculations. This tool provides the ability to quantify the risk associated with different weather conditions.

5.3.1.3. Ignition probability mapping

Please refer to Section 5.3.1.1 above for ignition probability mapping showing the probability of ignition along SDG&E's electric lines and equipment. The figure below is an example of an output from SDG&E's WRRM Model showing the probability of ignition along SDG&E's electric lines and equipment.

Figure 4: Example of Ignition Probability Map

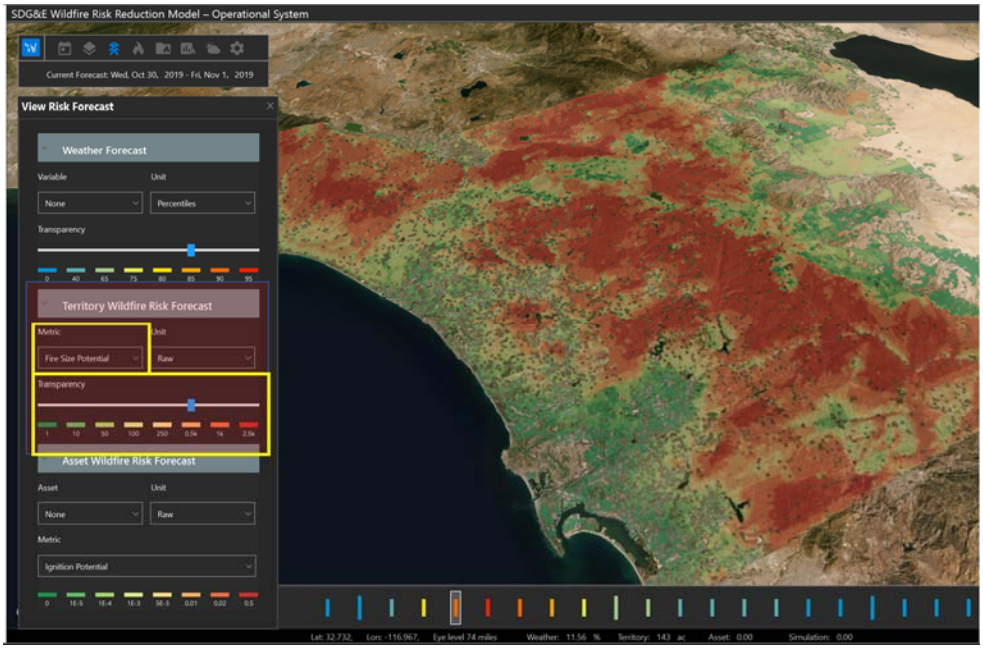


The image above shows the ignition potential that was incorporated into SDG&E's risk calculations for one of the PSPS events that occurred in October 2019. This, along with several other variables, is used to determine the wildfire risk in three hour increments 365 days a year.

5.3.1.4. Initiative mapping and estimation of wildfire and PSPS risk-reduction impact

SDG&E's WRRM Model provides initiative mapping and estimation of wildfire and PSPS risk-reduction impact. Please refer to Section 5.3.1.1 above. The figure below is an example of an output from SDG&E's WRRM Model showing initiative mapping and estimation of wildfire and PSPS risk-reduction impact.

Figure 5: Initiative Mapping and Estimation of Wildfire and PSPS Risk-Reduction Impact

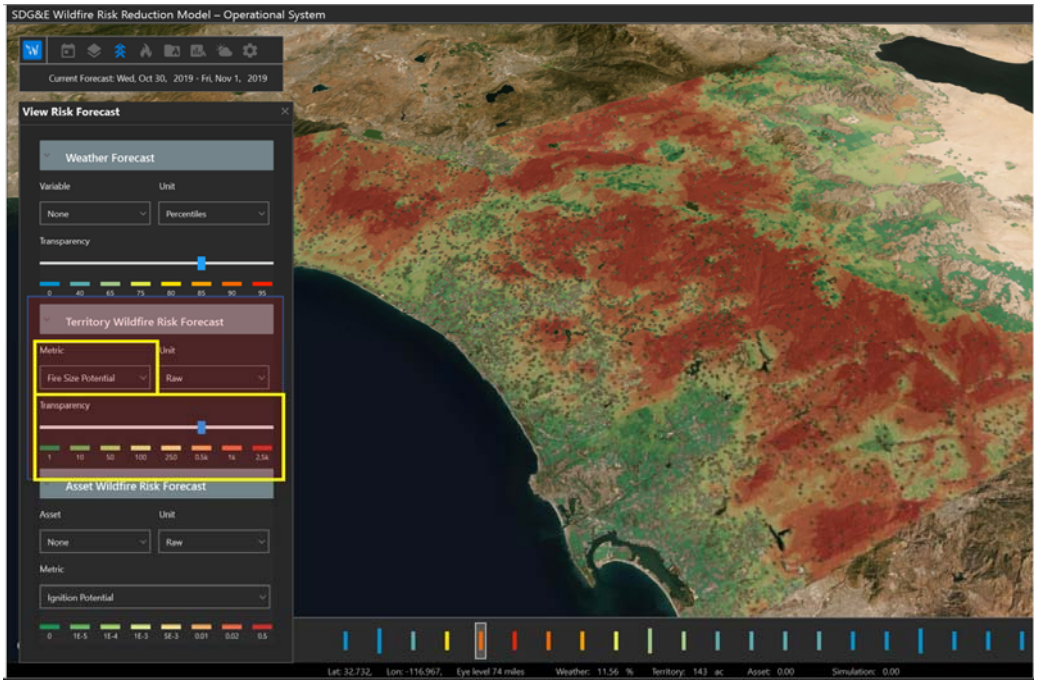


The image above shows the fire size potential for any ignitions that are initiated during one of the PSPS events that occurred in October 2019. This brings situational awareness of the wildfire potential and the risk reduction if PSPS is implemented in these areas.

5.3.1.5. Match drop simulations

Please refer to Section 5.3.1.1 above. The figure below is an example of an output from SDG&E's WRRM Model depicting a match drop simulation showing the potential wildfire consequence of ignitions that occur along the electric lines and equipment.

Figure 6: Example of Match Drop Simulation

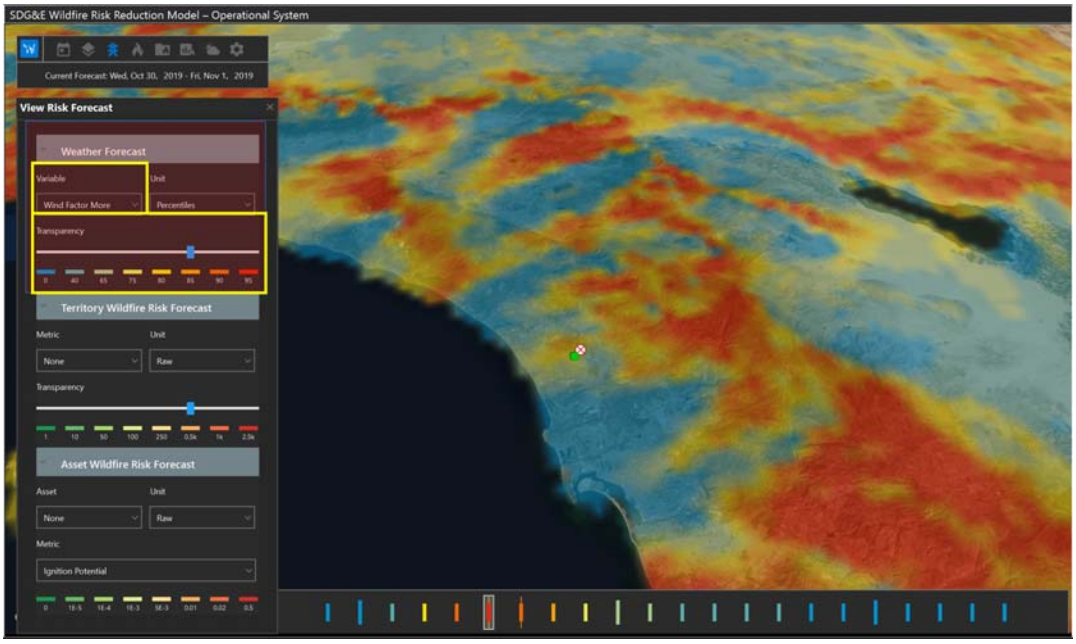


The image above depicts a virtual wildfire in SDG&E's service territory based on one of the PSPS events that occurred in October of 2019. This particular image shows the potential impact and time of arrival to building in the area of the wildfire.

5.3.1.6. Weather-driven risk map and modelling

SDG&E's WRRM Model is able to provide weather-driven risk map and modelling based on various relevant weather scenarios. Please refer to Section 5.3.1.1 above. The figure below is an example of an output from SDG&E's WRRM Model showing such a map.

Figure 7: Example of Weather-Driven Risk Map and Modelling



The image above shows a custom layer, which was developed to identify areas where winds were very strong during one of the PSPS events that occurred in SDG&E's service territory in October 2019. This brings situational awareness to areas that have an increase potential of being impacted by strong winds. This information is incorporated into the risk modeling during an event.

5.3.1.7. High-performance computing infrastructure

SDG&E utilizes three high-performance computing clusters to generate high quality weather data that is incorporated directly into operations. Collectively, nearly 2,000 compute core hours of high-performance computing are used per day to generate operational products, including the SAWTI, FPI, and WRRM-Ops. The forecast data generated by these supercomputers is shared with several partners, including the U.S. Forest Service, which disseminates the data through their public website, and the National Weather Service.

SDG&E plans to continue the production of forecast products as well as prioritize data analytics and modeling for the foreseeable future. As science evolves and new technologies become available, SDG&E will use its computing clusters to integrate the new methodologies in order to maintain forecast reliability and situational awareness. This computing has proven beneficial to system planning and emergency operations making tools possible such as the FPI, SAWTI and WRRM.

SDG&E established a management structure responsible for the ongoing development and quality checks on this program. The program management structure consists of a Data Science Meteorologist and collaborations with the San Diego Supercomputing Center, ensuring that

SDG&E's computing methodologies are rooted in leading science. SDG&E has also initiated a process to monitor and validate all wildfire modeling through the experience of its subject matter experts. Through this process, all components of SDG&E's computing platform will be analyzed to determine focus areas for future development and enhancement.

SDG&E anticipates replacing its existing supercomputers in 2022 since they will then be at the end of their useful lives. The high-performance computing infrastructure is essential to the ongoing development of fire science and big data analytics. Further, the output from the high-performance computing infrastructure is required to enable the continuous evolution of fire science and analytical fire preparedness tools such as the FPI and SAWTI. The replacement of these supercomputers was not included in the 2019 WMP.

Over the next ten years, SDG&E intends to work closely with the San Diego Supercomputing Center to closely monitor data science advancements to ensure that this program remains highly capable of providing the advanced analytics required to operate the utility of today and of the future.

5.3.2. Situational awareness and forecasting

Electric utilities worldwide recognize that the weather has a significant impact on operations. SDG&E is an industry leader in the development and implementation of utility-specific meteorological technology to anticipate, prepare for, respond to, and recover from severe weather and wildfire events. From the nation's original circuit-by-circuit utility-owned network of weather stations to outage prediction modeling, the information provided by SDG&E's team of meteorologists is integral to the safe and reliable operation of the electric system.

Most utilities across the country own or utilize a handful of weather monitoring stations. At over 190 stations, however, the SDG&E weather network was the first utility-owned weather network of this size and density in the nation and has served as a model for other utilities. Each weather station is physically located on distribution and transmission poles and provides 10-minute reads of temperature, humidity, and winds, all which are variables that impact risk of ignition and propagation from utility assets.

This allows real-time conditions to be monitored on every distribution circuit and transmission line across the fire-prone areas of the SDG&E service territory, enabling extremely granular monitoring of the system, down to span level in some of the highest risk areas. This data informs day-to-day operational decision-making at all levels of the company, including Electric Distribution and Transmission Operations, to enhance situational awareness and mitigate the risks associated with wildfires and other adverse weather conditions.

With over 200,000 pieces of weather data collected daily through a fully automated process, the Weather Awareness System was developed as a means of streamlining the information to both SDG&E and the general public. The web-based tool produces a combined weather map that can be used to help make decisions and provides current weather information, as well as

images from mountaintop cameras and forecast intelligence, to enhance situational awareness for the company and community.

The size and density of the SDG&E weather network provides a unique opportunity to pull in actual data for the verification and calibration of weather models. Understanding the value these models could play in safe operations, SDG&E partnered with the University of California system to develop and operate a fully automated and customized suite of weather and fuel moisture models, gathering data from multiple sources such as the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA), to support daily and emergency operations.

Through close collaboration with meteorology and fire science experts in academia and the fire agencies, it was determined that a seven-day forecast horizon was optimal for preparation purposes, with additional granularity and forecast details made available up to three-days before an event. SDG&E has found that these forecast horizons are optimal to support operations and plans to focus on optimizing forecast accuracy rather than investing in expanding the forecast horizon.

This partnership also led to development of models to generate forecasts for important components of the fire environment that could not be measured in real time such as fuel moisture content. This provides SDG&E's in-house subject matter experts with the best automated tools to finalize our daily weather and fire potential forecasts. In 2012, SDG&E launched its first internal high-performance computer cluster to integrate weather data directly into operations. This program has grown over the last five years and today SDG&E operates close to 2,000 compute core hours of high performance computing a day, coupled with advanced analytical techniques to generate new forecasting products. As described in earlier sections of this plan, these advanced analytics have resulted in tools such as the Fire Potential Index, Santa Ana Wildfire Threat Index and Wildfire Risk Reduction Model.

To ensure high quality data, SDG&E trains qualified electric workers to conduct annual calibrations of all its weather stations. SDG&E also has established multiple automated quality assurance and quality control algorithms which analyze the data every ten minutes and automatically alert SDG&E of any quality concerns with the data. In addition to the automated QA/QC process, SDG&E adds additional QA/QC checks of the weather network weather modeling and associated tools daily by subject matter experts.

SDG&E's meteorological innovation and technology allows it to better anticipate, prepare for, respond to, recover from, and ultimately mitigate the exposure to weather related threats. For instance, SDG&E relies on its innovative meteorological information and tools when staging crews prior to a severe weather event. SDG&E will continue to evolve its forecasting capabilities. Moving forward, SDG&E has specific plans to enable adjustments to weather forecasts in real time based on a learning algorithm that are trained of the historical weather data SDG&E has collected over the last decade.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Situational Awareness and Forecasting initiatives in Sections 5.3.2.1 through 5.3.2.7 below. Table 22 – Situational Awareness and Forecasting initiatives is provided in Appendix A.

5.3.2.1. Camera network and advanced weather station integration

SDG&E utilizes over 100 cameras that enhance situational awareness with respect to potential wildfire events. Twenty of these cameras are owned by SDG&E, while 89 cameras are supported by SDG&E in collaboration with the University of California San Diego (UCSD) as part of the High-Performance Wireless Research and Education Network (HPWREN). Of these 89 cameras, 72 are static and 17 are high-definition pan-tilt-zoom "Alert SDG&E Cameras," which are capable of remote directional and zoom control.

The Alert SDG&E Camera network is a state-of-the-art camera network designed to monitor wildfire activity and enhance situational awareness for SDG&E and its first responders and the communities they serve. SDG&E partnered with UCSD and the University of Nevada to deploy this network of 17 live-stream pan-tilt-zoom mountaintop cameras, which allows for quicker identification and triangulation of wildfires. Alert SDG&E Cameras are heavily used by CAL FIRE's Monte Vista Dispatch Center to aid in locating and sizing up wildfires for initial attack prior to the arrival of first responders. SDG&E will continue to fully support the Alert SDG&E Camera network data management process to include image collection, processing, and dissemination.

SDG&E has also closely monitored and tested the capability of fire detection software algorithms that could potentially be used to enhance wildfire detection and provide increased situational awareness to suppression forces across the region. In its experience, SDG&E encountered significant over-detection of wildfire activity from the algorithms, and it thus determined that the technology was not yet optimal for operational deployment. SDG&E has engaged and partnered with the academic community to advance and improve this capability, leveraging over a decade of historical camera images and artificial intelligence techniques. As with all work that SDG&E conducts with wildfire situational awareness, advancements will be made available to all stakeholders in the wildfire suppression community.

The SDG&E weather network, discussed in greater detail in Section 5.3.2.4 below, has been an integral aspect of the SDG&E's wildfire prevention and mitigation efforts over the last decade. The weather information is used to calibrate models such as the FPI and the SDG&E Outage Prediction Model which gives the Company the ability to anticipate when critical fire weather conditions or strong storms are approaching the area, allowing proactive preparedness measures to be taken.

SDG&E intends to continue to prioritize situational awareness platforms into the future such as weather stations and cameras. This situational awareness has proven beneficial to system planning and emergency operations supporting the successful implementation of programs such as PSPS. SDG&E has established a professional meteorology group that is responsible for

the ongoing development and quality checks on the program. The successful implementation of the PSPS program at SDG&E has demonstrated the effectiveness of the weather station and camera networks.

Before the 2020 wildfire season, SDG&E plans to expand its weather network by adding approximately 20 weather stations at strategic locations. It also intends to rebuild approximately 50 of the original weather stations. Before the 2021 WMP annual update, SDG&E intends to continue expanding, rebuilding and refining its weather network to support the safe and reliable operation of the electric system.

In the 2020-2022 time period, SDG&E will further modernize its weather network beyond the levels described in its 2019 WMP. As SDG&E's service territory faces the impacts of a changing climate, SDG&E plans to expand the weather network into high-impact wildland urban interfaces where extreme weather and fire conditions may increase. SDG&E also plans strategic weather station relocations to account for changes on the landscape and an increased understanding of climatological wind patterns in the SDG&E service territory.

By mid-2021, SDG&E expects to increase the number of its owned and operated weather stations to approximately 225. The weather network serves as a data foundation for high-performance computer modeling that supports multiple analytical tools used across the organization. As mentioned above, SDG&E plans to modify its weather system by adding and rebuilding weather stations and replacing aging sensors and equipment with the latest technology. This will include new dataloggers, thermometers, hygrometers, anemometers, batteries, solar panels, modems, and in some cases pyranometers.

SDG&E's subject matter experts and data scientists obtain a lot of value from a long period record of weather observations. To that end, SDG&E intends to continue to support its situational awareness tools throughout the next ten years. The situational awareness networks will be expanded into areas where they can be used to minimize the impacts of PSPS and make our communities safer.

5.3.2.2. Continuous monitoring sensors

SDG&E utilizes continuous monitoring sensors on critical substation equipment, such as high voltage transformers and circuit breakers. These sensors allow for continuous sampling of oil and gas, allowing SDG&E to utilize a condition-based maintenance approach for substation equipment. At this time, SDG&E has not identified an application of continuous monitoring sensors that would mitigate the risk of ignitions on overhead transmission or distribution equipment.

5.3.2.3. Wireless fault indicators

This program will install wireless fault indicators on SDG&E's electric distribution system. Wireless fault indicators are a proven technology that helps narrow the search area to

determine where a system failure has occurred, so SDG&E can quickly identify a search area and dispatch crews to find system failures. This technology is important to SDG&E's operational mitigation measures that decrease wildfire ignition risk.

SDG&E employs measures such as the use of sensitive protection schemes and the removal of reclosing on circuit devices, which increase the frequency of forced outages, decrease the damage caused by system failures, and increases customer impact from "temporary" faults (faults that remove themselves from the system such as a metallic balloon contact). During times of heightened wildfire risk, SDG&E also patrols all infrastructure for damage prior to restoring power. In instances where large areas are de-energized due to sensitive protective relay settings, wireless fault indicators are used to concentrate focus to a much smaller portion of the electric circuit, which allows for: a faster response to the site if an ignition exists; a greater chance of determining and correcting a fault cause (when damage on the overhead electric system is not immediately obvious); and, potentially, faster customer restoration (which could offset customer reliability impacts caused by wildfire mitigation measures).

Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, which is explained in detail in Section 5.3.8 below. All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. For simple jobs, like the installation of wireless fault indicators that do not involve additional structure loading or engineering, the construction field advisor and senior designers ensure quality.

In 2019, SDG&E installed 594 wireless fault indicators, exceeding by 19% its 2019 target of 500 units installed. SDG&E plans on installing approximately 500 additional wireless fault indicators in 2020 and another 500 in 2021. This program is expected to be completed in 2021, with a total of roughly 1,600 units installed from 2019-2021.

Over the next ten years, as technology changes and new innovations are introduced into the industry, SDG&E will continue to evaluate products to enhance its system and potentially incorporate new devices with optimum features. Such new devices may lead to modifications and a request for future installations.

5.3.2.4. Forecast of a fire risk index, fire potential index, or similar

5.3.2.4.1. Fire science and climate adaptation department

In recognition of the drought conditions, increased tree mortality, and ever-changing climate conditions throughout California, SDG&E established a Fire Science and Climate Adaption (FS&CA) department in 2018. The department is comprised of meteorologists, community resiliency experts, fire coordinators, and project management personnel. This department's purpose is responding to and strategizing for SDG&E's fire preparedness activities and programs.

The FS&CA department leads SDG&E's partnerships with academia, government and public safety professionals to innovate and implement more advanced technologies designed to further improve wildfire safety in the region. These advancements comprise SDG&E's new Fire Safe 3.0 initiatives, which include maximizing artificial intelligence and machine learning to improve situational awareness; developing and implementing a new and enhanced Vegetation Risk Index; and satellite enabled wildfire alerts.

In an effort to continuously evaluate and operationalize new and emerging technologies, SDG&E is building a Fire Science and Innovation Lab (FSI Lab). The FSI Lab will bring together leading thinkers and problem solvers in academia, government and the community to create forward-looking solutions to help prevent ignitions, mitigate the impacts of fires, and ultimately help build a more resilient region. With this FSI Lab, SDG&E aims to lead the development of the next generation of fire science and wildfire innovation.

As climate change and community growth continue to impact the region and the state, the FS&CA department must likewise evolve to address and provide situational awareness around emerging threats to utility infrastructure. This team will continuously evaluate new and emerging technologies, operationalizing them as necessary and warranted. Examples of this technology include the integration of artificial intelligence into the SDG&E forecasting system and the development of a satellite-based wildfire detection system. The FS&CA department performs a variety of activities that are accounted for in the department's cost centers and are consistent with SDG&E's 2019 WMP, though SDG&E continuously looks for opportunities to enhance our situational awareness capabilities. These activities are described in greater detail in the Sections below.

SDG&E intends to continue to prioritize the integration of subject matter expertise and the advancement of fire science and climate adaptation moving forward. SDG&E's Director of Fire Science and Climate Adaptation is responsible for demonstrating the effectiveness of Fire Science and Climate Adaptation initiatives.

Before the 2020 wildfire season, the FS&CA department will continue to focus on the collaborations with stakeholders in the community. Before the WMP annual update in 2021, the FS&CA will continue to evolve by creating the FSI Lab. Looking forward three and ten years into the future, the department will be focused on further expanding community partnerships, collaborating with academia and the governmental sectors, while ensuring that SDG&E has the best possible fire science intelligence and information upon which to base its safety decisions.

5.3.2.4.2. Fire potential index

A detailed description of the FPI is included in Section 4.2(A) above. SDG&E will continue to prioritize the integration of the FPI into its operational decision making to mitigate wildfire potential. SDG&E's meteorology team consists of experts in fire science and data science who conduct daily verification of the FPI tool. Through the verification process of the FPI, any

instance of the index not performing as expected is investigated, leading to improvements by the fire science team.

Before the 2020 wildfire season, the SDG&E fire science team will be operationalizing a new forecasting platform to further analyze output from SDG&E's high-performance computing platform when developing the daily FPI forecast. SDG&E is also planning to further expand the availability of the FPI to stakeholders in the wildfire community. Before the WMP annual update in 2021 as well as within the next three and ten years, SDG&E will continue a daily verification of the FPI, and the meteorology team will work to continuously improve the performance of the safety tool.

5.3.2.4.3. Santa Ana wildfire threat index

A detailed description of the SAWTI program is included in Section 4.2 (A) above. SDG&E intends to continue to support the daily operation of the Santa Ana Wildfire Threat Index and continue to share the information daily with the fire agencies for public dissemination. SDG&E's meteorology team conducts verification of the SAWTI though tracking daily of SAWTI values and tracking the occurrence of large wildfire activity. Before the 2020 wildfire season and the WMP annual update in 2021, SDG&E will continue to conduct verification of the SAWTI in collaboration with fire agencies and stakeholders in the wildfire community.

Over the next three years, SDG&E plans to work towards the creation of new artificial intelligence-based fuel moisture modeling, which will be integrated into SAWTI to improve model output. Looking forward over the next ten years, SDG&E will continue to work with academia and the fire agencies to further develop fire science for integration into SAWTI.

5.3.2.4.4. PSPS situational awareness dashboard

SDG&E is currently seeking to expand its operational awareness capabilities to include risk factors of electric system failure and risks related to foreign causes of electric system failure, which serve to inform PSPS decisions. SDG&E also plans to expand its current operational awareness by building visual dashboards that integrate the VRI, historical wind conditions, 95th and 99th percentile wind gusts, and the ability to identify areas that contain vulnerable electric infrastructure. These systems will also have the capability to geolocate infrastructure with poor historical system performance and to identify at-risk infrastructure by extrapolating asset failure analytics. Additionally, SDG&E is seeking to develop, document, and deploy a circuit risk index that will quickly aggregate this data for the purposes of operationally quantifying this risk into a single metric that can be tied to various system isolation points. This program is newly presented in this 2020 WMP.

The PSPS situational awareness dashboard was implemented in 2019, incorporating VRI, historical wind conditions, and some elements of at-risk infrastructure. In 2020, SDG&E's Asset Management department will identify and automate several data sources that generate risk quantification, system performance, system design and nameplate information, and

maintenance data, to begin aggregating these data sources into a single location for use by a circuit risk indexing tool. Once aggregated in 2021-2022, SDG&E will employ data science to find correlations between system performance and various risk factors. This data will be utilized to create a data model that will create components of a Circuit Risk Index, which is currently planned for end-of-year 2022 deployment. SDG&E plans to refine and evolve this program over the next three and ten years depending on what is learned over this Plan cycle.

5.3.2.5. Operating conditions

SDG&E monitors the potential for wildfires throughout its service territory daily, and SDG&E adjusts its operating behaviors accordingly, using its situational awareness capabilities and a formalized escalation approach. This information allows SDG&E to be flexible and successful in its operations.

As conditions for wildfires increase, SDG&E can deploy additional layers of safeguards, or, as a last resort, it might be required to de-energize certain areas of its service territory in the interest of public safety. SDG&E uses a variety of inputs to determine the appropriate operating environment given current and expected wildfire conditions. These tools are used for operational decision-making so that SDG&E personnel can plan and prepare appropriately. Among these inputs for situational awareness are the FPI and SAWTI, which are discussed in detail in Section 4.2(A), Section 5.3.2.4.2, and Section 5.3.2.4.3 above. In addition, SDG&E strategically positions field personnel throughout its service territory based on system conditions, weather, and wildfire potential, which may be considered a threat to SDG&E facilities. Field observers inform operational decisions by providing real-time input regarding onsite conditions, such as debris, vegetation, and system conditions.

SDG&E established Operating Conditions (i.e., Normal, Elevated, Extreme, and Red Flag Warning) to monitor wildfire potential throughout its service territory and, among other things, inform decisions regarding recloser settings, sensitive relay settings, testing procedures, and work restrictions. Each Operating Condition is summarized below:

- **Normal Condition (FPI forecast is in the range of 1 through 11):** declared when SDG&E determines that the burn environment is not conducive for wildfires within its service territory.
- **Elevated Condition (FPI forecast is in the range of 12 to 14):** declared when SDG&E determines that the burn environment has become conducive to wildfires within its service territory.
- **Extreme and RFW Conditions (FPI forecast is 15 or above):** declared when SDG&E determines that a combination of high winds, low relative humidity, and the burn environment will create critical wildfire weather conditions in its service territory.

These Operating Conditions inform how SDG&E operates the system impacting its recloser protocols (see Section 5.3.6.1 below), restrictions on the type of work being performed in high risk locations (see Section 5.3.6.3 below), and the use of contract firefighting resources (see Section 5.3.6.2 below).

5.3.2.6. Weather forecasting and estimating impacts on electric lines and equipment

Please see Section 5.3.2.4.1 above.

5.3.2.7. Network management system situational awareness upgrades

SDG&E's Outage/Distribution Management system uses Oracle's Network Management System (NMS) as the operational tool to manage planned and unplanned outages. Today, SDG&E's weather data, including FPI and wind speed data, are leveraged extensively, through manual processes, to set operational restrictions and make operational decisions. SDG&E plans to building key weather integrations into the NMS system to enable more accurate and real-time operational decision-making to implement reclosing policies, sensitive relay settings policies, and work cancellation decisions during extreme weather events. This program is new and was not included in SDG&E's 2019 WMP.

In 2020, key integrations will be developed to provide NMS visibility into operational conditions to make informed operational decisions related to wildfire risk. In addition, this improved functionality will provide better visibility into active planned and unplanned work in the HFTD, to identify potential risks during events.

In 2021-2022, SDG&E anticipates that the generation of switch plans will be automated to turn off reclosing and enable sensitive relay profiles in the HFTD. These tools will enable the necessary situational awareness to make operational changes during high risk events and provide real-time visibility into current conditions in the field, to make informed operational decisions. In an effort to continuously improve, SDG&E intends to evolve this program over the next three and ten years, however, specific plans are dependent on the outcome in 2021.

5.3.3. Grid design and system hardening

Overview of Grid Design and System Hardening

As discussed in Section 5.1 above, SDG&E's system hardening programs are evolving to address not only the reduction of wildfire risk, but also the mitigation of the scale and impacts of PSPS events. The core of this strategy evolution involves two major components. The first is changing from asset-based scoping to circuit-based scoping. SDG&E's most significantly resourced hardening programs, FiRM and PRiME focused on targeting specific assets with the highest probability of failure in the areas with the greatest impact prioritized through the WRRM model. While these strategies maximized wildfire risk reduction, they did not account for PSPS mitigation. By focusing system hardening on assets instead of circuits, there are small pockets of hardened areas on circuits, but the circuit as a whole is not hardened. When

SDG&E's service territory experienced Red Flag Warning days and the conditions supported a decision to utilize PSPS, these hardened areas were located downstream of remote sectionalizing devices alongside the non-hardened areas and were de-energized for safety.

To address this, SDG&E's PSPS Mitigation Engineering team is scoping projects in the HFTD on a circuit-by-circuit basis based on small wire information (the target of FiRM), at-risk pole information (the target of PRiME), and the WRRM model to understand the impacts as prioritization criteria. In addition, the team is considering historical PSPS information, ingress and egress, vegetation risk, and customer and community impact information. Most importantly, they are proposing mitigations to the circuit as a whole that would maximize the reduction of both wildfire risk and PSPS impacts and exposure to customers.

The second component of SDG&E's system hardening strategy evolution focuses on the mitigation type chosen. Overhead hardening mitigates the majority, but not all of wildfire risk. SDG&E's overhead hardening programs address every line component to significantly reduce the risk of equipment failure. Further, electric infrastructure is built to withstand winds up to 85 to 110 mph, and phase spacing is increased to address the risk of foreign object line contact. Between overhead hardening with high-tensile strength conductor, installing covered conductor, and undergrounding, overhead hardening was calculated to be the most risk spend efficient of these major mitigations because it mitigated much of the wildfire risk for the least amount of cost. When winds are blowing at the 99th percentile, however, that is when the risk of foreign object contact with power lines are highest, and even though these lines are hardened, there is risk in keeping them energized during such weather conditions.

SDG&E's overhead hardening programs and a precise use of PSPS are complimentary mitigations. The hardening programs reduce the risk of equipment failure at all times (catastrophic fires could occur at lower than 99th percentile winds as well), and SDG&E utilized PSPS when the foreign object contact risk was highest (greater than 95th percentile localized wind). This strategy has been effective, as SDG&E has had no utility fires of consequence since 2007, and SDG&E's PSPS events have historically impacted a small percentage of its customer base. Nevertheless, SDG&E has learned lessons from the October 2019 PSPS events and is working to reduce or minimize the PSPS impacts to customers.

SDG&E also continues to analyze equipment failure data, reliability data, and ignition data, together with equipment technology innovation in the industry, to propose programs that target high risk equipment with ignition history. SDG&E's expulsion fuse replacement program, capacitor replacement program, and lightning arrestor replacement programs are all examples of how SDG&E is exploring new technology to reduce the risk of equipment related failures and ignitions.

Alternatives Analysis

Consistent with D.14-12-025, D.16-08-018, and D.18-12-014, SDG&E has considered alternatives to its wildfire risk mitigation activities. Typically, analysis of alternatives occurs when implementing activities to obtain the best mitigation result or product for the cost. The

alternatives analysis for this Wildfire Mitigation Plan considered resource constraints (budget and work force) and whether modifications to what was presented in the 2019 WMP were necessary.

In-Line Disconnect Removal/Replacement Program

SDG&E has different types of equipment throughout its service territory used as sectionalizing devices. One specific sectionalizing device is called an in-line disconnect. These devices provide a sectionalizing location on a distribution circuit and are normally closed (i.e., they are not used in conjunction with a recloser or a voltage regulator as a bypass). During an outage restoration, or in locations with limited clearances, SDG&E has used these devices to assist with sectionalizing efforts to reduce the numbers of customers impacted during an outage, or when requested by field crews to provide isolation points. This specific type of sectionalizing device is not installed directly on the pole like other devices, but rather is installed on the conductor roughly 20 inches away from the pole, similarly to a splice/connector.

With roughly 160 in-line disconnects in the HFTD, SDG&E considered a program to remove these in-line disconnects within the HFTD. This equipment is not CAL FIRE-approved, and it has the potential for an ignition. SDG&E found different means to address the issue and thus dismissed this program. While in-line disconnects can cause sparks upon operation, SDG&E is not aware of in-line disconnects being a source of an ignition while closed and energized. Given that the risk only occurs while operating these disconnects under voltage, SDG&E has implemented work restrictions, as described in Section 5.3.6.3 below, which restricts these types of operation during FPI elevated or higher. With work restrictions, this alternative would be unnecessary, as the risk is otherwise mitigated.

Bridged Fuse Replacement Program

Another type of equipment is a bridged fuse (i.e., a solid blade disconnect), which provides a sectionalizing location on a distribution circuit. During outage restoration or isolation of known damaged equipment, these units have assisted SDG&E operations by reducing the customer impact and providing isolation points for crews to perform construction or maintenance work. These types of sectionalizing devices are installed to replace fuses when coordination from downstream fuses cannot occur. There are roughly 400 bridge fuses within the HFTD in SDG&E's service territory.

SDG&E considered removing these bridged fuses within the HFTD through a formal replacement program. The equipment is not CAL FIRE-approved, and it could potentially become an ignition source. After an operation requiring these devices to be opened and then closed, the limited visibility and existing design of the devices can result in a poor connection. If the contacts are not properly connected and then energized, there is potential for a hot connection that could potentially fail.

SDG&E decided not to move forward with this program because this type of failure has never caused an ignition, so the historical data does not support this type of program. In addition, SDG&E is implementing another distribution inspection mitigation measure, referred to as the

Distribution Infrared inspection program (see Section 5.3.4.4 below), which should detect this type of failure before it happens, thus mitigating much of the same risk as the considered alternative program.

Describe utility approach to the following categories of maintenance of transmission lines, distribution lines, and equipment, respectively:

1. *Routine maintenance programs and protocols (i.e., covering general maintenance approach and programmatic structure),*
2. *Non-routine maintenance, further delineated into:*
    a. *Emergency response maintenance/repair, and*
    b. *Inspection response maintenance/repair.*

A description of SDG&E's approach to routine and non-routine maintenance of transmission lines, distribution lines, and equipment is set forth in Section 5.3.4 below.

Discuss proactive replacement programs versus run-to-failure models for each group, including:

1. *Whether there are specific line elements or equipment that are prioritized for preventive maintenance or replacement,*
2. *How those programs are established,*
3. *What data or information is utilized to make those determinations, and*
4. *What level of subjectivity is implemented in making those determinations*

Overview of Proactive Replacement Programs

Given the wildfire risks associated with faults in the HFTD, SDG&E does not utilize run-to-failure models for its overhead asset classes. Instead, SDG&E utilizes a combination of inspection and maintenance programs to attempt to identify and replace at risk assets before failures occur, as well as proactive replacement programs for aging or obsolete infrastructure in high risk areas. The only run-to-failure model SDG&E utilizes is for underground cable, as there are few ways to inspect the integrity of such infrastructure. If multiple runs of cable failures impact the same customers, however, that criteria can create the need for proactive cable replacement jobs to improve reliability for a neighborhood or community.

The process is described in greater detail in Section 5.3.8 below. At a high level, a business case must be made for the purpose and need of a project or program that considers program benefits including risk reduction, feasibility, costs, impacts, and an alternatives analysis. If the business case is approved, it goes through a quantitative ranking process with other approved programs. Once a budget is set, the project or program will either be funded or not funded and may need to wait additional years for approval.

Wildfire mitigation programs typically start with ignition data, reliability data (near miss data), and PSPS historical data. From there, programs are proposed to mitigate these outcomes. They must pass committee reviews that assess the soundness of arguments and the cost effectiveness of the mitigations, as well as a quantitative prioritization process that focuses on

risk reduction and cost efficiency. A qualitative and quantitative analysis is completed in order for an idea to become a fully implemented project or program.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Grid Design and System Hardening initiatives in Sections 5.3.3.1 through 5.3.3.18 below. Table 23 – Grid Design and System Hardening initiatives is provided in Appendix A.

5.3.3.1. SCADA capacitors

The supervisory control and data acquisition (SCADA) capacitors program will replace existing non-SCADA capacitors with a more modern SCADA switchable capacitor. The current capacitors are designed to provide continuous voltage and power factor correction for the distribution system. During a failure of a capacitor from either mechanical, electrical, or environmental overstress, an internal fault is created resulting in internal pressure and the potential to rupture the casing. This rupture of molted metal has the potential to be an ignition source.

The modernization of these capacitors will introduce a monitoring system to check for imbalances and internal faults and open based on the protection settings. In addition, the SCADA capacitor will provide a method for remote isolation and monitoring of the system providing additional situational awareness during extreme weather conditions. The program will first prioritize replacing fix capacitors within the system to capacitors with switches. Both types of capacitors will be modernized to a SCADA switchable capacitor. Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below.

All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. In addition, SDG&E's QA/QC department performs audits on all wildfire mitigation projects that impact structure loads or conductor clearance to ensure quality. Should any component of a project not meet standards, it is identified as a punch list item that must be resolved before construction contracts are completed and final payments are made to contractors. SDG&E's QA/QC department is independent of SDG&E's Construction Services department that manages the project and contractors. This process ensures SDG&E receives a quality construction product.

This is a new WMP program, which prioritizes construction within the HFTD. Design and construction will begin in 2020 and is anticipated to be completed by 2022. SDG&E is planning on modernizing approximately 100 capacitors in the HFTD, roughly 30 in each 2020 and 2021, and roughly 40 in 2022. SDG&E will start by removing fixed capacitors, which are considered to be the most at-risk capacitors in SDG&E's service territory, followed by switchable capacitors. This program is planned to address 100% of capacitors within the HFTD over the three period of the plan. SDG&E will monitor reliability and ignition data related to capacitor failures. SDG&E

expects that system faults and ignitions associated with capacitor failures would decrease over time as a result of this program.

As technology changes and new innovated ideas are introduced into the industry, over the next ten years SDG&E will continue to evaluate products that may enhance its system and potentially provide an opportunity to acquire new devices with optimum features. Such new devices may lead to modifications and a request for future installations.

5.3.3.2. Advanced protection

The Advanced Protection (AP) program develops and implements advanced protection technologies within electric substations and on the electric distribution system. AP aims to prevent and mitigate the risks of fire incidents, create higher visibility and situational awareness in fire-prone areas, and allow for the implementation of new relay standards in locations where protection coordination is difficult due to lower fault currents attributed to high impedance faults.

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

- **Falling Conductor Protection (FCP)** designed to trip distribution overhead circuits before broken conductors can reach the ground energized;
- **Sensitive Ground Fault Protection** for detecting high impedance faults resulting from downed overhead conductors that result in very low fault currents;
- **Sensitive Profile Relay Settings** enabled remotely on distribution equipment during red flag events to reduce fault energy and fire risk;
- **High Accuracy Fault Location** for improved response time to any incident on the system;
- **Remote Event Retrieval and Reporting** for real-time and post-event analysis of system disturbances or outages;
- **SCADA Communication** to all field devices being installed for added situational awareness;
- **Increased Sensitivity and Speed of Transmission Protection Systems** to reduce fault energies and provide swifter isolation of transmission system faults; and

- **Protection Integration with Distribution Communications Reliability Improvements (DCRI)** as a means of facilitating the communication infrastructure needs (note: this activity is further described below).

The installation of equipment capable of enabling schemes such as Falling Conductor Protection (FCP) allows for the remaining technologies mentioned in the list above to likewise be enabled. Further, it should be noted that these technologies continue to be researched and developed, and therefore are subject to upgrades to increase functionality. These potential advancements may impact cost forecasts.

Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. Quality checks on this program will be performed through the existing standard practice of field commissioning devices installed on the electric transmission and distribution system to ensure proper operation. Field commissioning includes testing relays, RTUs, line monitors, controllers, and communication systems to ensure they meet calibration tolerances, communication functionality, and protection threshold pickups per issued settings. Devices found out of tolerance during testing will be repaired or replaced in kind.

SDG&E tracks reliability event data as well as ignition data for both transmission and distribution lines. SDG&E's advanced protection program is designed to reduce the risk of transmission or distribution faults leading to an ignition. To evaluate the effectiveness of this mitigation, SDG&E would expect to see the ratio of faults leading to ignition to decrease over time.

Prior to 2015, SDG&E largely invested in the deployment of distribution line devices, such as overhead sectionalizing devices, which facilitated remote SCADA communication and sensitive protection settings profiles. Starting around 2015, SDG&E began researching and developing algorithms and devices capable of more advanced protection functions such as FCP and PMU data streaming, which were deployed in a test mode on four distribution circuits in the back-country region of San Diego County.

From 2015 until 2019, SDG&E learned about the precise requirements to enable and deploy this technology. Primarily, SDG&E found the requirements for highly available, reliable, and fast communication between field devices and controllers required the wide deployment of a standardized, utility owned network to facilitate the needs of this program. In 2019, SDG&E expanded its deployment of advanced protection to eight distribution circuits in the backcountry and tested and validated the communication functionality of its proposed Distribution Communications Reliability Improvements (DCRI). As explained in Section 5.3.3.18.1 below, SDG&E is building the DCRI to meet the precise communication requirements of the program.

From 2020 to 2022, AP aims to replace aging substation infrastructure such as obsolete 138kV, 69kV, and 12kV substation circuit breakers, electro-mechanical relays, and Remote Terminal

Units (RTUs). New circuit breakers incorporating microprocessor-based relays, RTUs, and the latest in communication equipment facilitating the requirements of SDG&E's advanced protection systems will be installed in SDG&E substations within the HFTD. On distribution circuits within the HFTD, AP coordinates with the overhead system hardening programs to strategically install or replace sectionalizing devices, line monitors, direct fiber lines, and communication radios to facilitate the requirements of SDG&E's advanced protection systems.

Over the next 10 years, SDG&E plans to enable the advanced protection functions described herein on all transmission lines, substations, and distribution circuits within the HFTD. By upgrading these facilities with advanced protection devices, SDG&E will advance its existing capabilities with regard to remotely enabled sensitive profile settings, FCP, distribution synchrophasors, remote event retrieval, and fault location.

5.3.3.3. Distribution overhead system hardening

SDG&E's Distribution Overhead System Hardening program combines all of SDG&E's overhead hardening programs, Fire Risk Mitigation (FiRM), Pole Risk Mitigation Engineering (PRiME), and Wire Safety Enhancement (WiSE) into one program. The driver for the consolidation of programs involves the strategy evolution described above in the introduction to Section 5.3.3. Rather than scoping projects by small wire or at-risk poles, SDG&E is taking a comprehensive, circuit-by-circuit approach that will weigh those risk inputs alongside the need to mitigate PSPS impacts.

As discussed in Section 5.3.8.4.2 below, SDG&E has formed a PSPS Mitigation Engineering team that will consider wildfire risk reduction and PSPS mitigation impacts to customers and select the most cost-effective mitigation solutions that maximize the benefit of both goals. The mitigation choices include undergrounding overhead lines, covered conductor, traditional overhead hardening (bare conductor), remote sectionalizing devices, microgrids, and utility provided customer generation. Once the team develops a scope of work that involves either covered conductor installations or traditional overhead hardening installations, it will go to the overhead hardening program. Whether the conductor utilized for hardening is bare or covered, it still involves the same rigorous design and engineering process that involves a LiDAR survey, and a PLS-CADD line design to ensure proper line clearances at all operating temperatures and that steel poles structures will be sized to withstand the maximum known local wind conditions.

For tracking purposes, covered conductor and overhead job packages will be issued separately to enable the tracking of cost and mileage, as well as to account for the differences in RSEs. Overhead hardening mitigates the ignition risk of all overhead equipment failure with a small reduction to foreign object in line risk due to increased phase spacing, and it costs less than covered conductor. Covered Conductor mitigates equipment failure and most foreign objects in line contacts, which creates a greater risk reduction than overhead hardening, but at higher cost. The Distribution Overhead Hardening Program is prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in

Section 5.3.8 below. Projects within this program are being developed and prioritized by the PSPS Mitigation Engineering team described in Section 5.3.8.4.2 below.

SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. In addition, SDG&E's QA/QC department performs an audit on wildfire mitigation projects that impact structure loads or conductor clearance to ensure quality. Should any component of a project not meet standards, it is identified as a punch list item that must be resolved before construction contracts are completed and final payments are made to contractors. SDG&E's QA/QC department is independent of SDG&E's Construction Services department that manages the project and contractors. This process ensures SDG&E receives a quality construction product.

For areas of the electric system that have been mitigated by overhead system hardening, SDG&E would expect to see a decrease in both system faults and ignitions on the hardened lines versus unhardened lines over time. Prior to consolidation, the Distribution Overhead System Hardening program consisted of FiRM, PRiME, and WiSE. In 2013, SDG&E established the FiRM program, an overhead distribution, fire-hardening, and rebuilding effort. The goal of the FiRM program is to fire-harden facilities in the HFTD by replacing aged line elements, utilizing advanced technology, and designing for known local weather conditions, with a specific goal of replacing all small conductor in the HFTD that had been known to have high failure rates. To date, the program has hardened over 400 miles of distribution lines, including 83 miles as part of the 2019 WMP.

SDG&E's PRiME program was developed to assess pole strength and integrity considering loading conditions, third party attachments, localized weather conditions, and remaining pole strength throughout SDG&E's service territory. In 2019, the first full year of the program, PRiME replaced 695 at risk structures as part of the 2019 WMP.

The WiSE program is similar to the FiRM program in that is was created as an overhead rebuilding effort with the goal of replacing small conductors with high failure rates. The difference is that the WiSE program was intended to focus on areas outside the HFTD. In 2019, SDG&E identified certain high fire risk areas of the wildland urban interface and utilized the WiSE program to begin hardening those circuits. WiSE hardened roughly 5 miles of distribution line within the wildland urban interface in 2019.

In 2020, SDG&E is consolidating its prior system hardening programs (e.g., FiRM, PRiME, and WiSE) into the Distribution Overhead Hardening program and will continue to work through its existing planned jobs for these programs. Prior to the 2021 Plan update, SDG&E plans to harden approximately 100 miles of at high risk distribution assets within the HFTD as part of this Overhead System Hardening program. It is also piloting the use of covered conductor in 2020.

Over the three-year period of the Plan, overhead hardening mileage is expected to decline with the increase in strategic undergrounding. The use of covered conductor, however, is planned to increase in 2021 and 2022. The scope of work of the PSPS Mitigation Engineering team is still being developed and could impact the future years of the overhead system hardening forecast. To the extent that there are changes to the Distribution Overhead Hardening program, those updates will be presented in an annual update to this WMP.

Looking forward over the next 10 years, SDG&E's long-term vision is to reduce the risk of wildfires, as well as the customer impacts of PSPS. It is expected that to minimize the use of PSPS, overhead hardening with bare wire will decline in future years in favor of undergrounding and covered conductor options. But hardening with bare wire will still have a place in locations where undergrounding or covered conductor is not feasible, cost effective or warranted by the environmental conditions. Some of the solutions to mitigate the customer impacts of PSPS involve bare wire hardening combined with utility provided customer generators, to mitigate the impacts of the PSPS events.

5.3.3.4. Covered conductor maintenance

Please see Section 5.3.4.1 below, which discusses maintenance of distribution overhead.

5.3.3.5. Crossarm maintenance, repair, and replacement

Crossarm maintenance, repair, and replacement is covered by the detailed CMP inspections discussed in Section 5.3.4.1 below.

5.3.3.6. Pole replacement and reinforcement

The Pole Replacement and Reinforcement program replaces deteriorated wood distribution poles,as well as other asset-related components identified through SDG&E's various inspection programs (e.g., CMP and HFTD Tier 3 Inspections). With respect to poles, damage is attributed to numerous factors including, the loss of original preservative treatment experienced with Penta-Cellon poles, the presence of fungi decay, and bird or termite damage. In addition to poles, any issues that are identified through various inspections are remediated to timely clear potential infractions and vulnerabilities in SDG&E's system. To do this, jobs are created and sent to SDG&E's various districts, where they are then addressed and cleared. This process mainly consists of internal labor and fixing or replacing various equipment, as needed.

Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. All SDG&E pole replacements under this program are audited 100% by SDG&E's Civil/Structural Engineering department. This includes field verifying what was constructed and verifying pole load calculations for compliance. For pole reinforcements, Construction Services performs audits on 10% of those that are reinforced. If there are any issues found, those issues are routed back to the district or contractor who performed the work to be resolved in a timely manner.

All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. In addition, SDG&E's QA/QC department performs a 100% audit on all wildfire mitigation projects that impact structure loads or conductor clearance to ensure quality. Should any component of a project not meet standards, it is identified as a punch list item that must be resolved before construction contracts are completed and final payments are made to contractors. SDG&E's QA/QC department is independent of SDG&E's Construction Services department that manages the project and contractors. This process ensures SDG&E receives a quality construction product.

SDG&E monitors reliability and ignition data due to deteriorated structure failures. The Pole Replacement and Reinforcement program has been successful at mitigating this risk, with only one electrical fault and zero ignitions associated with deteriorated wood poles in the last five years. SDG&E has been executing its GO 165 maintenance program for many years. In 2019, SDG&E replaced 725 structures within the HFTD. SDG&E expects to replace 670 structures within the HFTD in 2020 based on historical inspection results.

In 2020 and 2021, the wood pole intrusive inspections are cycling through structures located in the HFTD based on the inspection cycles (e.g., 3 or 5-year cycles). Pole replacements associated with deteriorated structures found on these intrusive inspections reduce the risk of ignitions by preventing wood pole failures. In addition, replaced poles will be constructed to SDG&E's improved site-specific design criteria, (e.g., wood poles will be replaced with steel poles that meet the known local wind conditions of a particular area). For poles identified for replacement in Tier 3 of the HFTD, SDG&E intends to accelerate the replacement (including the design, engineering, and construction of the new structures) faster than the six-month time frame required by the Commission's General Orders.

This will reduce the risk of wildfire by replacing poles that fail inspection or design criteria on an accelerated schedule within the highest risk areas. Over the three-year period, SDG&E expects to replace 2,010 structures in the HFTD based on historical inspection data.

SDG&E plans to continue its mandated and enhanced inspection programs over the next 10 years. Regular inspections and subsequent remediations are a critical piece of preventing potential equipment failures, faults, and ignitions. Expected structure replacement forecasts are adjusted annually based on the latest inspection data results, and the location and number of assets contained in specific inspection cycles.

5.3.3.7. Expulsion fuse replacement

SDG&E's distribution system is dynamic and can experience events that result in a fault. When the distribution system experiences a fault or overcurrent, there are fuses connected to the system to protect its integrity and isolate the fault. These expulsion fuses are designed to operate by creating a significant expulsion within the fuse, resulting in the fuse opening and

isolating the fault, and in turn limiting further damage to other equipment. Because of this internal expulsion, the fuses are equipped with a venting system that sends a discharge of energy out of the fuse and into the atmosphere. This external discharge has the potential to ignite flammable vegetation.

To mitigate this potential, SDG&E has developed a multi-year program to proactively replace existing branch expulsion fuses within the HFTD with CAL FIRE approved power fuses.[28] There are approximately 11,000 branch expulsion fuses (value includes known expulsion fuses and unknown fuse types) in SDG&E's HFTD, and this new program is designed to lessen the chance for an ignition source in the HFTD by reducing external discharges during fuse operation. Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below.

All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. For simple jobs, like the replacement of fuses that do not involve additional structure loading or engineering, the construction field advisor ensures quality. SDG&E monitors reliability data and ignition data and utilizing the CAL FIRE approved power fuses should reduce the ratio of expulsion fuse operation caused ignitions per fuse operation over time.

In 2019, SDG&E kicked off this program and replaced 2,490 of the approximately 11,000 total population of such fuses in the HFTD, which is nearly 23%. In 2020, SDG&E plans on replacing approximately 3,000 fuses, taking the total replaced to 5,490, which includes 100% of Tier 3 of the HFTD and 50% of the total expulsion fuses within the HFTD. Over the three-year WMP cycle, SDG&E plans on replacing 100% of the fuses within the HFTD, which is roughly 8,500 fuses. Over the next 10 years, as technology changes and new innovated ideas are introduced into the industry, SDG&E will continue to evaluate products to enhance its system and potentially incorporate new devices with optimum features. Such new devices may lead to modifications and a request for future installations.

5.3.3.8. Grid topology improvements to mitigate or reduce PSPS events

5.3.3.8.1. PSPS sectionalizing enhancements

In addition to other PSPS mitigation strategies, this program mitigates the impact to customers and communities involved in PSPS events by installing additional remote sectionalizing devices within the HFTD. In conjunction with weather station data, this program allows PSPS events to be more precise and potentially localized, which reduces the outage impact to customers. Currently, SDG&E has approximately 280 remote sectionalizing devices, which combined with its 190 weather stations sectionalize an average of 500 customers per device. SDG&E is

[28] Power fuses are equipment that have been previously granted an exemption from CAL FIRE.

evaluating locations for these sectionalizing devices and other localized construction (e.g., remove of overhead system and/or reconfiguring circuits to optimize switch installations.

Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. Projects within this program are being developed and prioritized by the PSPS Mitigation Engineering team described in Section 5.3.8.4.2 below. All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E's standards. In addition, SDG&E's QA/QC department performs audit on all wildfire mitigation projects that impact structure loads or conductor clearance to ensure quality. Should any component of a project not meet standards, it is identified as a punch list item that must be resolved before construction contracts are completed and final payments are made to contractors. SDG&E's QA/QC department is independent of SDG&E's Construction Services department that manages the project and contractors. This process ensures SDG&E receives a quality construction product.

Through the PSPS events which have occurred in SDG&E's service territory since 2013, SDG&E has demonstrated how remote sectionalizing devices combined with a dense weather station network can limit the impacts of PSPS only towards those customers with the highest risk. SDG&E has over 270,000 customers located within its HFTD, but because of SDG&E's hardened transmission system, weather station network, and remote sectionalizing devices, only a small percentage of those customers are exposed to PSPS events during the highest risk system conditions, and only if they are the customers exposed to the risk on a particular high wildfire threat day. In 2019, SDG&E installed seven additional switches to further increase its sectionalizing capability and intends to install more in future years, starting with ten additional remote sectionalizing devices in the HFTD in 2020.

Over the next three years, SDG&E plans to install roughly 30 switches. This forecast could increase, however, depending on the circuit-by-circuit analysis results from the PSPS Mitigation Engineering team. If increases are made, they will be documented in the SDG&E's 2021 annual Plan update. Over the next 10 years, SDG&E has a long-term strategy to reduce or minimize the customer impacts of PSPS events, through a combination of strategic undergrounding, overhead hardening, covered conductor, remote sectionalizing, microgrids, and individual customer generation. Remote sectionalizing will continue to have a role in achieving this long-term goal.

5.3.3.8.2. Microgrids

SDG&E's Microgrids program will provide backup power and resilience[29] in the form of microgrids to critical facilities (e.g., fire stations, urgent care centers, evacuation centers, schools, and others) and communities in and near areas impacted by PSPS. These microgrid

[29] The National Academy of Sciences defines "resilience" as the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

projects focus on investing in infrastructure to provide backup power to strategic locations. As part of determining these strategic locations, SDG&E examines potential locations using the following criteria:

- Identify the critical facilities/communities and the impacts (or potential impact) of PSPS events on the critical facilities/communities, and/or the impacts on the surrounding areas; This may include feedback SDG&E receives when working with local communities impacted by PSPS events;
- Determine the proximity of the critical facilities in relation to one another and to SDG&E infrastructure;
- Determine the amount of undergrounding;
- Identify available land and its proximity to the point of interconnection;
- Determine the load profile and electric needs of the critical facilities/communities;
- Determine technology solution (e.g., solar with storage, generator with storage, storage alone); and
- Determine the feasibility of the solution from a cost perspective.

To safely and reliably use microgrids as a resilience tool in the HFTD, the critical facilities/communities fed by the microgrid must be fire hardened in a manner that does not reintroduce the risk (i.e., energized overhead lines), which PSPS was intended to mitigate. In the HFTD, this necessary microgrid fire hardening may translate to underground conversions or covered conductor to harden the area planned for the microgrid.

The appropriateness of microgrid solutions depends on grid topology. Such grid topology may include: 1) a community that typically does not see high risk conditions, but is fed from a circuit that does, and is therefore subject to PSPS because of the circuit configuration; or 2) areas where critical facilities are concentrated in one location but are a long distance away from the main electrical feed. Deploying a microgrid and fire hardening the area making up the microgrid can be more cost effective than hardening the entire distance of the circuit. Consistent with SDG&E's Generator Grant Program which provides generators to customers, these microgrid projects will help mitigate the impacts of PSPS events on customers most affected by extreme fire weather and provide them resilience benefits.

SDG&E recognizes that microgrids are of particular interest to the Legislature and the Commission. The Legislature enacted Senate Bill (SB) 1339, which requires the Commission, in consultation with the California Energy Commission, and the California Independent System Operator, by December 1, 2020, to take a number of specific actions to facilitate the commercialization of microgrids for distribution customers of large electrical corporations. To implement this directive, the Commission initiated a rulemaking to consider all microgrid policy framework issues, including "programs, rules, and rates related to microgrids that will help the

accomplish the state's broader policy goals."[30] SDG&E believes its microgrid projects will aid in achieving broader state policy goals.

Track 1 of the Microgrid and Resiliency OIR required the investor owned utilities (IOUs) to submit both proposals and a report which: 1) describes new proposals and other resiliency strategies for outages ready for implementation by September 2020, and 2) identifies the microgrid-related activities each IOU is planning or proposing for 2020 and beyond, including what additional Commission action or relief is requested for each microgrid-related resiliency activity (Microgrid Report).[31]

On January 21, 2020, SDG&E filed its Microgrid Report, which included specific new proposals for consideration in the Microgrid and Resiliency OIR as well as a report on ongoing resiliency activities, much of which were captured in SDG&E's 2019 WMP. Specifically, SDG&E reported its ongoing resiliency strategies which include three microgrid projects that could potentially be in-service by the end of 2020: Cameron Corners, Ramona Air Attack Base, and Desert Circuit 221.

Microgrid projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. In addition, SDG&E's QA/QC department performs an audit on wildfire mitigation projects that impact structure loads or conductor clearance to ensure quality. Should any component of a project not meet standards, it is identified as a punch list item that must be resolved before construction contracts are completed and final payments are made to contractors. SDG&E's QA/QC department is independent of SDG&E's Construction Services department that manages the project and contractors. This process ensures SDG&E receives a quality construction product.

SDG&E anticipates that through the deployment of microgrids, the number of customers impacted by PSPS events and the severity of those impacts would decrease over time. SDG&E began this program in 2019 as a way to mitigate the impacts of PSPS events on its customers. SDG&E is continuing to analyze the appropriate locations to deploy microgrids and is currently in the process of developing three microgrids, Cameron Corners, Ramona Air Attack Base, and

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[30] R.19-09-009, Order Instituting Rulemaking Regarding Microgrids Pursuant to Senate Bill 1339 (September 12, 2019) at 2 (Microgrid and Resiliency OIR). The Commission amended the Microgrid and Resiliency OIR's caption to include "resiliency strategies" in recognition of the fact that there are other important technologies and activities that may be useful for achieving resiliency goals in addition to microgrids. *See* R.19-09-009, Assigned Commissioner and Administrative Law Judge's Ruling Amending Proceeding Caption to Rulemaking 19-09-009 (December 5, 2019).

[31] R.19-09-009, Assigned Commissioner's Scoping Memo and Ruling for Track 1 (December 20, 2019). On December 30, 2019, the Administrative Law Judge issued a ruling directing the IOUs to answer specific questions about "microgrid-related activities" the utility is "planning or proposing.";

Desert Circuit 221. SDG&E is performing the engineering, designing, and permitting work necessary to move towards construction and commissioning for a potential 2020 implementation.

Cameron Corners is a remote, low-income community located in Tier 3 of the HFTD, in the eastern part of San Diego County. The critical customers that will be served by the microgrid include a medical care facility, CAL FIRE station, telecom central office (switching station), as well as local food establishments, convenience stores and gas (and propane) stations that can provide residents of this remote community with important goods and services during an outage. The microgrid will be designed to support 300 kW of critical load continuously, and the project will consist of a 725 – 884 kW solar photovoltaic array with an approximately 2,000-kWh energy storage resource. The fully renewable microgrid solution will support resiliency at these key facilities and therefore will provide significant benefits to the surrounding rural community. During a de-energization event, SDG&E will be able to island the critical facilities during a PSPS event.

The Ramona Air Attack Base is located in Tier 2 of the HFTD in the northeastern part of San Diego County and is directly adjacent to a low-income community. The critical customers who would be served by the microgrid include CAL FIRE Air Support, United State Forest Service Air Support, and the fire-retardant mixing station. These critical facilities provide stewardship and fire protection for San Diego County and adjacent communities, including tactical coordination with the incident commander on the ground and directing airtankers and helicopters to critical areas for fire retardant and water drops.

Phase 2 of the project may add a nearby waste water treatment facility to the microgrid. The initial project scope will consist of an approximately 2,000-kWh energy storage resource, to support 60 kW of critical load for up to 1.5 days (a new C-130 aircraft has been recently added to the air attack fleet, and the load necessary to maintain service for the aircraft may continue to change over time). The critical facilities will be able to island during a PSPS event.

Desert Circuit 221 serves a small residential, low-income desert community of approximately 230 customers with about 550-kW of peak load in the far eastern part of San Diego County. While the community itself is not in the HFTD, the distribution line feeding the community runs through a Tier 3 HFTD, resulting in relatively frequent PSPS events for this community. The microgrid islands all residential customers and critical customers (i.e., a San Diego County Fire Station and a community center). The project may be sized-similarly to the Cameron Corners project, and during a de-energization event, the community and critical facilities will be able to island during a PSPS event.

Currently, SDG&E plans to add several other microgrids for years 2021 and 2022. The microgrid locations currently under review include: Potrero, Agua Caliente, Valley Center, and Alpine. SDG&E is also evaluating microgrids to support and serve the communities of Jacumba Hot Springs, Cuyamaca and Palomar Mountain. SDG&E is evaluating the potential to reduce or minimize the customer impacts of PSPS events over the next 10 years, through a combination

of strategic undergrounding, overhead hardening, covered conductor, remote sectionalizing, microgrids, and individual customer generation. Microgrids will continue to have a role in achieving this long-term goal. SDG&E is also evaluating off-grid technologies to mitigate costly hardening efforts for long lines with minimal customer loading and mobile battery solutions to support Community Resource Centers.

5.3.3.9. System automation equipment

Please see Section 5.3.3.2 above for a discussion of installation of system automated equipment.

5.3.3.10. Hotline clamps

Through equipment failure analysis related to wire down outages, SDG&E has identified high risk connectors known as "hotline clamps" that SDG&E intends to replace as part of this program. These hotline clamps have been identified because they have been associated with creating a weak connection resulting in a wire down event. This wire down event can lead to an energized wire on the ground or coming into contact with a foreign object, thus becoming an ignition source.

Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. For simple jobs, like the replacement of hotline clamps that do not involve additional structure loading or engineering, the construction field advisor ensures quality.

SDG&E tracks reliability and ignition data. SDG&E expects to see a reduction in wire down events and ignitions caused by connection failures over time as a result of this mitigation. The hotline replacement program was a new program initiated in 2019. SDG&E replaced 694 hotline clamps in 2019 as part of its WMP. In 2020, SDG&E is planning on replacing roughly 1,650 hotline clamps. Within the next three years, SDG&E plans to replace approximately 4,950 hotline clamps, which would bring the program to date total to roughly 5,600 clamps or 65% of the approximately 8,500 clamps located within the HFTD system. SDG&E intends to replace every hotline clamp within the HFTD. At the current pace, SDG&E will complete this program by the year 2024.

5.3.3.11. Mitigation of impact on customers and other residents affected during PSPS events

5.3.3.11.1. Customer resiliency programs

Generator Grant Program – Medical Baseline

In 2019, SDG&E created a Generator Grant Program (GGP) in response to feedback received from residential customers who had been impacted by PSPS events. Certain customers lacked the financial capability to acquire a generator. The GGP was launched as a pilot program earlier in 2019 as a first attempt at reaching these impacted communities on a limited basis. The program is administered by a neutral third-party to grant certain residential customers (e.g., medical baseline customers) the funding to acquire and be able to use a portable generator during outages, in particular PSPS events.

SDG&E understands that, despite the safety benefits, there are inconveniences associated with de-energization, and this program is one way to provide tools to help mitigate the impact while enhancing customer resilience. Nevertheless, SDG&E strongly encourages all customers to take important steps to prepare themselves before the wildfire season, such as creating an emergency kit and a thorough family emergency plan.

The GGP will help a subset of SDG&E's Access and Functional Needs (AFN) customers charge cell phones and other small electronic devices while they enact their personal emergency plans and also demonstrate that SDG&E is starting to look at solutions and test renewable, portable generator options, to aid customers' resiliency during PSPS events.

Community Generators and Critical Infrastructure Generators

SDG&E is considering a potential generator program to benefit communities and critical facilities during PSPS events. SDG&E is in the early stages of evaluating communities prone to PSPS where a large generator could serve as a temporary microgrid to mitigate the impact of PSPS events. Deploying a generator to a community may involve some small-scale capital upgrades, including undergrounding of distribution lines and the installation of sectionalizing devices to ensure the community centers can be safely energized through the generators during high risk events.

SDG&E is also evaluating the potential deployment of small generators to critical facilities that are frequently impacted by PSPS areas. These are new potential generator programs and as such, SDG&E will make every effort to explore both technology and installation options that factor in cost effectiveness, fire risk, customer safety, and reducing customer impact as a result of PSPS events.

Generators for Community Resource Centers

SDG&E plans to implement a program to provide backup power to Community Resource Centers (CRCs) and other community critical infrastructure in areas impacted by PSPS. Mobile Home Parks (MHP) located within the HFTD often express hardship during PSPS events and as

such, will be investigated for potential backup power for resilience measures similar to that of the CRCs. SDG&E's plan to deploy these backup facilities furthers the integration of technology in support of safe and reliable electric operations. Given that CRCs are intended mitigate the impacts of PSPS, SDG&E believes it is critical to provide backup power to such facilities.

SDG&E is also expanding upon or developing new programs and strategies, leveraging backup power for resilience to mitigate the risk associated with PSPS. These programs are specifically related to resilient internet connectivity at fire stations, the expansion of the Community Resource Center Network and the development of a grant program for portable generators targeted at select residential customers. New to the CRCs in 2020, SDG&E is exploring collaboration with community-based organizations (CBOs) and local stakeholders to provide transportation for AFN customers to and from CRCs during PSPS events.

The Generator Grant Programs are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. SDG&E has and will continue to perform customer surveys to gather feedback and improve the Generator Grant Programs and Community Resource Centers. Random sample quality checks are also performed with respect to the GGP, prior to delivery of units.

SDG&E expects this program to reduce the impacts of PSPS events on customers over time. SDG&E will utilize the results from customer surveys and observations through our public safety partners to understand public perception regarding effectiveness of these programs. SDG&E launched the GGP pilot in 2019 and provided 65 generators to certain residential customers in the HFTD. In addition, eight CRCs were established with back up generation to provide communities a place to charge cell phones and mitigate some of the impacts of the PSPS events.

After surveying participants in 2019, SDG&E learned that the program was well-received. Based upon positive feedback received, SDG&E plans to expand the use of the GGP in 2020 as part of its focus on mitigating the impacts of PSPS to customers, including customers with various needs. SDG&E will expand the pilot program into a full program implementation, targeting a subset of customers within the HFTD that are most prone to PSPS events. SDG&E anticipates providing 1,250 generators to customers in 2020 and intends to extend this program over the next three years, taking into account customer feedback and lessons learned. By 2022, SDG&E estimates providing 4,630 generators to customers to mitigate the impacts of PSPS. SDG&E also anticipates further expanding its CRCs in the 2020 through 2022 timeframe in order to support the most impacted communities.

5.3.3.11.2. Expanded generator grant program

As discussed in Section 5.3.3.11.1, SDG&E received positive customer feedback from its pilot GGP and plans to begin a pilot Expanded Generator Grant Program that would offer these portable generator units to an expanded customer base. The first GGP specifically targets medical baseline customers, and as described above will be expanding to meet the needs of

more medical baseline customers. This pilot Expanded GGP will allow all customers with additional needs to apply for portable generator grants to help mitigate the impacts of PSPS events. The pilot Expanded GGP plans to provide approximately 130 generators per year, with half funded through rates and half funded through shareholders. Over this three-year Plan cycle, SDG&E would provide nearly 400 mobile generators to customers in need.

5.3.3.11.3. Whole house generator program

In Section 5.3.3 above, SDG&E discussed its overall fire hardening strategy evolution from asset-based risk reduction to mitigation techniques that not only reduce the risk of wildfires, but also mitigate the customer impacts of PSPS events. SDG&E plans to implement a new Whole House Generator Program to support its long-term vision to reduce or minimize the impacts of PSPS to customers. As previously noted, SDG&E's PSPS Mitigation Engineering team will take a circuit-by-circuit approach in selecting mitigations that will reduce both the risk of wildfire while mitigating the impacts to customers. These mitigations include strategic undergrounding, overhead hardening with covered conductor, overhead hardening with bare conductor, remote sectionalizing, and microgrids, as well as SDG&E-funded whole home generators for customers.

The PSPS Mitigation Engineering team is tasked with the developing the most cost-effective solutions to achieve SDG&E's strategic goals. In rural areas with lots of circuit miles but very low customer density, the cost of hardening programs can be very high relative to the cost of providing generators. In these specific cases, SDG&E plans to continue utilizing PSPS as a last resort measure to protect public safety but will seek to help reduce the PSPS customer impacts by installing whole home generators with automatic transfer switches. SDG&E anticipates installing approximately 300 whole home units in 2020 and expects that to continue in future years of the plan. If the scope of work changes as the PSPS Mitigation Engineering team completes their circuit analysis, these forecasts will be revised in the annual WMP updates.

5.3.3.12. Other corrective action

Please see Section 5.3.4.1 below.

5.3.3.13. Pole loading infrastructure hardening and replacement program

Please see Section 5.3.3.3 Hardening above.

5.3.3.14. Transformers maintenance and replacement

Please see Section 5.3.4.1 and Section 5.3.4.7 below.

5.3.3.15. Transmission tower maintenance and replacement

Please see Section 5.3.4.8 below.

5.3.3.16. Strategic undergrounding

SDGE's Strategic Undergrounding Program was established in 2019. This program began as a small-scale program to target areas of HFTD with the most significant risk, or in areas where it could significantly reduce PSPS impacts. While undergrounding is nearly 100% effective at mitigating both equipment related and foreign object in line related ignition risks, it is expensive relative to overhead hardening options.

SDG&E's 2019 RAMP analysis showed the overhead projects provided a better RSE than undergrounding projects and SDG&E allocated resources accordingly. But given the lessons learned from the October 2019 PSPS events, SDG&E has evolved its wildfire mitigation strategy to focus on a mix of wildfire risk reduction combined with mitigating the impacts of PSPS to customers and eliminating those impacts where feasible. Given this strategy evolution, SDG&E is proposing a significant expansion of undergrounding through this Strategic Undergrounding program, which is informed by the circuit-by-circuit resource allocation strategy described under PSPS Mitigation Engineering in Section 5.3.8.4.2 below.

As part of the initial effort of Strategic Undergrounding program, infrastructure feasibility assessment is ongoing, and pilot projects are in progress to provide a baseline for scope, cost, and schedule for the overall program. Concurrently with the pilot projects, assessment of cost savings and types of construction methods to determine the appropriate design approach to environmentally sensitive locations and potentially non-advantageous terrain (e.g., granite rock, equipment up a hillside) are also being considered. SDG&E has experience undergrounding lines in urban settings where franchise agreements with the cities and counties are in place to help expedite these projects. In the more rural settings, there are challenges associated with undergrounding overhead lines. SDG&E cannot simply follow the existing overhead lines but must go through existing roads.

As discussed in Section 5.2 above, SDG&E anticipates the need to acquire underground easements on private roads, tribal lands, and other jurisdictional territory; the need to trench through environmentally sensitive areas; and other permitting delays. Some regulatory or statutory assistance may be required to expedite these efforts if SDG&E is to meet its undergrounding goals. Depending on the number of specific projects that encounter these constraints, it could impact SDG&E's ability to execute this program at the levels planned in this WMP.

There is also an additional challenge of undergrounding service lines from the main road to the house. Through this 2020 WMP, SDG&E seeks to underground such service lines by working directly with customers to determine the best possible routing for the underground service and attachment point to the building. This would involve both the need to underground customer services as well as the customer access point, converting from a weatherhead connection to an underground-fed electrical panel. While there is a model on how this could be accomplished through the Rule 20A tariff and the City of San Diego Surcharge 20SD program, these regulatory mechanisms do not sufficiently address the complexities associated with the conversion of

individual services since they each derive their funding to convert services through collaboration between SDG&E and the governing jurisdiction.

SDG&E will need to work with regulatory and local authorities to develop a mechanism to better address these complexities associated with work on individual customer-owned equipment. Issues which need to be studied include the possible environmental issues, access and land-use issues, jurisdictional panel inspection and permitting issues, and equitable cost sharing amongst all customers. The PSPS Mitigation Engineering team is developing criteria for which service lines would qualify for undergrounding. SDG&E ultimately seeks to reduce wildfire risk and mitigate PSPS impacts to customers, but all stakeholder perspectives must be taken into account.

The Strategic Undergrounding efforts will focus on locations within Tier 3 and Tier 2 of the HFTD and the WUI. SDG&E is evaluating long-term and short-term solutions to execute in the next 10 years. The current short-term solution is to mitigate PSPS customer impacts by supporting critical infrastructure such as community centers, schools, post offices, hospitals, libraries, fire stations, gas stations, and other essential businesses. The concept is to provide a direct underground (DUG) feed to these collective community services so that they remain powered even in extreme weather conditions.

By the end of the three-year implementation period of this Plan, through the efforts of SDG&E's Strategic Undergrounding program and microgrid program, SDG&E projects that most schools within SDG&E's HFTD that had experienced PSPS events in the past will no longer experience PSPS events, mitigating the impacts to families in those communities. Over the long term, SDG&E's PSPS Mitigation Engineering Team is developing a circuit-by-circuit scope of work with the goal of mitigating PSPS to the greatest number of customers, and to the customers who experience the greatest frequency of PSPS events. Strategic undergrounding will have a large role in accomplishing this goal. Overall, the benefits of this program are that it reduces or minimizes wildfire risk and PSPS impacts; increases resiliency; and key community facilities, such as schools, can remain energized during a PSPS.

The Strategic Undergrounding program is prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. Projects within this program are being developed and prioritized by the PSPS Mitigation Engineering team described in Section 5.3.8.4.2 below.

In 2019, SDG&E installed 2.5 miles of strategic underground cables. In 2020, SDG&E plans to install a total of 25 miles of underground. Over the next three years, SDG&E plans to significantly expand this program by installing approximately 120 miles of underground cables by the end of this Plan period. Strategic Undergrounding is part of SDG&E's strategy to reduce PSPS over time. SDG&E expects this to continue over the next 10 years.

5.3.3.17. Updates to grid topology to minimize the risk of ignition in HFTD

5.3.3.17.1. Overheard transmission fire hardening

SDG&E is committed to fire-hardening its transmission and associated 12kV distribution system located in the HFTD. This hardening effort is a multi-faceted approach that starts with enhanced design criteria that account for greater wind speeds and includes the use of high tensile strength conductor, increased wire-to-wire spacing, and the use of steel poles. Previously, lines were constructed to withstand working loads under stress of 56 miles per hour (mph) wind speeds.

The new electric lines are designed to withstand working loads under the stress of 85 mph wind speeds, and in some specific cases, up to 111 mph, based on known local wind conditions. The new lines are being designed utilizing steel poles instead of wood. Steel poles are a more reliable construction material, giving more confidence in their designed strength, and are more resilient should a fire occur, leading to faster restoration times. These new steel pole facilities are being installed in conjunction with the application of higher strength conductors and increased spacing between lines, exceeding the requirements of GO 95, and resulting in a decrease in the likelihood of energized lines coming into contact with one another or arcing after being struck by flying debris. SDG&E's current design standards now reflect the use of the enhanced design criteria, steel poles over wood poles, high strength conductor, and increased conductor spacing in the HFTD.

SDG&E has been hardening its transmission system within the HFTD since the wildfires that impacted Southern California in 2007. As of the end of 2019, SDG&E has hardened approximately 65% of its 69kV transmission system within the HFTD, which includes over 4,800 steel structures and plans on further investment to continue efforts to fire harden the remainder of the HFTD.

By the time the transmission portion of the Cleveland National Forest project is completed, which is scheduled to occur by the end of 2020, SDG&E will have at least one hardened transmission line into every substation within the HFTD. This not only reduces the risk of ignitions caused by SDG&E's transmission system in the areas of greatest consequence, but it also significantly reduces the risk of transmission-related PSPS events impacting customers at the substation level. SDG&E's hardened transmission system allows SDG&E to take a targeted approach to PSPS decisions utilizing remote sectionalizing on the distribution system, because the substations and transmission lines typically remain energized.

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 69kV transmission system and the associated 12kV distribution system located in the HFTD. This WMP provides only the CPUC-jurisdictional elements related to this strategy.

Transmission projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. SDG&E has many quality reviews along the process of transmission projects. SDG&E has specifications for LiDAR data quality that is the basis for transmission PLS-CADD designs. SDG&E then has a PLS-CADD design specification and checklist, which is reviewed at multiple design stage gates to by experienced engineers to ensure design quality.

Once a job package is assembled, a QA/QC review team independent of Transmission Engineering and design reviews the package for constructability and completeness before bidding the jobs to construction contractors, reducing contract costs and requests for information. During construction, SDG&E field construction advisors monitor construction contractor progress and audit contractor construction processes to ensure they meet SDG&E's construction specifications. During the project close out phase, SDG&E's QA/QC team that is independent of SDG&E's construction services department will audit the completed construction and create a punch list of items that must be completed by contractors before the contract is deemed complete and final payments are made. Through this process, SDG&E ensures that quality is maintained from design through construction.

SDG&E studies reliability and ignition data over time to determine whether programs have been effective. For this particular program, SDG&E will study reliability data from transmission lines before they were hardened and after they were hardened, normalizing the data by fault events per year to ensure comparable data. SDG&E would expect reductions in both transmission caused faults and ignitions on hardened lines.

Transmission projects take a significant amount of planning, design, and permitting to complete. Even a typical SDG&E transmission project with relatively minimal permitting requirements (advice letter or exempt) typically averages three years from initiation through completion. As a consequence, SDG&E does not plan transmission projects around wildfire seasons. Rather, SDG&E typically manages projects through stage gates of initiation, preliminary design, final design, pre-construction, construction, and close out, according to a schedule.

SDG&E expects to complete construction on approximately 19 miles of transmission and 10 miles of distribution underbuilt on transmission lines (in addition to the transmission hardening occurring on the CNF project) by the end of 2020. These include projects currently in construction in the communities of Kearny Mesa, Otay Mesa and portions of lines located on Camp Pendleton.

Over the three-year period of this Plan, SDG&E plans to harden approximately 66 miles of transmission lines and 41 miles of associated distribution underbuilt on transmission lines within the HFTD. By the end of 2022, SDG&E will have 100% of transmission lines traversing the Tier 3 HFTD hardened, and over 80% of the HFTD overall. SDG&E intends to complete this long-term strategy of fire hardening its transmission system within the HFTD by 2025. Projects for the remaining unhardened lines have been identified and have started the process of being

scoped and approved. The projects scheduled for completion outside this plan period are currently in the preliminary design phase. This represents a total of approximately 50 miles of transmission lines to be constructed from 2023-2025.

5.3.3.17.2. Cleveland National Forest fire hardening

SDG&E currently operates and maintains a network of electric facilities located within the Cleveland National Forest (CNF). In 2016, SDG&E received a Master Special Use Permit (MSUP) to operate and maintain facilities within CNF. Specifically, the MSUP allows SDG&E to develop a series of projects and activities aimed at increasing the safety and reliability of existing electric facilities within and near the CNF. SDG&E has received final approval for these projects and associated permits, and work has been ongoing since 2016.

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

The project design was based on various recommendations addressing fire prevention and the U.S. Forest Service's environmental requests. Using an analytical matrix reflecting elements of fire risks and environmental concerns, SDG&E and the U.S. Forest Service collaborated to determine which sections of the electric system should be upgraded. Each segment required a custom solution based on many factors, including the location of the customer being served by the distribution system, the topography of the land, and various biological, cultural, and environmental factors.[32]

Transmission projects, including the CNF project, are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. SDG&E has many quality reviews along the process of transmission projects. SDG&E has specifications for LiDAR data quality that is the basis for transmission PLS-CADD designs. SDG&E then has a PLS-CADD design specification and checklist and is reviewed at multiple design stage gates to by experienced engineers to ensure design quality. During construction, SDG&E field construction advisors monitor construction contractor progress and audit contractor construction processes to ensure they meet SDG&E's construction specifications. During the project close out phase, SDG&E's QA/QC team that is independent of SDG&E's construction services department will audit the completed construction and create a punch list of items that must be completed by contractors before the contract is deemed

[32] The U.S. Forest Service relies on the Project Activity Level (PAL) system, which was designed to help fire and timber resource managers establish the level of industrial precaution for the following day. PAL applies to the Cleveland National Forest.

complete and final payments are made. Through this process, SDG&E ensures that quality is maintained from design through construction.

SDG&E studies reliability and ignition data over time to demonstrate whether programs have been effective. For this particular program, SDG&E will study reliability data from the CNF transmission lines and distribution lines before they were hardened and after they were hardened, normalizing the data by fault events per year to ensure apples to apples comparisons. SDG&E would expect reductions in both transmission caused faults and ignitions on hardened lines.

Construction commenced on the CNF program in late 2016 and is planned to continue through 2021. At the end of 2019, SDG&E has fire-hardened a total of 122 miles of electric transmission and distribution; including approximately 64 miles of transmission and 838 structures replaced with steel and approximately 58 miles of distribution lines and 505 structures replaced with steel. In 2020, SDG&E plans to harden an additional 29 miles of transmission, 50 miles of distribution overhead, and 14 miles of distribution underground.

SDG&E expects to complete the CNF project by the end of 2020. But depending on potential constraints or issues that occur during construction, it is possible that construction on the last of distribution lines or at a minimum close out activities such as the QA/QC reviews may occur in 2021. SDG&E expects that the CNF project will be competed and closed within the three-year period of this Plan.

5.3.3.18. Other

5.3.3.18.1. Distribution communications reliability improvements

SDG&E is deploying a privately-owned LTE network using a licensed radio frequency (RF) spectrum by means of the Distribution Communications Reliability Improvements (DCRI) program. This will enhance the overall reliability of SDG&E's communication network, which is critical for enabling fire prevention and public safety programs. SDG&E's communication network is foundational to the wildfire mitigation enhancements proposed in Advanced Protection (see Section 5.3.3.2 above). For this reason, these two mitigations were grouped together for the purposes of RSE calculations in this document, as well as SDG&E's 2019 RAMP filing. SDG&E's falling conductor protection in particular relies on a robust communications network to operate successfully and falling conductor circuits will continue to be enabled as SDG&E's communication network comes online.

Currently, there are gaps in coverage of third-party communication providers in the rural areas of eastern San Diego County that limit SDG&E's ability to communicate with field personnel during red flag crew deployments and Emergency Operations Center activations. The installation of LTE in Tiers 2 and 3 of the HFTD will mitigate these gaps, allowing for more timely and reliable communication and information from SDG&E's field crews to emergency

management leadership in these critical situations. This is accomplished through the installation of LTE base stations as well as microwave and fiber optic infrastructure.

Communications system improvements are prioritized in accordance with the applications making use of the system. These applications are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. Quality checks on this program will be performed through the existing standard practice of commissioning communications systems to ensure proper operation. These commissioning processes include testing components of the communication system to ensure they meet quality assurance requirements documented during the design process.

DCRI's deployment scheduling has been prioritized to provide coverage for WMP technologies. The communication network provided by the DCRI program enables the Advanced Protection enhancements to work reliably. The Advanced Protection enhancement reduce the risk of transmission and distribution faults leading to ignitions, providing an extra layer of mitigation to all SDG&E electric facilities with Advanced Protection enabled.

As SDG&E builds the LTE network, it will be focused on providing connectivity to support WMP programs. DCRI plans to commission approximately 25 base stations in 2020. Additionally, secondary focus will be given to consolidating applications from other SDG&E owned private networks onto the private LTE network. Over the three-year period of this Plan, DCRI expects to commission 175 base stations enhancing communication in the HFTD. Private LTE coverage will be expanded throughout the entire SDG&E territory.

5.3.3.18.2. Lightning arrestor removal and replacement

In designing its electric distribution system, SDG&E incorporates unique equipment to protect the infrastructure from external forces. This equipment ranges from shields for avian protection to covered conductor. Each type of equipment has its own unique role. One type of device that protects the distribution system from external forces, such as damages caused by the effects of a lightning strike or a surge from a fault, is a lightning arrestor. These devices are installed on the distribution system throughout the SDG&E service territory. Some locations have more installations than others based on the increased probability of lightning strikes, in order to protect other major equipment from abnormal surges and failing. When thermally overloaded, as a result of an excessive increase in energy experienced during an event, these units can become an ignition source. The existing design of arrestors require additional measures to protect the distribution system from becoming an ignition source.

Through SDG&E's effort of continuing to improve and explore alternate solutions and evaluate new technology, a new product was introduced that received CAL FIRE approval. Utilizing this new product, SDG&E is proposing a program to replace these arrestors in strategic locations within the HFTD with a CAL FIRE approved lightning arrestor. The CAL FIRE approved device comes with an external device that operates prior to the arrestor overloading, dramatically reducing the potential of becoming an ignition source.

Distribution equipment replacement projects are prioritized in accordance with SDG&E's wildfire mitigation program prioritization and resource allocation process, as described in Section 5.3.8 below. All SDG&E construction projects utilize field construction advisors who monitor projects during construction to ensure distribution infrastructure is built in accordance with SDG&E standards. For simple jobs, like the replacement of fuses that do not involve additional structure loading or engineering, the construction field advisor ensures quality. SDG&E monitors reliability data and ignition data, utilizing the CAL FIRE approved lightning arrestor should reduce the ratio of lightning arrestor operation caused ignitions per lightning arrestor operation over time.

In 2020, SDG&E plans on finalizing construction standards and constructing at test sites to ensure successful installation, along with designing the required jobs for 2021. SDG&E plans to start construction in 2021 and replace approximately 2,700 lightning arrestors within a three-year period. This new program will begin in 2020 and contemplates ramping up installation to potentially replace all at-risk locations in 10 years.

5.3.4. Asset management and inspections

Instructions: *Explain the rationale for any utility ignition probability-specific inspections (e.g., "enhanced inspections") within the HFTD as deemed necessary over and above the standard inspections. This shall include information about how (i.e., criteria, protocols, etc.) the electrical corporation determines additional inspections are necessary.*

Describe the utility's maintenance protocols relating to maintenance of any electric lines or equipment that could, directly or indirectly, relate to wildfire ignition. Include in the description the threshold by which the utility makes decisions of whether to (1) repair, or (2) replace electric lines and equipment. Describe all electric lines and equipment that the utility "runs-to-failure", those that the utility maintains on a risk-based maintenance plan, and those that are managed by other approaches; describe each approach. Explain the maintenance program that the utility follows and rationale for all lines and equipment.

Overview of Maintenance of Transmission Lines, Distribution Lines, and Equipment
SDG&E maintains its distribution system (and associated equipment) in accordance with GO 165, GO 128, and GO 95. With regards to distribution overhead inspections, SDG&E performs the mandated overhead (OH) visual inspections on a five-year cycle and the intrusive wood pole inspections on a ten-year cycle, per GO 165. In GO 165, patrols must be done on an annual basis for all facilities located in an urban environment and every other year in a rural environment. SDG&E determined that the majority of areas with high wildfire risk were located in rural environments, and in 2010 made it an internal requirement to patrol every distribution facility every year, exceeding the requirements of GO 165.

Also in 2010, as a result of the 2007 wildfires, SDG&E implemented its HFTD Tier 3 inspection program, whereby it performs additional detailed overhead visual inspections in the Tier 3 of the HFTD on a three-year cycle. These inspections use a modified infraction code inspection check list that focuses on conditions that increase the probability of ignition if not remediated.

As part of this WMP, SDG&E will implement new inspection programs to supplement and provide a new perspective to the current visual inspection programs. The infrared inspection program will allow SDG&E inspectors to identify "hot" connections that have the potential to cause wire downs and ignitions upon failure. SDG&E will also establish a drone inspection program that has the ability to provide a top down view perspective of infrastructure as well as detailed zoomed-in photos of connectors and hardware which, provides a more robust inspection than what can be seen from the ground or by helicopter. When conditions are identified that show nonconformance with GO 95, the levels of remediation are classified into the following categories:

- **Emergency:** Inspector is to make as safe as possible and stand by the facility until a supervisor arrives to confirm the severity and call out a construction crew to make immediate repairs.
- **Non-Critical:** All other non-conformances are classified as non-critical and will be remediated within a one-year time frame, unless they are found in Tier 3 of the HFTD where they are remediated within a six-month time frame.

SDG&E maintains its transmission (and associated equipment) in accordance with California Public Resource Code (PRC) Sections 4292 and 4293, GO 95, GO 128, and GO 165. SDG&E annually evaluates its maintenance practice to ensure that inspection intervals meet or exceed regulatory requirements. SDG&E performs OH visual and infrared inspections on all transmission structures on an annual basis, detailed inspections on a three-year basis, and intrusive wood pole inspections on a ten-year cycle.

As stated in the distribution inspection Section 5.3.4.1 below, per GO 165, patrols must be done on an annual basis for all facilities located in an urban environment and every other year in a rural environment. SDG&E performs a visual inspection on all transmission structures, conductor spans, and right-of-way encroachments, regardless of environment, on a yearly basis, exceeding the requirements of GO 165. In addition, SDG&E performs a detailed inspection of structures and components on a three-year cycle which exceeds the requirements GO 165.

SDG&E has been utilizing infrared inspection technology to inspect its transmission structures, conductors, and equipment on a yearly basis to identify any potential hotspots or points of concerns, a methodology which is planned to be implemented on the distribution system. In addition, SDG&E will also implement a drone inspection program for the transmission system that has the ability to provide a top down view perspective of infrastructure as well as detailed zoomed-in photos of connectors and hardware which, provides a more robust inspection than what can be done from the ground or by helicopter. When conditions are identified through any of the above noted inspection techniques that show nonconformance with GO 95, the levels of remediation are classified into categories with timeframes that meet or exceed GO 95, Rule 18.

The highest severity level prescribed to a noted condition requires an immediate response. If noted by an inspector, they are to make as safe as possible and stand by the facility until a supervisor works to schedule a construction crew to make immediate repairs. Upon notification of an emergency event, a supervisor may fill the role of a first responder and will make the site as safe as possible and stand by the facility until a construction crew can make immediate repairs. For inspection and patrols not classified as high severity or emergency replacements, additional severity levels corresponding to three-month, six-month, and 12-month timeframes are provided. All structures located within Tier 3 of the HFTD require a maximum of a six-month timeframe.

These inspection and maintenance programs are discussed in greater detail in Section 5.3.4 below.

Replacement of Assets

Replacement of asset decisions are based on asset condition and risk, when such information is available. The asset replacement strategies currently employed by SDG&E are listed and defined below.

- **Responsive**: This strategy is utilized to replace an asset or equipment when an asset or equipment is operated until it stops functioning per its specifications. This is a reactionary strategy since the asset is only replaced when it fails. This strategy may be costly since it requires immediate follow-up because of a failure and may adversely disrupt current operations. It is used for lower risk assets that do not impact public safety.
- **Time-Based (also known as Interval-Based or Manual Condition-Based)**: This strategy is utilized to replace an asset or equipment that does not meet acceptance criteria found during a cyclical inspection performed routinely. The inspection cycle may be determined by regulatory mandates, equipment manufacturer recommendation, or industry best practice. This strategy may also be referred to as "manual condition-based" replacement since the condition is only assessed at the time of inspection.
- **Condition-Based Monitoring**: This strategy is utilized to replace an asset or equipment when certain attributes of the asset or equipment exceed the defined thresholds as alerted by a continuous monitoring system. This strategy requires continuous monitoring and analysis of the key health data of an asset such as age, location, gassing, number of operations, electrical loading, and temperature.
- **Risk-Based**: This strategy is utilized to replace an asset or equipment based on the probability and consequence of failure. While the automated condition-based strategy considers the health of the asset, which is often a proxy for the likelihood of failure, the risk-based strategy considers the consequence of failure of the assets in addition to the health of the asset. The asset replacement strategies vary by asset class. These replacement strategies promote public safety and meet or exceed regulatory mandates and industry best practices.

For the substation class, time-based and condition-based strategies are predominantly employed to assess the health and need for replacement of assets. The transmission class primarily utilizes time-based strategies to determine asset condition and need for replacement. But some risk-based strategies have been implemented specifically around safety and fire prevention. For the distribution class, a combination of reactive replacement, time-based and risk-based strategies are performed.

SDG&E's Substation System Inspection and Maintenance Program is mandated by the CPUC through GO 174 and promotes safety for SDG&E personnel and contractors by providing a safe operating and construction environment. This is accomplished through routine inspections at reoccurring cycles. Substation System Inspections, while conducted primarily for reliability, also provide incidental wildfire mitigation benefits. Since wildfire mitigation benefits are only incidental, no "enhanced inspections" are performed inside HFTD substations– every SDG&E substation is inspected with the same level of detail and with the same criteria. That level of detail and criteria is described in Section 5.3.4.15 below.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Asset Management and Inspections initiatives in Sections 5.3.4.1 through 5.3.4.15 below. Table 24 – Asset Management and Inspections initiatives is provided in Appendix A.

5.3.4.1. Detailed corrective maintenance program inspections

Commission GO 165 requires SDG&E to perform a service territory-wide inspection of its electric distribution system, which is referred to as the Corrective Maintenance Program (CMP). GO 165 establishes inspection cycles and record-keeping requirements for utility distribution equipment. In general, utilities must patrol their systems once a year in urban areas and in HFTD Tier 2 and Tier 3. These patrols are discussed in Section 5.3.4.11 below.

In addition to the patrols, utilities must conduct detailed inspections at a minimum every three to five years, depending on the type of equipment. For detailed inspections, the utilities' records must specify the condition of inspected equipment, any problems found, and a scheduled date for corrective action. Utilities are also required to perform intrusive inspections of distribution wood poles depending on the age and condition of the pole and prior inspection history.

The CMP helps to mitigate wildfire risk by providing SDG&E additional information about its electric distribution system, including in the HFTD. With this information, SDG&E's corrective actions address infractions before a potential issue can occur. The following table summarizes the top five conditions found on overhead detailed inspections in 2019.

Table SDG&E 3: Top Five Conditions During Overhead Detailed Inspections in 2019

Condition	Count
Damaged/Missing/incorrect Station Pole ID	2,348
Damaged/Missing High Voltage Signs; two-man repair	1,725
Pole Steps Lower than 8ft.	1,005
Damaged/Missing Guy Guard	923
Damaged Ground Molding	900

Distribution Inspection Frequencies

SDG&E's CMP is an inspection program, which consists of eight different inspection categories with various, corresponding inspection cycle intervals per program. These are summarized in the table below. These inspections are required by GO 165 unless otherwise noted.

Table SDG&E 4: SDG&E Distribution System Inspection Cycle Intervals

Inspection Categories	Inspection Cycle Interval (in years)
• **Overhead Detailed** ○ Electric distribution structures and equipment ○ Electric distribution equipment on Communication Infrastructure Provider (CIP) poles ○ Electric distribution equipment on transmission poles	5
• **Underground Detailed**	3-5
○ Underground Above Ground Dead-front, Internal and External Inspections (AGDF)	5
○ Underground Above Ground Live-front, Internal and External Inspections (AGLF)	5
○ Underground Subsurface with Equipment, Internal Inspections (SS3)	3
○ Underground Oil and Gas Switch Inspections (SW3)	3
• **Underground Subsurface without Equipment, Internal Inspections (SS10)**[33]	10
• **Wood Pole Intrusive Inspections (POIN)** ○ Electric distribution wood poles	10
• **Patrol (PATROL)**[34] ○ Electric distribution both overhead and underground structures and equipment	1

[33] This inspection type is not mandated by GO 165, however, SDG&E continues to perform this type of inspection.

[34] Although GO 165 allows for a two-year cycle, SDG&E patrols rural areas outside of Tier 2 and Tier 3 of the HFTD on a one-year cycle.

Inspection Categories	Inspection Cycle Interval (in years)
○ SDG&E-owned or operated streetlights are inspected for structural problems or hazards.	
• **HFTD Tier 3 (Formerly called, QA/QC Inspections)**[35] ○ High Fire Threat District Tier 3	3
• **Distribution Infrared**[36]	5
• **Drone Assessments**[37] ○ High Fire Threat District Tier 3 ○ High Fire Threat District Tier 2	TBD after 1 cycle

The five-year detailed inspections are mandated by GO 165. Upon completion of prescribed actions necessitated by the detailed CMP inspections, SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's operational and engineering managers, who are responsible for certain districts. They typically select about 1.5% of the combined (overhead and underground) territories and assess their conditions to see if the appropriate improvements have been properly carried out. This audit work is also discussed in Section 5.3.4.14 below. SDG&E tracks the issues identified through this inspection method. These records can be evaluated to identify the quantity and types of issues found that demonstrate the effectiveness of the program.

Before next wildfire season, before the next Plan update, over the next three years, and over the next 10 years, SDG&E will continue to comply with GO 165.

5.3.4.2. Transmission system inspection

All SDG&E transmission system facilities covered by the transmission inspection practice are routinely inspected using visual and infrared inspection techniques. Infrared and aerial inspections are completed annually on all transmission circuits and are discussed in further detail in Sections 5.3.4.5 and 5.3.4.11 below. Ground-based, detailed inspections are completed on three-year cycles. Non-routine inspections are scheduled depending on operational need. Inspections and patrols of all structures, attachments, and conductor spans are performed to identify facilities and equipment that may not meet PRC §§ 4292 and 4293 or GO 95 and GO 128 rules. When non-conformances are identified through these inspections, secondary assessments are performed based on severity levels assigned. These assessments decide the mitigation measures and timeline for corrective action.

[35] These inspections exceed the requirements of GO 165.
[36] These inspections exceed the requirements of GO 165.
[37] These inspections exceed the requirements of GO 165.

This inspection program mitigates the risk of equipment failure by identifying equipment deterioration, making the repair and/or replacement before failures occur. Equipment failure can lead to electrical faults, which can lead to ignitions. Therefore SDG&E considers its inspection and maintenance programs to be crucial wildfire mitigation activities when performed within the HFTD and wildland urban interface.

Inspection/Patrol Types and Frequencies

To maintain transmission system reliability, SDG&E conducts a variety of inspection types to promote the safety of the general public as well as the personnel engaged in the maintenance and operation of overhead and underground electrical facilities. Inspections and patrols are prioritized based on safety, reliability, and operational need. The types of inspections and patrols that are performed are summarized in the table below.

Table SDG&E 5: Transmission Inspection and Patrol Frequencies

Inspection Types	Inspection Cycle (Years)
Fault/Safety Patrol	As Needed
Detailed Overhead & Underground Inspection/Patrol	Three
Visual and Infrared Overhead Inspection/Patrol	Annual
Special Inspection	As Needed
Climbing Inspection	As Needed
Wood Pole Ground Line Inspection and Treatment	Ten
Miscellaneous Inspection	As Needed

In addition to the inspections/patrols specified in the maintenance practice, SDG&E conducts an additional aerial patrol of 69kV transmission lines in HFTD Tier 3 prior to September 1 each year. Conditions of concern related to fire safety that are identified are addressed, as specified in GO 95 Rule 18.

Access Road Maintenance

Access to transmission facilities is key to performing adequate inspection and maintenance activities. SDG&E performs maintenance of many of its access roads on a two-year cycle, barring any permitting or agency delays. Road segments are tracked electronically to document the date and type of maintenance performed, who performed the maintenance, and which roads have biological or cultural restrictions. This road maintenance program is designed to provide SDG&E inspectors and crews reliable access to transmission structures or facilities. Many public agencies utilize SDG&E's transmission access roads to traverse the back country and respond to wildfires that may be in the area.

The maintenance of these roads and the ability to create new roads when transmission line projects are approved is critical to SDG&E's ability to safely maintain its system and to allow SDG&E and other first responders to quickly respond during emergencies, especially wildfires. While environmental organizations frequently oppose access roads, SDG&E's ability to grade new access roads provides significant safety benefits to SDG&E and the communities it serves, and those benefits strongly outweigh other considerations.

SDG&E has teams dedicated to infrared inspections and patrols, visual and detailed inspections and patrols, and access road maintenance. Each inspection methodology or maintenance method has specific target goals, such as 100% infrared inspections on all energized, overhead tie lines every year. The status of completion for inspection and maintenance programs is reviewed throughout the year and resources within each team are deployed to ensure compliance with our maintenance practice and target inspection cycles.

SDG&E annually evaluates its maintenance practice to confirm inspection and repair intervals meet or exceed regulatory requirements. SDG&E regularly monitors all its inspection programs and ensures all inspection goals are met. Yearly inspections and patrols are performed simultaneously with multiple inspectors and inspection types, validating the quality of the patrols performed. In addition, every quarter, transmission supervisors randomly select 1% of the structures with conditions identified and mitigation measures completed, to field verify the reported conditions have been appropriately addressed. The table below summarizes the top five corrective transmission maintenance orders for 2019.

Table SDG&E 6: Top Five Corrective Transmission Maintenance Orders for 2019[38]

Maintenance Order	Qty
Ceramic Insulators - Rust	49
Anchor Rods – Rust	39
High Voltage/Danger Signs – Missing/Unreadable	39
Foundations – Covered/Washed Out	34
Pole Butts – Damaged/Assessment Required	33

SDG&E tracks the issues identified through each method of inspection and patrol. These records can be evaluated to identify the quantity and types of issues identified to demonstrate the effectiveness of the program.

As conditions allow, prior to the first event of the 2020 wildfire season, SDG&E plans to complete an additional set of transmission visual and infrared inspections on tie lines located within Tier 3 of the HFTD which are likely to be impacted by high winds. SDG&E's transmission infrared inspection program currently completes an infrared patrol on 100% of energized

[38] Represents only maintenance orders created based on findings from 2019 transmission detailed inspections.

structures and tie lines within the HFTD. The transmission visual inspection program completes patrols on 100% of structures and tie lines within the HFTD on a yearly basis. The detailed inspection program completes patrols on 100% of structures and tie lines within the HFTD every three years.

5.3.4.3. Improvement of inspections

Please see Section 5.3.4.9.

5.3.4.4. Infrared inspections of distribution infrastructure

SDG&E is piloting new periodic infrared (IR) inspections for overhead distribution equipment, with the intent of creating a formalized program beginning in 2020. This is a new program presented in this WMP, which will consist of using the same high-grade IR technology currently utilized for transmission and substation inspections to identify thermal hotspots in equipment and connections. SDG&E intends to inspect distribution circuits, with the goal of early detection of potential issues on electrical connections and equipment that cannot be seen during SDG&E's traditional visual inspections.

To perform the inspections, SDG&E assembled a thermography team with thermographers of various levels of certification. Thermographers with a Level III Certification will help oversee the program and will be responsible for performing quality checks on the equipment and the program. This will include periodic review of photos and videos provided by thermography team members for analysis and review. The goal of the IR inspection program is to proactively identify potential issues on electrical connections and equipment that could lead to wire downs or ignitions on SDG&E's distribution system. SDG&E will track the issues identified through this inspection method. These records can be evaluated to identify the quantity and types of issues found that demonstrate the effectiveness of the program.

The IR inspections will generate repair orders to address any infractions discovered as part of the inspection. Overall, these inspections and associated repairs will reduce the potential for equipment failure on SDG&E's overhead system, including wires down, which can cause ignitions. These inspections will be conducted primarily via land but may also be conducted from the air. Given that this is currently a pilot program, repairs resulting from these inspections are not estimated herein. SDG&E will provide forecasts for resulting repairs in the GRC, as appropriate.
SDG&E continues to look for new technologies and mitigations to reduce the risk of utility caused wildfires. Infrared on the distribution system enables the detection of connector failures that is superior to a visual inspection and provides the ability to see the heat from a failing connection before it fails.

SDG&E will pilot this program in 2020 before the start of wildfire season, and if the results demonstrate effectiveness, appropriate inspection cycles will be established for the future. Generally, SDG&E plans to annually inspect approximately 20% of the distribution structures

within the HFTD, on a five-year cycle. The program will start in 2020 and will ramp up to the 20% of structures by 2021. SDG&E will prioritize inspections in Tier 3 of the HFTD, before moving on to Tier 2. Within the next three years, SDG&E plans to ramp up the inspection program to include up to 20% of the structures within the HFTD resulting in a five-year inspection cycle. As the program is implemented, this timeframe will be evaluated based on findings.

5.3.4.5. Infrared inspections of transmission infrastructure

SDG&E currently performs yearly IR inspections for all energized overhead transmission equipment. The purpose of these inspections is to proactively look for potential issues on electrical connections and equipment that cannot be seen during SDG&E's traditional visual inspections. This program utilizes high-grade IR technology to identify thermal hotspots in equipment and connections. The goal of this program is to proactively identify potential issues on electrical connections and equipment that could lead to wire downs or ignitions on SDG&E's transmission system. The number of issues identified for correction will be tracked and will be evaluated to determine effectiveness.

The IR inspections will generate repair orders to address any infractions discovered as part of the IR inspection. Overall, these inspections and associated repairs will reduce the potential for equipment failure on SDG&E's overhead system, including wires down, which can cause ignitions. These inspections will be conducted primarily via air but may also be conducted from the ground.

Transmission inspections are performed on 100% of the transmission lines within the HFTD. To ensure completion, SDG&E's thermographer team will shift resources as needed to meet this yearly cycle.[39] The table below summarizes the top corrective transmission maintenance orders for 2019.

Table SDG&E 7: Top Corrective Transmission Maintenance Orders for 2019[40]

Maintenance Order	Qty
Shield Wire Attachment – Heat Damage	1
Jumper – Heat Damage	1

As conditions allow, prior to the first Red Flag Warning event of the 2020 wildfire season, SDG&E plans to complete an additional set of transmission infrared inspections on tie lines located within Tier 3 of the HFTD which are likely to be impacted by high winds. The transmission infrared inspection program currently completes an infrared patrol on 100% of

[39] SDG&E uses the same thermographer team to perform the IR inspections for both transmission and distribution infrastructure. *See* Section 5.3.4.4 above for a discussion of the composition of the thermographer team as well as their responsibilities.

[40] Represents only maintenance orders created based on findings from 2019 transmission infrared inspections

energized structures and tie lines within the HFTD. The only planned evolution is noted in the section above for evolution prior to the 2020 wildfire season.

5.3.4.6. Intrusive pole inspections – distribution

SDG&E performs wood pole intrusive inspections on a 10-year (average) cycle. Each pole is inspected visually and, if conditions warrant, intrusively. GO 165 requires that any pole 15 years of age or older is inspected intrusively. The form of the intrusive inspection is normally an excavation about the pole base and/or a sound and bore of the pole at ground-line. Treatment is applied at this time in the form of ground-line pastes and/or internal pastes. The 10-year cycle fulfills the requirements of GO 165: 1) all wood poles over 15 years of age are intrusively inspected within 10 years and 2) all poles which previously passed intrusive inspection are to be inspected intrusively again on a 20-year cycle.

Depending on the cavities found, or the amount of rot found, an estimate of the remaining pole strength is determined utilizing industry-wide standards. Depending on the severity of the deterioration, the pole either passes, must be reinforced with a steel truss to provide it another five to ten years of useful life, or replaced. This replacement and reinforcement processes are described in Section 5.3.3.6 above. The following table summarizes the top conditions found during intrusive inspections on distribution poles in 2019.

Table SDG&E 8: Top Conditions Found on Intrusive Inspections on Distribution Poles in 2019

Condition	Count
Climbing Inspection Recommended	696
Restoration Recommended, C-Truss	222
Pole Leaning Badly	112
Restoration Rejected, Replace	96
Pole replacement from POIN	3

5.3.4.7. LiDAR inspections of distribution infrastructure

LiDAR Survey has evolved into a necessary function for overhead transmission and distribution line engineering analysis and design. The transmission department was an early adopter of utilizing LiDAR into its designs. In 2013, with the start of the FiRM program, SDG&E began utilizing LiDAR for the distribution system for clearance and structural adequacy. LiDAR surveys provide the most cost effective, scalable and accurate solution for overhead power line analysis increasing both system reliability and safety.

Ideally, a transmission or distribution line should be susceptible to modeling with a single deployment of LiDAR and subsequent modeling. But in actual experience, transmission and distribution systems are often changing with joint use additions; customer relocations; compliance, reliability and maintenance modifications; conductor creep and pole settling; and external development. Rural transmission lines, particularly those in the HFTD, require

attentive vegetation analysis. As such, it is important that LiDAR is relatively recent, and field verified. Distribution utilizes LiDAR data to perform the following critical functions: post-construction survey, and pre-construction design.

Quality control is often a function of the LiDAR survey postprocessing. LiDAR vendors use relevant statistical sample sizes to verify LiDAR point returns to established physical and photogrammetric controls. SDG&E's specifications establishes the requirements for LiDAR survey including horizontal and vertical accuracy to physical benchmarks with ground control. When quality issues are missed from the LiDAR provider and recognized by SDG&E (or contractor) design staff, these issues are relayed to the LiDAR provider for system-wide auditing. Common issues (missing data, duplicate points, weather data) can be resolved through post-processing calibration and often do not require redeployment of aircraft.

As stated above, LiDAR is a critical component of all overhead line engineering functions and analysis. Its effectiveness has already been well-established. While the deployment technology and processing are continuously changing, the largest change for SDG&E is LiDAR deployment for overhead distribution lines. As SDG&E's fire hardening projects roll out, additional pre-LiDAR and post-LiDAR design and analysis follow. Additionally, pilot vegetation analysis of HFTD projects using LiDAR are underway (see Section 5.3.5.7). SDG&E's overhead hardening programs plan to utilize LIDAR as needed to support its WMP projects and programs.

SDG&E does not anticipate major changes to the use of LiDAR over the next three to ten years and will continue to monitor the advancements in the technology of LiDAR detection and implement new features as deemed useful.

5.3.4.8. LiDAR inspections of transmission infrastructure

As discussed in the previous section, LiDAR Survey has evolved into a necessary function for overhead transmission and distribution line engineering analysis and design. LiDAR acquisition and inspections will continue to support the transmission and distribution fire hardening efforts. SDG&E plans to assess transmission lines for vegetation and clearance compliance with a targeted completion of all HFTD Tier 3 projects by the end 2021. Section and structural usage analysis based on the same LiDAR set, will follow in 2022.

Additionally, Tier 2 transmission projects will be analyzed for vegetation and clearance compliance. Tier 3 projects will finalize section and structural analysis leveraging LiDAR data acquired by the end of 2021. Tier 2 section and structural analysis will be evaluated for necessity depending on the status of other fire-hardening initiatives. LiDAR Inspection will continue to supplement the fire hardening efforts and post-construction analysis. Vegetation and clearance checks will be fully implemented within the HFTD and potentially expand into non-HFTD projects. Results of these analyses will also be used for emergency operations during red flag and other extreme events.

5.3.4.9. Other discretionary inspection of distribution infrastructure beyond requirements

5.3.4.9.1. HFTD Tier 3 inspections

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

These inspections were conducted from 2010 through 2016 as a result of a settlement agreement adopted in D.10-04-047. In 2017, SDG&E decided to proactively continue the HFTD Tier 3 Inspections as part of its normal program. In 2018, when the CPUC adopted the current statewide fire threat map, SDG&E began applying the QA/QC three-year cycle to the newly defined HFTD Tier 3. From 2016 to 2018, SDG&E performed HFTD Tier 3 Inspections on an average of 15,000 poles annually (approximately one-third of the distribution poles in the HFTD Tier 3) in its then-existing "extreme" and "very high" fire threat areas.

In addition to the inspections, SDG&E performs a system maintenance patrol (as specified by GO 165) for the entire overhead electric distribution system in the HFTD on an annual basis. Safety-related issues identified on those patrols are scheduled for follow-up repair.

For HFTD Tier 3 Inspections, the main purpose is to identify fire safety conditions in the HFTD Tier 3. SDG&E performed 15,176 inspections in the HFTD Tier 3 in 2019. The table below, summarizes the top 5 conditions found from the HFTD Tier 3 Inspections. All conditions found on the SDG&E electric distribution system from the HFTD Tier 3 Inspections in 2019 have been fully resolved. For conditions involving third-party communications providers, SDG&E has provided notifications to those communication companies.

In addition, SDG&E intends to accelerate repairs of these types of conditions found in the Tier 2 and 3 of the HFTD (including the design, engineering, and construction of the new structures) faster than the six-month or twelve-month time frame required by the Commission's General Orders. This will reduce the risk of wildfire on an accelerated schedule within the highest risk areas. The table below shows the top five conditions found on HFTD Tier 3 inspections for 2019.

Table SDG&E 9: Top Five Conditions Found on HFTD Tier 3 Inspections for 2019

Condition Found	Count
Damaged Poles	121
Vegetation	38
3rd Party Communication Issues	36
Damaged Cross-arms	32
Leaning Poles	14

SDG&E measures the effectiveness of inspection programs by the number of significant issues found on inspections. When SDG&E switched from performing detailed inspections once every five years, to adding an additional inspection once every three years in the HFTD (total detailed inspections for Tier 3 structures averages out to be .53 per year so a little over every other year), the rate of issues found dropped from 20% from a five-year cycle down to 3% with the additional inspections.

SDG&E completes HFTD Tier 3 inspections before wildfire season every year. SDG&E plans to continue these inspections for the long-term.

5.3.4.9.2. Drone assessments of distribution infrastructure

SDG&E will enhance its existing inspection efforts by implementing and utilizing drones. This innovative technology is capable of capturing imagery of overhead structures in the HFTD from multiple angles, including from above the structure, which can help identify issues posing a potential ignition risk. Utilizing drones to capture images from above, allows qualified personnel to gain a visual perspective that cannot be achieved from normal ground-based inspections. The imagery data from the drone assessments will be uploaded to a new centralized database application to allow for qualified personnel to identify infractions that could result in a fire hazard. These assessments will then generate repair orders to address the various fire hazard infractions discovered as part of the assessment, which will reduce the risk of ignition caused by equipment or structural failure of SDG&E's overhead system.

The data generated will be analyzed to determine trends and patterns of infractions to quickly identify systemic issues and support more proactive replacements, including more programmatic approaches to reducing ignition risk. Assessments of the images will also enable SDG&E to build a repository of annotated images that will facilitate the development of intelligent image processing capabilities. The annotated images collected during the assessment step showing whether a component is good or damaged, will be used to train and refine a machine learning model over time. After the model is trained to identify potential damages, these algorithms can be used to quickly analyze and prioritize assets that may pose a risk. The technology solution has the potential to greatly increase safety by rapidly detecting potential asset risks before they become public safety issues. In addition, the capability will increase insight, awareness, and confidence in our asset information to support on-going risk mitigation activities. Preventing equipment failure and investing in innovative technology now,

will ultimately allow for more efficient and economical infrastructure maintenance in the future.

SDG&E continues to look for new technologies and mitigations to reduce the risk of utility caused wildfires. Early results from the pilot program initiated in September 2019, show infractions identified that were not detected from the ground. SDG&E began this pilot, learning from the successes that other utilities had with their drone inspection programs. SDG&E completed research and development prior to rolling out its drone assessment program. This was to help ensure SDG&E chose the correct approach and equipment needed to properly capture images by drones on the electric system.

The portion of SDG&E's QA/QC team that is dedicated to the drone project consists of team leads, foremen, and inspectors. All such individuals are experienced journeyman linemen. The structures and their accompanying images are assigned to the image review team for assessment. Once the assessment is complete, the preliminary assessment report goes through a peer check process prior to approval by the team lead. If the final assessment report identifies a potential infraction, the report is then sent to the engineering and design management team where the issues are sorted based on the type of infraction and assigned to the appropriate group to initiate and execute the repair (e.g., vegetation management, CIP, customer service connection, issue requiring engineering/design, etc.).

All issues found that require repair also have an urgency level assigned to them. Once the issue is sorted by urgency level and assigned to the appropriate responsible group, individuals from that group validate the infraction and the standard SDG&E QA/QC process is followed as needed for design review and quality checks are performed during and post-construction/repair.

The process is set up in this manner to ensure quality and consistency of the inspections and urgency/time frames assigned. SDG&E management regularly conducts spot-check audits of the processes and inspection reports to ensure oversight and accountability of the program.

SDG&E tracks the issues identified through this inspection method. These records are evaluated to identify the quantity and types of issues found in order to demonstrate the effectiveness of the program. Information collected will be compared to inspections performed as part of SDG&E's routine inspection efforts along with the cost of implementation of the other programs. In addition, SDG&E will test the algorithms developed by the machine learning technology to validate the use of technology to identify the condition of distribution assets and evaluate the best approach to deploy these algorithms within its existing system. Based on the results, SDG&E may modify the drone program to reduce the human resources needed to execute the program in the future.

SDG&E started a pilot program in 2019, which will continue into 2020, to assess approximately 40,000 distribution structures within the HFTD Tier 3. This pilot program was not included in SDG&E's 2019 WMP. The pilot effort enabled us to develop the standards, processes, and

other materials necessary to effectively implement the program that remains ongoing into the first quarter of 2020. This included developing, requirements for pilot vetting, flight planning, training materials for field personnel, customer outreach and communication procedures, safety and security plans (e.g., program specific fire prevention requirements), software development for the review and markup of images, and workflow processes to properly direct the infraction identified to the appropriate group for repair.

Prior to 2022, SDG&E plans to complete development of all program processes, procedures and technologies, as well as complete the inspections of all its distribution facilities in the HFTD areas. In 2020, SDG&E plans to complete assessment of all the Tier 3 distribution facilities. In 2021, SDG&E will begin assessment of Tier 2 distribution facilities and plans to complete assessment of the entire HFTD (the remaining half of the Tier 2) in 2022. At that point, after the entire assessment of the HFTD is completed, the program will be reevaluated to set up appropriate cycle times, evaluating both the effectiveness of the program at reducing wildfire risk and the overall cost per inspection.

SDG&E will also determine whether to continue utilizing this new technology and the best way to incorporate this assessment approach into its ongoing and route inspection and maintenance programs. As this is a new program, SDG&E will continually assess the effectiveness of the program by reviewing the quantity and quality of issues identified and will adjust the frequency of drone inspections accordingly.

5.3.4.9.3. Circuit ownership

This Circuit Ownership program provides the opportunity for SDG&E's field employees and management of field employees to submit circuit vulnerabilities via a Mobile Data Terminal (MDT) program or mobile application (both iOS and Android). Specifically, this program facilitates supplemental submission of circuit vulnerabilities (in addition to the existing inspection programs) so that they can be timely repaired, to prevent a potential ignition and minimize the risk of wildfire. This program accordingly allows SDG&E to leverage its workforce to self-report identified vulnerabilities related to its system. Each vulnerability is thus evaluated through a consistent method and then prioritized and repaired. While the identified vulnerabilities may not be considered formal infractions, through this program, SDG&E will document and remediate any such findings before issues occur. This program is newly presented herein and was not included in the 2019 WMP.

SDG&E continues to look for new technologies and mitigations to reduce the risk of utility caused wildfires. This pilot program and technology platform will leverage that culture to allow any employee to report infrastructure that looks damaged or out of place. SDG&E will monitor the issues identified through this application and evaluate the impact versus the software update expenses.

A program dashboard was created to establish key performance indicators for each submittal. Management oversight of this dashboard and follow up action items will act as the QA/QC of

the program. SDG&E tracks the issues identified through this inspection method. These records can be evaluated to identify the quantity and types of issues found that demonstrate the effectiveness of the program.

Before next wildfire season, before the next Plan update, over the next three years, and over the next 10 years, this program will continue to be evaluated by management for improvements. Since it is a new program, SDG&E will continue to encourage participation and seek feedback from both front end and back end users.

5.3.4.10. Drone assessments of transmission infrastructure

Like SDG&E's distribution drone assessments, SDG&E will be developing a program to enhance its existing inspection efforts of transmission structures in HFTD areas starting in 2020. While SDG&E currently performs routine aerial inspections of its transmission facilities, the use of drones will further enhance transmission inspections. Drones are capable of capturing imagery of overhead structures in the HFTD from multiple angles and from closer vantage points than observable from a helicopter. SDG&E anticipates that the images collected will help qualified personnel gain a visual perspective that cannot be achieved from normal ground-based or helicopter inspections. The imagery data will be uploaded to the new centralized database application to allow for qualified personnel to identify infractions that could result in a fire hazard. If an infraction is identified during the assessment, a repair order will be generated to address the fire hazard infraction, which will reduce the risk of ignition caused by equipment or structural failure of SDG&E's overhead transmission system.

SDG&E will analyze the data and use it to develop more programmatic approaches to reducing ignition risk, as well as develop intelligent image processing capabilities for transmission facilities as discussed above. SDG&E will develop standards to ensure the consistent and safe collection of images for each facility-type as well as the assessment of the facility for infractions that could present a fire hazard.

SDG&E will focus on inspecting all of its transmission structures in Tier 3 areas in 2020, along with four select circuits in the Tier 2 HFTD that have been identified based on a number of risk criteria, such as age of infrastructure, proximity to wildland vegetation, and weather patterns. SDG&E will then inspect additional structures in the Tier 2 HFTD in 2021 and 2022 and data gathered during this initial deployment will allow SDG&E to evaluate the effectiveness of the program coupled with the cost to ratepayers. SDG&E will implement the same quality checks and audits as are utilized in the distribution drone assessment program. SDG&E will also implement the same evaluation methodology and approach as described above in the distribution drone assessment program.

Prior to the next wildfire season, SDG&E will be developing the program during the first quarter of 2020 and will begin performing inspections of transmission facilities in HFTD areas in second quarter of 2020. SDG&E plans to complete inspections of transmission structures in Tier 3 HFTD in 2020 and select Tier 2 areas in 2020 and 2021. Over the next three years, SDG&E

expects to perform drone inspections of all Tier 3 structures and select Tier 2 tie lines in 2020. In 2021 and 2022, SDG&E will inspect additional Tier 2 transmission structures.

As this is a new program, SDG&E will continually assess the effectiveness of the program by reviewing the quantity and quality of issues identified and will adjust the frequency of drone inspections accordingly. At the end of 2022, SDG&E will evaluate whether to continue to the program and what the appropriate cycle would be to effectively implement the program based on costs to the ratepayers and reduction in potential fire risk to the community.

5.3.4.11. Patrol inspections of distribution poles - CMP

In general, utilities must patrol their systems once a year in urban areas and in HFTD Tier 2 and Tier 3. Patrols in rural areas outside of HFTD Tier 2 and Tier 3 are required to be performed once every two years. As a long-standing practice, however, SDG&E performs patrols in all areas on an annual basis. In addition to the patrols, utilities must conduct detailed inspections at a minimum every three to five years, depending on the type of equipment. These detailed inspections are discussed in Section 5.3.4.1 above. The table below summarizes the top five conditions found on patrols of distribution poles in 2019.

Table SDG&E 10: Top Five Conditions Found on Patrols in 2019

Condition	Count
Damaged/Missing High Voltage Signs; two-man repair	539
Damaged Crossarm	247
SDG&E Leaning Pole or Potential Overload	152
SDG&E/Vegetation Caused Pole Inaccessible or Cannot Locate	146
Private Property Caused Cannot Open, Locate, or Inspect	130

The annual patrol inspections are mandated by GO 165. Upon completion of prescribed actions necessitated by the detailed CMP inspections, SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's operational and engineering managers, who are responsible for certain districts. The managers typically select about 1.5% of the combined (overhead and underground) territories and assess their conditions to see if the appropriate improvements have been properly carried out. This audit work is also discussed in Section 5.3.4.14 below.

SDG&E tracks the issues identified through this inspection method. These records can be evaluated to identify the quantity and types of issues found that demonstrate the effectiveness of the program. Before the upcoming wildfire season and next Plan update, as well as over the next three and ten years, SDG&E will continue to comply with GO 165.

5.3.4.12. Patrol inspections of transmission poles

The transmission patrol inspections consist of visual inspection and detailed inspections. Visual inspections are conducted once per year on all overhead tie lines within the HFTD. These inspections, conducted by helicopter, allow for an aerial perspective of overhead structures, conductor spans and right-of-way encroachments. These inspections are designed to identify obvious structural problems and hazards. Structures that cannot be accessed by helicopter (structures in Federal Aviation Administration air space) are driven for the visual patrols. Prior to September 1st of each year, SDG&E performs an additional visual patrol of all 69kV tie lines located within Tier 3 of the HFTD.

Detailed inspections are completed every three years on all overhead lines within the HFTD. Inspection cycles may be adjusted to meet operational needs provided the new target date does not exceed the original three-year date. This detailed inspection of overhead structures and attachments is performed to identify possible safety hazards and system defects while ensuring compliance with PRC Sections 4292 and 4293, GO 95, and GO 128. These inspections also include assessment of access roads, vegetation, right-of-way encroachment and vandalism.

SDG&E works to complete all visual inspections on a yearly basis and all detailed inspections every three years. Additional transmission patrollers will be deployed to tie lines as required to ensure 100% completion of inspections during the planned duration. SDG&E performs multiple visual patrols each year. Two transmission patrollers are utilized simultaneously for these visual patrols to ensure the quality of the inspection. In addition, SDG&E Transmission supervisors perform an audit of 1% of repaired findings to ensure the findings are being properly repaired.

Table SDG&E 11: Top Corrective Transmission Maintenance Orders for 2019[41]

Maintenance Order	Qty
Pole Top – Rotten	2
Bird Nest Removal	2
Splice – Broken	1
Insulator – Damaged	1

SDG&E tracks the issues identified through each method of inspection and patrol. These records can be evaluated to identify the quantity and types of issues identified to demonstrate the effectiveness of the program. As conditions allow, prior to the first event of the 2020 wildfire season, SDG&E plans to complete an additional set of transmission visual inspections on tie lines.

[41] Represents only maintenance orders created based on findings from 2019 transmission visual inspections.

The transmission visual inspection program completes patrols on 100% of structures and tie lines within the HFTD on a yearly basis. The detailed inspection program completes patrols on 100% of structures and tie lines within the HFTD every three years.

5.3.4.13. Pole loading assessment program

Please see Section 5.3.3.3 above.

5.3.4.14. Monitoring and auditing of inspections

SDG&E utilizes various reports to monitor its CMP progress, for both inspections and repairs. In addition, regular monthly meetings are held with various internal construction and operations centers to discuss detailed CMP progress and compliance.

Upon completion of prescribed actions necessitated by the CMP inspections, SDG&E conducts an audit to ascertain the effectiveness of the inspections. This audit is managed by SDG&E's Operational and Engineering managers, who are the ones responsible in each of our districts. They randomly select 1.5% of the combined (overhead and underground) inspections and assess their conditions to see if the appropriate improvements have been properly carried out.

5.3.4.15. Substation system inspection

SDG&E's Substation System Inspection and Maintenance Program is mandated by the CPUC through GO 174 and promotes safety for SDG&E personnel and contractors by providing a safe operating and construction environment. This is accomplished through routine inspections at reoccurring cycles. A security check is planned once per week, and a more detailed inspection is planned monthly or bimonthly, which takes a visual look at equipment and attempts to identify any problems, like oil leaks.

Substation System Inspections, while conducted primarily for reliability, also provide incidental wildfire mitigation benefits. Specifically, this inspection program mitigates the risk of equipment failure, which has the potential to cause ignitions, by identifying equipment deterioration to make the repair or replacement before failures occur. In this instance, equipment failure can lead to fires in oil-filled substation equipment; however, those fires would be contained within the substation footprint. Thus, SDG&E's inspection and maintenance programs have incidental wildfire mitigation benefits when performed within the HFTD and wildland urban interface.[42]

Additional goals of this program include: meeting the requirements of GO 174, achieving a level of station availability satisfactory to SDG&E's health and safety programs and maintenance standards, and assuring compliance with all sections of the California Independent System Operator (CAISO) Transmission Control Agreement (TCA).

[42] Wildland urban interface refers to a zone of transition between wildland (unoccupied land) and human development, which is at risk of wildfire.

Inspection Frequencies

SDG&E's routine substation inspections are completed at reoccurring cycles as described in the table below. Planned frequency is the cycle for which maintenance is regularly initiated. Acceptable frequency is the planned frequency plus the due time or condition tolerance within which maintenance shall be completed to be in compliance with filed maintenance practices. The table below provides the substation inspection frequencies.

Table SDG&E 12: Inspection Frequencies

Inspection	Planned Frequency	Acceptable Frequency
Substation Security Check	Once per week	9 per 12 weeks
Substation Inspection	Once per month (Priority 1); Once per two months (Priority 2)	10 per every 12 months (Priority 1); 5 per every 12 months (Priority 2)
Substation Infrared Inspection	12-month Trigger	Due in 15 months

SDG&E applies the same prioritization criteria to substations inside and outside of the HFTD. Priority 1 substations have an operating voltage above 200kV or have a total of 4 or more transmission lines at or above 69kV. All other substations are categorized as Priority 2. All substations have a Security Check planned once per week.

SDG&E regularly monitors its inspection programs and ensures all inspection goals are met. The supervisor who oversees the Substation Inspection Program regularly conducts spot checks of substations, ensuring the quality of inspections conducted. The substation inspections serve multiple purposes, to gather information on equipment (such as circuit breaker odometer readings) and to identify items that require follow-up.

Table SDG&E 13: Top Five Corrective Substation Maintenance Orders for 2019[43]

Maintenance Order	Qty
Switchyard Vegetation Removal	73
N2 Cylinder Replacement	26
LTC Pass Through Neutral	23
Petro Pipe Repair / Replacement	23
Disconnect Switch Lube & Adjust	21

Substation System Inspections, which provide incidental wildfire mitigation benefits, are conducted primarily for reliability. The substation inspection program has been refined over

[43] Corrective maintenance orders are opened for any item requiring follow-up. SDG&E does not identify the source of the corrective maintenance order (Scheduled Substation Inspection or some other method). Not all of the items in the table above were captured by the substation inspection program alone.

the years, and there are no current plans to change the program before the 2020 wildfire season, the next Plan update, or over the next three to ten years.

5.3.5. Vegetation management and inspections

Instructions: *Explain the rationale for any utility ignition probability-specific inspections (e.g., "enhanced inspections") within the HFTD as deemed necessary over and above the standard inspections. This shall include information about how (i.e., criteria, protocols, etc.) the electrical corporation determines additional inspections are necessary.*

Describe the utility's vegetation treatment protocols relating to treatment of any vegetation that could pose a grow-in or fall-in risk to utility equipment. Include in the description the threshold by which the utility makes decisions of whether to (1) treat, or (2) remove vegetation.

Discuss the overall objectives, strategies, and tactics of the electrical corporation for vegetation management. In the discussion,

1. *Address how the electrical corporation has collaborated with local land managers to leverage opportunities for fuel treatment activities and fire break creation, and compliance with other local, state, and federal forestry and timber regulations.*
2. *Discuss how the electrical corporation identifies and determines which vegetation is at risk of ignition from utility electric lines and equipment.*
3. *Describe how (i.e., criteria, data, protocols, studies, etc.) the utility made the determination to trim any vegetation beyond required clearances in GO 95.*
4. *Describe utility plan to mitigate identified trees with strike potential, including information about how (i.e., criteria, protocols, data, statutes, etc.) the electrical corporation identifies and defines "hazard trees" and "trees with strike potential" based on height and feasible path to strike powerlines or equipment. Describe utility plan to identify reliability/at-risk tree species to trim or remove, where feasible, per location-specific criteria.*
5. *Include a discussion of how the utility's overall vegetation management initiatives address risks that may arise from trimming or removing trees, including but not limited to erosion, wind, flooding, etc.*

As part of its efforts to make its electric system more resistant to wildfires, and to comply with relevant Commission rules and state law, SDG&E designed and actively maintains a vegetation management program aimed at keeping trees and brush clear of electric power lines.[44] SDG&E's vegetation management program involves several components, such as: tracking and maintaining a database of trees and poles that are located close to electric infrastructure; regular patrolling, pruning, and identifying and removing hazardous trees and replacing with the right tree at the right place; pole maintenance with pole brushing and clearing; training first responders in electrical and fire awareness; and red flag operations. These program components are discussed in more detail below.

[44] SDG&E's vegetation management program complies with current regulatory requirements, such as GO 95, Rule 35 and PRC §§ 4292 and 4293, and in some areas, exceeds the minimum regulatory requirements. It also follows the North American Electric Reliability Corporation (NERC) vegetation reliability standard FAC-003-04.

SDG&E's strategy for conducting its vegetation management program focuses on annual routine and enhanced inspections. Routine operations are driven by regulatory requirements following a master schedule that includes the activities of pre-inspection, trimming, auditing, and pole brushing. Enhanced inspections augment the operations by including incremental activity frequency and scoping to address potential line strikes and fire hazard.

For both routine and enhanced activities, SDG&E has identified tree species to target for enhanced trimming and removal. The criteria for determining target species include factors such as growth rate and characteristics, failure potential, outage history, and other environmental factors. Targeted species include eucalyptus, palm, oak, pine, and sycamore. SDG&E's vegetation data indicates these species have the highest relative frequency of tree-related outages. Many of these trees, such as eucalyptus and sycamore, are fast-growing and have a propensity to shed branches during wind conditions.

SDG&E maintains an electronic tree database that tracks the inspection, trimming, and auditing activity of its nearly 460,000 inventory trees. SDG&E defines an inventory tree as one that could encroach the minimum clearance or otherwise impact the electrical facilities within three years of the inspection date. The database includes information pertaining to the tree including species, height, diameter, growth rate, clearance, and other characteristics. This history provides the inspector the information with which to determine which trees require work for the annual cycle. The tree inventory database is updated daily reflecting trees that are added to or removed from the system. SDG&E employs a contracted workforce of ISA-Certified Arborists trained in tree species characteristics and hazard assessment.

SDG&E schedules its enhanced tree inspections within the HFTD to coincide with the post-trim QA/QC activity. The enhanced inspection activity occurs approximately six months after the routine inspection activity. This inspection frequency enables a second look at trees within the annual cycle to ensure conditions have not changed that may result in a tree/line conflict. In areas of the HFTD where the annual, routine pre-inspection activity occurs during the Fall months (September-December), SDG&E performs the additional, enhanced tree inspection activity in the Spring/Summer months in advance of the dangerous Santa Ana wind conditions.

The protocol and scope for both routine and enhanced inspections within the HFTD includes a visual inspection of all trees that have the potential to strike the electrical facilities if they were to fail at ground level. The visual inspection includes a 360-degree hazard inspection of trees from ground level to canopy height to determine tree health, structural integrity, and environmental conditions. Where appropriate, sounding techniques or root examination may also be conducted.

The scope for determining post-trim clearances includes factors such as species, height, growth rate, health, location of defect, site conditions, proper cuts. SDG&E's post-trim clearances are tree-specific applying each applicable factor. The strategy is to ensure a tree cannot grow into the power lines or otherwise make contact either by branch breakout or trunk failure. SDG&E follows the industry standard of directional pruning to achieve this goal. If a tree cannot be

mitigated by pruning, SDG&E may determine that complete removal is necessary. This course may be followed if pruning will lead to the tree's demise, if the remaining tree poses a threat, or if its growth potential cannot be managed.

SDG&E's vegetation management operations are conducted in consideration of the residual state of the environment where the activity occurs. Debris associated with pruning operations are chipped and removed from the site. All debris is removed from water channels to prevent flooding or erosion. SDG&E works with land agencies such as U.S. Forest Service to implement best practices and Forest Practice Rules in the dispersal and removal of green waste associated with tree pruning/removal operations. SDG&E's vegetation management operations are reviewed for environmental compliance in accordance with regulations to prevent negative impact of species and protected habitat.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Vegetation Management and Inspections initiatives in Sections 5.3.5.1 through 5.3.5.20 below. Table 25 – Vegetation Management and Inspections initiatives is provided in Appendix A.

5.3.5.1. Vegetation management – community engagement

In the effort to inform and engage customers, SDG&E has participated in several community town hall meetings centered in communities in its service territory that are subject to enhanced vegetation management operations. These sessions are coordinated and scheduled through SDG&E Public Affairs and Media Relations Departments and include various stakeholders such as homeowner associations (HOAs), public agencies, first-responders, and fire agencies. During these meetings customers are provided detailed information about Company activities, work scope, and potential impacts to property. Customers are educated on the concept of "Right Tree-Right Place," proper planting near power lines, maintaining safe clearances, and fire safety. SDG&E Vegetation Management personnel participate in Company-led tours of its Emergency Operations Center. These tours are attended by community leaders, elected officials, public agencies, and other invested stakeholders to learn the Company's objectives and execution of its fire mitigation activities.

SDG&E has also produced multimedia content on its internet website to illustrate its enhanced vegetation management operations for the public. SDG&E created a 30-minute documentary about its wildfire safety efforts and advancements. The documentary aired in late 2019 on local TV stations, with trailers being shown in strategically located movie theaters within SDG&E's service territory. Part of the documentary covered SDG&E's vegetation management practices and provided education on the need for these efforts. Collateral materials have also been developed to further educate customers about the need and value of vegetation management. These materials provide tips and recommendations to help customers and residents manage vegetation and defensible space around their homes and businesses.

SDG&E utilizes its contract workforce of professional arborists and tree trimmers to directly engage customers on the positive benefits of safe and proper utility line clearance operations.

All vegetation management contractors are trained in positive customer communications, which affords multiple opportunities to interface with customers regarding vegetation management operations. SDG&E leads and participates in Arbor Day events in several of its communities and utilizes a non-profit vendor to educate the public and school-age children on electrical awareness, and safe and proper management of trees near power lines.

SDG&E is developing its customer engagement activities via a centralized team of associated departments to improve customer outreach and awareness of the various wildfire mitigation efforts. This will include identifying the appropriate customer baseline and various forums to engage customers. SDG&E will continue to conduct pre- and post- event customer research to obtain feedback on the quality of the messaging and communication tactics that are employed. Surveys and focus groups will be used to engage customers and solicit reactions to the public education campaign materials created. Surveys are also employed during the community outreach events. Attendees are asked to provide feedback about the event as well as any additional information they would like at future events. This type of feedback helped SDG&E establish its Community Resource Centers.

As discussed in further detail in Section 5.3.5.9 below, SDG&E intends to enhance its vegetation management effectiveness by increasing post trim clearance to 25-feet on SDG&E's most dangerous tree species and removing hazard trees with strike potential. These enhancements have an impact on customers, and customer communication and education will have a large role in SDG&E's ability to execute these vegetation management enhancements.

SDG&E will continue to create content for its public education campaign, outreach activities and broadcast and social media outreach. Initiatives considered for this effort include:

- Expanded collateral materials to proactively support the awareness of mitigation efforts
- An updated vegetation management education video
- Updated content of the annual public education campaign (e.g., bill insert, HFTD newsletter, social media, TV/radio - broadcast media, sdge.com)
- Educational materials for outreach events such as back-country Open Houses and Fire Safety Fairs
- Continue to air the SDG&E documentary on local TV stations during wildfire season
- Content for public awareness stories pitched to the media outlets
- Develop and air public service announcements/TV and radio commercials

Along with the items listed above, customer, community and stakeholder solicited feedback will lead to the development of additional education opportunities. SDG&E also conducts affected customer research after wildfire season events to gather feedback on communications and process optimization, which is evaluated and incorporated into the WMP Annual Update as

appropriate. Furthermore, SDG&E will continue to evolve a diversified portfolio of customer communications, outreach and public education based on lessons learned.

5.3.5.2. Detailed inspections of vegetation around distribution infrastructure - tree trimming

To comply with Commission rules as well as state and federal laws, SDG&E developed and maintains a vegetation management work plan, which is a schedule-based approach to its operations so that applicable lines within its service territory are inspected each year. SDG&E divides its service territory into 133 distinct zones known as Vegetation Management Areas (VMA). SDG&E's activities in each VMA are driven by a master schedule that identifies specific activities that are calendared to take place in each VMA every year. The activities include: pre-inspection, audit of pre-inspection work, tree pruning and removal, pole brushing, post-trim, and brushing audits. These activities are managed within PowerWorkz. Patrol activities are generally termed to include routine inspections and off-cycle, incremental and enhanced inspections throughout the service territory.

During the pre-inspection activity, trees in proximity to SDG&E's power lines are inspected and evaluated and the tree condition in the database is updated accordingly. Each tree is visited on an annual cycle. The annual inspections include routine maintenance and hazard tree assessments to verify that trees will remain compliant for the duration of the cycle and/or pruned according to standards and clearances. Trees that will not maintain compliance, or that have the potential to impact power lines within the annual pruning cycle, are identified and assigned to the tree contractor to work. If a tree requires urgent work, the inspector has the discretion to issue the job to the tree contractor for priority completion. Emergency pruning occurs when a tree requires immediate attention to clear an infraction or poses an imminent threat to the electrical facilities.

SDG&E tree contractors follow American National Standards Institute (ANSI) A300 industry tree standards and the concept of directional pruning, which fosters the health of a tree while maximizing clearance and extending the pruning cycle. All tree branches overhanging conductors are considered a potential risk. Thus, SDG&E removes all branches that cross the vertical plane of the conductors from the conductor to the top of the tree. Once the work is completed, the tree crew updates the tree information and records the work performed in a mobile data terminal (MDT), then uploads this information into the Vegetation Work Management System. Where prudent and achievable, SDG&E prunes trees 12 feet (or more). The post-pruning clearances obtained by the tree contractor are determined by factors such as species, tree growth, wind sway, and proper pruning practices. On average, SDG&E prunes approximately 175,000 trees each year and removes approximately 8,500 non-compatible trees.

The scoping operations for removing trees includes the chipping of all material and removal of the debris off-site. The only material left on site is the larger wood (> 6-8-inch diameter). Any large debris left on slopes is positioned to prevent movement of the material by gravity. All

debris associated with pruning and removal operations is removed from watercourses to prevent flooding or degradation of water quality. Tree removal operations that may occur in sensitive environmental areas are reviewed to determine protocols that must be followed to protect species and habitat.

Within the HFTD, SDG&E performs routine and non-routine hazard tree inspections annually. These inspections are performed by International Society of Arboriculture (ISA) Certified Arborists. Theses inspections include a 360-degree assessment of every tree within the "strike zone" of the conductors. The strike zone includes the area adjacent to power lines both inside and outside the rights-of-way for trees that are tall enough to potentially strike the overhead facilities. SDG&E completes work identified during the non-routine inspections prior to the start of the peak fire season (September 1). SDG&E requires its contractors to perform hazard tree assessment and fire awareness training annually.

SDG&E has historically utilized a contractor workforce to perform its vegetation management program activities of tree pre-inspection, tree pruning and removals, pole brushing, and quality assurance. SDG&E notes there are general concerns regarding the availability of contractors given that all the electric utilities within California are working expeditiously on vegetation management activities. In the future, SDG&E may seek ways to mitigate this potential exposure to resource constraints. Further, SDG&E will likely experience additional upward cost pressures due, in part, to the enactment of Senate Bill 247 (2019). While the exact impacts of this law are still unclear, it may be interpreted that compensation for represented qualified line clearance tree trimmers will significantly increase.

Safety, regulatory requirements, and service reliability dictate the vegetation management methodology of spend and resource allocation. SDG&E must remain compliant year-round by patrolling its entire service territory and inspecting all trees that have the potential of impacting electrical facilities. A master schedule of inter-related vegetation management activities ensures all components of the plan are completed on an annual basis. SDG&E's Vegetation Management tree inventory database contains a rich, multi-year history of all work performed within the system and informs as to the scope of work and number of resources needed to complete all activities.

SDG&E conducts QA/QC audits on a random sample population of all work completed by its contractors to assess work quality and contractual adherence. The audits are performed by a third-party contractor using statistical analysis. SDG&E's Audit Services department also performs an internal audit on all its vegetation management activities. SDG&E will utilize the results of QA/QC auditing to demonstrate the effectiveness of each component of the program. Other metrics that will inform of the effectiveness will include the number of infractions identified during inspections as well as incidents of tree-related outages.

In 2019, as part of its enhanced vegetation management activities, SDG&E integrated a second hazard tree inspection activity throughout the entire HFTD to coincide with the post-trim audit activity. This inspection activity is performed by ISA-Certified Arborists trained tree species

characteristics and hazard tree assessment. SDG&E will continue its second hazard tree inspection activity as a routine component of the post-trim audit activity before the next Plan update. In addition to its contracted workforce personnel, SDG&E plans to hire in-house inspectors (as SDG&E employees) whose responsibility would be to conduct vegetation patrols of the HFTD as well as additional targeted species patrols.

Over this Plan cycle, SDG&E will determine the need to increase the number of internal SDG&E inspectors within the Vegetation Management program and will further engage with the Fire Science & Climate Adaptation Department in the refinement and application of the Vegetation Risk Index. SDG&E will work to develop a comprehensive audit program to assess and quantify the state of compliance of the Vegetation Management program with regulatory requirements over the next 10 years. These audits will inform on overall success of the program, state of compliance, and procedural integrity.

5.3.5.3. Detailed inspections of vegetation around transmission infrastructure

Please see Section 5.3.5.2 above.

5.3.5.4. Emergency response vegetation management

Please see Section 5.3.5.9 above.

5.3.5.5. Fuels management

Protection of SDG&E's electric system from wildfires is critical to system reliability and first responder and public safety. Accordingly, SDG&E (in partnership with fire departments, fire safe councils, and other stakeholders) is implementing a comprehensive fuels management program to reduce wildfire fuel accumulations. This program removes, thins, or treats vegetation along SDG&E rights of way and adjacent fire-prone corridors. The reduction of wildland fuel in these areas has the potential to slow the spread of fire and makes it more likely that firefighting activities are successful at reducing impacts to the surrounding areas. The reduction of fuel loading adjacent to and under power lines also reduces the risk of the smoke column being thick enough for electricity to flow through the column and come to ground.

This program also enables non-profit organizations in the SDG&E service territory to apply for grant awards ranging from $25,000 - $100,000. SDG&E strongly encourages grant proposals to be innovative, collaborative projects in the highest fire threat areas that identify and support wildland fuel treatment initiatives which modify wildland fire behavior with the goal of reducing burn intensity, limiting spread and aiding in suppression efforts.

SDG&E is expanding this program beyond levels described in the 2019 WMP. The expanded efforts are due in part to the progress of the program, developed through partnering with cooperating agencies (e.g., fire departments, Caltrans, local, state and tribal governments, and land management agencies).

SDG&E intends to continue to prioritize the ongoing development of fuel management initiatives moving forward. This work is closely aligned with the priorities of our partners in the fire agencies and local fire safe councils. SDG&E is not planning to conduct specific audits, though SDG&E is in the process implementing some organizational updates to support quality assurance on these programs including a fuels management professional in the Fire Science and Coordination group.

The emerging fuels management program will improve the long-term state of the fuels in San Diego County. The effectiveness of fuel management can be demonstrated through success stories and though published literature, such as the after-action report from the West Fire. The report specifically described the benefits of fuel management in saving homes during that wildfire.

In 2019, SDG&E significantly increased fuel management initiatives along its right of ways. SDG&E targeted high-risk areas by leveraging subject matter expertise from its Fire Science and Coordination team to identify the highest risk regions, and then further refined areas by cross referencing with CAL FIRE's "Extreme" fire risk areas. SDG&E then work with landowners to enhance fuel management efforts in these areas.

SDG&E also reviewed several proposals and awarded four grants for fuel management work within the HFTD in 2019. Rincon Reservation, Pauma Reservation, and La Jolla Reservation were each awarded grants in the amount of $75,000. San Diego Fire Safe Council (FSC) was awarded a $100,000 grant to be distributed to the following three Fire Safe Councils: Wynola FSC, Palomar FSC, and Deer Springs FSC. Each of the proposals that were awarded funding targeted a circuit or tie line within the HFTD for fuel management.

Prior to the 2020 wildfire season and before 2021, SDG&E will continue to expand upon the work that was completed in 2019 to develop additional relationships and collaboration efforts in the fuel management community. SDG&E will closely track the work completed through our Hazard Fuels Management Grant program and will continue to expand upon our efforts to conduct fuel management initiatives on our rights of way.

Over the next three years this program will be focused on expanding community partnerships and collaborating with governmental sectors. SDG&E subject matter experts specializing in fuel management will continue to advise and help guide the program in coordination with fire agency initiatives and goals. Over the next ten years, SDG&E will continue to build upon the work completed over the next three years with the same guiding principles to expand community partnerships, collaborate with academia and the governmental sectors, and ensure that SDG&E has the best possible fuel management program to support regional wildfire safety.

5.3.5.6. Improvement of inspections

Please see Section 5.3.5.9 below.

5.3.5.7. LiDAR inspections of vegetation around distribution infrastructure and vegetation management technology

SDG&E periodically utilizes LiDAR as a tool in its vegetation management operations. This technology augments and enhances the inspection activity by determining the empirical spatial relationship between trees and power lines. SDG&E is researching future use of LiDAR to identify change detection on trees, to serve as an audit tool, and to identify pole movement and equipment condition, although this technology is still in the early phases of development.

SDG&E plans to use LiDAR technology following the routine tree trim activity in portions of the HFTD as an audit tool to confirm safe and compliant clearances between trees and power lines. SDG&E will assess the incremental benefit of LiDAR based on the timeliness of data acquisition and the ability to integrate the technology into its routine activity schedules.

In 2019 SDG&E entered into contract with a vendor that developed a mobile phone app which utilizes LiDAR data and PLS-CADD modeling for field verification of tree clearances, line movement, and position relative to electric infrastructure. Thus far, data modeling and acquisition has been somewhat inconsistent, but SDG&E continues to pilot the use of the app within its routine tree inspection activity.

SDG&E expects to use LiDAR technology to some degree across multiple company initiatives and throughout a larger portion of the service territory before 2021. As the frequency of flights increase, Vegetation Management will utilize the data as an integral component of the HFTD auditing and inspection activities.

Over the next three years, SDG&E will monitor the improvement of LiDAR technology to the extent it can inform not just of relative clearances but also in the identification of tree species, tree hazards, and change detection. The advancement in this arena will increase the benefit of the technology and the integration of tree hazard assessment throughout the service territory. Program evolvement over the next 10 years will depend entirely on the advancement of the technology.

As another tool in the management of its inventory trees, SDG&E has in recent years implemented the use of Tree Growth Regulators (TGR), which is a chemical application that dramatically reduces the new shoot growth of trees. Results have shown that the use of TGR can reduce the frequency of pruning on some species of up to three years. An added benefit of using TGR is that it provides growth reduction, root and leaf enhancement, and in some instances can help with disease and insect protection.

SDG&E has begun to integrate data science into its vegetation management operations. SDG&E is utilizing the information from its tree inventory database, outage history and meteorology data to develop its VRI of the highest tree risk areas of its service territory. The goal of this initiative is to leverage machine learning and artificial intelligence techniques to correlate SDG&E's extensive vegetation and meteorological datasets to gain additional insights on how

atmospheric conditions impact growth rate of certain species and to identify certain high-risk vegetation areas.

5.3.5.8. LiDAR inspections for vegetation around transmission infrastructure

Please see Section 5.3.5.7 above.

5.3.5.9. Other discretionary inspection of vegetation around distribution infrastructure – Enhanced inspections, patrols, and trims

In its 2019 WMP, SDG&E proposed enhancements to its current vegetation management practices related to inspections, patrols, and trimming (specifically in the HFTD) as well as training. SDG&E proposed that, during the annually scheduled routine inspections, the pre-inspection scope for all VMAs would be increased to include trees within the strike zone of transmission and distribution electric facilities. Trees tall enough to strike overhead electric lines will be assessed for hazardous conditions, and tree crown height will be reduced or removed to prevent a line strike from either whole tree failure or limb break out. This would include dead, dying and diseased trees, live trees with a structural defect, and locations with dense tree population that could strike as a result of wind exposure. Greater consideration would be given to environmental conditions that can impact a tree's relationship to the electric facilities, such as wind sway and line sag. The Commission approved SDG&E's enhanced vegetation management proposal on a pilot basis.[45]

This same scope and criteria will be applied during off-cycle tree patrols of all VMAs within SDG&E's service territory. These additional patrols will be timed to occur mid-cycle, with the routine inspection, so that all lines are reviewed twice annually in accordance with the enhanced scope.

SDG&E's tree-trim scope will be increased to achieve a 25-foot clearance post-prune, where feasible, between trees and electric facilities within the HFTD. This is a significant increase over the average 12 feet post-prune clearance that SDG&E currently achieves. There may be some barriers to fully achieving this goal. For instance, environmental agencies, land agencies, and customers may oppose the tree pruning to this new clearance. Nevertheless, SDG&E expects to work through these issues to achieve the desired wildfire risk mitigation.

Given that tree growth is by some degree uncertain and is a product of items outside of SDG&E's control (e.g., weather), additional post-prune clearance provides another layer of mitigation to prevent a vegetation contact with SDG&E's overhead equipment. All tree operations will use the concept of directional pruning, where all branches growing towards the lines will be rolled back to direct the growth away from the lines and to increase the post-trim clearance. These activities are expected to incrementally decrease the risk of tree branches contacting electric facilities, whether by growth encroachment, limb failure, or complete tree failure.

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[45] *See generally* D.19-05-039 at 8-10.

In addition, during elevated or extreme weather events, SDG&E's vegetation management contractors are kept informed of the conditions, allowing them time to relocate crews into safe work areas. In instances of emergency tree pruning during elevated fire conditions, additional fire equipment or support from the contracted, professional fire services may be utilized.

In advance of a forecasted RFW, SDG&E will determine if vegetation management patrols are warranted to reassess tree conditions in advance of, during, or immediately following red flag events. SDG&E's Meteorology team will work with the Fire Coordination and Vegetation Management departments to determine where this activity should occur. These inspections are incremental to the routine cyclical inspections.

Further, SDG&E provides electrical equipment training to CAL FIRE representatives. While CAL FIRE inspections have been jointly performed with SDG&E, this training is intended for CAL FIRE to better understand the operation of the electric system and which equipment should be targeted to best prevent an ignition source. This training can be used by CAL FIRE while they are conducting their day-to-day operations and inspections and is dependent on CAL FIRE's participation. CAL FIRE has communicated it will not be available for training in 2019 but will make themselves available in 2020 and future years.

SDG&E's enhanced vegetation management program is consistent with the intent presented in the 2019 WMP. As SDG&E has implemented enhanced inspections, patrols, and trimming, it has identified additional tools, fleet, and crews are needed to support this program. As such, the costs were expanded as compared to what was estimated in the 2019 WMP.

SDG&E prioritization for spending and resources is dependent on safety, compliance, reliability, and budgeting allocations. As a starting point, SDG&E uses its Master Schedule to determine when and where activities should be performed. Routine operations such as inspection and tree trimming follow an established scope to meet the requirements. Additional and enhanced activities expand on these operations to focus on the higher risk within the HFTD. SDG&E works with its contractors to determine the adequate number of personnel and equipment to complete all routine and enhanced activities.

SDG&E conducts QA/QC audits on a random sample population of all work completed by our contractors to assess work quality and contractual adherence. A third-party contractor performs the audits using statistical analysis. SDG&E will utilize the results of QA/QC auditing to assess the effectiveness of each component of the program. Other metrics that will inform of the effectiveness will include the number of infractions identified during inspections, as well as incidents of tree-related outages. SDG&E will perform post-trim audits on all completed tree trim activities conducted during the off-cycle activities.

Before the upcoming wildfire season, SDG&E is planning to create internal SDG&E inspector positions to augment the contractor workforce to perform the off-cycle HFTD and additional patrol activities for target species, such as Century plant and bamboo. Tree contractors will be

adding to their work force to meet the demand of the increased workload associated with enhanced scoping. Prior to 2021, SDG&E will expand its wildfire mitigation activities with a fuels modification activity which will include the thinning and removal of non-native, flammable vegetation around structures to reduce the risk of ignition due to electrical facilities.

SDG&E will continue to refine and expand the use of its Vegetation Risk Index over the next three years to identify where to target additional trimming and removal activities. SDG&E will work with CAL FIRE to schedule annual training and joint inspection activities. SDG&E will continue to partner and collaborate with fire agencies and stakeholders on fire avoidance and fuel reduction initiatives. Over the next 10 years, SDG&E will continue to build and grow its fuel modification program to include modifying the vegetation cover within its rights-of-way.

5.3.5.10. Other discretionary inspection of vegetation around transmission infrastructure

Please see Section 5.3.5.9 above.

5.3.5.11. Patrol inspections of vegetation around distribution infrastructure

Please see Section 5.3.5.2 above.

5.3.5.12. Patrol inspections of vegetation around transmission infrastructure

Please see Section 5.3.5.2 above.

5.3.5.13. Quality assurance/quality control of inspections

SDG&E utilizes a third-party contractor to perform quality assurance audits of all its vegetation management activities. These audits include a statistical analysis of a representative sampling of all completed work. A minimum random sampling of 10% is audited to determine compliance with scoping requirements. Safety, regulatory requirements, and service reliability dictate the vegetation management methodology of spend and resource allocation. SDG&E works with audit contractor to determine the scope, frequency, and number of resources needed to complete all audit activities.

During the post-prune audit, the Certified Arborist also performs an inspection of all the power lines within the VMA for any trees that will not remain compliant with applicable regulatory requirements for the duration of the annual cycle. SDG&E and the contractor review the results to determine if any additional work is required. SDG&E performs an annual, internal audit of its vegetation management program through its Internal Audit Services Department.

Before the upcoming 2020 wildfire season, SDG&E's audit contractor will hire additional personnel to perform an anticipated increase in audit scope and activities. Before an annual update, SDG&E anticipates completion of 100% audit on all its enhanced HFTD trim and removal activities. By 2022, SDG&E hopes to pilot the use of LiDAR for compliance. Over the

next 10 years, SDG&E will work to develop a comprehensive audit program to assess and quantify the state of compliance of the Vegetation Management program with regulatory requirements. These audits will inform on overall success of the program, state of compliance, and procedural integrity.

5.3.5.14. Recruiting and training of vegetation management personnel

SDG&E Vegetation Management contractors are responsible for developing and conducting training of its personnel. SDG&E does require all its contractors to perform annual training to include hazard tree assessments, customer engagement, fire preparedness and environmental regulations. Through its service agreements, SDG&E requires professional certifications of some of the contract personnel based on activity type or employee level (i.e., Pre-inspectors, Auditors, General Foremen, Supervisors). These certifications include ISA-Certified Arborist and ISA-Utility Specialist.

SDG&E provides training to contractors where scoping activities are changed or modified. SDG&E also provides training to contract leadership. SDG&E documents procedural changes. SDG&E personnel attend and participate in contractor-led training modules. All contractors are required to have personal protective equipment (PPE), including all applicable fire PPE on their vehicles at all times and be trained in the safe and proper use of the equipment. SDG&E also requires tree contractors to have fire PPE staged at each job site and at the ready for use. SDG&E contractors must be enrolled in the ISNetworld safety clearinghouse that scores and tracks contractor safety performance. Contractors must also meet minimum safety thresholds to remain a viable vendor and work for SDG&E.

SDG&E requires its contractors to document employee training and to provide it to SDG&E upon request. SDG&E's Safety Department supports Vegetation Management by utilizing a third-party vendor to perform field safety observations. These observations are documented and reviewed by internal SDG&E personnel for safety adherence.

SDG&E tracks the success and effectiveness of the safety program in a database. SDG&E measures the success of the various training requirements through such measures as the reduction customer complaints, outages, claims, notice of violations, ignitions, and safety incidents. Through SDG&E Safety, Vegetation Management utilizes a predictive analytics software to record and anticipate contractor safety performance.

Prior to 2021 and over the next three to 10 years, SDG&E will engage SDG&E Fire Coordination to provide awareness training to the contractors including fire behavior and the use fire equipment.

5.3.5.15. Remediation of at-risk species

Please see Section 5.3.5.2 and Section 5.3.5.9 above.

5.3.5.16. Removal and remediation of tress with strike potential to electric infrastructure – Hazard tree removal and Right Tree-Right Place

Hazard tree evaluation is a critical component of SDG&E's vegetation management program operations to reduce tree-related outages and fire ignitions. SDG&E has a robust tree removal program that targets problematic species such as eucalyptus and palms. SDG&E follows the industry-established "Right Tree-Right Place" program to assist customers in the selection of compatible tree species with the goal of minimizing interference with electrical infrastructure and maximizing energy savings and environmental benefits. SDG&E also offers free tree replacements if an existing tree cannot be maintained safely near power lines.

SDG&E performs additional off-cycle patrols of select species (such as bamboo and Century plants) that have fast and unpredictable growth rates and are difficult to manage near power lines. These patrols help target and remove problematic species before they become a danger. Because of the potential threat to the power lines from detached fronds, SDG&E also proactively pursues the removal of palms located far outside its rights-of-way.

SDG&E Vegetation Management activities have greatly reduced tree-caused outages over the years. In the early 1990s, prior to industry regulation, SDG&E encountered 400-500 tree-caused outages on an average annual basis. After the establishment of its vegetation program, SDG&E experienced a dramatic reduction in tree-related outages. SDG&E conducts a thorough investigation of all tree-related outages and maintains an investigation database to track and record the events. The information helps identify the mechanics of outages and how to prevent future occurrences.

SDG&E's Vegetation Management department also uses its historical tree removal data to forecast the number of removals it may perform in a given year, including an analysis of known targeted species that are fast-growing and that have a propensity for branch or trunk failure. Environmental factors such as drought and insect infestation continue to impact the urban and rural forest environment. All hazard trees are assessed for risk and prioritized based on severity of condition and activity schedule.

SDG&E's hazard tree removal program is integrated within the routine inspection cycle and its enhanced patrols. Certified Arborists trained in hazard tree evaluation perform these inspections. The scope of these inspections includes a critical look at any tree that could strike the power lines. In addition, the tree trim contractors receive hazard tree training and perform a safety assessment before working on any tree to identify potential defects.

Contractors conduct annual hazard tree training for all field personnel. The Pre-inspection contractor performs an internal review of trees identified for removal. This assessment is used to determine whether the contractor is correctly identifying tree hazards. A third-party contractor performs an audit on 100% of all trees removed to ensure work was completed per scope and contract including an assessment of the efficacy of stump treatment application and facility protection.

SDG&E will develop a customer survey initiative to assess the overall success of its tree replacement program. A measure of effectiveness of the hazard tree removal program can be a reduction in the frequency of tree-outages and ignitions. SDG&E will enhance its tree replacement program with more direct and specialized customer involvement including on-line selection of species and by improving the timeliness of tree replacements.

Prior to the upcoming wildfire season, SDG&E will continue in its approach to hazard tree assessment with multiple, annual inspections within the HFTD. SDG&E will work with contractors to identify the most accurate tools and technology to assist in hazard tree assessment. SDG&E will continue its efforts to increase the number of targeted species removals within the HFTD. SDG&E will establish a metric for increasing the annual number of tree replacements.

SDG&E plans to develop its inspection activity to include internal-company patrollers to perform its enhanced inspection activities such as hazard trees, Century plant, and bamboo patrols by 2021. SDG&E will increase the training requirements of hazard tree inspectors to include Tree Risk Assessment Qualified certification. Over the next three years, SDG&E will work with contractors to identify the safest and most effective practices and equipment in the execution of its hazard tree operations. SDG&E will continue its outreach and collaboration with cities and other stakeholders to increase the number of tree plantings as a sustainability initiative.

SDG&E plans to further evolve this program over the next 10 years by leveraging enhanced VRI and WRRM data to develop a more strategic approach to identify areas of high risk and prioritization of mitigation efforts. Utilize LiDAR more effectively to improvement its assessment of hazard trees. SDG&E will research collaborative opportunities with outside organizations to develop a means of tracking the sustainability of its tree replacement program including assessing the health of its tree replacements and measuring the ancillary environmental benefits.

5.3.5.17. Substation inspections

Please see Section 5.3.5.2 and Section 5.3.5.9 above.

5.3.5.18. Substation vegetation management

Please see Section 5.3.5.2 and Section 5.3.5.9 above.

5.3.5.19. Vegetation inventory system – Tree database

Beginning in 1998, SDG&E developed and implemented an internal vegetation work management system to track and manage trees that are in proximity to its electric infrastructure. SDG&E's database contains records for approximately 460,000 known, specific trees located near its electric power lines. SDG&E's inventory database and work management

systems are collectively referred to as PowerWorkz. PowerWorkz includes an ESRI-based electronic mapping mobile application and server-based workflow tool.

SDG&E's inventory trees comprise trees with the potential of impacting the power lines by encroachment and/or tree failure within three years of the inspection date. SDG&E monitors all trees in its inventory using known species growth rates, with additional consideration given to the amount of rainfall occurring during periods affecting overall tree growth, and past pruning practices. Each inventory tree is assigned a unique alpha-numeric identification number within the electronic database, which allows the activity history of each tree to be tracked. Accordingly, this database allows SDG&E to monitor and identify which trees to address in efforts to reduce vegetation-related ignitions.

The tree inventory database enables a systematic and efficient approach to managing assets, scheduling, activity history, and resource allocation. The database and work management system provide a current view and status of all inventory trees and prioritizes work. All contractors work within the electronic system to provide real-time updates and scheduling as well as robust reporting functionality.

SDG&E has a team of IT analysts, business control, and personnel to support the PowerWorkz management system. Contractors also have access to these personnel to provide software and hardware functionality. SDG&E is currently working with a vendor on the next generation of its electronic work management system to provide greater efficiency and functionality.

SDG&E currently expects to phase-in the new work management system in 2020. Prior to 2021, SDG&E will investigate the integration of its new work management system with other inter-departmental systems to streamline workflows. SDG&E will research opportunities to share its inventory data with external stakeholders for cross-activity initiatives.

Over the next three years, SDG&E plans to research and initiate next-generation hardware for contract field personnel to interface with the electronic work management system. SDG&E will continue to research industry best practices and work management software applications to further streamline and enhance its operations within the next 10 years.

5.3.5.20. Vegetation management to achieve clearances around electric infrastructure – Pole brushing

SDG&E utilizes the same work management system to manage and track the inventory of all poles that require inspection and brush clearing in the State Responsibility Area. The current inventory of such poles comprises approximately 31,000 distribution poles with nonexempt subject hardware. Inspectors determine which poles will require brushing, and which are clear and require no work, updating the record in the database. A work order is assigned to the Pole Brush Contractor to perform the clearing of identified poles requiring brush clearing.

SDG&E currently performs three activities to more effectively manage subject poles annually. These activities include mechanical pole brushing, chemical application, and a re-clearing of pole brushing. Mechanical pole brushing involves clearing all vegetation from around the pole base, removing all tree limbs that encroach the cylinder up to a height of eight feet and remove all encroaching dead or diseased tree limbs from eight feet up to the top of the pole. Mechanical brushing is typically performed in the spring months. The contractor will then apply an Environmental Protection Agency (EPA) approved herbicide, the chemical application. SDG&E treats approximately 10,000 poles with a pre-emergent herbicide to minimize vegetative re-growth and reduce overall maintenance costs. The chemical application is typically done just before the rain season (during the fall and winter months) so that the application is activated and effective.

Not all subject poles can be treated with herbicide due to environmental constraints, which include considerations such as slope, proximity to water, proximity to trees and other vegetation, and customer approval. Following this, re-clearing is performed in summer months by removing any additional flammable vegetation which has grown into, or blown into, the required clearance area since the last maintenance activity occurred. The need to revisit a subject pole multiple times is not uncommon, due to leaf litter blown back into the managed clearance zone during windy conditions and 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 circle from the ground up to the height of the electrical conductors. This process aims to reduce growth of vegetation to minimize the potential of vegetation-related ignitions.

Pole brushing follows a specific multi-activity, annual schedule in order to remain compliant year-round. The number of subject-poles fluctuates minimally year-to-year so scheduling, spend, and resource allocation remains fairly constant. SDG&E performs an environmental review in advance of all new pole brushing activities to assess impacts to protected habitat and resources. With multiple wildfire initiative projects currently underway, including new pole sets and conversions, the need for pole brushing has increased. Resource allocation and schedules must be reviewed and prioritized accordingly. SDG&E also performs pole brushing on approximately 1500 poles located outside the SRA that are not subject to brushing requirement. These poles are located in portions of the service territory where the surrounding vegetation could propagate a fire.

Like all other vegetation management activities, a QA/QC audit is performed on a random, representative sample of all completed pole-brush work. Additionally, SDG&E conducts internal compliance audits for vegetation management on an annual basis. The relatively few instances of ignitions due to equipment on poles demonstrate the effectiveness of the pole brushing program. SDG&E plans to evolve the program with independent and joint inspections by regulatory authorities such as CAL FIRE.

In 2019, SDG&E replaced approximately 1,100 fuses and 250 hot line clamps attached to poles within the HFTD. This will reduce the risk of equipment-related ignitions and will potentially reduce the number of poles that are subject to pole brushing requirements in PRC § 4292. In 2020 SDG&E plans to replace approximately 1,500 fuses and 700 hot line clamps attached to poles within the HFTD. This will continue to reduce the risk of equipment-related ignitions and will potentially reduce the number of poles that are subject to pole brushing requirements in PRC § 4292.

Pole brush inspection occurs in conjunction with the tree inspection activity. There are opportunities for redundancy and data discrepancy between this and the pole brushing activity which is performed on a different schedule. Within the next three years, SDG&E is planning to revise its procedure to integrate pole brush inspection within the pole brush activity. This will help reduce property visits and customer contacts and improve contractor work efficiency and data integrity.

Over the next 10 years, SDG&E will develop the use of LiDAR to help with equipment change detection and auditing of pole brushing. SDG&E is also investigating inter-departmental processes that could automate notification when equipment is changed out that makes a pole subject to brushing.

5.3.6. Grid operations and protocols

SDG&E operates its system with safety as its top priority. When operating conditions, as described in Section 5.3.2.5 above, reach elevated or extreme levels, SDG&E implements operating protocols that reduce the risk of ignitions on the system. This can be in the form of disabling reclosing, enabling enhanced protection settings, work restrictions, and in the most extreme cases as a last resort, shutting off the power to the specific areas that experience the extreme risk. The Sections below describe these activities in detail.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Grid Operations and Protocols initiatives in Sections 5.3.6.1 through 5.3.6.6 below. Table 26 – Grid Operations and Protocols initiatives is provided in Appendix A.

5.3.6.1. Recloser protocols

SDG&E previously completed a large deployment of overhead distribution reclosers, focusing heavily on the HFTD. A recloser is a switching device that is designed to detect and interrupt momentary faults. The device can reclose automatically and open back up if a fault is still detected. The automated reclosing feature can be disabled, so if a device detects a fault it will trip open and remain open and minimize the potential for an ignition.

These overhead distribution reclosers allow SDG&E to operate its system in a variety of configurations depending on input from its meteorologists, known localized conditions, and its declared Operating Condition (see discussion above in Section 5.3.2.5). They also provide

SDG&E the ability to sectionalize various elements of its distribution system to efficiently manage system operations and reliability, which results in quicker restoration times for customers. Additionally, SDG&E has associated these remote SCADA-controlled sectionalizing devices with specific wind anemometer locations, allowing for targeted applications of PSPS to the areas that pose the most significant real-time system condition risk of wildfire.

Under Normal Conditions, overhead distribution reclosers operate to clear faults by isolating the fewest number of customers while reducing overall exposure to the electric system. Under Elevated Conditions or higher and now most of the year, all distribution reclosing functions are disabled on circuits located within the HFTD but may include other circuits if the burn environment is conducive to large wildfires. This is done so that if a fault occurs on the system, the recloser automatically opens and stays open so the fault only occurs once and is not closed, creating another opportunity for a potential ignition. Disabling reclosing functions is not optimal for reliability but is performed for public safety and wildfire risk reduction when weather conditions are elevated or higher. In addition to disabling the reclosing function, SDG&E recognizes a need to make overhead distribution reclosers operate faster and with greater sensitivity to clear faults in a manner that reduces the energy of the fault as much as possible. By reducing the resultant energy of a fault, the probability of causing significant damage to the surrounding area is reduced. Because of this need, SDG&E has developed the ability to enable more sensitive relay settings on overhead distribution reclosers. These sensitive relay settings improve both the sensitivity of fault detection and the speed at which faults are cleared.

SDG&E's internal operating procedure for reclosing protocols is validated annually prior to fire season. SCADA-controlled sectionalizing devices with specific anemometer locations are validated yearly to ensure all newly installed devices are updated on the procedure, along with the SCADA summary screen. SDG&E's recloser protocols are intended to reduce the chance of a fault leading to an ignition. This includes disabling reclosing and the enabling sensitive settings described in the narrative above. SDG&E would expect the ratio of ignitions/faults to rise over time if SDG&E were to stop following these procedures.

The disabling of reclosing and the enabling of sensitive settings were among the first mitigations SDG&E initiated after the lessons learned from the 2007 fires. These innovative mitigations represented a shift in priority from electric reliability in favor of public safety and wildfire risk reduction. Today, these procedures represent a standard best practice for California utilities. SDG&E continues to look for innovation in system protection settings for its automated reclosers and other automated sectionalizing devices. The enabling of the fast trip settings to reduce fault energy was a recent innovation. To see other innovations and improvements around protection settings and controls, see Advanced Protection above in Section 5.3.3.2.

5.3.6.2. Wildfire infrastructure protection teams – Contract fire resources

SDG&E contracts for wildfire prevention and ignition mitigation services, Contract Fire Resources, which are paired with SDG&E personnel during times of elevated wildfire potential. SDG&E may extend Contract Fire Resources coverage depending on operating conditions or when specific needs arise. These Contract Fire Resources accompany SDG&E or contract construction crews and other electric workers to provide site-specific fire prevention and ignition mitigation during the workday and after hours. During RFW events or when the FPI is "Extreme," additional Contract Fire Resources are deployed with SDG&E personnel to mitigate the risk of fire from emergency work.

The fire prevention personnel that serve as Contract Fire Resources largely mirror the classification of an ICS Type VI Fire Engine, which carries two qualified firefighters, firefighting hoses, valves, and approximately 300 gallons of water. The object of these Contract Fire Resources is to prevent a fire from igniting from work being performed and/or other heat sources that exist on a construction site. The Contract Fire Resource is also trained and equipped to extinguish a fire that may ignite while it is still small and prevent that ignition from becoming a wildfire.

SDG&E intends to continue to prioritize and build upon its decade of success with our Wildfire Infrastructure Protection Teams. At the present time only fires meeting the criteria of D.14-02-015 have data driven documentation. Fires meeting the criteria of the decision and other fires are discussed, appropriate mitigations determined, and those mitigations are implemented immediately to prevent future incidents.

SDG&E reviews standard work practices addressing fire annually. This review process includes identifying at risk work activities and consideration of the use of these Contract Fire Resources during those activities. This program is closely managed through our Fire Science and Coordination team.

Over the last decade, SDG&E has paired Wildfire Infrastructure Protection teams with its field crews conducting work in the highest risk portions of the service territory during high risk fire days to mitigate potential ignitions and focus on the prevention of wildfire. In 2019, due to the increased volume of work in our highest risk areas, SDG&E increased the number of Wildfire Protection teams accompanying our crews to eight during the primary fire season. Outside of June through November, these resources are available on a call when needed basis and accompany crews in performing at risk activities in areas that have a higher risk of wildfire.

SDG&E will continue to maintain and carry the historical success of this program into the 2020 wildfire season. Depending upon environmental conditions and the increase in work activity across the highest risk areas, SDG&E is prepared to expand the program to support the increased need to ensure the wildfire mitigation efforts taking place are being done to the highest wildfire safety standards to prevent potential ignitions.

This program will maintain and may exceed the levels presented in SDG&E's 2019 RAMP. The increases to both the number of days and the number of Contract Fire Resources on property for each of those days that began in 2019, will continue and may increase in 2020 through 2022 due to the high volume of work in the most fire prone portions of our service territory. The Contract Fire Resources role will remain the same and will focus on prevention and ignition mitigation. Contract Fire Resources will continue to be paired with SDG&E field personnel to mitigate the risk of an ignition origination for SDG&E activities. Over the next ten years, we will continue to build upon the work done over the next three years with the same guiding principles to focus on wildfire prevention and ignition mitigation.

5.3.6.3. Other special work procedures

SDG&E has designated the type of work activity that can be performed for each of the Operating Conditions discussed above in Section 5.3.2.5 – Operating Conditions. As conditions increase in severity, activities that present an increased risk of ignition have additional mitigation requirements. Where risk cannot be mitigated, work activity might cease. The following summarizes the work activity guidelines for each Operating Condition:

- **Normal Condition:** normal operating procedures are followed with baseline tools and equipment.
- **Elevated Condition:** certain at-risk work activities may require additional mitigation measures in order to proceed with work. The additional mitigation measures will be documented.
- **Extreme or RFW Condition:** most overhead work activities will cease, except where not performing the work would create a greater risk than doing so. In those cases where at risk work needs to be performed, an SDG&E Fire Coordinator is consulted, and additional mitigation steps are implemented. Status of work, ceased or continued, will be documented.

These guidelines suffice for most routine types of activities performed in the wildland areas, which consist of undeveloped areas with vegetation. For non-routine, or especially hazardous work, SDG&E's Fire Coordination group is consulted to determine whether additional mitigation requirements are needed.

SDG&E intends to continue to prioritize the integration of the Fire Potential Index into operational practices to promote safety. SDG&E conducts annual reviews of these procedures and makes updates as necessary. Other special work procedures restrict work activities on elevated and extreme FPI days. Because of these procedures, SDG&E would expect crew related ignitions to decrease on elevated or higher FPI days.

The operating conditions outlined above dictate the types of work that we perform under normal, elevated, extreme or RFW conditions today. The procedures that govern these operations are regularly reviewed. In 2019, SDG&E further formalized its process of reviewing all wildfire procedures by creating a Training and Plan Enhancement Fire Coordinator. SDG&E

plans to review, update (as needed) and provide training on the documents that govern special work procedures. SDG&E intends to leverage data collected through our ignition management initiatives to inform these procedures moving forward.

5.3.6.4. Protocols for PSPS re-energization

If SDG&E determines it is necessary to employ a PSPS for portions of its system, re-energization will take place after the SDG&E weather network shows that wind speeds have decreased, and SDG&E weather forecasts indicate that winds will not re-accelerate at or above dangerous levels. SDG&E inspects all lines that have been de-energized for damage before re-energization may occur. Although the conditions that initiated a PSPS event may conclude, there are factors that inhibit safe and thorough patrol of lines, such as winds that inhibit flights needed to access remote infrastructure, and a lack of daylight needed to see the infrastructure patrolled. The time needed to conduct the patrol can also vary by several hours. The terrain traversed, the distance, and access to SDG&E facilities may hinder foot patrols. Lastly, the amount and severity of damage found during patrols may also affect restoration times. Once a line is patrolled and all damage has been repaired, the lines are re-energized.

5.3.6.5. PSPS events and mitigation of PSPS impacts

5.3.6.5.1. PSPS protocols

Please see Section 4.4 above for a detailed discussion of SDG&E's PSPS history and protocols.

SDG&E regularly evaluates its PSPS protocols before, during, and after wildfire season to identify areas for improvement and incorporate lessons learned. Consistent with the requirements outlined in Resolution ESRB-8 and D.19-05-042, SDG&E submits PSPS post-event reports with the CPUC so they can evaluate SDG&E's decision-making process.

After PSPS events, SDG&E conducts patrols prior to re-energization to assesses whether there is damage to its system. Typical types of damage found during the re-energization patrols are vegetation contact with conductor, other foreign object in power lines, or damaged equipment. These lines cannot be safely re-energized until crews cleared the debris or made the equipment repairs. SDG&E tracks damages which would have caused a system fault had it occurred while the circuit was energized. Once all the locations are determined, SDG&E can utilize the WRRM model to simulate the spread and damage caused by potential damage.

SDG&E plans to continue to use PSPS as last resort mitigation measure when appropriate. Nevertheless, SDG&E has created a PSPS mitigation engineering team that is developing mitigations intended to reduce impacts to customers that have been exposed to PSPS in the past. For the work planned in 2020, SDG&E will utilize a combination of strategic undergrounding, remote sectionalizing, covered conductor, overhead hardening, microgrids, and SDG&E provided customer generation to reduce customer impacts. The plans for 2020 include mitigations that will eliminate PSPS for eight public schools that had been shut off

previously, as well as eliminate impacts to over 7,000 customers (28% of SDG&E's largest recorded PSPS event) who had seen shutoffs in the past.

Over the three-year period of the plan, SDG&E will continue its strategy shift towards mitigations that reduce both wildfire risk and customer impacts of PSPS events. SDG&E expects to mitigate the impacts to thousands of additional customers, including nearly all public schools (approximately two dozen) that had previously been subject to a PSPS event. SDG&E believes that PSPS will still be a necessary tool of last resort in certain situations in the next ten years. But SDG&E has a long-term aspirational goal to reduce or minimize the customer impacts of PSPS events. SDG&E's grid hardening strategy has targeted reducing these impacts over the next ten years.

5.3.6.5.2. Mitigating the public safety impact of PSPS protocols

SDG&E manages and mitigates the impacts of a PSPS event through collaboration with key stakeholders in the wildfire response community. SDG&E partners on a regular and ongoing basis with the following agencies to address a range of fire prevention and emergency activities:

- **San Diego County Fire Chiefs' Association** – SDG&E provides monthly written and oral updates while seeking feedback and comments on planning, response, recovery, and communications programs;
- **CAL FIRE and the San Diego County Fire Authority** – SDG&E engages in frequent communications related to aerial firefighting and contract management of the year-round Skycrane and Blackhawk programs;
- **County Unified Disaster Council** – SDG&E receives and provides quarterly updates on regional planning and response programs while building relationships with 18 cities, the County of San Diego, and participating Special Districts;
- **County Office of Emergency Services** – SDG&E communicates and meets as needed (no less than quarterly) to discuss and agree on emergency planning, response, recovery, and communications needs;
- **All Fire Agencies in San Diego County** – SDG&E meets annually with fire agencies in San Diego County (including cities, fire districts, military, and tribal) to provide in-service training and exercises on electric and natural gas safety, response, Incident Command integration with utilities, and communications, to coordinate response during wildfire and other emergencies;
- **All Law Enforcement Agencies in San Diego County** – SDG&E engages in various activities including outreach efforts, trainings, and data sharing with the San Diego County Sheriff's department and all municipal law enforcement agencies; and

- **Fire Dispatch Centers** – SDG&E provides bi-annual communications training and requirements related to electric and natural gas incidents and emergencies to fire dispatch centers.

5.3.6.5.3. PSPS communication practices

In advance of the peak of fire season, in accordance with P.U. Code § 8386(c)(16)(B) and D.19-05-039, SDG&E conducts ongoing education campaigns in a minimum of eight languages (English, Spanish, Mandarin, Cantonese, Korean, Tagalog, Vietnamese and Russian) regarding how to be prepared for Public Safety Power Shutoffs and emergencies in the event of a wildfire, natural disaster or major outage.

SDG&E's comprehensive wildfire communication program has been developed, and is continuously refined, in partnership with the California Office of Emergency Services (Cal OES), and other local communication stakeholders such as the San Diego County Office of Emergency Services (County OES), public safety partners, impacted customers surveyed, local tribal councils, critical facilities and infrastructure, the San Diego County AFN Working Group, and other community partners, such as the American Red Cross, 2-1-1 and CERTS.

SDG&E's wildfire communications framework consists of a multi-pronged approach and is divided into three phases – prior to, during, and following the extreme weather event. The purpose of the communications program is to educate and help the public prepare for, respond to, and recover from a PSPS or wildfire event. In the days leading up to a forecasted PSPS, and during an active event, SDG&E establishes and maintains contact with customers, non-account holders, and community stakeholders that it believes may be impacted. SDG&E maintains communication with public safety partners, impacted customers, affected populations (non-customers), critical facilities and infrastructure, Access and Functional Needs (AFN) populations, and community partners.

SDG&E utilizes multiple platforms to communicate through the various stages of an event, including: media outlets, radio, social media channels, the SDG&E website, along with established community-based organization communications networks. Event messaging includes, but is not limited to: event timing, the wildfire mitigation strategies and activities being utilized, and the resources available to help mitigate impacts and support customers through a PSPS or wildfire event. SDG&E also communicates with key stakeholders, public officials, and first responders through a variety of channels and personnel to align with their established communication protocols.

SDG&E has shifted to a year-round wildfire safety education and communication campaign. SDG&E adjusts and refines communications tactics in real time based on customer and stakeholder feedback to ensure ongoing relevancy and effectiveness. Following major communication campaigns, mitigations efforts, or wildfire/PSPS event response, SDG&E conducts research and analytics to evaluate the overall effectiveness of the campaign. SDG&E then incorporates lessons learned into its wildfire communications strategy. The overarching

communications strategy consists of a series of specific outreach campaigns which target all customers and stakeholders in the service territory and enlists multiple tactics to inform residents and businesses in the region. The outreach campaign includes:

- Print Advertising
- Paid Search
- Paid Social Media
- Bill Newsletter
- HFTD Newsletter
- Public Service Wildfire Safety Commercials on local TV and radio outlets
- Wildfire Mitigation Activities/Statistics Collateral
- Open House and Community Fair Posters, Flyers and Emails
- Outage Notification Scripts (email, text, voice)
- PSPS Policies and Procedures
- Educational Outreach through local news media partnerships
- Statewide PSPS Campaign Tactics, such as:
    - Radio Spot/Buy
    - Paid Social/Digital Assets/Buy
    - Website (prepareforpowerdown.com)
- Print advertising for the outreach campaign is provided in eight languages: English, Spanish, Mandarin, Cantonese, Korean, Vietnamese, Tagalog and Russian. The in-language advertising is placed in corresponding in-language community publications.

Throughout the year SDG&E works directly with its public safety partners (e.g., local cities, counties, tribal governments, water and telecom providers and emergency response partners) to educate them on Public Safety Power Shutoffs and collaborate on how to minimize the impact to the region. SDG&E also engages its community partners, such as fire safe councils, planning groups, chambers of commerce and CERTs, and provides these organizations with education on Public Safety Power Shutoff events. SDG&E recognizes that each jurisdiction, utility and emergency response partner have diverse needs and different perspectives, with the common goal of increasing resiliency and minimize impacts of shutoff events; therefore, SDG&E deploys an educational approach that is collaborative and varied. For example, SDG&E holds Public Safety Power Shutoff briefings individually with local elected officials and government staff and holds table top exercises for water and telecom utilities.

Extreme weather conditions can change at any time, and SDG&E's top priority is safety. SDG&E is focused on providing impacted communities with advanced notifications. In the event of a Public Safety Power Shutoff, SDG&E will advise public safety partners, first responders, affected communities, and local municipalities in the impacted areas.

5.3.6.5.3.1. Notice to customers

Depending on conditions, SDG&E will communicate with customers in advance of an event – 48, and 24 hours as well as 1-4 hours in advance when possible, prior to shutting off power; upon starting safety inspections of affected power lines; and upon re-energization, as practicable.[46] SDG&E will also reach out to the AFN populations and the organizations that serve them during the same intervals. SDG&E communicates these notifications to customers in eight languages (English, Spanish, Mandarin, Cantonese, Vietnamese, Korean, Tagalog and Russian). SDG&E has launched an ongoing campaign asking customers to update their contact information and sign up for outage notifications at *sdge.com/MyAccount*.

Additionally, SDG&E has recognized the importance of developing a solution to identify and communicate with all people within a de-energized area, including people who may be visiting the area or not directly listed on utility accounts. In 2019, SDG&E created a self-registration portal that enables people not directly listed on utility accounts to create an authenticated account and opt-in for PSPS notifications by zip code(s). Those people may receive notifications by voice, text and e-mail, and they will use this account to maintain their notification preferences, as well as the ability to opt-out of notifications. Both SDG&E customers and non-account holders can sign up for PSPS notifications at sdge.com/notifications.

SDG&E uses this information to reach its customers using the Emergency Notification System (ENS) through phone, text and/or email in advance of a Public Safety Power Shutoff, if conditions allow, and throughout the event until power is restored. As part of this WMP, SDG&E will invest in enhancements to its Emergency Notification System (ENS) in order to streamline business processes, support situational awareness, and enhance reporting capabilities. In addition, SDG&E is exploring the feasibility of a dedicated PSPS mobile application, which can further improve customer (and non-customer) communications and notifications, including maps of event information, situational awareness, and available resources.

In addition to notifying customers directly, outage updates are provided through social media, local news, radio and SDG&E's website at *sdge.com* and *sdgenews.com*. Anticipated PSPS events may be avoided altogether if weather conditions improve. In such instances, SDG&E will notify customers that weather conditions have improved in their area, and SDG&E does not anticipate the need to turn off power for safety. SDG&E also encourages customers to visit *sdge.com/wildfire-safety* for tips on putting together an emergency preparedness plan for their home or business.

[46] *See* D.19-05-042 at Appendix A, pp. A-7 to A-8.

In some circumstances, SDG&E may not have an opportunity to provide advance notification to customers when CAL FIRE or a local agency requests a PSPS due to an active wildfire or other emergency response situation. Additionally, if a problem is identified that poses an immediate safety risk, SDG&E may have to turn off the power immediately (e.g., a car crashing into a power pole may require immediate de-energization for safety).

5.3.6.5.3.2. Notice to state, counties, cities, and tribes

SDG&E provides priority advanced notification to its public safety partners about a potential Public Safety Power Shutoff approximately 48-72 hours before a de-energization is anticipated. As a best practice, SDG&E also provides advanced notification to its community partners. By providing advanced notifications to its government and agency contacts, SDG&E alerts them that conditions are being monitored; provides them with anticipated start time, estimated restoration time, the number of medical baseline customers that may be impacted, and access to GIS information of potentially impacted areas; and provides them with three dedicated 24/7 points of contact for information throughout the event. SDG&E continues to communicate with these important public safety partners, and maintains open two-way communication with them as well, throughout the duration of an event.

5.3.6.5.3.3. Notice to customers who provide critical services

SDG&E has identified and maintains direct contact with companies and organizations that provide critical services, such as healthcare, fire stations, schools and universities, water agencies, and communications providers within a potentially impacted area. Via this contact, SDG&E seeks to ensure that its customers providing critical services know that a Public Safety Power Shutoff may occur during extreme weather conditions, so that they can take steps to prepare, such as securing backup generation. Annually, SDG&E asks critical services customers to confirm an appropriate point of contact for these types of notifications, along with the correct contact information, so that SDG&E can provide early warning notifications, when and where possible, depending on conditions. After an event, SDG&E meets with critical customers to understand lessons learned and ways to improve communication and support. SDG&E provides them with three dedicated 24/7 points of contact for information throughout the event.

5.3.6.5.3.4. Notice to medical baseline customers

SDG&E takes additional steps to reach customers enrolled in the Medical Baseline program. Customers are asked to evaluate the safety of their situation and have an emergency plan ready in case of an outage. When communicating with Medical Baseline customers, the Emergency Notification Service captures a positive physical response when the customer is contacted. If a positive response is not obtained, a second live attempt is made through SDG&E's Customer Call Center. If no contact is achieved with the second attempt, SDG&E field personnel are dispatched to the address of record to deliver the message in person.

During a PSPS event, there may be a need to provide additional support to an impacted community. SDG&E may open a Community Resource Center near the affected area, if conditions prolong the estimated outage duration. Community Resource Center activations will be communicated via the SDG&E website, social media, local news and radio and the SDG&E News Center. At these Centers, residents will have access to water, light snacks and charge small electronic devices, as well as receive the most up-to-date information about the power shutoff.

5.3.6.6. Stationed and on-call ignition prevention and suppression resources and services

5.3.6.6.1. Aviation firefighting program

When wildfires occur north of SDG&E's service territory, CAL FIRE may divert aerial firefighting resources to emerging wildfires outside of SDG&E's service territory. This can lead to reduced aerial firefighting capability in the San Diego region. Accordingly, SDG&E has developed and implemented an effective, year-round aerial firefighting program to support the fire agencies in its service territory.

SDG&E has two aerial assets available for the purpose of helping fight fires. SDG&E leases an Erickson S-64 helitanker (Air Crane). Starting in June of 2019, SDG&E also leases 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 will be capable of night firefighting with the appropriate crew and training.

SDG&E has agreements with the County of San Diego, CAL FIRE, and the Orange County Fire Authority for aerial firefighting within SDG&E's service territory. Dispatch of SDG&E's aviation firefighting assets is performed through CAL FIRE and these assets support their initial attack strategy to keep wildfires at less than 10 acres. SDG&E maintains a Flight Operations duty to assist in dispatching the assets 365 days per year. This allows the assets to be launched rapidly once dispatched by CAL FIRE.

SDG&E based its decision to procure aerial resources on a few factors. First, these resources provide very good fire suppression capability to SDG&E's service territory. And they have been successfully utilized in many instances, preventing fires from burning out of control in San Diego County. Second, SDG&E performs capital work in the more rural areas with access issues. In areas of difficult access, aerial resources are a necessary construction tool to be able to set structures and string conductor. During elevated or higher conditions when helicopter work is restricted, they are on call and ready to be dispatched to any active fires in San Diego County.

Aerial operations will be assessed throughout the year to ensure that they meet the need of the firefighting authorities requesting the helicopters. Contractors operating the leased or owned aircraft will be audited by an external aviation auditor every 2 years for aviation operations. Currently, SDG&E is in negotiations to purchase an S-70i (Firehawk) to replace the Blackhawk and anticipates that the transaction will be complete prior to the next Plan update. Over the next three to 10 years, SDG&E will continue to assess the effectiveness of its Aviation Firefighting program and will work with CAL FIRE on any changes for improved firefighting effectiveness.

5.3.6.6.2. Industrial fire brigade

SDG&E has contracted an Industrial Fire Brigade (IFB), which is available 24 hours a day, 365 days a year. The IFB differs from the Contract Fire Resources: whereas the IFB is specially trained to fight fires involving electrical equipment (substations and large transformers) as well as flammable liquids, the Contract Fire Resources are focused on site-specific fire prevention and ignition mitigation. The IFB members are stationed at facilities near the geographical center of SDG&E's service territory and are equipped to handle utility-related fire emergencies.

The IFB incorporates a portable fire suppression trailer equipped with 330 gallons of Class B alcohol resistant firefighting foam, 500 pounds of chemical extinguishing agent, a 500 gallon-per-minute monitor, and hoses designed to work with hydrants or other fire apparatus. SDG&E also provides three additional trailers and training to fire agencies to aide in emergency response to SDG&E facilities as well as other emergencies that may occur in their jurisdictions. The IFB also develops comprehensive pre-emergency response plans for each SDG&E substation and large-scale energy storage facility.

SDG&E intends to continue the IFB program. SDG&E conducts quality checks of the program though annual review with the contractor facilitating the program. Any updates will be made through this renewal process. SDG&E does not currently anticipate any updates or changes to this program.

5.3.7. Data governance

SDG&E has begun the process of updating its IT systems and centralizing data for better access to enhance the state of data analytics and find opportunities for automation. The effort to combine and cross-reference data sources and processes into a centralized enterprise repository yields the opportunity to flag data gaps, discover stale or missing data, and identify data that represents the system truth. These benefits are often difficult to achieve with separate data systems. Identifying these opportunities supports better business processes and more efficient data collection for various use cases that support operations, engineering and risk management.

SDG&E's roadmap includes establishment of a central data repository and foundation for electric engineering and operations data. There are currently multiple repositories, including

Engineering Data Warehouse, Customer Data Warehouse, and databases managed by individual business groups. SDG&E's strategy is to integrate all critical application data into the central repository and to develop logical views of the data. Data integration methods are dependent on the use case – batch or real time, physical or virtual. The end vision is that the data will be combined and leveraged to develop reports, visualizations and predictive models, and to provide inputs to other applications.

As part of building out this data foundation, all data will be catalogued in a central data management tool. This catalogue will include data glossary, data dictionary and data lineage. It is essential that all data in the repository can be trusted, and the key terms are well defined and consistently used across the enterprise. In parallel with building out a central data repository for structured data, SDG&E also plans to build out a repository for imagery data, such as photo imagery and LIDAR information. This repository will be a logical extension of the central data repository. Images will need to be appropriately indexed and tagged with metadata so they can be associated with assets and geospatially referenced.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Data Governance initiatives in Sections 5.3.7.1 through 5.3.7.4 below. Table 27 – Data Governance initiatives is provided in Appendix A.

5.3.7.1. Centralized repository for data

SDG&E is developing an Enterprise Asset Management Platform (EAMP), which is a centralized repository for asset data. The EAMP will enable SDG&E to predict and assign asset health indexes (AHI) on its critical electric assets to identify and compare assets based on its likelihood of failure. An AHI is a score designed to track the condition and performance of an asset by applying predictive analytics to multiple sources of data and used as a basis for asset management strategies. The key benefits of employing AHI include the ability to measure overall health of assets, recognize asset data parameters associated with failure modes, predict failures, relatively compare between assets of same class in a consistent manner. Asset risk is determined when AHI and the associated likelihood of failure consequence are jointly considered. Based on this information, asset strategies would be evaluated, prioritized and implemented to manage the asset in a manner that aligns with SDG&E's overall risk management strategy, supports risk-informed platform for managing assets, and reinforces safe operations, maintenance and proactive replacement strategies.

The EAMP project began in late 2019 starting with critical electric distribution assets by collecting relevant data sources, finding opportunities to practice data governance, and building predictive asset models to inform operational, maintenance and replacement strategies. SDG&E anticipates that future expansions of EAMP may include transmission and substation assets with a manner to compare health indexes and risks in a consistent and uniform manner.

Integrating this asset risk information with other inputs, such as a circuit risk index for situational awareness, will inform the appropriate asset-related operational decision-making

and strategies for enhanced reliability and safe operations of assets on given current and expected conditions. SDG&E believes asset management will provide a means to optimize the its risk, performance, and investments, while meeting or exceeding safety and regulatory objectives. A comprehensive asset management system will provide the access to and integration of data throughout the asset life cycle to develop analysis and a health index for critical assets.

5.3.7.1.1. Asset management

Please see Section 5.3.8.1 Asset Management below.

5.3.7.1.2. Geographic information system data

In response to the increasing desire to have the GIS data of electric facilities available to support statewide emergency preparedness, SDG&E is collaborating with state agency stakeholders to find the best solution to provide the requested information in a timely manner. In 2019, SDG&E developed a process to automate the sharing of PSPS event data with many different entities utilizing ESRI's ArcGIS Online (AGOL) application. This method of sharing PSPS data is used with Cal OES representatives in order to provide them with the requested data in a timely and secure fashion. During PSPS events, SDG&E shares PSPS-related GIS data with Cal OES, County OES, approximately 55 Public Safety Partners, and it also posts the information on SDG&E's PSPS outage webpage.

5.3.7.2. Collaborative research on utility ignition and/or wildfire – Innovation lab and other collaboration

In conjunction with the EOC remodel efforts discussed in Section 5.3.9.4.7, SDG&E plans to establish a Fire Science and Innovation Lab in 2020. The lab will bring together leading thinkers and problem solvers in academia, government, and the community to create forward-looking solutions to help prevent ignitions, mitigate the impacts of fires, and ultimately help build a more resilient region. With this lab, SDG&E aims to lead the development of the next generation of fire science and wildfire innovation.

5.3.7.3. Wildfire-related data and algorithms

To adapt to the effects of the changing climate and the threat of year-round wildfires, SDG&E partnered with academia, government and other professionals to undertake unprecedented initiatives over the last decade to innovate, implement, and share advanced technologies to improve wildfire safety in the region. Initial measures taken have advanced fire potential and weather forecasts, provided real-time situational awareness, and activated leading-edge utility wildfire prevention. Several weather-related analytical tools and associated algorithms have been developed over the last decade. These tools and algorithms are described in greater detail throughout this WMP. These include the Fire Potential Index, Santa Ana Wildfire Threat Index, and fuel modeling, all described in greater detail in Section 4.2, as well as the Operational Wildfire Risk Reduction Model, described in section 5.3.1.1.

5.3.7.4. Tracking and analysis of near miss data

5.3.7.4.1. Ignition management program

In 2019, SDG&E established a pilot Ignition Management Program (IMP). The purpose of this program is to track ignitions and potential ignitions in order to perform root cause analysis on each ignition or potential ignition to detect patterns or correlations. Such ignition or potential ignition events are documented and analyzed. When patterns or correlations are identified, the outcomes are communicated and assigned to mitigation owners from the business unit most logically positioned to eliminate or reduce future events of a similar nature. This data will be used to inform metrics, operational and system hardening in the future.

In 2019, SDG&E employed a Fire Ignition Management Program Coordinator to implement and manage this program, as well as support ongoing quality assurance of the program. Early results of the pilot have shown this program is valuable in understanding and preventing ignitions. While the IMP is still in its early stages, the program has enabled SDG&E to gather focused data on near ignition events and through analysis this data has helped educate fire prevention decisions. SDG&E intends to continue to develop the IMP in 2020. This work is closely aligned with priorities in this WMP and is intended to enhance SDG&E's ignition data and analytics. Further, this program is important to facilitate the enhancement of the data used to inform several WMP initiatives from operational procedures to the prioritization of hardening efforts.

Prior to the upcoming fire season, SDG&E expects to continue learning from the IMP and plans to further expand the program. These expansion efforts will include refining the data gathering procedures and expanding the IT-related support to house and process data associated with findings from the program. Before the WMP update in 2021, SDG&E plans to integrate the findings and analytics from the IMP into the WMP metrics and strategic WMP hardening initiatives. Over the next decade, the Fire Ignition Management Program Coordinator will review the IMP to identify potential enhancements to the program and oversee the implementation of any refinements, as needed.

5.3.7.4.2. Reliability database

SDG&E tracks and maintains customer outage impact data for CPUC annual reporting, other internal and external reporting, and to analyze causes of electric system outages in order to use that information to optimize electric system reliability investments. The data tracked includes any outages in the primary voltage (i.e., 4kV, 12kV, 69kV, 138kV, 230kV, 500kV) electric systems that leads to customer impact. Planned outages and secondary voltage related outages are not tracked within this database. The database tabulates results in terms of industry measurements such as Customers Impacted (CI), Customer Minutes interrupted (CMI), System Average Interruption Duration Index (SAIDI), and System Average Interruption Frequency Index (SAIFI).

5.3.8. Resource allocation methodology

SDG&E's enterprise risk management process, discussed in Section 5.4 below, includes a step focused on risk-informed investment decision-making. As addressed in SDG&E's 2019 RAMP,[47] the capital planning process is the Company's current annual process for prioritizing funding based on risk informed priorities and input from operations. The capital allocation planning sessions begin with input from functional capital committees that comprise subject matter experts who perform high level assessments of the capital requirements based on achieving the highest risk mitigation at the lowest attainable costs. These requirements are presented to a cross-functional team representing each functional area with capital requests.

This committee reviews the resource requirement submissions from all functional areas, and projects are evaluated against priority by assessing a variety of metrics including safety, cost effectiveness, reliability, security, environmental, strategic, and customer experience. Recommendations for capital spending are then presented to an executive committee for approval. Once the capital allocations are approved, each individual operating organization is chartered to manage their respective capital needs within the capital allotted by the plan. This includes re-prioritizations as necessary to address imminent safety concerns as they arise. As with the Company's risk evaluation processes, the capital planning process is continuing to evolve as the Company endeavors to achieve the goal of determining more quantitatively the risk reduction per dollar invested, also referred to as risk spend efficiency or RSE.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Resource Allocation Methodology initiatives in Sections 5.3.8.1 through 5.3.8.4 below. Table 28 – Resource Allocation Methodology initiatives is provided in Appendix A.

5.3.8.1. Asset management

In 2017, SDG&E established its Asset Integrity Management (AIM) program to develop and implement a comprehensive and sustainable asset management system, encompassing people, process, and technology. AIM utilizes an integrative approach to electric assets for governance, strategy, analytics, and continuous improvement. SDG&E is developing the new asset management system to conform with ISO 55000, an international standard that specifies the requirements (ISO 55001) and application (ISO 55002) for the establishment, implementation, maintenance, and improvement of an asset management system. Benefits of such a system may include enhanced asset safety, improved performance, managed risk, demonstrated compliance, and improved efficiencies and effectiveness of asset utilization and operations.

Asset management is a critical element of SDG&E's focus on creating sustainable and high-quality asset safety for electric operations, and optimizing asset utilization, while mitigating asset-related risks. This is also one element of SDG&E's vision for an electric safety

[47] 2019 RAMP, Chapter RAMP-B at B-7 – B-8.

management system, as further discussed below.[48] A comprehensive asset management system, which includes process improvements, data analytics and system solutions, will provide the access to and integration of data throughout the asset life cycle to develop analysis and a health index for critical assets.

SDG&E is also developing an asset health index (AHI) to identify and compare assets based on likelihood of failure. An AHI is a score designed to track the condition and performance of an asset by applying statistical modeling and predictive analytics to multiple sources of data and is used as a basis for asset management strategies. The key benefits of employing AHI include the ability to measure the overall health of assets, recognize asset data parameters associated with failure modes, detect failures, and make relative comparisons between assets of same class in a consistent manner. Asset risk is determined when AHI and the associated asset failure consequence or impact are jointly considered. Based on this asset risk information, asset replacement or rehabilitation strategies would be evaluated, prioritized, and implemented to manage the asset in a manner that aligns with SDG&E's overall risk management strategy, supports risk-informed platform for managing assets, and reinforces safe operations, maintenance and proactive replacement strategies. Integrating this asset risk information with other inputs, such as circuit risk index for situational awareness, especially within fire-prone areas, will inform the appropriate asset-related operational decision-making and strategies for enhanced reliability and safe operations of assets on given current and expected wildfire conditions.

With safety as the Company's highest priority, and with the objective of promoting continuous improvement, the Asset Management department has embarked on a cross-functional project of streamlining an end-to-end process on investment prioritization and allocation. This includes incorporating an enterprise-wide, multi-attribute value framework for evaluating capital investments through a data-driven, quantitative risk- and safety-based lens. This value framework will utilize the Company's strategic values and determine standardized value-based metrics to quantitatively compare projects, and thereby enhance the Company's ability to cross-prioritize across portfolio and optimize investment decisions, including wildfire mitigation investments, while ensuring effective spend of ratepayer funds.

The initial value framework development will be applied to electric transmission and substation capital investments as these will be more manageable in volume and scope compared to electric distribution capital investments. Once developed, this initial value framework will serve as a foundation to build upon for other asset-intensive capital investments and eventually evolve to enterprise-wide value framework. Further development will employ a phased approach with electric distribution investments as next in line and subsequently, other assets supporting the electric system infrastructure.

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48 *See also* SDG&E 2019 RAMP at Chapter RAMP-F (Safety Culture).

The Asset Management department is in the process of developing audit requirements based on the Performance Evaluation criteria of ISO 55000. This process entails defining the audit criteria and scope; identifying auditors to conduct the audits; defining the audit reporting process, and records retention; and resolution of audit results. The product of this development stage is an established Internal Audit program that implements a consistent and objective quality check across the organization. Audit results will be used to identify opportunities for corrective actions and improvements.

The main objective of developing analysis and a health index for critical assets is to enhance performance evaluation and continuous improvement. An AHI will allow SDG&E to measure the overall health of assets, recognize asset data parameters associated with failure modes, detect failures, and relatively compare between assets of same class in a consistent manner, thereby enhancing performance evaluation of assets and any need for preventive measures. Considering AHI and associated asset failure consequence, asset risk is then determined, evaluated and prioritized. With asset risk identification and prioritization, asset strategies (i.e., replacement or rehabilitation) are also evaluated for their effectiveness on risk mitigation and performance, which demonstrates continuous improvement.

The enterprise-wide, multi-attribute value framework for evaluating capital investments is used to demonstrate appraisal of investments in a consistent, transparent, repeatable and standardized manner through data-driven, quantitative risk- and safety-based lens with the appropriate review and approval committees.

The asset management program implementation will employ the ISO 55000's "Plan-Do-Check-Act" (PDCA) cycle, which is a cyclic and iterative four-step management model, to ensure continuous monitoring and improvement of people, process and technology relevant to managing assets safely and reliably.

To date, SDG&E's Asset Management department has achieved several milestones, all of which are ISO 55000 requirements:

- Development of an organizational structure, including executive steering committee, asset management governance, program leadership, asset class owners and managers, implementation and support leaders, and subject matter experts;
- Determination of asset classes and identification of critical asset types within each class based on risk assessments;
- Development of asset management policy, integrated electric strategy, and asset operational plans for electric distribution, transmission and substation operations;
- Initial compilation of asset-related operational and performance metrics for consistent and comprehensive reporting;
- Initial development of alternative replacement strategy analyses and asset health indices for certain critical assets;

- Assessment and design of information systems needed to support electric asset management;
- Launch of development of information system solutions for data integration, asset performance analytics and portfolio optimization;
- Development of value framework utilizing company strategic values and determining value-based metrics for initial application to electric distribution assets;
- Development of high-level asset management processes and identification of sub-processes for integrated governance, strategy, analytics and performance evaluation; and
- Assessment and assignment of roles and responsibilities required for organizational development and implementation of the AIM program.

The AIM will be in the implementation design phase for electric transmission, substation and distribution business segments before the 2020 wildfire season. By 2021, the AIM will likely be in the early stages of executing the implementation plan for electric transmission, substation and distribution business segments, while in planning and implementation design for other assets supporting the electric system infrastructure.

Over the next three years, the AIM is forecasted to further expand due to anticipated incremental data exploratory analyses and data integration of key asset attributes from multiple sources and associated costs of systems needed to further develop AHIs and sustainably support the asset data analytics. Within the next 10 years, SDG&E anticipates implementing AIM enterprise wide.

5.3.8.2. Risk reduction scenario development and analysis

Please see Section 5.4 below. See also SDG&E's 2019 RAMP.

5.3.8.3. Risk spend efficiency analysis

The WMP Guidelines (as clarified by the WSD in its "Follow-Up Clarification From 1/27 Utility Working Group" document) requested RSE calculations on the proposed programs and strategies identified in this WMP for reducing wildfire risk. As explained in SDG&E's 2019 RAMP, "RSEs are numerical values that attempt to portray changes in risk scores per dollar spent."[49] Simplistically, it is the ratio between the pre-mitigation and post-mitigation risk scores divided by the cost.

[49] 2019 RAMP, Chapter RAMP-D at D-1.

Calculating RSEs were also a required element in RAMP submissions[50] and have proven to be a substantial undertaking. Due to timing constraints, SDG&E utilized the same approach regarding RSEs as it did in its 2019 RAMP,[51] filed in late November 2019. More specifically, SDG&E calculated RSEs for a wide variety of activities, including all non-mandated[52] activities, certain mandated controls,[53] and all mitigations,[54] whether they were mandated or not. SDG&E calculated RSEs for all non-mandated activities and all new activities.

Since its November 2019 RAMP submission, however, SDG&E reviewed and updated, where necessary, the RSE calculations for the activities presented in this Plan. SDG&E continues its best efforts related to RSEs and plans to further expand the activities for which an RSE is calculated in future WMP and RAMP filings. Please see Section 5.4 below, as well as SDG&E's 2019 RAMP.

5.3.8.4. Other resource allocation methodology initiatives

5.3.8.4.1. Wildfire mitigation personnel

SDG&E's workforce and organizational structure has evolved significantly since its first fire mitigation efforts. In the infancy of these efforts, SDG&E largely utilized cross-functional teams that, over time, continued to transform into additional formal programs and personnel. In 2019, SDG&E recognized that a new department focusing on fire mitigation, fire mitigation strategies, program measurement, and vegetation management would prove useful in assessing the overall effectiveness and direction of SDG&E's WMP.

In July 2019, SDG&E established the Wildfire Mitigation and Vegetation Management department with existing management personnel already deeply familiar with the WMP. This new department is overseen by the Director of the Wildfire Mitigation and Vegetation Management and contains four groups to address aspects of the overall WMP effort:

- The Wildfire Mitigation Programs group will be involved with the various regulatory proceedings that address wildfire and de-energization as well as legislative and media inquiries.

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50 *See* D.18-12-014.

51 *See* 2019 RAMP, Chapter RAMP-D at D-9 – D-11.

52 For purposes of this discussion, "mandated" refers to activities conducted in order to meet a mandate or law, such as the Code of Federal Regulations (CFR), Public Utilities Code, or a General Order. *See* 2019 RAMP, Chapter RAMP-A at A-16.

53 "Control" is defined in D.18-12-014 at 16 as a "[c]urrently established activity that is modifying risk."

54 "Mitigation" is defined in D.18-12-014 at 17 as an "activity proposed or in process designed to reduce the impact/consequences and/or likelihood/probability of an event."

- The Vegetation Management group will manage the current tree and vegetation management inspection and trim program and will begin to address SDG&E's newly formed fuels management program.
- The WMP Strategic group will develop metrics, lead vision projects, promote new ways to enhance fire safety and explore advancements to further drive improvement and change.
- The WMP Accountability group will be responsible for monitoring fire-related metrics, tracking WMP activities, complying with reporting requirements, provide for governance specifications and procedures, and act in a lead capacity on audits of the WMP programs.

The owners of this Plan, described in Section 1 above, will execute, monitor, review, and address deficiencies in SDG&E's approach to wildfires. The structure is integrated across the entire SDG&E organization as well as through its reporting hierarchy. With regular monthly meetings of each group, this structure allows for wide collaboration and information gathering, as well as the ability to inform, plan, act, and improve within a compressed timeline, when needed. This structure will also allow any operational or strategic changes to be communicated and captured within SDG&E's approach to wildfire mitigation and response.

In 2018, SDG&E created a new group in the FS&CA department to closely monitor the Community Fire Safety Plan and this Plan. This monitoring and continuous improvement process for wildfires at SDG&E can start with any employee or any one of the three groups involved in the governance structure, though this newly formed group, Fire Mitigation and Climate Adaptation, will monitor and track this Plan implementation with the Community Fire Safety Plan. This group meets monthly to review the implementation status of wildfire mitigation and emergency management initiatives as well as to monitor the Plan's performance against metrics. The Community Fire Safety Plan will report the status, including variances, of SDG&E's performance to the Fire Directors Steering Committee.

The Fire Directors Steering Committee will discuss and create plans to address any variances against the Plan, as well as to discuss any new ideas or strategies that could be immediately assigned and implemented. The members of the Fire Directors Steering Committee will implement any necessary corrections or adjustments within existing operational and budgetary constraints. It will also report the status, plans, and variances to the Executive Wildfire Council. The Fire Directors Steering Committee will also make recommendations or request additional funding or resources to address existing variances. The Executive Wildfire Council will address strategic considerations and guide the organization to address wildfire mitigation efforts efficiently.

5.3.8.4.2. PSPS mitigation engineering team

SDG&E continuously evaluates its wildfire risk management efforts to identify new ways to further mitigate risks and opportunities for improving its overall approach to wildfire mitigation.

At its inception, PSPS was identified as a core element of the Company's approach to mitigating wildfire that goes together with the Company's investments in system hardening efforts. SDG&E's system hardening efforts focus on mitigating the failure of its equipment and building the Company's infrastructure to withstand extreme conditions. PSPS mitigates the risk of debris contacting energized electric infrastructure during such conditions.

Since PSPS continues to be a key component of the Company's wildfire risk management, SDG&E is examining areas with a high probability of PSPS in fire prone conditions with the intention of reducing the impacts of PSPS to customers. With a focus on increasing safety and reliability, SDG&E recently formed a dedicated team of experts bringing in a diverse set of skillsets from engineering to meteorology and risk management to look at the Company's infrastructure in the areas of highest wildfire risk with the objective of identifying short and long-term strategies to not only minimize wildfire risk, but also to reduce or minimize the customer impacts of PSPS.

The team's effort will include a segment-by-segment analysis of circuits prone to PSPS to identify highest risk areas within the circuit to target various mitigation efforts that can either eliminate the need for shutoffs or reduce impacts of the shutoffs. The analysis incorporates a variety of risk factors including the WRRM model, tree strike potential, customer density, ingress/egress issues, and critical infrastructure among other factors to identify the most appropriate portfolio of mitigations across the high wildfire risk areas. The portfolio of mitigations that the team is looking at scoping includes but is not limited to:

- Strategic undergrounding
- Overhead system hardening, which may include:
    - Expanded use of covered conductors
    - Bare conductor overhead hardening
    - Additional sectionalizing or circuit reconfigurations
    - Falling conductor protection
- Enhanced vegetation management
- Fuels management
- Providing backup generation either in the form of individual customer generators or microgrid solutions

As the team conducts its assessment and scopes these various mitigation options, the scope of other programs within this WMP will likely be adjusted to balance short and long-term strategies for mitigating wildfire risk.

5.3.9. Emergency planning and preparedness

The mission of the SDG&E's Emergency Management department is to coordinate safe and effective emergency preparedness for the company, 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 a sustained Quality Assurance and Improvement process.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Emergency Planning and Preparedness initiatives in Sections 5.3.9.1 through 5.3.9.4 below. Table 29 – Emergency Planning and Preparedness initiatives is provided in Appendix A.

5.3.9.1. Overview of emergency preparedness plan

Include a general description of the overall emergency preparedness and response plan, and detail:

1. *A description of how plan is consistent with disaster and emergency preparedness plan prepared pursuant to Public Utilities Code Section 768.6, including:*

Emergency Preparedness and Response Plan

The SDG&E emergency preparedness plan is developed in collaboration with key internal and external stakeholders and lessons learned from past incidents, trainings, and exercises are incorporated as appropriate. SDG&E has a world-class Meteorology department that has set the standard nationwide for forecasting and simulation technology that is leveraged to preposition manpower and equipment before anticipated severe weather. Annually SDG&E Emergency Management and Regional Government Liaisons meet with local city, and county public safety partners to ensure effective communications between SDG&E and the partners. This meeting also includes a review of the emergency preparedness plan and working collaboratively to mitigate any possible issues for the upcoming year. Additionally, this plan is on a three-year planning cycle and the local public safety partners are engaged to review, and comment on the plan.

a. *Plans to prepare for and restore service, including workforce mobilization (including mutual aid and contractors) and prepositioning equipment and employees*

Service Restoration and Workforce Mobilization

Please see Section 5.3.9.4.4.1 below.

b. *Emergency communications, including community outreach, public awareness, and communications efforts before, during, and after a wildfire in English, Spanish, and the top three primary languages used in California other than English or Spanish, as determined by United States Census data*

Emergency Communications

Emergency communications include community outreach through promotional communications and collateral to help promote Wildfire Safety open houses and Community

Fair events. In addition, public awareness communications occur before, during, and after a wildfire.

Before a potential wildfire event

SDG&E maintains a Wildfire Safety Community Awareness campaign to provide education to customers and residents throughout its service territory. This campaign helps the community prepare for the risk of wildfires and encourage customers to take preparatory measures such as updating contact information and signing-up for SDG&E notifications. It is also a collaborative outreach effort with local public safety and community partnerships.

SDG&E provides regular proactive communications to residents and businesses within its service territory. Aside from English and Spanish, communication materials are produced in Mandarin, Cantonese, Tagalog, Korean, Russian, and Vietnamese. These fire-safety and emergency preparedness communications may include, but are not limited to:

- Community events, emergency preparedness workshops for businesses, public participation meetings, and backup generator safety workshops;
- Informational and emergency preparedness mailings to customers in the HFTD;
- Educational and general awareness advertising campaign focused on SDG&E's preparations for the fire season and the preparations SDG&E's customers should make to be ready for emergencies. This campaign includes a series of advertisements in community newspapers in the HFTD and the service territory.
- Educational information disseminated through a bill newsletter or special insert included in customer bills. An electronic version is emailed to paperless customers;
- Various wildfire safety videos including the new SDG&E Fire Safety documentary;
- Distribution of a co-branded "newsletter" with the American Red Cross, the San Diego Office of Emergency Services, and the San Diego County Fire Chiefs' Association;
- The provision of weather information and system-outage status on SDGE.com;
- Dissemination of information regarding emergency-preparedness events via social media, such as Twitter and Facebook;
- Publication of information for SAFE San Diego Education and Outreach events in the community following an emergency.

SDG&E also works closely with its network of over 103 nonprofit community-based organizations to share the fire-safety and emergency communications to their networks via their established communication protocols as well as their social media channels and newsletters.

During wildfire events
Emergency communications protocols are agnostic of the triggering event. SDG&E follows its long-established emergency communication framework. During a wildfire, if SDG&E infrastructure is impacted, communications are immediately initiated to customers tied to that impacted infrastructure by utilizing SDG&E's customer notification system, the Enterprise Notification System (ENS). SDG&E provides situation updates to communities via the broadcast media (radio and TV), social media, outage map, SDG&E app, SDG&E NewsCenter and sdge.com. The emergency broadcasting system, TV and radio is also engaged to provide SDG&E-relevant messaging.

In addition to its routine outreach and communications, SDG&E initiates communication protocols with impacted customers and residents. SDG&E utilizes multiple communication channels to notify impacted community members. The ENS is used to directly contact all potentially impacted customers as well as residents and businesses who have signed up to receive notifications. In partnership with local media, SDG&E provides 24/7 real-time situation updates through the SDG&E NewsCenter and SDG&E personnel is available 24/7 for media interviews when requested during the event. The media is driven to the SDG&E NewsCenter landing page for real-time updates as well. The SDG&E NewsCenter and sdge.com provide event-specific information about impacted areas. Social media is also utilized to broadcast updates and safety information across the region.

SDG&E establishes communications with local water districts, telecommunications infrastructure providers, the San Diego County Office of Education, the San Diego County Office of Emergency Services, and the American Red Cross. Communication protocols are ongoing through the event duration and customer restoration.

After wildfire events
Please see Section 5.3.9.2 below for greater detail regarding SDG&E's communications after wildfire events as well as the customer protections available.

c. Showing that the utility has an adequate and trained workforce to promptly restore service after a major event, taking into account mutual aid and contractors

Adequate and Trained Workforce
Please see Section 5.3.9.4.1 and Section 5.3.9.4.5 below.

5.3.9.2. Overview of customer support in emergencies

2. Customer support in emergencies, including protocols for compliance with requirements adopted by the CPUC regarding activities to support customers during and after a wildfire, including:

a. Outage reporting
b. Support for low income and medical baseline customers
c. Billing adjustments
d. Deposit waivers

e. Extended payment plans
f. Suspension of disconnection and nonpayment fees
g. Repair processing and timing
h. Access to utility representatives

SDG&E provides emergency residential and non-residential customer protections and availability communications for wildfire victims, as ordered by the CPUC.[55] Examples of protections include billing adjustments, deposit waivers, extended payment plans, suspension of disconnection and nonpayment fees, and specific support for low income and medical baseline customers.[56]

SDG&E will provide descriptions of the protections offered to affected customers on a special landing page on its website, SDG&E.com (with a contact telephone number for more details of eligibility and protections available) and promote the page with social media campaigns. In addition, SDG&E will make every effort possible to contact impacted customers to bring awareness regarding these protections. An Energy Service Specialist (ESS) or an account executive will make these calls.

Customer Protections and Contact
Customers eligible for the wildfire residential and non-residential customer protections described below are those directly impacted by the fires and identified as such by SDG&E or who have self-reported as being impacted. Directly impacted customers would include those without electric service or those needing to re-locate (either temporarily or permanently) due to fire damage.

Description of Adopted Consumer Protections
In Decisions 19-05-039 and 19-07-015, the Commission confirmed that SDG&E should continue to provide certain residential and non-residential customer protections for wildfire victims. These customer protections are described in the following sections and unless otherwise noted, each apply to both residential and non-residential customers.

Outage Reporting
Throughout the lifecycle of an adverse weather event, it is important that the customer is adequately informed and prepared at all times. SDG&E's multi-channel approach utilizes the broadcast media (radio and TV), the SDG&E NewsCenter, dedicated PSPS landing page (sdge.com/ready), the SDG&E outage map (on sdge.com and the SDG&E app), and social media for real-time situational awareness. SDG&E's ENS also provides notifications and updates directly to impacted customers and community members who have signed up to receive PSPS alerts.

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[55] Commission Resolution M-4835 (January 11, 2018). SDG&E filed Advice Letter 3177-E on January 26, 2018 in compliance with Resolution M-4835, which was made effective December 7, 2018. See also Commission Decisions D.19-05-039 and D.19-07-015.

[56] Costs were not identified for this activity because they are not tracked in that manner.

The ENS system provides information in eight languages (English, Spanish, Korean, Vietnamese, Mandarin, Cantonese, Tagalog and Russian). As the event progresses, these notifications become more specific and targeted to customers as the situation warrants. Along with outage updates the channels listed above provide information related to wildfire safety, emergency preparedness, PSPS, and Community Resource Centers.

After adverse weather conditions are forecasted and the National Weather Service issues a Red Flag Warning, SDG&E begins to coordinate with local government agencies, community-based organizations, and emergency responders approximately 72 hours prior to the event. Communications are then initiated with customers via SDG&E's ENS, broadcast media and social media channels. These communications drive traffic to SDG&E's NewsCenter and/or dedicated PSPS landing page for more information and real-time situation updates.

Support for Low Income Customers/Medical Baseline

In support of customer protections, SDG&E takes the following actions for all low-income customers in the fire-impacted areas within SDG&E's service territory to align with the California Alternate Rate for Energy (CARE) and Energy Savings Assistance (ESA) programs as follows:

- Freeze all standard and high-usage reviews for CARE program eligibility standards and high-usage post enrollment verification (PEV) requests for all customers in the impacted areas within SDG&E's service territory.
- Partner with the United Way, the administrator of its Neighbor-to-Neighbor program that provides emergency bill assistance, to increase the bill assistance cap amount for impacted customers from $200 to $400.
- Modify the ESA program by allowing impacted customers to self-certify if: 1) the customer states they lost documentation necessary for income verification of a fire, or 2) if the customer states that individuals displaced by the wildfires reside in the household.
- Immediately following a fire, SDG&E deploys outreach representatives to the field to support American Red Cross and County of San Diego assistance centers. These outreach representatives help customers download the mobile outage map to stay up to date on estimated restoration times, promote and enroll them in programs like CARE and ESA and connect them to the vast array of services provided by San Diego emergency services.
- SDG&E also works with local Community Based Organizations (CBOs) to help connect customers with emergency related information, outage information, and program information. These CBOs also help to refer customers in need to San Diego emergency services for further information and assistance. SDG&E will continue to work with the local CBOs to place an emphasis on the additional measures available to low-income customers.

In addition to the protections for the low-income customers discussed above, SDGE will freeze all recertification for medical baseline customers in the impacted areas within SDG&E's service territory.

Billing Adjustments
SDG&E will provide additional billing assistance for residential customers. Where the customer's residential structure has been destroyed, SDG&E will waive closing bills that include charges from the previous regular read date up until the dates the fires occurred, along with charges from the prior month of billing. For non-residential customers, where the structure has been destroyed, closing bill amounts from the previous regular read date up to the dates on which fires occurred will be waived. However, non-residential customers will be held responsible for charges billed for any months prior to the fires. SDG&E will stop estimated energy usage for billing purposes when a home/unit was unoccupied due to a wildfire.

Deposit Waivers
SDG&E will waive deposit requirements for customers who are seeking to re-establish service at either the same location or a new location.

Extended Payment Plans
SDG&E will extend payment arrangements with a 0% down payment and offers a repayment period of 12 months to all impacted customers, including customers whose employment was impacted by wildfires.

Suspension of Disconnection and Nonpayment Fees
For customers impacted by fires, including customers whose employment was impacted by wildfires, SDG&E will suspend disconnection for non-payment and associated fees, waive the deposit and late fee requirements for affected customers who pay their utility bills late, and not report late payments by customers who are eligible for these protections to credit reporting agencies or to other such services.

SDG&E identifies the premises of customers impacted by the fires that are not capable of receiving utility services and discontinues billing these premises. SDG&E does not currently charge a disconnect charge. Customers impacted by the fires will not be charged a reconnection charge, nor will a deposit be required.

Repair Processing and Timing (Move In – Move Out)
SDG&E initiates best efforts to expedite move-in and move-outs to support customers returning to their homes and establishing service in new locations, and to monitor and track the time from when service requests are submitted to SDG&E to when services are provided to customers. If a customer advises SDG&E that they are relocating to another location due to the damage to their home, SDG&E will make every attempt to have service available to the customer on the requested day. Additionally, SDG&E will track the time from when the service is requested to the time it is completed.

Access to Utility Representatives
Customers and stakeholders have a variety of SDG&E representatives available to them to receive information and communicate concerns. These include representatives in SDG&E's Call Centers, Regional Public Affairs, Business Services, and Fire Coordination.

- **Call Centers:** Any customer, or concerned person, can contact SDG&E's call centers to obtain information before, during, or after an event. SDG&E's call centers monitor events as they approach and adjust resource needs accordingly throughout the event.
- **Regional Public Affairs:** SDG&E has assigned specific personnel to develop and maintain relationships with local elected officials. As an event approaches, the SDG&E representative will establish and maintain contact with their key stakeholder. The SDG&E representative provides answers to questions and addresses concerns.
- **Business Services:** SDG&E has identified key and critical accounts for which it assigns a specific resource to establish and maintain contact during an event. The SDG&E representative reaches out to the customer as the event develops and maintains contact until the event is over.
- **Fire Coordination**: The Fire Coordinators are experienced in fire behavior, fire prevention, and firefighting techniques. The Fire Coordinators serve as the direct link between SDG&E and emergency-response agencies. They also serve as the single point of contact for the fire agency Incident Command System, provide periodic updates to fire emergency personnel and SDG&E personnel, establish radio and communications assignments, assist in the coordination of activities related to de-energizing and re-energizing power lines, and update on-scene personnel, control centers, service dispatch, and the SDG&E regional operations centers as to the status of each incident.

5.3.9.3. Coordination with public safety partners

3. Coordination with Public Safety Partners, such as stationing utility personnel in county Emergency Operations Centers

Throughout the year, SDG&E works with its Public Safety Partners, including local jurisdictions, to ensure coordination exists during Public Safety Power Shutoff events. SDG&E accomplishes this coordination, via the following activities: conducting tours of its Emergency Operations Center for its Public Safety Partners in advance of events; and providing 24/7 contacts to its Public Safety Partners based on Public Safety Partner customer segment (e.g., a dedicated contact for emergency services, jurisdictional and utility partners and fire services). Additionally, emergency services, utility partners and jurisdictional partners have individual SDG&E representatives that provide information year-round in preparation for wildfire season and these representatives are available to answer additional questions and concerns. During PSPS events SDG&E can provide County OES with a government liaison if requested by the County. During the 2019 PSPS season, SDG&E did send a government liaison to County OES and both Cal OES and County OES sent liaisons to SDG&E's EOC.

Additionally, Emergency Management staff regularly attend the San Diego Fire Chiefs Association meetings, Unified Disaster Council meeting, and hosts annual Regional Emergency Manager meetings. Staff also conduct annual trainings with fire and law enforcement personnel on safety (how to be safe in and around gas and electric) and how to incorporate gas and electric field staff into the incident command system.

Describe utility efforts to identify which additional languages are in use within the utility's service territory, including plan to identify and mitigate language access challenges.

Communication in Additional Languages

In addition to English and Spanish, communications material will also be produced in Mandarin, Cantonese, Tagalog, Korean, Russian, and Vietnamese. SDG&E is researching other prevalent languages within the territory. Local population demographics, census and Registrar of Voters information will be among the data considered for additional in-language outreach collateral and activities.

SDG&E also collaborates with the San Diego County Office of Emergency Services Access and Functional Needs Working Group and the Partner Relay Network along with other CBOs to help amplify communications and notifications to their constituents. In some cases, SDG&E seeks to help these CBOs translate the messaging to non-prevalent languages and further amplify communications to their constituents.

5.3.9.4. Emergency planning and preparedness programs

Please see Section 5.3.9 above.

5.3.9.4.1. Adequate and trained workforce for service restoration

Under the Incident Command System (ICS) framework, SDG&E uses a three-pronged approach with respect to its trained workforce for service restoration:

1. Integration of ICS training and exercises for field Utility Incident Commanders, Department Operations Centers, EOC responders, and Executives;
2. Required participation of field operational responders in Utility ICS training and requirement to follow Electric Standard Practice No. 113.1 (ESP 113.1) which specifically addresses wildland fire prevention and fire safety;
3. Annual ICS training of operational leaders, field responders, and supporting personnel including cross-functional training workshops and exercises covering all-hazards as well as the deployment of field training advisors to ensure continuous improvement on practical application in the field.

Additionally, SDG&E actively trains field resources with the appropriate electric distribution and transmission operational skills.

Due to these extensive efforts, SDG&E has a qualified EOC response workforce with over 490 Federal Emergency Management Agency-certified responders, equivalent to more than 10% of the total SDG&E workforce. These responders are certified in the functions of ICS including command, operations, planning, logistics and finance. EOC responders, which include responder executives, are qualified annually in order to maintain their emergency response proficiency. Additionally, SDG&E's EOC collaborates annually with internal and external stakeholder organizations to conduct a Company-wide wildfire workshop, as well as a tabletop or functional exercise prior to the beginning of fire season. Following training, exercises, and activations, the EOC utilizes findings to develop an After-Action Report to highlight positive response elements, areas for improvement, and corrective actions.

5.3.9.4.2. Community outreach, public awareness, and communication efforts

Please see Section 5.3.9.2 (b) above as well as Sections 5.3.10 and 5.3.10.1 below.

5.3.9.4.3. Customer support in emergencies

Please see Section 5.3.9.2 above.

5.3.9.4.3.1. Protocols for compliance with requirements to support customers

Please see Section 5.3.9.2 above.

5.3.9.4.4. Disaster and emergency preparedness plan

5.3.9.4.4.1. Company emergency response plan overview

SDG&E's Emergency Response Plan (CERP) and its risk specific response plans provide a framework by which it can effectively coordinate its pre-incident and response and recovery activities to a given threat or hazard. Pursuant to the CERP, the Utility Incident Commander or Officer-in-Charge (OIC) is ultimately responsible for incident management and support activities respectively. While a Utility Incident Commander or OIC may delegate authority, they cannot delegate the responsibilities outlined in the Wildfire Annex or the CERP.

In addition to the CERP, SDG&E works collaboratively with the local jurisdictions to ensure integration into regional plans. SDG&E representatives are members of the Southern California Catastrophic Earthquake planning committee, Co-chair of the Southern California Lifelines training and exercise committee and are part of a three-year Department of Homeland Security Regional Resiliency Assessment Program sponsored by Cal OES.

Phases of Operation
There are three phases of emergency operations:

- **Pre-Incident:** Pre-incident planning activity in anticipation of an incident occurrence.
- **Response:** Period spanning from when the incident occurs, and a response team is established, until the response team has demobilized and transitioned operations to long-term recovery.
- **Recovery:** Spanning the period from when the response team has demobilized and transitioned to long-term recovery, until all recovery operations have been completed.

Incident Conditions
Certain fire-related criteria initiate SDG&E's notification process. The following are the criteria that trigger such communications:

- Fires during an FPI of 14 or greater;
- Any uncontrolled fire within 1 mile of a transmission line;
- Any fire where SDG&E is potentially related to the cause regardless of the FPI;
- Any fire regardless of FPI that is:
    - Expected to escape initial attack/exceed 10 acres, or
    - Has impacted or may have a direct impact on any SDG&E facilities, or
    - Is expected to draw significant social or media attention

Pre-Incident Planning
Pre-incident planning is a key element in preparing for the risk of wildfire. SDG&E must be prepared to react to mitigate impacts from any wildfire within SDG&E's service territory. If SDG&E becomes aware of a potential incident expected to have adverse impacts on its system, Fire Coordination will consult with the SDG&E Meteorologists daily to come to agreement on fire potential and burning conditions based on the weather forecast, fuel conditions, current fire activity, availability of firefighting resources, and other relevant factors.

If an incident is anticipated, Emergency Management will begin to coordinate pre-incident activities with a day-ahead call focused on assessing real-time and forecasted weather conditions, operational resource needs and response plans, customer and stakeholder notification plans, EOC staffing needs and timing. Emergency Management will also provide projections for incident impacts. During pre-incident planning, assuming there is enough advance warning, SDG&E submits proactive notifications to customers and key external stakeholders.

Annually, SDG&E Emergency Management staff hosts meetings with local County and City representatives to review the CERP and ensure it is integrated with their emergency plans. These meetings provide the opportunity for the local jurisdictions to review the plan and provide feedback for consideration. SDG&E also conducts annual exercises to simulate

compounding incidents (i.e., PSPS with a wildfire) to validate the planning and response training.

Response

Response to and during a wildfire requires immediate assessment and incident characterization, the communication of appropriate situational awareness, and the development of an incident planning cycle to facilitate the collection, assessment and dissemination of relevant wildfire incident information. Should an ignition occur, a Fire Coordinator may deploy to the Incident Command Post (ICP) to provide real-time situational awareness to SDG&E.

The Fire Coordinator serves as the primary point of contact between first responder agencies and the SDG&E Utility Incident Commander. Field operations is responsible for scene safety, along with command and control of the incident to recover the system and restore customers. The EOC's focus is on the incident's big picture of the incident, which involves managing and deconflicting critical information, communicating to customers and key external stakeholders, and providing operational support and strategic and policy-level decision-making. De-mobilization planning remains a focus during the response phase to ensure adequate recovery of the system.

A wildfire may require de-energization of electric distribution circuit(s), and transmission tie line(s) for public or first responder safety. The OIC will carefully examine whether de-energization is required based on input from the field response and EOC responders. This type of de-energization for public or first responder safety is not considered a PSPS as is not triggered by a wind or Red Flag event. Rather, it is in response to unsafe conditions due to wildfire activity and therefore does not follow the PSPS protocols.

Crew Mobilization and Deployment Strategy

During an extreme operating condition or RFW condition, the management of the SDG&E Electric Regional Operations, Electric Distribution Operations and Electric Grid Operations control centers work in collaboration with SDG&E's Meteorology to coordinate the assignment of appropriate and needed resources to each of the affected regional operating districts. At minimum, electric troubleshooters and personnel from the Wildland Fire Prevention resources are made available for immediate response to address fire threats or events. SDG&E may also coordinate and assign additional resources to manage the event. SDG&E may assign Field to observe an area forecasted to experience the most adverse weather conditions. These personnel are under instructions to report flying debris, vegetation damage, or significant conductor movement. Based on these field observations, SDG&E deploys appropriate resources to address the fire threats posed by these conditions.

SDG&E has four mobile command trailers (MCT) and one, state of the art, self-contained Tactical Command Vehicle (TCV), which collectively provide a response space with land, mobile, radio, video, and internet capabilities. Additionally, four tactical communications trailers with internet capabilities are available to support the ICS structure during emergency response and

restoration activities. During the high-risk fire season, these assets are staged in districts located within the HFTD. SDG&E's district personnel are trained annually on the assets operations and maintenance to ensure these assets remain effective and functional.

Recovery and Post Incident Activities

Recovery from a wildfire is just as important as the response to a wildfire. The location, extent, and severity of the wildfire and its impacts to SDG&E's infrastructure and customers are rigorously tracked, assessed, and prioritized to identify mitigation or improvement measures available when recovering for safe and swift restoration. SDG&E integrates into the regional recovery efforts by ensuring there are representatives in any Local Assistance Center or recovery area to provide support and information for our customers.

SDG&E continually reviews its program delivery, decision making processes, and responses to emergencies to ensure improvement and service to our customers. Through its Quality Assurance and After-Action Review process, the planning, response, and recovery processes are evaluated across relevant internal response groups. Observations will address the following areas:

- Plan execution;
- Response structure;
- Activation and mobilization for the incident;
- Circumstances that contributed to, enhanced, or resulted in improvement opportunities in incident management or communications;
- Process execution and effectives;
- Communications strategy;
- Media interactions;
- Logistics support; and
- Financial tracking and support.

Based on lessons learned, emergency response plans are updated, processes and standards are enhanced, and training exercises are designed to stress test lessons learned and improvements to support a continuously improved response. SDG&E will continue to review ongoing recovery operations and use its findings of post incident activities to drive improvements across the organization's resilience, response, and recovery programs. Quality checks on the program will consist of validation of the plans during training and exercises.

The emergency plans are updated in a three-year cycle, with the next scheduled update in 2020. The plan will be updated and validated prior to the 2020 wildfire season. Each update of the plan is developed in collaboration with key internal business units and external public safety partners. The emergency plans will be updated again in 2023.

5.3.9.4.5. Preparedness and planning for service restoration – Mutual assistance and contractors

Mutual assistance is an essential part of the energy industry's contingency planning and restoration process. Utility and electric service companies impacted by a major outage event use mutual assistance to augment the size of their workforce by borrowing restoration workers form other companies. When called up, a utility company will send trained and qualified skilled restoration workers, along with specialized equipment, oversight management and support personnel, to assist the restoration efforts of a fellow utility/electric service company.

SDG&E is a member of multiple emergency associations to facilitate mutual assistance and maintains active mutual assistance agreements with the following organizations: California Utilities Emergency Association (CUEA); Western Regional Mutual Assistance Group; Western Energy Institute; Edison Electric Institute; and the American Gas Association. The decision to deploy a response team or request mutual assistance is facilitated by SDG&E Emergency Management group and determined by the OIC in consultation with key operations directors and executives.

5.3.9.4.6. Protocols in place to learn from wildfire events – After action reports

As an essential part of the ongoing effort to improve its overall emergency readiness and ensure continued safety on every worksite and emergency incident, SDG&E reviews all significant incidents and activations to identify potential improvements. Once fully implemented and mature, this program will establish a comprehensive and measurable After-Action Review (AAR) process to continue building and improving our capabilities in operational planning, and in response to wildfire, PSPS incidents, and all-hazards emergencies.

5.3.9.4.7. Other – Emergency management operations

SDG&E manages emergencies in alignment with the state Standardized Emergency Management System (SEMS) and federal National Incident Management System (NIMS), to coordinate across all levels of utility, government, and agency activity. The Company utilizes a utility-compatible Incident Command System (ICS) structure as an all-hazards framework to manage emergency incidents and events. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure and serves as the mechanism to direct those functions during an emergency response.

The SDG&E Emergency Management organization is responsible for coordinating emergency management activities and activation of the Emergency Operations Center (EOC). The department's mission is to support effective, efficient, and collaborative planning, preparedness, response, and recovery processes for all hazards and risks, including those associated with the Wildfire risk and Red Flag Warning incidents, enterprise wide. Collectively,

this department leads efforts and strategies to prepare for, respond to, and recover from all risks, hazards, and incidents that may impact SDG&E operations.

SDG&E's EOC serves as the location from which centralized emergency management is coordinated. To respond and recover effectively from all hazards and threats, like wildfires, SDG&E established an EOC with cross-functional teams representing every major business line within the company and functioning within a utility-compatible ICS. The activation of the EOC assembles the internal subject matter experts to assess and provide situational awareness to internal and external stakeholders, overarching incident objectives, planning, anticipation, response, communications, and coordination.[57] External Emergency Management partners, such as the County OES and Cal OES are provided with situational awareness up to 24-72 hours in advance or as soon as operationally feasible; additionally, those partners are embedded within SDG&E's EOC during emergency conditions.

SDG&E is further expanding its Emergency Management Operations to include an Operational Field & Emergency Readiness program to manage SDG&E's comprehensive After-Action Review program to continue building and improving its capabilities in operational planning and response to wildfire, PSPS incidents, and emergencies. To address a continued focus on Wildfire, including PSPS events, two new resources will help in developing and implementing internal and external training and exercises, and all risk response plans (cybersecurity, earthquake, natural gas, tsunami, terrorism, active shooter, and other man-made and natural disasters). Additionally, SDG&E will be embedding four Information Technology Specialists in Emergency Management to help support, develop and drive technology solutions to the ever-changing preparedness and response requirements necessary to ensure timely and appropriate decision making.

SDG&E's current EOC is an approximately 6,500 square-foot facility constructed over 20 years ago to serve as SDG&E's central command post in the event of a natural disaster or other significant incident impacting the region's electric and natural gas systems. Over time, the EOC has evolved to serve as the central hub to support the growing demands of SDG&E's wildfire mitigation, situational awareness, and outreach and collaboration initiatives. It also houses SDG&E's meteorology center.

In its Test Year (TY) 2019 GRC, SDG&E sought to remodel the EOC to, among other things, revise existing electrical work to accommodate new equipment and reconfigurations; update the existing workstations to enhance the exchange of information between subject matter experts

[57] To prepare for and support emergencies, GIS is used to provide information about SDG&E's system.

and strategic decision makers; and upgrade audio visual technologies.[58] The final TY 2019 GRC decision authorized the EOC remodeling project for 2019.[59]

Since SDG&E submitted its TY 2019 GRC testimony in 2017, it has become necessary to refresh and expand the EOC beyond what was contemplated at that time and authorized in the final GRC decision.[60] The existing EOC will be rebuilt to facilitate and support SDG&E's ongoing wildfire mitigation, situational awareness, outreach and collaboration, and emergency response efforts. While the EOC supports all emergencies and response efforts, the discussion included herein relates to wildfire operations. This project will include expanding the EOC complex to approximately 15,000 square feet to accommodate the increase in staff and function of the EOC. Staff increases are due to combining the Emergency Management, Fire Science & Climate Adaptation, and Wildfire Mitigation and Vegetation Management departments into the EOC complex to improve planning, coordination, program development and internal/external stakeholder communications.

Additionally, new technologies, equipment, processes and procedures will be developed as part of this EOC complex to further facilitate continued improvement of training and exercises toward building strong core competencies of all employees assigned to the complex and those that respond to the EOC during activations. The new layout will also facilitate the further integration of the ICS structure in the seating layout by providing a collaborative solution. An additional feature of the EOC will be an expanded media room where SDG&E's Public Information team can more effectively track and respond to social media, broadcast on social media, and update SDG&E's website real-time based on the needs and information from the EOC to be more consistent with OneVoice messaging and an improved customer experience.

During PSPS events, SDG&E's employees respond and work within the HFTD, sometimes under dangerous conditions with unreliable communications. This poses the risk of not being able to accurately identify Company vehicles and personnel working in those areas. Additionally, there are times, due to gaps in communications to computers, cell phones, and radios causing a potentially inadequate and potentially unsafe environment for assigned workers in these areas. SDG&E, through Emergency Management and Fleet Services, has implemented a pilot program with Verizon Connect to track vehicles assigned to the HFTD. Additionally, in 2020, SDG&E will implement a "Lone Worker" tracking system utilizing satellite communications equipment to track the individual employee once they leave their vehicle in the HFTD and provide improved communications in the back-country gap areas. These programs will also improve resource management and accountability during PSPS events.

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[58] *See* A.17-10-007, SDG&E-22 Direct Testimony of R. Dale Tattersall at RDT-35 and SDG&E-22-CWP Capital Workpapers to Prepared Direct Testimony of Richard D. Tattersall at 53.

[59] *See* D.19-09-051 at 434.

[60] D.19-09-051 authorized approximately $2.8 million of direct capital expenditures in 2019 (in 2016$) for EOC tenant improvements. SDG&E reevaluated the EOC remodel project that was authorized in D.19-09-051 which resulted in additional, value added features as described in this Plan, incremental costs beyond authorized levels, and an updated in-service date of 2020.

SDG&E's comprehensive After-Action Review program, discussed above, has established a process for learning from past events to improve our overall response and readiness capabilities in operational planning, and in response to wildfire, PSPS incidents, and all-hazards emergencies. Based on a standardized list of capabilities, all training and exercises are designed to strengthen and evaluate progress and gaps. When corrective actions are identified and assigned following events or incidents, they are logged into a database and tracked to completion.

Each component of SDG&E's Emergency Planning and Response programs is evaluated after each emergency activation and annually to ensure organizational and operational effectiveness. Modifications and revisions are made and introduced in new training and exercise programs for the next program year. The current Emergency Management program was revised in 2018. In 2019, SDG&E completed FEMA certification and training of 460 EOC responders, conducted and participated in training and exercises related to PSPS and other company risk factors. See Section 5.3.9.4.1 Adequate and Trained Workforce for Service Restoration.

5.3.10. Stakeholder cooperation and community engagement

SDG&E does not operate alone in mitigating the risk of wildfires and impacts of PSPS events. Customers, elected officials, nonprofit support organizations, and first responders, all play a vital 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's objective is to provide all residents and businesses with information so that they are well-equipped and informed to handle the inherent adversity of a wildfire or PSPS event. To this end, SDG&E has implemented a robust, external communication strategy, which is consistently analyzed to identify areas of improvement. SDG&E also leverages its relationships with community organizations and stakeholders to amplify and disseminate critical, sometimes life-saving information.

The following sections provide greater detail on the importance SDG&E places on active community engagement to ensure it is available and visible for every person it serves. SDG&E initiated several practices and partnerships outlined below over 10 years ago and continues to develop additional ways to benefit its customers. Some of the resources SDG&E offers are newly implemented and will evolve and grow as needed. One thing is consistent – by incorporating public opinion, best practices and lessons learned -- SDG&E can modify the areas which need improvement and build upon the opportunities that work best. Community and stakeholder engagement is a dynamic component of wildfire safety, and it is something SDG&E will continue to adapt, based on community input.

Currently, SDG&E works with almost 98 nonprofit readiness and response organizations, as well as close to 260 community-based organizations. As SDG&E's wildfire program evolves, so will its list of emergency response agencies and strategic partner organizations. SDG&E will remain open to fostering new, strategic relationships aimed to improve collaboration and public messaging. Understanding that all customers should have equal access to information, SDG&E has created dedicated websites for safety information, as well as a landing page that provides resources to assist the AFN communities, particularly for PSPS event.

SDG&E has also found success in partnerships with many emergency response agencies. SDG&E provides electrical equipment training to CAL FIRE representatives and, on all levels, partners with fire agencies, regional dispatch centers, law enforcement and other emergency management agencies, making sure incidents are addressed timely and effectively through comprehensive trainings. Additionally, a grant program was recently introduced through partnerships with fire districts, Caltrans, local, state and tribal governments, and land management agencies, whereby nonprofit organizations are encouraged to identify and support wildland fuel treatment initiatives, which modify wildland fire behavior with the goal of reducing burn intensity, limiting spread and aiding in suppression efforts.

SDG&E understands the importance of productive collaboration and community engagement and is committed to finding new ways to better serve our communities. SDG&E refuses to be stagnant and will continue to identify effective and efficient ways to cooperate with stakeholders and leverage valuable, external relationships to help champion important safety messages.

Consistent with the Commission's WMP Guidelines, SDG&E presents its Stakeholder Cooperation and Community Engagement initiatives in Sections 5.3.10.1 through 5.3.10.4 below. Table 30 – Stakeholder Cooperation and Community Engagement initiatives is provided in Appendix A.

5.3.10.1. Community engagement – Community outreach and public awareness

SDG&E has created a multi-pronged approach to community education, outreach and engagement related to public awareness of fire risk, fire prevention, and emergency preparedness. Plans for community outreach and public awareness before, during, and after a wildfire, including language notification in English, Spanish, Mandarin, Cantonese, Filipino, and Vietnamese, Korean and Russian, will be made where feasible. In-language communications will apply to collateral and print advertising before and after wildfires. These materials have previously educated customers about how to be prepared for wildfires and encouraged them to sign up for outage notifications and updates. SDG&E anticipates continuing this outreach messaging to further prepare customers for PSPS.

Notifications during wildfires are also created in the languages listed above. Pre-drafted and pre-recorded messages have been loaded into the Enterprise Notification System for execution as voice, text and/or email messages. During certain events, the need may arise for customized

messaging during an event, and the Communications team creates those messages and notifications as needed. The key elements of SDG&E's multi-level approach to community education and outreach are described in further detail below.

Fire Safety Stakeholder Collaboration and Communication

In 2009, SDG&E customers and community leaders were invited to participate in a fire safety collaboration process, which was facilitated by a federal mediator. Approximately 40 stakeholders – representing various entities, such as local schools, water districts, disability rights advocates, consumer groups, and fire departments – worked with SDG&E for more than a year to develop a joint fire prevention plan. The process produced more than 100 potential solutions aimed at preventing the occurrence of major fires.

SDG&E has implemented many of these solutions as identified by the stakeholders, including deactivating automatic reclosers, hardening its overhead electric system, replacing wood poles with stronger steel poles and larger conductors, and undergrounding portions of the electrical system, where feasible. In addition, in 2019, SDG&E formed a Wildfire Safety Community Advisory Council to strengthen wildfire prevention and preparedness in the region. The Council will provide insight, ideas, expertise, and recommendations integral to public safety, wildfire matters, community preparedness, regional coordination, the use of emerging technologies, and best practices.

As discussed in the following sections, SDG&E frequently invites community leaders, government agencies, and the public at-large to participate in a collaborative fire-safety process to continue dialogue and partnerships regarding public safety.

Partnering with Organizations Dedicated to Readiness and Response

SDG&E partners with approximately 98 nonprofit organizations dedicated to readiness and response to wildfires and emergencies. Specifically, SDG&E: facilitates coordinated multi-agency preparedness; participates in the annual County of San Diego wildland and Community Emergency Response Team drills; underwrites philanthropic grants to support San Diego County wildfire readiness; and works closely with media and key stakeholders to promote wildfire preparation initiatives in the San Diego region. In 2019, SDG&E began partnering with the County of San Diego Office of Emergency Services Access and Functional Needs (AFN) Working Group and Partner Relay network who help share messaging with some of the vulnerable population within SDG&E's territory. The two groups are comprised of approximately 260 local community-based organizations who work directly with the AFN population. The purpose of the AFN Working Group is to ensure emergency planning efforts in San Diego County reflect the unique needs of the whole community.

This group works to identify the needs of individuals with disabilities and other AFN populations before, during and after disaster strikes, and takes steps to ensure that needs and resources are integrated into emergency management systems. SDG&E is a member of this working group and looks for ways to incorporate some of these unique needs into their PSPS procedures. The Partner Relay network is a broad network of trusted community organizations such as

churches, nonprofit organizations and refugee resettlement organizations, who help disseminate information in various languages to their key stakeholders. SDG&E will continue to look for more ways to partner with organizations dedicated to readiness and response throughout its service territory.

SDG&E is also a member of the CUEA, who serves as a point of contact for critical infrastructure utilities and the Cal OES and other governmental agencies before, during, and after an event.

First Responder Outreach Program
SDG&E works with local emergency response agency leadership to ensure continued awareness of electric and natural gas safety protocols and collaboration on roles and responsibilities for mutual emergency preparedness, including with respect to wildfires. SDG&E works with all local, state, and federal fire agencies, regional dispatch centers, law enforcement and other emergency management partner agencies to ensure effective command, coordination, and communications in preparing for and responding to incidents. This is accomplished through training, exercises, relationship development and utilization of the Utility ICS.

Community Resource Centers
As a result of community meetings held in communities in SDG&E's service area, SDG&E established a network of Community Resource Centers (CRCs) to help communities in real-time during extreme weather events. Currently, SDG&E has identified eight customer-owned facilities located within the HFTD to serve as CRCs during extreme weather events. SDG&E may establish more CRCs should the need arise.[61]

As discussed in Section 5.3.3.15 above, if SDG&E anticipates that power will be off for an extended period, SDG&E may open CRCs in affected areas. The CRC locations selected by SDG&E were identified through a rigorous process, which included input from fire and meteorological experts, as well as consideration of those areas most prone to extreme weather, as indicated by historical data. The CRCs, if activated for a PSPS event that lasts longer than 24 hours, will be powered using a portable back-up generator connected through a manual transfer switch. Once activated, the CRC will operate in roughly 10-hour shifts from 8:00 a.m. through 6:00 p.m. daily, until power to the affected community has been restored. SDG&E subject matter experts collaborate with volunteer staff at an activated CRC to provide, to the extent possible, updates and real-time information directly to the impacted community. Other volunteer organizations provide bottled water and snacks for temporary relief to residents in the area.

Community Outreach
SDG&E proudly supports nonprofit organizations whose programs promote emergency preparedness and safety at home and in communities within its service territory. In 2012, SDG&E began providing funds to charitable organizations committed to regional and local

[61] Further information on CRCs may be found here: https://www.sdge.com/wildfire-safety/community-resource-centers.

emergency preparedness and fire safety, such as 2-1-1 San Diego, the American Red Cross, and the Burn Institute, plus several volunteer fire departments, CERTS, LISTOS, Fire Safe Councils and the Inter-Tribal Long-Term Recovery Foundation. In addition to the organizations committed to regional and local emergency preparedness and fire safety, SDG&E works with more than 200 community-based organizations to promote many of SDG&E's program and service offerings, including: California Alternative Rates for Energy (CARE), Energy Savings Assistance (ESA), Demand Response, Energy Efficiency and more. These organizations help share messaging within their communities and are looked to as trusted sources of information. SDG&E will continue to utilize these partners to share important messaging around emergency preparedness and safety.

In compliance with Resolution ESRB-8, SDG&E held a series of workshops in 2018 regarding its PSPS practices. The purpose of these workshops was to educate stakeholders and obtain feedback from elected officials, community leaders, government agencies, and appropriate tribal organizations. SDG&E has incorporated much of the feedback into its public safety initiatives and continues to maintain an ongoing dialogue and partnerships with these stakeholders.

In 2019, SDG&E hosted six Wildfire Safety Open House events and three Wildfire Safety Fairs. These events brought together more than 30 different internal and external groups focused on wildfire preparedness and safety. SDG&E provided customer education on SDG&E programs and services, system upgrades and projects, generator safety, Meterology, Public Safety Power Shutoffs, outage notifications and Community Resource Centers. External groups that participated in the events included 2-1-1 San Diego, the American Red Cross, local fire departments and other fire agencies, local CERT groups and more. The community events were a success, reaching over 1,200 customers. SDG&E plans to continue to host these open house and fairs events in the upcoming years.

Community Communication

SDG&E provides regular proactive communications to residents and businesses located in the HFTD. Aside from English and Spanish, communications material will also be produced in other languages, including Cantonese, Mandarin, Korean, Tagalog, Russian and Vietnamese. These fire-safety and emergency communications include, but are not limited to:

- Community events, emergency preparedness workshops for businesses, public participation meetings, and backup generator safety workshops;
- Informational and emergency preparedness mailings to customers in the HFTD;
- Educational and general awareness advertising campaign focused on SDG&E's preparations for the fire season and the preparations SDG&E's customers should make to be ready for emergencies. This campaign includes a series of print advertisements that run in community newspapers in the HFTD and the rest of the service territory. These ads also encourage customers to update their contact information and to sign up for outage notifications;

- Educational information disseminated through a bill newsletter or special insert included in customer bills. An electronic version is emailed to paperless customers;
- Distribution of a co-branded "newsletter" with the American Red Cross, the San Diego Office of Emergency Services, and the San Diego County Fire Chiefs' Association;
- Various videos that highlight wildfire safety preparation, including the SDG&E documentary "Everything in Our Power;"
- The provision of weather information and system-outage status on SDGE.com;
- Dissemination of information regarding emergency-preparedness events via social media, such as Twitter and Facebook;
- Publication of information for SAFE San Diego Education and Outreach events in the community following an emergency.

In addition to routine outreach and communications, SDG&E augments its effort to communicate with customers when fire-threat conditions are elevated or extreme. SDG&E has instituted an early warning system advising customers that a RFW has been declared by the National Weather Service and dangerously high winds are expected. SDG&E also establishes communications with local water districts, telecommunications infrastructure providers, the San Diego County Office of Education, the San Diego County Office of Emergency Services, and the American Red Cross as soon as possible following the declaration of a RFW. SDG&E assembles a team of subject matter experts to provide updates on the status of the SDG&E system and weather conditions.

As alert conditions are elevated, SDG&E also contacts Medical Baseline customers, including life support and temperature sensitive customers. Under severe threats of emergencies, where SDG&E cannot contact these customers via our outbound-dialer system, or a Customer Contact Center representative, SDG&E will send field personnel to make personal contact and, failing all else, to leave door hangers alerting the customer of the situation.

Emergency Preparedness Safety Website

SDG&E maintains a publicly accessible website focused on wildfire safety, as well as other safety areas, including natural gas, electric, trees, generator safety, emergency preparedness and outage information. This information and can be found at http://www.sdge.com/safety. SDG&E's emergency preparedness brochures, traffic radio IDs, newspaper advertisements, digital ads, and social media postings via Facebook and Twitter, have been used to drive customers to the Company's wildfire safety section: http://www.sdge.com/wildfire-safety.

SDG&E also created a landing page that provides resources to assist the AFN communities, particularly for PSPS events (https://www.sdge.com/AFN). The page provides information and links for: PSPS notification registration; Emergency plan/kit checklists, generator safety; Medical Baseline program and application; California Alternate Rates for Energy (CARE); Family Electric Rate Assistance (FERA); and Energy Savings Assistance Program (ESA). Additional fire or

weather-related webpages are actively maintained throughout the incident by SDG&E and are accessible using the following addresses: Weather web pages: http://sdgeweather.com; Community Resource Centers: http://www.sdge.com/resource-centers.

SDG&E will continue to conduct pre- and post- event customer research to solicit feedback on the quality of the messaging and communication tactics that are employed. Surveys and focus groups will be used to engage customers and gauge reactions to the public education campaign materials. SDG&E will use the feedback to update materials where appropriate. Surveys are also employed during the community outreach events. Attendees are asked to provide feedback about the event as well as any additional information they would like at future events. This type of feedback helped us establish Community Resource Centers in the past. Post-event surveys will be used to garner feedback on messaging and communications used during PSPS or wildfire events. Applicable lessons learned will also be used to update materials accordingly. This process will be used annually to help update materials and communications in the coming years.

5.3.10.2. Cooperation and best practice sharing with agencies outside California

SDG&E's Emergency Management and Fire Science & Climate Adaptation departments are identified as world-class and innovators both nationally and internationally. SDG&E has hosted numerous knowledge sharing tours of the EOC and weather center for utility personnel from throughout the U.S., as well as international utility partners. In 2019, utility representatives from other states (e.g., Colorado, Texas, North Carolina, New York, and Utah) and countries (e.g., Australia, Costa Rica, and Spain) have sought to learn best practices from SDG&E.

SDG&E prioritizes cooperation and sharing of best practices as an important component of our fire mitigation activities. SDG&E plans to continue these practices and believes that its cooperation and sharing practices have been effective and a contributor to its success in wildfire mitigation activities over the last decade. Prior to the upcoming wildfire season and before the next Plan update, as well as over the next three to ten years, SDG&E plans to continue its practice of cooperation and sharing of best practices outside of California. For 2020, SDG&E already has several events planned.

5.3.10.3. Cooperation with suppression agencies

SDG&E employs a full-time staff of five fire coordinators. The current fire coordinators on staff have over 150 years of fire suppression, prevention, and fire behavior experience collectively. The fire coordinators serve as the direct link between SDG&E and emergency-response agencies. They also serve as SDG&E's single point of contact for fire agencies and utilize Incident Command System protocols during incidents, provide periodic updates to both firefighters and SDG&E personnel, establish radio and communications assignments, assist in the coordination of activities related to de-energizing and re-energizing power lines, and update on-scene personnel, control centers, service dispatch, and the SDG&E regional operations centers as to the status of each incident.

The Fire Coordinators are active in professional forums, seminars, and training throughout the service territory to ensure state-of-the-art fire practices are incorporated into SDG&E operations and practices. They also participate in engineering and operational meetings to advise SDG&E personnel regarding fire threats and prevention. The Fire Coordinators also share information with the firefighting agencies within the SDG&E service territory and, on a rotating basis, provide those agencies with electrical and gas safety training.

In addition, the Fire Coordinators provide wildfire prevention training to SDG&E personnel who work in wildland areas of the service territory. This annual training utilizes SDG&E's Electric Standard Practice No. 113.1 – Operations and Maintenance Wildland Fire Prevention Plan (ESP 113.1) to educate employees about the activities that present a risk of igniting a wildfire. The plan provides a fire risk and mitigation matrix based on work activity and the FPI to set a minimum level of requirements for fire prevention, work restrictions, and fire tools for suppressing small, witnessed ignitions. SDG&E requires that contractors and consultants also undergo wildland fire prevention training, and that they follow SDG&E's ESP 113.1.

SDG&E Fire Coordination also participates in county-wide wildland fire drills that include electric utility scenarios, provide instructors for electric safety for CAL FIRE's Truck Academy and the Heartland Firefighter Recruit Academy training.

The First Responder Outreach Program, as part of the Operational Field and Emergency Readiness Program (OFER), trains fire, law enforcement, and emergency management first responders, on how to safely work utility emergencies with SDG&E. SDG&E Fire Coordinators and OFER Staff work together to teach electric and natural gas safety. In 2019, the First Responder Outreach Program completed 31 train the trainer sessions throughout the county, helping to prepare 581 first responders to safely respond to a utility emergency.

SDG&E participated in an evacuation working group to develop standardized training for all the public safety disciplines involved in evacuations. The participants included SDG&E, CAL FIRE/SD County Fire, San Diego Sheriff's Department, County OES, San Diego Fire and Rescue Department, San Diego Police Department, San Diego Office of Homeland Security, California Highway Patrol, SD County Animal Services and Caltrans. The evacuation working group developed a training presentation, class exercise, and the San Diego Sheriff's Office developed six wildfire training videos in support of the effort, including one video featuring an SDG&E Fire Coordinator discussing utility safety during wildland fires. While SDG&E supports and collaborates with the aforementioned agencies in evacuation planning, it is the responsibility of city and county first responders to develop, prepare, and implement evacuation plans.

Further, as stated in Section 5.3.5.9 above, SDG&E provides electrical equipment training to CAL FIRE representatives so that SDG&E is maintaining proper clearances of vegetation to conductors and equipment prior to the start of the fire season. While CAL FIRE inspections have been jointly performed with SDG&E, this training is intended for CAL FIRE to better understand the operation of the electric system and which equipment should be targeted to best prevent an ignition source. This training can be used by CAL FIRE while they are

conducting their day-to-day operations and inspections and is dependent on CAL FIRE's participation.

SDG&E highly values the partnerships and collaborations that it has built with the fire suppression agencies across its service territory over the last decade and fully intends to maintain and continue to build these relationships. SDG&E does not plan to conduct official audits or quality checks on our cooperation with suppression agencies, however, SDG&E does plan to continue to build upon these foundational relationships.

SDG&E will leverage the Fire Science and Coordination group, and their over 150 years of combined experience in the fire suppression agencies, to evaluate and expand upon our collaborations. As described above, SDG&E closely collaborated with fire suppression agencies in 2019 through training, collaborative community outreach, and emergency response to wildfire activity.

In January 2020, SDG&E received the 2019 CAL FIRE Director's Partnership Award for work done to improve and standardize evacuation procedures countywide. SDG&E's efforts streamlined the process by which response agencies will evacuate communities should the need arise. Interagency cooperation of this type is how local response agencies prepare for the impacts of large-scale emergencies.

Prior to the next wildfire season and Plan update, as well as over the next three and 10 years, SDG&E plans to continue to build and evolve collaborations with fire suppression agencies with the foundational goal of keeping its communities safe.

5.3.10.4. Forest service and fuel reduction cooperation and joint roadmap

Please refer to Section 5.3.5.5 above for a detailed description of SDG&E's forest service and fuel reduction joint roadmap.

5.4. Methodology for Enterprise-Wide Safety Risk and Wildfire-Related Risk Assessment

Instructions: *Describe methodology for identifying and evaluating enterprise wide safety risk and wildfire related risk, and how that methodology is consistent with the methodology used by other electric utilities or electrical corporations. If the risk identification and evaluation methodology is different, the utility shall explain why in this section.*

Risk Framework

SDG&E's risk framework is modeled after an internationally recognized risk management standard, ISO 31000.[62] This framework consists of an enterprise risk management governance

[62] ISO 31000 is a family of standards relating to risk management codified by the International Organization for Standardization.

structure, which addresses the roles of employees at various levels ranging up to SDG&E's Board of Directors, as well as various risk processes and tools.

One such process is SDG&E's six-step enterprise risk management process. The figure below describes SDG&E's enterprise risk management process, by which SDG&E identifies, manages, and mitigates enterprise risks, and aims to provide consistent, transparent, and repeatable results.

Figure 8: Enterprise Risk Management Process

This six-step process is aligned with the Cycla Corporation's 10-Step Evaluation Method, which was adopted by the Commission "as a common yardstick for evaluating maturity, robustness, and thoroughness of utility Risk Assessment and Mitigation Models and risk management frameworks."[63] While the lexicon used by Cycla differs slightly from that of the Company, the content is largely aligned. It is SDG&E's understanding that each of the large energy utilities also use a form of Cycla's Method.

SDG&E performs its enterprise risk management process annually, resulting in an enterprise risk registry (ERR). The Commission defines an ERR as "[a]n inventory of enterprise risks at a snapshot in time that summarizes (for a utility's management and/or stakeholders such as the CPUC) risks that a utility may face. The [ERR] must be refreshed on a regular basis and can reflect the changing nature of a risk; for example, risks that were consolidated together may be separated, new risks may be added, and the level of risks may change over time."[64]

63 D.16-08-018 at 195, Ordering Paragraph 4.

64 D.18-12-014 at 16-17.

Accordingly, SDG&E's identified enterprise-level risks, including safety-related and wildfire-related risks, are presented in its ERR. Each risk has one or more risk owner(s), a member of the senior management team who is ultimately responsible and accountable for the risk, and one or more risk manager(s), who is responsible for ongoing risk assessments and overseeing implementation of risk plans. SDG&E uses input from the risk managers and the risk owners to ultimately finalize its ERR. Therefore, SDG&E's enterprise risk management process is both a "bottoms-up" and "top-down" approach.

In addition, each risk in the ERR has an associated set of mitigations (i.e., projects or programs that reduce the likelihood of the risk and/or negative consequences should the risk occur). Notwithstanding these risk management and mitigation efforts, however, adverse events will occur. When that happens, SDG&E's efforts, including implementation of response plans, development of role and responsibility descriptions and checklists, and facilitation of training and exercises, are designed to prepare the Company to respond safely and effectively to those adverse events that occurred despite mitigation efforts.

Risk Identification & Evaluation

In SDG&E's enterprise risk management process, as explained in the 2019 RAMP,[65] risk identification is the process of finding, recognizing, and describing risks. As the first step in the enterprise risk management process, the Enterprise Risk Management organization works with various business units to update existing risk information and identify enterprise-level risks that have emerged or accelerated since the prior assessment. This part of the process also includes the identification of risk events, their causes, and potential consequences, which is summarized in a Risk Bow Tie. The Risk Bow Tie is "a tool that consists of a Risk Event in the center, a listing of drivers on the left side that potentially lead to the Risk Event occurring, and a listing of Consequences on the right side that show the potential outcomes if the Risk Event occurs."[66] Risk evaluation is also included in SDG&E's enterprise risk management process.[67] It results in a pre-mitigation risk score. As explained in Section 4.2, the methodology or framework utilized by SDG&E to calculate risk scores, including for the Wildfire risk, was adopted in the S-MAP (D.18-12-014) and presented in SDG&E's 2019 RAMP.

The S-MAP puts forth a consistent framework to be applied in future RAMP and GRC filings for identifying and evaluating risk across all California utilities. Thus, SDG&E's approach generally follows a consistent framework with the other utilities. It is important to note that SDG&E is the first utility to apply the new quantitative risk methodology adopted in the S-MAP and is continuing to review opportunities for improvement and lessons learned from the new approach.

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65 2019 RAMP, Chapter RAMP-B at B-4.

66 D.18-12-014 at 16.

67 *See* 2019 RAMP, Chapter RAMP-B at B-6.

Safety Management System

Additionally, SDG&E is working to implement an enterprise-wide Safety Management System (SMS). As discussed in the TY 2019 GRC Decision, SDG&E's Pipeline SMS for gas operations is following the recommendations in American Pipeline Institute (API) 1173.[68] While there is not currently a recommended practice applicable to an SMS for electric operations, in the fall of 2019, SDG&E embarked on an effort to adapt API 1173 principles and approaches to create an SMS to drive continuous improvement in electric operations. This demonstrates SDG&E's commitment to developing an electric SMS. Using API 1173 as a general standard for operational safety for both gas and electric operations requires alignment of risk management (based on ISO 31000), asset management (based on ISO 55000), and emergency management (based on the Incident Command System) with traditional views of safety management (based on OSHA) to support development of a comprehensive and proactive safety program.

5.5. Planning for Workforce and Other Limited Resources

Instructions: *Include a showing that the utility has an adequately sized and trained workforce to promptly restore service after a major event, taking into account employees of other utilities pursuant to mutual aid agreements and employees of entities that have entered into contracts with the utility.*

Please see Section 5.3.9.4.1 and Section 5.3.9.4.5 above. See also Appendix D for a summary of the types and number of SDG&E's field resources (current as of January 31, 2020). While SDG&E is a member of multiple emergency associations to facilitate mutual assistance, historically, SDG&E's internal resources have been adequate to restore power to affected customers in a timely manner after events.

5.6. Expected Outcomes of Three-Year Plan

5.6.1. Planned utility infrastructure construction and upgrades

Instructions: *Explain how the utility expects the geographic location of transmission and distribution lines to shift over the three-year plan period and discuss its impact on 1) the utility's risk exposure and 2) the utility's wildfire mitigation strategy. Outline portions of grid within HFTD that are highest cost to serve, by highlighting circuits or portions of circuits that exceed $0.5M per customer in capital cost required to harden. Provide justification for the level of hardening required and why the lowest cost path to harden this equipment exceeds $0.5M per customer, including by describing the various alternatives that were considered to reduce ignition probability and estimated wildfire consequence. For each of these sections of the grid, outline any analysis that was conducted around islanding, serving with microgrids, or providing backup generation, all to reduce the impact of PSPS events and reduce ignition probability and estimated wildfire consequence at the lowest possible cost.*

Discuss how the utility wildfire mitigation strategy influenced its plan for infrastructure construction (in terms of additions or removal of overhead lines, including undergrounding of overhead lines) as detailed in Section 3.4.2. Discuss how the utility wildfire mitigation strategy

[68] D.19-09-051, Findings of Fact 40 at 729.

influenced its plan for upgrades to overhead lines and substations as detailed in the Section 3.4.2.

As previously described in Section 4.4, SDG&E is currently undergoing a shift in its hardening strategy that will refine the scope of its various mitigation efforts within the HFTD. At this time, specific information regarding the level of hardening in each portion of the HFTD is not available as SDG&E's PSPS Mitigation Engineering team has not completed its in-depth segment level analysis of circuits in the HFTD. The team is also evaluating various alternatives to mitigate the probability and consequence of wildfire risk. This in-depth analysis assesses various factors within each segment including customer density, potential egress issues, tree-strike potential among others to determine the most appropriate type of mitigation as well as the level of hardening.

As a part of this effort, SDG&E's team is currently scoping specific activities that provide "quick-wins" in terms of reducing PSPS impacts, as well as wildfire risk in the short-term. This includes identifying opportunities for microgrids, personal generators, short runs of undergrounding, additional sectionalizing, and weather stations, to further reduce the number of customers impacted by PSPS. Early estimates of the potential reduction in PSPS customer impacts could be up to 7,000 customers as a result of these various initiatives. The team has identified opportunities to reduce impacts to community centers, schools, fire stations, police stations, urgent care facilities, water facilities, as well as communication sites. As the team continues to conduct this in-depth analysis, scoping of various initiatives will be refined and an update to this can be provided when better data is available.

Instructions for Table 31:

Assume weather patterns for each year are as consistent with the 5-year historical average and that wildfire mitigation initiatives are implemented according to plan. Report change in drivers of ignition probability based on WMP implementation according to whether or not near misses of that type are tracked, the number of incidents anticipated per year (e.g., all instances of animal contact regardless of whether they caused an outage, an ignition, or neither), the rate at which those incidents (e.g., object contact, equipment failure, etc.) are anticipated to cause an ignition in the column, and the number of ignitions that those incidents are anticipated to cause by category. List additional risk drivers tracked in the "other" row and additional rows as needed.

Table 31 – Change in Drivers of Ignition Probability Taking into Account Planned Initiatives, for each year of plan, is provided in Appendix A.

5.6.2. Protocols on Public Safety Power Shutoff

Describe protocols on Public Safety Power Shut-off (PSPS or de-energization), to include:

1. *Strategy to minimize public safety risk during high wildfire risk conditions and details of the considerations, including but not limited to list and description of community assistance locations and services provided during a de-energization event.*

SDG&E's strategies to minimize public safety risk during high wildfire risk conditions are discussed in Section 4.4, Section 5.3.6.5.2, and Section 5.3.6.5.3 above. Please also see Section 5.3.10.1 for information on Community Resource Centers.

2. *Outline of tactical and strategic decision-making protocol for initiating a PSPS/de-energization (e.g., decision tree).*

SDG&E's PSPS protocols are set forth in Section 4.4 and Section 5.3.6.5.1 above.

3. *Strategy to provide for safe and effective re-energization of any area that was de-energized due to PSPS protocol.*

Section 5.3.6.4 above provides an overview of SDG&E's protocols for PSPS re-energization.

4. *Company standards relative to customer communications, including consideration for the need to notify priority essential services – critical first responders, public safety partners, critical facilities and infrastructure, operators of telecommunications infrastructure, and water utilities/agencies. This section, or an appendix to this section, shall include a complete listing of which entities the electrical corporation considers to be priority essential services. This section shall also include description of strategy and protocols to ensure timely notifications to customers, including access and functional needs populations, in the languages prevalent within the utility's service territory.*

SDG&E's protocols related to PSPS communications adhere to the guidelines set forth in Appendix A of D.19-05-042 and are discussed in Section 5.3.6.5.3 above. Beginning with the advanced warning system, where SDG&E notifies customers of a potential Red Flag Warning, SDG&E starts to notify customers 48 to 78 hours prior to an anticipated PSPS event, beginning with priority essential service partners. Within 24 hours critical infrastructure customers are notified as are priority essential service, critical first responders and public safety partners. The subsequent cadence of communications will follow Appendix A of D.19-05-042.

Customers, and those without SDG&E accounts who are registered to receive notifications, are contacted via the Enterprise Notification System (voice, text, and/or email notifications). Notifications continue through the start and completion of the PSPS event. These notifications are made in English, Spanish, Mandarin, Cantonese, Korean, Vietnamese, Tagalog and Russian.

A list of customers SDG&E deems to provide priority essential services, as of February 7, 2020, is included in Appendix C.

SDG&E began partnering with the County of San Diego Office of Emergency Services AFN Working Group and Partner Relay network to help share messaging with some of the vulnerable population within its territory. The two groups are comprised of approximately 260 community-based organizations who work directly with the AFN population. During a PSPS event both groups of community-based organizations help amplify SDG&E's PSPS notifications by sharing it with their constituents.

In addition to sharing the English version of the PSPS notification message, the Partner Relay network – which is made up of a broad network of trusted community organizations such as churches, nonprofit organizations and refugee resettlement organizations – help to disseminate

the PSPS notification in various languages to their community. SDG&E will continue to look for new ways to partner with organizations dedicated to readiness and response throughout its service territory to help amplify the PSPS notifications that are sent.

SDG&E has also recognized the importance of developing a solution identifying and communicating with all people within a de-energized area, including people who may be visiting the area or not directly listed on utility accounts. In 2019, SDG&E created a self-registration portal that enables people not directly listed on utility accounts to create an authenticated account and opt-in for PSPS notifications by zip code(s). They may receive notifications by voice, text and e-mail. They will use this account to maintain their notification preferences, as well as the ability to opt-out of notifications. Both SDG&E customers and non-account holders can sign up for PSPS notifications at sdge.com/notifications.

5. *Protocols for mitigating the public safety impacts of these protocols, including impacts on first responders, health care facilities, operators of telecommunications infrastructure, and water utilities/agencies.*

Please refer to Section 5.3.6.5.3.3 above. During a PSPS event, there may be a need to provide additional support to an impacted community. SDG&E may open a Community Resource Center near the affected area, if conditions prolong the estimated outage duration. Community Resource Center activations will be communicated via the SDG&E website, social media, local news and radio and the SDG&E News Center. At these Centers, residents will have access to water, light snacks and charge small electronic devices, as well as receive the most up-to-date information about the power shutoff.

Additionally, SDG&E communicates the differences between an unplanned outage and a PSPS. Despite SDG&E's best efforts to maintain reliable service, unexpected outages happen. These unplanned outages are caused by various circumstances beyond SDG&E's control, such as traffic accidents, damage to power lines and Mylar balloons caught in overhead wires. In contrast to an unplanned outage, a PSPS occurs after careful planning and analysis of the various threats to public safety. If a PSPS takes place, it will be uniquely identified on our outage map with a different marker. SDG&E encourages the public to learn more about planned and unplanned outages at sdge.com/outage-map.

Finally, a component of SDG&E's communication program for wildfire safety includes contributing to and supporting the statewide Public Safety Power Shutoff campaign established in 2019. The overarching message communicated to the public in SDG&E's service territory is that all Californians need to take important steps to get ready before the wildfire season, such as creating an emergency kit and having a thorough emergency plan. The statewide campaign refers the public to learn more about preparing for the threat of wildfire and PSPS at *www.prepareforpowerdown.com*.

6. Utility GIS Attachments

The GIS attachments related to Table 8 and 9 are available on SDG&E's website at: https://www.sdge.com/node/15241. Certain GIS layer information relating to customer locations, and transmission and substation assets operated at 230 kV and above, are confidential. Customer location data is confidential due to, among other reasons, privacy concerns. The 230 kV and above transmission and substation information is confidential due to cyber and physical security reasons, per NERC Critical Infrastructure Protection standards, as well as FERC Critical Energy Infrastructure Information regulations.

6.1. Recent Weather Patterns

Please see Table 2, Row 3 and Table 10 in Appendix A.

6.2. Recent Drivers of Ignition Probability

Please refer to the attribute tables included in the GIS files.

6.3. Recent Use of PSPS

Please refer to Section 6.1 above.

6.4. Current Baseline State of Service Territory and Utility Equipment

Please refer to the attribute tables included in the GIS files. SDG&E identified 692 census tracts within the service territory including customer information and square mileage. SDG&E also provided GIS layers of the HFTD Tier 2, Tier 3, WUI, and Non-HFTD. SDG&E does not already have and cannot develop a non-manual way of creating a field for each census tract that divides the tract into percentages of HFTD, Non-HFTD, and WUI and is thus unable to provide the data in the requested format. In addition, asset conditions are managed through an SAP database and not a GIS database. SDG&E believes that data could be pulled in as they utilize common structure numbers, but that work will not be complete as of the date of this Plan submission.

6.5. Location of Planned Utility Equipment Additions or Removal

While SDG&E plans to perform fire hardening work within the HFTD and WUI, it has not designed and engineered all of these programs to the point where they can be geospatially located on a map. Once these areas progress through engineering and design, portions of this information can be provided.

6.6. Planned 2020 WMP Initiative Activity by End-2022

While SDG&E plans to perform fire hardening work within the HFTD and WUI, it has not designed and engineered all of these programs to the point where they can be geospatially located on a map. Once these areas progress through engineering and design, portions of this information can be provided.

Appendix A

WMP Tables 1 through 31

TABLE 1: Recent Performance on Progress Metrics, Last 5 Years

Project Metric Name	Annual Performance	Unit(s)
	2015	2016	2017	2018	2019	
Grid condition findings from inspection- Electric *Transmission*	Issues in FTZ / FTZ Circuit Miles in 2015 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.013 0.000 Type 2 0.000 0.298 0.009 Type 3 0.000 0.010 0.000 Issues/ Total Circuit Miles in 2015 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.001 0.035 0.000 Type 2 0.002 0.533 0.031 Type 3 0.003 0.034 0.000	Issues in FTZ / FTZ Circuit Miles in 2016 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.001 0.000 Type 2 0.000 0.044 0.002 Type 3 0.000 0.010 0.000 Issues/ Total Circuit Miles in 2016 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.021 0.000 Type 2 0.001 0.156 0.032 Type 3 0.001 0.023 0.000	Issues in FTZ / FTZ Circuit Miles in 2017 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.002 0.000 Type 2 0.000 0.043 0.010 Type 3 0.000 0.001 0.017 Issues/ Total Circuit Miles in 2017 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.001 0.006 0.000 Type 2 0.001 0.226 0.033 Type 3 0.001 0.009 0.009	Issues in HFTD / HFTD Circuit Miles in 2018 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.009 0.000 Type 2 0.002 0.413 0.029 Type 3 0.000 0.006 0.000 Issues/ Total Circuit Miles in 2018 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.005 0.000 Type 2 0.004 0.445 0.032 Type 3 0.000 0.005 0.000	Issues in HFTD / HFTD Circuit Miles in 2019 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.004 0.000 Type 2 0.000 0.228 0.026 Type 3 0.000 0.009 0.000 Issues/ Total Circuit Miles in 2019 Inspection Type / Level 1 / Level 2 / Level 3 Type 1 0.000 0.004 0.000 Type 2 0.001 0.338 0.026 Type 3 0.004 0.013 0.000	Number of Level 1, 2, and 3 findings per mile of circuit in HFTD, and per total miles of circuit for each of the following inspection types: 1. Patrol inspections 2. Detailed inspections 3. Other inspection types
Grid condition findings from inspection- Electric *Distribution*	Issues in FTZ / FTZ Circuit Miles in 2015 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.008 0.049 NA Detail 0.0014 0.1929 NA QC 0.0006 0.2408 NA Issues/ Total Circuit Miles in 2015 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.0070 0.1059 NA Detail 0.0097 0.3856 NA QC 0.0001 0.0505 NA	Issues in FTZ / FTZ Circuit Miles in 2016 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.0083 0.0596 NA Detail 0.0049 0.1408 NA QC 0.0003 0.1958 NA Issues/ Total Circuit Miles in 2016 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.0055 0.1328 NA Detail 0.0069 0.3575 NA QC 0.0001 0.0411 NA	Issues in FTZ / FTZ Circuit Miles in 2017 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.0017 0.0602 NA Detail 0.0011 0.0659 NA QC 0.0009 0.1032 NA Issues/ Total Circuit Miles in 2017 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.0058 0.1311 NA Detail 0.0044 0.3005 NA QC 0.0002 0.0217 NA	Issues in HFTD / HFTD Circuit Miles in 2018 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.008 0.043 NA Detail 0.0009 0.0614 NA QC 0.0003 0.1775 NA Issues/ Total Circuit Miles in 2018 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.0041 0.1269 NA Detail 0.0074 0.2984 NA QC 0.0001 0.0372 NA	Issues in HFTD/ HFTD Circuit Miles in 2019 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.002 0.1216 NA Detail 0.0011 0.0648 NA QC 0.0003 0.0665 NA Issues/ Total Circuit Miles in 2019 Inspection Type / Level 1 / Level 2 / Level 3 Patrol 0.0031 0.1263 NA Detail 0.0039 0.3770 NA QC 0.0001 0.0140 NA	Number of Level 1, 2, and 3 findings per mile of circuit in HFTD, and per total miles of circuit for each of the following inspection types: 1. Patrol inspections 2. Detailed inspections 3. Other inspection types

TABLE 1: Recent Performance on Progress Metrics, Last 5 Years						
Project Metric Name	Annual Performance					Unit(s)
	2015	2016	2017	2018	2019	
Vegetation clearance findings from inspection	0.8%	0.7%	1.1%	0.1%	0.8%	Percentage of right-of-way with noncompliant clearance based on applicable rules and regulations at the time of inspection, as a percentage of all right-of-way inspected. *NOTE: "Noncompliant" - a tree observed during inspection to have less than the minimum clearance required ("memo" tree) "All right-of-way inspected" – total number of inventory trees % of noncompliance = number of memo trees observed divided by the total number of inventory trees.
Extent of grid modularization	1. FTZ: 0.066 2. Non-FTZ: 0.059	1. FTZ: 0.071 2. Non-FTZ: 0.092	1. FTZ: 0.072 2. Non-FTZ: 0.094	1. HFTD: 0.072 2. Non-HFTD: 0.099	1. HFTD: 0.073 2. Non-HFTD: 0.100	Number of sectionalizing devices per circuit mile plus number of automated grid control equipment in: 1. HFTD 2. Non-HFTD *NOTE: Per Total number of sectionalizing positions (OH and UG, UG can have between 2-5 per device) divided by total miles (OH and UG)
Data collection and reporting	NA	NA	NA	NA	95%	Missing Table 31 and 50% of table 9. The submittal was calculated as providing data for 29.5/31 tables, or 95% complete.

TABLE 2: Recent Performance on Outcome Metrics, Annual and Normalized for Weather, Last 5 Years									
Metric Type	#	Outcome metric name	Annual performance					Unit(s)	Comments
			2015	2016	2017	2018	2019		
1. Near misses	1.a.	# of all events that could result in ignition, by type according to utility-provided list (Total)	1,509	1,841	1,751	1,594	1,558	Number per year	(Such as unplanned outages, faults, conventional blown fuses, etc.)
	1.b.	# of all events that could result in ignition, by type according to utility-provided list (Normalized)	0.0003	0.0008	0.0014	0.0020	0.0007	Number per RFW circuit mile day per year	
	1.c.	Number of wires down (total)	59	138	129	96	108	Number of wires down per year	System wide
	1.d.	Number of wires down(normalized)	0	0.00004	0.00004	0.00003	0.00005	Number per RFW circuit mile day per year	
2. Utility inspection findings	2.a.	Number of Level 1 findings that could increase the probability of ignition discovered per circuit mile inspected	0.010 (ED)	0.013(ED)	0.004(ED)	0.009 (ED)	0.003(ED)	Average number of Level 1 findings that could increase the probability of ignition discovered by all inspections per circuit mile per year	Substation findings do not increase the probability of ignitions per circuit mile; Substation inspections are conducted primarily for reliability, they have incidental wildfire mitigation benefits.
	2.b.	Number of Level 2 findings	0.483 (ED)	0.396(ED)	0.229(ED)	0.282(ED)	0.253(ED)	Average number of Level 2 findings	
	2.c.	Number of Level 3 findings	0	0	0	0	0	Average number of Level 3 findings	
3. Customer hours of PSPS and other	3.a.	Customer hours of planned outages including PSPS (total)	1010005	862687	1884251	2185302	2395433	Total customer hours of planned outages per year	
	3.b.	Customer hours of planned outages including PSPS (normalized)	0.1703	0.0006	7.14	17.39	30.39	Total customer hours of planned outages per RFW circuit mile day per year	
	3.c.	Customer hours of unplanned outages, not including PSPS (total)	1504042	2058237	2090995	1887418	1617201	Total customer hours of unplanned outages per year	
	3.d.	Customer hours of unplanned outages, not including PSPS (normalized)	80.76	21.79	19.61	30.80	38.65	Total customer hours of unplanned outages per RFW circuit mile day per year	
	3.e.	Increase in System Average Interruption Duration Index (SAIDI)	-12.55	22.75	31.48	3.53	-2.94	Change in minutes compared to the previous year	

TABLE 2: Recent Performance on Outcome Metrics, Annual and Normalized for Weather, Last 5 Years									
Metric Type	#	Outcome metric name	Annual performance					Unit(s)	Comments
			2015	2016	2017	2018	2019		
4. Utility ignited wildfire fatalities	4.a.	Fatalities due to utility-ignited wildfire (total)	0	0	0	0	0	Number of fatalities per year	SDG&E is unaware of any utility-ignited wildfire fatalities resulting from utility wildfire mitigation initiatives in the period 2015-2019.
	4.b.	Fatalities due to utility-ignited wildfire (normalized)	0	0	0	0	0	Number of fatalities per RFW circuit mile day per year	
5. Accidental deaths resulting from utility wildfire mitigation initiatives	5.a.	Deaths due to utility wildfire mitigation activities (total)	0	0	0	0	0	Number of fatalities per year	SDG&E is unaware of any accidental deaths resulting from utility wildfire mitigation initiatives in the period 2015-2019.
6. OSHA-reportable injuries from utility wildfire mitigation initiatives	6.a.	OSHA-reportable injuries due to utility wildfire mitigation activities (total)	0	1	0	0	0	Number of OSHA-reportable injuries per year	One contractor OSHA-reportable injury in 2016 related to the FiRM (Fire Risk Mitigation) project. It is the responsibility of the contractor to report the incident to OSHA; SDG&E has no documentation to confirm such a report.
	6.b.	OSHA-reportable injuries due to utility wildfire mitigation activities (normalized)	0	0.001	0	0	0	Number of OSHA-reportable injuries per year per 1000 line miles of grid	
7. Value of assets destroyed by utility-ignited wildfire, listed by asset type	7.a.	Value of assets destroyed by utility-ignited wildfire (total)	0	0	0	$2,900.00	0	Dollars of damage or destruction per year	Value is a round number including material only for one wood 45' pole, and 25kVA transformer. Rounded up, to compenstate for additonal conductor and connectors.
	7.b.	Value of assets destroyed by utility-ignited wildfire (normalized)	0	0	0	0.0437292	0		
8. Structures damaged or destroyed by utility-ignited wildfire	8.a.	Number of structures destroyed by utility-ignited wildfire (total)	0	0	0	1	0	Number of structures destroyed per year	
	8.b.	Number of structures destroyed by utility-ignited wildfire (normalized)	0	0	0	0.0000151	0	Number of structures destroyed per RFW circuit mile day per year	

TABLE 2: Recent Performance on Outcome Metrics, Annual and Normalized for Weather, Last 5 Years									
Metric Type	#	Outcome metric name	Annual performance					Unit(s)	Comments
			2015	2016	2017	2018	2019		
9. Acreage burned by utility-ignited wildfire	9.a.	Acreage burned by utility-ignited wildfire (total)	213	7	16	28	8	Acres burned per year	If a fire meets the CPUC definitiof for recorable fire but does not grow beyond .25 acres it was assumed to be .1 acres for consistency
	9.b.	Acreage burned by utility-ignited wildfire (normalized)	0.24580232	0.000225941	0.000180167	0.000422215	0.000236904	Acres burned per RFW circuit mile day per year	
10. Number of utility wildfire ignitions	10.a.	Number of ignitions (total) according to existing ignition data reporting requirement	32	30	23	26	21	Number per year	
	10.b.	Number of ignitions (normalized)	0.036928048	0.000968317	0.00025899	0.000392056	0.000621872	Number per RFW circuit mile day per year	
	10.c.	Number of ignitions in HFTD (subtotal)	19	18	15	13	11	Number in HFTD per year	
	10.c.ii.	Number of ignitions in HFTD Tier 2	13	11	7	7	8	Number in HFTD Tier 2 per year	
	10.c.iii.	Number of ignitions in HFTD Tier 3	6	7	8	6	3	Number in HFTD Tier 3 per year	
	10.d.	Number of ignitions in HFTD (subtotal, normalized)	0.036928048	0.034620045	0.026542035	0.030004039	0.024234032	Number in HFTD per RFW circuit mile day per year	
	10.d.ii.	Number of ignitions in HFTD Tier 2 (normalized)	0.01500202	0.012694017	0.008078011	0.008078011	0.009232012	Number in HFTD Tier 2 per RFW circuit mile day per year	
	10.d.iii.	Number of ignitions in HFTD Tier 3 (normalized)	0.006924009	4.09728E-07	9.09618E-08	1.21809E-07	2.73387E-07	Number in HFTD Tier 3 per RFW circuit mile day per year	
	10.e.	Number of ignitions in non-HFTD (subtotal)	13	12	8	13	10	Number in non-HFTD per year	
	10.f.	Number of ignitions in non-HFTD (normalized)	0.01500202	0.000387327	9.00834E-05	0.000196028	0.000296129	Number in non-HFTD per RFW circuit mile day per year	
11. Critical infrastructure	11.a.	Critical infrastructure impacted by PSPS	NA	NA	NA	NA	76,236	Number of critical infrastructure (in accordance with D.19-05-042) locations impacted per hour multiplied by hours offline per year	

TABLE 2: Recent Performance on Outcome Metrics, Annual and Normalized for Weather, Last 5 Years									
Metric Type	#	Outcome metric name	Annual performance					Unit(s)	Comments
			2015	2016	2017	2018	2019		
11. Critical infrastructure impacted	11.b.	Critical infrastructure impacted by PSPS (normalized)	NA	NA	NA	NA	1.46	Number of critical infrastructure (in accordance with D.19-05-042) locations impacted per hour multiplied by hours offline per RFW circuit mile day per year	

TABLE 3: List and Description of Additional Metrics, Last 5 Years								
Metric	Performance					Units	Third-party validation	Underlying assumptions
	2015	2016	2017	2018	2019			
Number of elevated or extreme FPI and RFW days	FPI: 108 RFW: 4	FPI: 138 RFW: 20	FPI: 169 RFW: 21	FPI: 182 RFW: 12	FPI: 137 RFW: 12	Days	NA	Day ends at 2359L (11:59pm) and begins at 0000L (midnight)
Vegetation Caused Ignitions in HFTD	FPI: 3 RFW:0	FPI: 1 RFW: 0	FPI: 2 RFW: 1	FPI: 0 RFW: 0	FPI: 1 RFW: 0	Days	NA	
Vegetation Caused Outages within HFTD	FPI: 3 RFW: 0	FPI: 7 RFW: 0	FPI: 8 RFW: 2	FPI: 4 RFW: 3	FPI: 9 RFW: 0	Days	NA	
Equipment Caused Ignitions within HFTD	FPI: 2 RFW: 0	FPI: 5 RFW: 0	FPI: 4 RFW: 2	FPI: 2 RFW: 1	FPI: 2 RFW: 0	Days	NA	
Overhead Faults on Circuits within HFTD	FPI: 121 RFW: 0	FPI: 110 RFW: 15	FPI: 145 RFW: 29	FPI: 134 RFW: 28	FPI: 125 RFW:17	Days	NA	
Energized Wire Down Events within HFTD	FPI: 3 RFW: 0	FPI: 7 RFW: 0	FPI: 9 RFW: 0	FPI:7 RFW: 1	FPI:8 RFW: 1	Days	NA	
Number of Non-CALFIRE Rated Fuse Operations within HFTD	FPI: 96 RFW: 1	FPI: 108 RFW:24	FPI: 115 RFW: 16	FPI: 131 RFW: 14	FPI: 83 RFW: 9	Days	NA	

TABLE 4: List and Description of Program Targets, Last 5 Years				
Program target	2019 performance	Units	Underlying assumptions	Third-party validation
Changed operating procedures on days with elevated or higher FPI	137	FPI elevated or higher	Target is 100% of elevated or higher FPI days. Number of elevated or higher FPI days will vary depending on weather conditions.	No
Disable reclosing and enable sensitive protections on reclosers within HFTD on days with elevated or higher FPI	137	FPI elevated or higher		No
Electric crews accompanied by fire suppression crews on days with elevated or higher FPI. On extreme days, certain activities are stopped altogether within the HFTD.	137	FPI elevated or higher		No
Wildfire infrastructure teams join SDG&E electric crews to provide fire suppression capabilities during high risk work on days with elevated or higher FPI. Support re-energization during PSPS events.	137	FPI elevated or higher		No
Three aerial fire suppression resources available year-round	279	water drops	The metric for this program is the number of water drops per year, which shows frequency of use for aerial fire suppression resources. Number of gallons dropped is also recorded. A target metric is not provided since the number of fires that aerial fire suppression resources will combat per year is unknown.	No
Three aerial fire suppression resources available year-round	220,453	gallons of water		No
Perform fuel management on BLM, priority 13, and tier 3 including CNF poles	511	poles treated	SDG&E's fuels management program removes, thins, or treats vegetation along SDG&E rights of way and adjacent fire-prone corridors.	No
15,000 QA/QC Distribution System Inspections	15,176	poles inspected	SDG&E's QA/QC distribution system inspections are performed within the HFTD Tier 3 prior to fire season and exceed the requirements of GO 165.	No
47,850 Detailed Distribution System Inspections	47,850	poles inspected	SDG&E's detailed distribution system inspections are conducted in compliance with GO 165.	No
300 Substation System Inspections	301	substations inspected	SDG&E's substation system inspections are conducted in compliance with GO 174.	No
6,730 Transmission System Inspections	6,730	OH structures inspected	SDG&E's transmission system inspections are conducted in compliance with PRC § 4292 and 4293 and GO 95 and GO 128 rules.	No
10 miles of OH transmission hardened	10	miles hardened	SDG&E program targets are set with +/-20% range to allow for unforseen impacts from external forces. The program target here is the midpoint of that range, and the number of miles hardened is within the 20% threshold.	No
85 miles of OH distribution hardened	83	miles hardened	SDG&E program targets are set with +/-20% range to allow for unforseen impacts from external forces. The program target here is the midpoint of that range, and the number of miles hardened is within the 20% threshold.	No
1.5 miles underground line segments	2.6	miles undergrounded	Strategic undergrounding began as a small scale program to target areas of the HFTD with the most significant risk. In 2019, SDG&E exceeded the goal of 1.5 miles undergrounded significantly reducing ignition risks in those areas.	No

TABLE 4: List and Description of Program Targets, Last 5 Years				
Program target	2019 performance	Units	Underlying assumptions	Third-party validation
68 miles hardened within Cleveland National Forest	61	miles hardened	SDG&E program targets are set with +/-20% range to allow for unforseen impacts from external forces. The program target here is the midpoint of that range, and the number of miles hardened is within the 20% threshold.	No
85 miles of high-risk conductor replaced with high tensile strength conductor	82	miles replaced	SDG&E program targets are set with +/-20% range to allow for unforseen impacts from external forces. The program target here is the midpoint of that range, and the number of miles hardened is within the 20% threshold.	No
700 poles hardened	695	poles hardened	SDG&E program targets are set with +/-20% range to allow for unforseen impacts from external forces. The program target here is the midpoint of that range, and the number of poles hardened is within the 20% threshold.	No
2250 expulsion fuses replaced	2490	fuses replaced	SDG&E program targets are set with +/-20% range to allow for unforseen impacts from external forces. The program target here is the midpoint of that range, and the number of devices replaced is within the 20% threshold.	No
500 hotline clamps replaced	660	hotline clamps replaced	Hotline clamps are a recognized high-risk connector that can lead to a wire down event. The overall goal of this program is to replace all 8,500 hotline clamps within the SDG&E's HFTD by the year 2024.	No
5.7 miles of wire safety enhancements	5.7	miles enhanced	The WiSE program replaced small conductor with high failure rates within the wildland urban interface.	No
8 circuits enabled with falling conductor protection	8	circuits enabled	SDG&E expanded its deployment of advanced protection to eight distribution circuits in the backcountry and tested and validated the communication functionality of its proposed Distribution Communications Reliability Improvements.	No
7 switches installed	7	switches installed	SDG&E installed seven additional switches to further increase is sectionalizing capability within the HFTD.	No
Replace all poles found through the GO195 visual and instrusive inspections within the HFTD	725	poles replaced	SDG&E's pole replacement and reinforcement is conducted in compliance with GO 165. For poles identified for replacement in Tier 3 of the HFTD, SDG&E intends to accelerate the replacement faster than the six-month time frame require by the comission's general orders.	No

TABLE 4: List and Description of Program Targets, Last 5 Years				
Program target	2019 performance	Units	Underlying assumptions	Third-party validation
Fit all 9 Community Resource Centers with a transfer switch to facilitate backup generation	9	CRC transfer switches installed	This metric tracked the CRC's ability to connect to backup power generators during a PSPS event.	No
Offer backup generators to all identified medical baseline customers and train them on its use (79 identified)	79	medical baseline customers offered backup generators	The goal of the program was to offer generators and training on generator use to MBL customers. 14 MBL customers while offered, chose not to participate.	No
Maintain inventory of trees within SDG&E service territory	460,000	trees in inventory	Tree inventory contains tree data for the entire service territory.	No
Enhanced 25-foot post prune clearance or complete removal of 81,000 trees along 28 circuits	28	Circuits with enhanced 25-foot clearance complete	SDG&E performs enhanced 25-foot clearance post-prune between trees and electric facilities within the HFTD.	No
Complete Quality Assurance of HFTD audits	80%	percent complete	SDG&E conducts QA/QC audits on a random sample population of all work completed by its contractors to assess work quality and contractual adherance.	No
Hazard tree removal	9884	trees removed	SDG&E's tree removal program targets problematic species such as eucalyptus and palms. SDG&E offers free tree replacements if an existing tree cannot be maintained safely near power lines.	No
Hazard tree replacement	260	trees replaced		No
Mechanical brushing and chemical applications	100%	percent complete	The current inventory of poles within the state responsibility area that require inspection and brush clearing is approximately 31,000 distribution poles with non-exempt subject hardware. For poles that require brushing as determined by the inspector, SDG&E performs three activities annually including mechanical brushing, chemical application, and a re-clearing of pole brushing.	No
Re-clear cycle	100%	percent complete		No
Provide electric equipment training to CalFire personnel through joint inspections	0	joint inspections	SDG&E was unable to provide training this year due to unavailability of Cal Fire personnel. SDG&E intends to resume this activity in 2020.	No
Expand SDG&E's weather network	191	total weather stations	SDG&E's weather network is located strategically throughout its service territory. The weather information is used to calibrate models such as the FPI and the SDG&E Outage Prediction Model which gives SDG&E the ability to anticipate when critical fire weather conditions or strong storms are approaching the area, allowing proactive preparedness measures to be taken.	No

TABLE 4: List and Description of Program Targets, Last 5 Years				
Program target	2019 performance	Units	Underlying assumptions	Third-party validation
Publish fire simulations	29	fire simulations published	WRRM-Ops is capable of simulating the growth and potential impact of a wildfire anywhere in SDG&E's service territory should an ignition begin.	No
Install 500 wireless fault indicators	594	wireless fault indicators installed	SDG&E program targets are set with +/-20% range to allow for unforseen impacts from external forces. The program target here is the midpoint of that range, and the number of devices installed is within the 20% threshold.	No
Add 13 weather stations	13	weather stations	SDG&E continues to add new weather stations to strategic locations to provide more granular weather data.	No
Install software enhancements on weather stations to allow 30 second reads	105	weather stations with software installed	Software upgrades to existing weather stations to allow for more frequent weather data for increased situational awareness.	No
Utilize PSPS as a last resort mitigation during the most extreme weather events of the year	3	events including activations of PSPS protocols	SDG&E utilizes PSPS as a last resort mitigation during the most extreme weather events of the year. During the wind events of October 2019, SDG&E utilized PSPS on three occasions.	No
Implement notification in five languages for potential and impending PSPS events utilizing multiple channels of communication	8	languages implemented for PSPS notifications	SDG&E communicates with customers in advance of an event; upon starting safety inspections of affected power lines; and upon re-energization, as practicable. SDG&E communicates these notifications to customers in eight languages (English, Spanish, Mandarin, Cantonese, Vietnamese, Korean, Tagalog and Russian.)	No

TABLE 5: Accidental Deaths Due to Utility Wildfire Mitigation Initiatives, Last 5 Years																
Activity	Victim															Total
	Full-time employee					Contractor					Member of public					
Year	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Inspection	0	0	0	0	0	0	0	0			0	0	0	0	0	0
Vegetation management	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Utility fuel management	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grid hardening	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

TABLE 6: OSHA-Reportable Injuries Due to Utility Wildfire Mitigation Initiatives, Last 5 Years																
Activity	Victim															Total
	Full-time employee					Contractor					Member of public					
Year	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Inspection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vegetation management	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Utility fuel management	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grid hardening	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1

TABLE 7: Methodology for Potential Impact of Ignitions						
List of all data inputs used in impact simulation	Sources of data inputs	Data selection and treatment methodologies	Assumptions, including SME input	Equation(s), functions, or other algorithms used to obtain output	Output type(s), e.g., wind speed model	Comments
Wind Speed	Wx Modeling	NAM, WRF, 2km grid	Best availiable Wx data	WRF	hourly for 84 hours - 2km grid in MPH	Wx = Weather NAM = North American Model WRF = Weather Research & Forecasting Model
Wind Direction	Wx Modeling	NAM, WRF, 2km grid	Best availiable Wx data	WRF	hourly for 84 hours - 2km grid in degrees	
Temperature	Wx Modeling	NAM, WRF, 2km grid	Best availiable Wx data	WRF	hourly for 84 hours - 2km grid in F	
Relative Humidity	Wx Modeling	NAM, WRF, 2km grid	Best availiable Wx data	WRF	hourly for 84 hours - 2km grid in %	
Moisture 1hr (%)	FM Modeling	NAM, WRF, Nelson, 2km grid	Nelson is leading practice	Nelson Fuel Model	hourly for 84 hours - 2km grid in %	FM = Fuel Moisture
Moisture 10hr (%)	FM Modeling	NAM, WRF, Nelson, 2km grid	Nelson is leading practice	Nelson Fuel Model	hourly for 84 hours - 2km grid in %	
Moisture 100hr (%)	FM Modeling	NAM, WRF, Nelson, 2km grid	Nelson is leading practice	Nelson Fuel Model	hourly for 84 hours - 2km grid in %	
Live Fuel Moisture (%)	FM Modeling	NAM, WRF, AI, 2km grid	Leading state-of-science	Custom AI	hourly for 84 hours - 2km grid in %	
Greeness	FM Modeling	NLDAS, 2km grid	Leading state-of-science	Custom Regression	hourly for 84 hours - 2km grid in %	
Energy Release Component	FM Modeling	NAM, WRF, Nelson, 2km grid	NFDRS16 is leading practice	NFDRS	hourly for 84 hours - 2km grid in btu/sqft	FB = Fire Behavior
Flame Length	FB Modeling	Wildfire Analyst	Leading state-of-science	Rothermel	hourly for 84 hours - 2km grid in ft	
Surface Fuel Height	Remote Sensing	N/A	Leading state-of-science	Satellite Image Analysis	static 25ft grid	
Slope	Remote Sensing	N/A	Leading state-of-science	Satellite Image Analysis	static 25ft grid	
Rate of Spread	FB Modeling	Wildfire Analyst	Leading state-of-science	Rothermel	hourly for 84 hours - 2km grid in (ch/h)	
Fuel Type	Remote Sensing	Wildfire Analyst	Leading state-of-science	Satellite Image Analysis	static 25ft grid	
Arrival Time	FB Modeling	Wildfire Analyst	Leading state-of-science	Rothermel	hourly for 84 hours - 2km grid in (h)	
Flame Intensity	FB Modeling	Wildfire Analyst	Leading state-of-science	Rothermel	hourly for 84 hours - 2km grid in (btu/ft/s)	
Structures	Land Use Model	Most recent	Additional structures added through anaysis	N/A	# of structures	
Population	Census Data	Most Recent	N/A	N/A	# of population	
Utility Assetts	GIS	N/A	Updated regularly	N/A	# and type	

TABLE 8: Map File Requirements for Recent and Modelled Conditions of Utility Service Territory, Last 5 Years			
Layer name	Measurements	Units	Attachment Location
Recent weather patterns	Average annual number of Red Flag Warning days per square mile across service territory	Area, days, square mile resolution	6.1
	Average 95th and 99th percentile wind speed and prevailing direction (actual)	Area, miles per hour, at a square mile resolution or better, noting where measurements are actual or interpolated	
Recent drivers of ignition probability	Date of recent ignitions categorized by ignition probability driver	Point, GPS coordinate, days, square mile resolution	6.2
Recent use of PSPS	Duration of PSPS events and area of the grid affected in customer hours per year	Area, customer hours, square mile resolution	6.3

TABLE 9: Map File Requirements for Baseline Condition of Utility Service Territory Projected for 2020			
Layer name	Measurements / variables	Units	Appendix location
Current baseline state of service territory and utility equipment	Non-HFTD vs HFTD (Zone 1, Tier 2, Tier 3) regions of utility service territory	Area, square mile resolution per type	6.4
	Urban vs. rural vs. highly rural regions of utility service territory	Area, square mile resolution per type	
	WUI regions of utility service territory	Area, square mile resolution	
	Number and location of critical facilities	Point, GPS coordinate	
	Number and location of customers	Area, number of people, square mile resolution	
	Number and location of customers belonging to access and functional needs populations	Area, number of people, square mile resolution	
	Overhead transmission lines	Line, quarter mile resolution	
	Overhead distribution lines	Line, quarter mile resolution	
	Location of substations	Point, GPS coordinate	
	Location of weather stations	Point, GPS coordinate	
	All utility assets by asset type, model, age, specifications, and condition	Point, GPS coordinate	
Location of planned utility equipment additions or removal	Non-HFTD vs HFTD (Zone 1, Tier 2, Tier 3) regions of utility service territory	Line, quarter mile resolution	6.5
	Urban vs. rural vs. highly rural regions of utility service territory	Line, quarter mile resolution	
	WUI regions of utility service territory	Line, quarter mile resolution	
	Circuit miles of overhead transmission lines	Line, quarter mile resolution	
	Circuit miles of overhead distribution lines	Line, quarter mile resolution	
	Location of substations	Point, GPS coordinate	
Planned 2020 WMP initiative activity per year	Location of 2020 WMP initiative activity for each activity as planned to be completed by the end of each year of the plan term	Line, quarter mile resolution	7.6

TABLE 10: Weather Patterns, Last 5 Years							
Weather measurement	2015	2016	2017	2018	2019	5yr Historical Average	Unit(s)
Red Flag Warning days	6816.99	25733.11	57729.96	45604.06	26532.72	32483.37	RFW circuit mile days per year
Days rated at the top 30% of proprietary fire potential index or similar fire risk index measure	0	18271	56522	38960	27531	28256.8	Circuit mile days where proprietary measure rated above top 30% threshold[1] per year
95th percentile wind conditions	27449.61	30047.93	32220.56	30511.59	31338.92	30313.72	Circuit mile days with wind gusts over 95th percentile historical (meaning the prior 10 years, 2005-2014) conditions per year
99th percentile wind conditions	7788.81	4454.58	10260.31	9995.22	9283.79	8356.54	Circuit mile days with wind gusts over 99th percentile historical (meaning the prior 10 years, 2005-2014) conditions per year

[1] Threshold here defined as top 30% of FPI or equivalent scale (e.g., "Extreme" on SCE's FPI; "extreme", 15 or greater, on SDG&E's FPI; and 4 or above on PG&E's FPI), .

*Notes:
- RFW days were calculated using the number of miles of transmission and distribution lines in the HFTD, multiplied by number of days per zone a RFW was in effect.
- FPI days were calculated using the number of days per SDG&E district with an Extreme FPI, multiplied by the number of HFTD transmission and distribution miles within that district
- Percentile wind conditions were calculated using the measured 95th and 99th percentile winds at SDG&E weather stations.

TABLE 11a Distribution: Key Recent Drivers of Ignition Probability, Last 5 Years																			
Incident type by ignition probability driver		Near misses tracked (y/n)?	Number of Incidents per year						Avg % probability of ignition per incident						Ignition per year caused by driver					
			2015	2016	2017	2018	2019	Average	2015	2016	2017	2018	2019	Average	2015	2016	2017	2018	2019	Average
Contact from object	All types of object contact	Yes	445	498	514	509	538	500.8	4.04%	2.81%	2.92%	2.55%	0.74%	2.56%	18	14	15	13	4	12.8
	Animal contact	Yes	73	79	83	81	98	82.8	0.00%	2.53%	1.20%	1.23%	1.02%	1.21%	0	2	1	1	1	1
	Balloon contact	Yes	70	85	120	112	91	95.6	2.86%	3.53%	4.17%	7.14%	0.00%	3.77%	2	3	5	8	0	3.6
	Veg. contact	Yes	32	52	39	27	50	40	21.88%	7.69%	7.69%	11.11%	0.00%	8.50%	7	4	3	3	0	3.4
	Vehicle contact	Yes	203	198	212	215	222	210	2.96%	2.02%	1.89%	0.00%	1.35%	1.62%	6	4	4	0	3	3.4
	Other	Yes	67	84	60	74	77	72.4	4.48%	1.19%	3.33%	1.35%	0.00%	1.93%	3	1	2	1	0	1.4
All types of equipment / facility failure	All types	Yes	1106	1258	1094	1050	1067	1115	0.63%	0.95%	0.46%	0.57%	0.94%	0.72%	7	12	5	6	10	8
	Capacitor bank failure	Yes	14	7	5	16	10	10.4	0.00%	14.29%	0.00%	0.00%	0.00%	1.92%	0	1	0	0	0	0.2
	Conductor failure - all	Yes	11	15	8	11	16	12.2	27.27%	20.00%	12.50%	0.00%	12.50%	14.75%	3	3	1	0	2	1.8
	Conductor failure - wires down	Yes	31	52	30	39	44	39.2	9.68%	5.77%	3.33%	0.00%	4.55%	4.59%	3	3	1	0	2	1.8
	Fuse failure - all	Yes	552	685	620	539	611	601.4	0.00%	0.00%	0.16%	0.00%	0.16%	0.07%	0	0	1	0	1	0.4
All types of equipment / facility failure	Fuse failure - conventional blown fuse	Yes	528	661	596	515	587	577.4	0.00%	0.00%	0.17%	0.00%	0.17%	0.07%	0	0	1	0	1	0.4
	Lightning arrestor failure	Yes	20	23	27	17	26	22.6	0.00%	8.70%	3.70%	0.00%	0.00%	2.65%	0	2	1	0	0	0.6
	Splice/Clamp/Connector	Yes	35	40	24	35	31	33	5.71%	7.50%	4.17%	0.00%	3.23%	4.24%	2	3	1	0	1	1.4
	Switch failure	Yes	14	21	19	22	15	18.2	7.14%	0.00%	0.00%	4.55%	6.67%	3.30%	1	0	0	1	1	0.6
	Transformer failure	Yes	293	282	257	219	208	251.8	0.34%	0.35%	0.00%	0.46%	0.00%	0.24%	1	1	0	1	0	0.6
Wire-to-wire contact / contamination		Yes	18	16	26	9	9	15.6	0.00%	0.00%	0.00%	11.11%	22.22%	3.85%	0	0	0	1	2	0.6
Vandalism/Theft		Yes	1	1	1	1	1	1	0.00%	100.00%	100.00%	0.00%	0.00%	40.00%	0	1	1	0	0	0.4
Other		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	0	0	1	0.4

TABLE 11b Transmission: Key Recent Drivers of Ignition Probability, Last 5 Years																			
Incident type by ignition probability driver		Near misses tracked (y/n)?	Number of Incidents per year						Avg % probability of ignition per incident						Ignition per year caused by driver					
			2015	2016	2017	2018	2019	Average	2015	2016	2017	2018	2019	Average	2015	2016	2017	2018	2019	Average
Contact from object	All types of object contact	Yes	35	34	34	32	18	30.6	11.43%	2.94%	2.94%	15.63%	5.56%	7.84%	4	1	1	5	1	2.4
	Animal contact	Yes	15	5	7	1	6	6.8	20.00%	0.00%	0.00%	100.00%	0.00%	11.76%	3	0	0	1	0	0.8
	Balloon contact	Yes	17	24	24	26	10	20.2	5.88%	0.00%	4.17%	0.00%	10.00%	2.97%	1	0	1	0	1	0.6
	Veg. contact	Yes	1	1	0	0	0	0.4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
	Vehicle contact	Yes	1	3	1	4	1	2	0.00%	0.00%	0.00%	75.00%	0.00%	30.00%	0	0	0	3	0	0.6
	Other	Yes	1	1	2	1	1	1.2	0.00%	100.00%	0.00%	100.00%	0.00%	33.33%	0	1	0	1	0	0.4
All types of equipment / facility failure	All types	Yes	60	27	22	21	15	29	1.67%	0.00%	0.00%	0.00%	0.00%	0.69%	1	0	0	0	0	0.2
	Capacitor bank failure	Yes	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
	Conductor failure - all	Yes	1	3	3	2	1	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
	Conductor failure - wires down	Yes	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
	Fuse failure - all	Yes	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
All types of equipment / facility failure	Fuse failure - conventional blown fuse	Yes	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
	Lightning arrestor failure	Yes	1	0	0	2	0	0.6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
	Splice/Clamp/Connector	Yes	1	1	0	1	0	0.6	100.00%	0.00%	0.00%	0.00%	0.00%	33.33%	1	0	0	0	0	0.2
	Switch failure	Yes	4	1	1	0	1	1.4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
	Transformer failure	Yes	0	0	0	0	1	0.2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
Wire-to-wire contact / contamination		Yes	41	20	15	12	12	20	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
Vandalism/Theft		Yes	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0	0	0	0	0
Other		N/A	12	2	3	4	0	4.2	0.00%	50.00%	0.00%	0.00%	0.00%	9.52%	0	1	0	0	1	0.4

TABLE 12: Recent Use of PSPS, Last 5 Years							
PSPS characteristic	2015	2016	2017	2018	2019	Unit(s)	Calculations
Frequency of PSPS events (total)	0	0	5	5	4	Number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability, per year	Count of unique PSPS outages (switch plans) per year
Frequency of PSPS events (normalized)	0	0	0.0001	0.0001	0.0001	Number of instances where utility operating protocol requires de-energization of a circuit or portion thereof in order to reduce ignition probability, per RFW circuit mile day per year	1 RFW / # RFW days per year / total OH circuit miles
Scope of PSPS events (total)	0	0	230	295	177	Circuit-events, measured in number of events multiplied by number of circuits de-energized per year	(Number of PSPS events per year) X (sum of # unique circuits per PSPS event)
Scope of PSPS events (normalized)	0	0	0.0020	0.0048	0.0042	Circuit-events, measured in number of events multiplied by number of circuits targeted for de- energization per RFW circuit mile day per year	3 RFW / # RFW days per year / total OH circuit miles
Duration of PSPS events (total)	0	0	744,542	1,061,637	1,325,490	Customer hours per year	Sum of Customer Minutes Interrupted (CMI) / 60
Duration of PSPS events (normalized)	0	0	7	17	30	Customer hours per RFW circuit mile day per year	5 RFW / # RFW days per year / total OH circuit miles

TABLE 13: Current Baseline State of Service Territory and Utility Equipment						
Land use	Characteristic tracked	In non- HFTD	In HFTD Zone 1	In HFTD Tier 2	In HFTD Tier 3	Comments
Service Territory	Circuit miles	11203		4047	2067	Tracking is not completed by rural/highly rural
	Circuit miles in WUI	6542		0	0	
	Number of critical facilities	8717		1268	515	
	Number of critical facilities in WUI	4409		0	0	
	Number of customers	1,287,181		172896	31181	Number of Meters
	Number of customers in WUI	619,466		0	0	
	Number of customers belonging to access and functional needs populations	47,263		7771	1939	Errata: HFTD Tier 2 and HFTD Tier 3 amounts were swapped in SDG&E's 02/07/2020 submittal. To clarify, the data provided for AFN populations encompasses SDG&E's medical baseline customer accounts
	Number of customers belonging to access and functional needs populations in WUI	27,079		0	0	
	Circuit miles of overhead transmission lines	1308		794	308	
	Circuit miles of overhead transmission lines in WUI	470		0	0	
	Circuit miles of overhead distribution lines	3002		1828	1658	
	Circuit miles of overhead distribution lines in WUI	1308		0	0	
	Number of substations	155		42	13	
	Number of substations in WUI	64		0	0	
In rural areas	Circuit miles					
	Circuit miles in WUI					
	Number of critical facilities					
	Number of critical facilities in WUI					
	Number of customers					
	Number of customers in WUI					
	Number of customers belonging to access and functional needs populations					
	Number of customers belonging to access and functional needs populations in WUI					
	Circuit miles of overhead transmission lines					
	Circuit miles of overhead transmission lines in WUI					
	Circuit miles of overhead distribution lines					
	Circuit miles of overhead distribution lines in WUI					
	Number of substations					

TABLE 13: Current Baseline State of Service Territory and Utility Equipment						
Land use	Characteristic tracked	In non- HFTD	In HFTD Zone 1	In HFTD Tier 2	In HFTD Tier 3	Comments
In highly rural areas	Circuit miles					
	Circuit miles in WUI					
	Number of critical facilities					
	Number of critical facilities in WUI					
	Number of customers					
	Number of customers in WUI					
	Number of customers belonging to access and functional needs populations					
	Number of customers belonging to access and functional needs populations in WUI					
	Circuit miles of overhead transmission lines					
	Circuit miles of overhead transmission lines in WUI					
	Circuit miles of overhead distribution lines					
	Circuit miles of overhead distribution lines in WUI					
	Number of substations					
	Number of substations in WUI					

TABLE 14: Summary Data on Weather Station Count			
Weather station count type	Current Count	Unit(s)	Comments
Number of weather stations (total)	191	Total number located in service territory and operated by utility	
Number of weather stations (normalized)	0.023	Total number located in service territory and operated by utility, divided by total number of circuit miles in utility service territory	Used OH circuit miles - T&D 8336 miles
Number of weather stations in non- HFTD (total)	25	Total number located in non-HFTD service territory and operated by utility	
Number of weather stations in non-HFTD (normalized)	0.007	Total number located in non-HFTD service territory and operated by utility, divided by total number of circuit miles in non-HFTD service territory	Used OH circuit miles - T&D 3834 miles
Number of weather stations in HFTD Zone 1 (total)		Total number located in HFTD Zone 1 service territory and operated by utility	
Number of weather stations in HFTD Zone 1 (normalized)		Total number located in HFTD Zone 1 service territory and operated by utility, divided by total number of circuit miles in HFTD Zone 1 service territory	
Number of weather stations in HFTD Tier 2 (total)	64	Total number located in HFTD Tier 2 service territory and operated by utility	
Number of weather stations in HFTD Tier 2 (normalized)	0.025	Total number located in HFTD Tier 2 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 2 service territory	Used OH circuit miles - T&D - 2550 miles
Number of weather stations in HFTD Tier 3 (total)	102	Total number located in HFTD Tier 3 service territory and operated by utility	
Number of weather stations in HFTD Tier 3 (normalized)	0.052	Total number located in HFTD Tier 3 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 3 service territory	Used OH circuit miles - T&D - 1952 miles

TABLE 15: Summary Data on Fault Indicator Count			
Fault indicator count type	**Current Count**	**Unit(s)**	**Comments**
Number of fault indicators (total)	4735	Total number located in service territory and operated by utility	
Number of fault indicators (normalized)	0.275	Total number located in service territory and operated by utility, divided by total number of circuit miles in utility service territory	
Number of fault indicators in non-HFTD (total)	3817	Total number located in non-HFTD service territory and operated by utility	
Number of fault indicators in non-HFTD (normalized)	0.344	Total number located in non-HFTD service territory and operated by utility, divided by total number of circuit miles in non-HFTD service territory	
Number of fault indicators in HFTD Zone 1 (total)		Total number located in HFTD Zone 1 service territory and operated by utility	
Number of fault indicators in HFTD Zone 1 (normalized)		Total number located in HFTD Zone 1 service territory and operated by utility, divided by total number of circuit miles in HFTD Zone 1 service territory	
Number of fault indicators in HFTD Tier 2 (total)	648	Total number located in HFTD Tier 2 service territory and operated by utility	
Number of fault indicators in HFTD Tier 2 (normalized)	0.16	Total number located in HFTD Tier 2 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 2 service territory	
Number of fault indicators in HFTD Tier 3 (total)	270	Total number located in HFTD Tier 3 service territory and operated by utility	
Number of fault indicators in HFTD Tier 3 (normalized)	0.13	Total number located in HFTD Tier 3 service territory and operated by utility, divided by total number of circuit miles in HFTD Tier 3 service territory	

TABLE 16: Location of Planned Utility Equipment Additions or Removal By End of 3-Year Plan Term					
Land use	Characteristic tracked	Changes by end-2022			
		In non-HFTD	In HFTD Zone 1	In HFTD Tier 2	In HFTD Tier 3
N/A	Circuit miles of overhead transmission lines	0		59.1	36
	Circuit miles of overhead distribution lines	16.5		116.1	242.4
	Circuit miles of overhead transmission lines in WUI	0		0	0
	Circuit miles of overhead distribution lines in WUI	16.5		0	0
	Number of substations	0		0	0
	Number of substations in WUI	0		0	0
	Number of weather stations	59		64	102
	Number of weather stations in WUI	59		0	0
In rural areas	Circuit miles of overhead transmission lines				
	Circuit miles of overhead distribution lines				
	Circuit miles of overhead transmission lines in WUI				
	Circuit miles of overhead distribution lines in WUI				
	Number of substations				
	Number of substations in WUI				
	Number of weather stations				
	Number of weather stations in WUI				
In highly rural areas	Circuit miles of overhead transmission lines				
	Circuit miles of overhead distribution lines				
	Circuit miles of overhead transmission lines in WUI				
	Circuit miles of overhead distribution lines in WUI				
	Number of substations				
	Number of substations in WUI				
	Number of weather stations				
	Number of weather stations in WUI				

Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.

TABLE 17: Location of Planned Utility Infrastructure Upgrades													
Land use	Characteristic tracked	In non-HFTD			In HFTD Zone 1			In HFTD Tier 2			In HFTD Tier 3		
		2020	2021	2022	2020	2021	2022	2020	2021	2022	2020	2021	2022
Total circuit miles planned for hardening each year, all types and locations		5.5	5.5	5.5				72.5	54.9	47.8	162	66	50.4
Total number of substations planned for hardening each year, all locations		0	0	0				0	0	0	0	0	0
In urban areas	Circuit miles planned for grid hardening of overhead transmission lines	0	0	0				21.5	23.4	14.2	29	7	0
	Circuit miles of overhead transmission lines in WUI to harden	0	0	0				0	0	0	0	0	0
	Circuit miles of overhead distribution lines to harden	5.5	5.5	5.5				51	31.5	33.6	133	59	50.4
	Circuit miles of overhead distribution lines in WUI to harden	5.5	5.5	5.5				0	0	0	0	0	0
	Circuit miles of overhead transmission lines in WUI to harden	0	0	0				0	0	0	0	0	0
	Number of substations to harden	0	0	0				0	0	0	0	0	0
	Number of substations in WUI to harden	0	0	0				0	0	0	0	0	0
In rural areas	Circuit miles of overhead transmission lines to harden												
	Circuit miles of overhead transmission lines in WUI to harden												
	Circuit miles of overhead distribution lines to harden												
	Circuit miles of overhead distribution lines in WUI to harden												
	Circuit miles of overhead transmission lines in WUI to harden												
	Number of substations to harden												
	Number of substations in WUI to harden												
In highly rural areas	Circuit miles of overhead transmission lines to harden												
	Circuit miles of overhead transmission lines in WUI to harden												
	Circuit miles of overhead distribution lines to harden												
	Circuit miles of overhead distribution lines in WUI to harden												
	Circuit miles of overhead transmission lines in WUI to harden												
	Number of substations to harden												
	Number of substations in WUI to harden												
Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.													

TABLE 18a Distribution: Key Drivers of Ignition Probability								
Ignition probability drivers		Number of incidents per year (according to 5-year historical average)	Average likelihood of ignition per incident	Ignitions from this driver (according to 5-year historical average)				
				Total	In non-HFTD	In HFTD Zone 1	In HFTD Tier 2	In HFTD Tier 3
Contact from object	All types of object contact	503.4	2.54%	12.8	5.80		4.20	2.80
	Animal contact	83.8	1.19%	1	0.40		0.40	0.20
	Balloon contact	96.2	3.74%	3.6	2.20		0.60	0.80
	Vegetation contact	40	8.50%	3.4	1.40		1.00	1.00
	Vehicle contact	210.8	1.61%	3.4	1.20		1.60	0.60
	Other	72.6	1.93%	1.4	0.60		0.60	0.20
All types of equipment / facility failure	All types	1116.4	0.72%	8.0	3.00		2.40	2.60
	Capacitor bank failure	10.4	1.92%	0.2	0.00		0.20	0.00
	Conductor failure— all	40.8	4.41%	1.8	0.60		0.60	0.60
	Conductor failure— wires down	39.6	4.55%	1.8	0.60		0.60	0.60
	Fuse failure—all	18.2	2.20%	0.4	0.20		0.00	0.20
	Fuse failure—conventional blown fuse	577.4	0.07%	0.4	0.20		0.00	0.20
	Lightning arrestor failure	22.8	2.63%	0.6	0.00		0.20	0.40
	Splice/Clamp/Connector Failure	33.2	4.22%	1.4	0.80		0.20	0.40
	Switch failure	19	3.16%	0.6	0.00		0.40	0.20
	Transformer failure	251.8	0.32%	0.8	0.20		0.20	0.40
Wire-to-wire contact / contamination		15.6	3.85%	0.6	0.40		0.20	0.00
Other		NA	NA	0.4	0.40		0.00	0.00

*Note: In SDG&E's Territory Zone 1 falls within Tiers 2 and 3. To avoid double counting all fires have been grouped into Tiers 2 and 3

TABLE 18b Transmission: Key Drivers of Ignition Probability								
Ignition probability drivers		Number of incidents per year (according to 5-year historical average)	Average likelihood of ignition per incident	Ignitions from this driver (according to 5-year historical average)				
				Total	In non-HFTD	In HFTD Zone 1	In HFTD Tier 2	In HFTD Tier 3
Contact from object	All types of object contact	30.6	7.84%	2.4	1.20		1.60	0.20
	Animal contact	6.8	11.76%	0.8	0.40		0.40	0.00
	Balloon contact	20.2	2.97%	0.6	0.20		0.40	0.00
	Vegetation contact	0.4	0.00%	0	0.00		0.00	0.00
	Vehicle contact	2	30.00%	0.6	0.40		0.00	0.20
	Other	1.2	33.33%	0.4	0.00		0.40	0.00
All types of equipment / facility failure	All types	29	0.69%	0.2	0.00		0.00	0.00
	Capacitor bank failure	0	0.00%	0	0.00		0.00	0.00
	Conductor failure— all	2	0.00%	0	0.00		0.00	0.00
	Conductor failure— wires down	0	0.00%	0	0.00		0.00	0.00
	Fuse failure—all	0	0.00%	0	0.00		0.00	0.00
	Fuse failure—conventional blown fuse	0	0.00%	0	0.00		0.00	0.00
	Lightning arrestor failure	0.6	0.00%	0	0.00		0.00	0.00
	Splice/Clamp/Connector Failure	0.6	33.33%	0.2	0.00		0.20	0.00
	Switch failure	1.4	0.00%	0	0.00		0.00	0.00
	Transformer failure	0.2	0.00%	0	0.00		0.00	0.00
Wire-to-wire contact / contamination		20	0.00%	0	0.00		0.00	0.00
Other		4.2	9.52%	0.4	0.20		0.20	0.00

TABLE 19: Macro Trends Impacting Ignition Probability and/or Wildfire Consequence		
Rank	Macro trends impacting utility ignited ignition probability and estimated wildfire consequence by year 10	Comments
1	Change in ignition probability and estimated wildfire consequence due to climate change	Climate change is already affecting California and San Diego County, and is driving higher wildfire risk for many reasons. Extended droughts
3	Change in ignition probability and estimated wildfire consequence due to relevant invasive species, such as bark beetles	Invasive species such as the bark beetle are not as much of a concern in the San Diego region, but eucalyptus trees and some grasses can be considered invasive and drive vegetation risk for wildfires.
2	Change in ignition probability and estimated wildfire consequence due to other drivers of change in fuel density and moisture	Fuel density and fuel changes as a result of climate change need more research, however fuel moisture will be an issue as lower relative humidity and drought as a result of climate change will created fuels that are at much higher risk of catastrophic fire
8	Population changes (including Access and Functional Needs population) that could be impacted by utility ignition	AFN populations are a very high priority for SDG&E and there are many programs in place that build their resilience and wildfire safety. AFN population vulnerability remains a high priority, but is better addressed at this time than these other risks.
7	Population changes in HFTD that could be impacted by utility ignition	There are two potential impacts of higher population in HFTDs. One impact is that more people will be living in areas with high-wildfire threat, but on the other hand, there is the potential of more urbanization, thus reducing the amount of people living in the WUI.
6	Population changes in WUI that could be impacted by utility ignition	More people moving to WUI increases ignition probability because there is more infrastructure as well as more people in direct course of wildfire. This trend is changing the most quickly relative to others and thus will be the most important looking just ten years out.
5	Utility infrastructure location in HFTD vs non-HFTD	The infrastructure in the HFTD vs. non-HFTD is a area of focus for SDG&E and there are major projects hardening infrastructure in HFTD's.
4	Utility infrastructure location in urban vs rural vs highly rural areas	There are WUI areas in San Diego that are not included as a part of the HFTDs that can be prone to wildfire and thus SDG&E infrastructure in these areas are targeted for risk mitigation.
*NOTE: Comment on difference in approach to serving customers in urban versus rural versus highly rural areas.		

TABLE 20: Anticipated Characteristics of PSPS Use Over the Next 10 Years			
Rank order 1-9	PSPS characteristic	Significantly increase; increase; no change; decrease; significantly decrease	Comments
1	Number of customers affected by PSPS events (total)	Significantly Decrease	
2	Number of customers affected by PSPS events (normalized by fire weather, e.g., Red Flag Warning line mile days)	Significantly Decrease	
7	Frequency of PSPS events in number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability (total)	Decrease	
8	Frequency of PSPS events in number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	
5	Scope of PSPS events in circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization (total)	Decrease	
6	Scope of PSPS events in circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	
3	Duration of PSPS events in customer hours (total)	Decrease	
4	Duration of PSPS events in customer hours (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	

TABLE 21: Risk Assessment and Mapping Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Wildfire Risk Reduction Model	2019 plan	$300	$500	NA	NA	$0.023	NA	This control was grouped with Public Safety Risk Reduction during high wildfire conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$270		NA	NA	$0.008	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$1,120	$1,680	NA	NA	$0.081	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$1,440	$2,160	NA	NA	$0.104	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$1,760	$2,640	NA	NA	$0.127	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$4,320	$6,480	NA	NA	$0.313	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
High Performance Computing Infrastructure	2019 plan	NA	NA	NA	NA	NA	NA	This control was grouped with Public Safety Risk Reduction during high wildfire conditions for purposes of RSE calculations		NA	New	NA	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA	NA	NA	NA			NA	New	NA	NA	Meets and exceeds	P.U. Code § 451	
	2020	0	0	NA	NA	$0.000	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	0	0	NA	NA	$0.000	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$7,500	$9,500	NA	NA	$0.492	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$7,500	$9,500	NA	NA	$0.492	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	

TABLE 22: Situational Awareness and Forecasting Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Camera Networks and Advanced Weather Station Integration	2019 plan	*	*	NA	NA	NA	Increased response speed to ignitions	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	*2019 WMP plan costs were combined with Fire Science and Climate Adaptation.
	2019 actual	$559		NA		$0.032				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$700	$850	NA	NA	$0.045				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$700	$850	NA	NA	$0.045				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$700	$850	NA	NA	$0.045				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$2,100	$2,550	NA	NA	$0.135				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Wireless Fault Indicators	2019 plan	$480	$720	NA	NA	$0.035	Mitigates customer impacts of sensitive settings	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$797		NA		$0.023		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$570	$690	NA	NA	$0.036		0%	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$570	$690	NA	NA	$0.036		0%	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$0	$0	NA	NA	$0.000		0%	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$1,140	$1,380	NA	NA	$0.073		0%	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 22: Situational Awareness and Forecasting Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Fire Science and Climate Adaptation Department (O&M)	2019 plan	$1,600	$2,400	NA	NA	$0.116	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$862		NA		$0.025	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$2,000	$3,000	NA	NA	$0.145	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$2,000	$3,000	NA	NA	$0.145	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$2,000	$3,000	NA	NA	$0.145	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$6,000	$9,000	NA	NA	$0.434	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Fire Science and Climate Adaptation Department (Capital)	2019 plan	NA	NA	NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$3,600	$5,400	NA	NA	$0.260	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$0	$0	NA	NA	$0.000	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$0	$0	NA	NA	$0.000	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$3,600	$5,400	NA	NA	$0.260	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 22: Situational Awareness and Forecasting Initiatives																	
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Situational Awareness Dashboard (Capital)	2019 plan	NA	NA	NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	NA	NA	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA	NA			NA	NA	NA	NA	Meets and exceeds	P.U. Code § 451	
	2020	$1,900	$2,300	NA	NA	$0.122	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$1,900	$2,300	NA	NA	$0.122	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$1,900	$2,300	NA	NA	$0.122	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$5,700	$6,900	NA	NA	$0.365	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
Situational Awareness Dashboard (O&M)	2019 plan	NA	NA	NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	NA	NA	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA	NA			NA	NA	NA	NA	Meets and exceeds	P.U. Code § 451	
	2020	$285	$345	NA	NA	$0.018	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$285	$345	NA	NA	$0.018	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$285	$345	NA	NA	$0.018	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$855	$1,035	NA	NA	$0.055	NA			NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	

TABLE 22: Situational Awareness and Forecasting Initiatives																	
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Operating Conditions	2019 plan	Base	Base	NA	NA	NA	Crew and all ignition probability from faults	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
NMS Situational Awareness Upgrades	2019 plan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA	NA	NA	NA	NA	NA	NA	NA	Meets and exceeds	P.U. Code § 451	
	2020	$475	$575	NA	NA	$0.030	NA	0%	0	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$475	$575	NA	NA	$0.030	NA	0%	0	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$475	$575	NA	NA	$0.030	NA	0%	0	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$1,425	$1,725	NA	NA	$0.091	NA	0%	0	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	

TABLE 22A: Situational Awareness and Forecasting Initiatives			
Initiative Activity	Year	Weather Stations Installed	
		Low	High
Camera Networks and Advanced Weather Station Integration	2019 Plan	11	15
	2019 Actual	13	
	2020	18	22
	2021	18	22
	2022	18	22
	2020-20222 Plan Totals	54	66
Initiative Activity	Year	Wireless Fault Indicators Installed	
		Low	High
Wireless Fault Indicators	2019 plan	450	550
	2019 actual	594	
	2020	450	550
	2021	450	550
	2022	0	0
	2020-2022 Plan Total	900	1100

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
SCADA Capacitor Program	2019 plan	NA	NA	NA	NA	NA	Equipment failure, capacitor	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$1,425	$1,725	NA	NA	$0.091		0.26%	140.4	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$1,425	$1,725	NA	NA	$0.091		0.02%	10.4	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$1,805	$2,185	NA	NA	$0.115		0.02%	10.1	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$4,655	$5,635	NA	NA	$0.298		0.30%	48.8	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Advanced Protection	2019 plan	$2,400	$3,600	NA	NA	$0.174	Reduces % chance fault becomes an ignition	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$3,400		NA	NA	$0.197		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$4,800	$5,800	NA	NA	$0.307		1.68%	24.8	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$8,200	$10,000	NA	NA	$0.527		1.85%	24.8	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$8,200	$10,000	NA	NA	$0.527		2.30%	24.8	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$21,200	$25,800	NA	NA	$1.360		5.83%	24.8	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Distribution Overhead Fire Hardening (OH)	2019 plan	$65,700	$85,100	112.8	146.7	$581	Equipment Failure All	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$120,611		122.9		$981		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$69,600	$104,400	81.6	122.4	$853		1.23%	22.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$9,600	$14,400	11.2	16.8	$857		0.21%	22.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$5,760	$8,640	6.7	10.1	$857		0.14%	22.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$84,960	$127,440	99.5	149.3	$854		1.58%	22.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Distribution Overhead Fire Hardening (Covered Conductor)	2019 plan	0	0	0	0	0	Equipment Failure All, Foreign Object in Line, all but large vegetation, vehicle contacts	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	0		0		NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$857	$1,285	0.8	1.2	$1,071		0.05%	20.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$8,640	$12,960	8	12	$1,080		0.20%	20.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$8,640	$12,960	8	12	$1,080		0.18%	20.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$18,137	$27,205	16.8	25.2	$1,080		0.42%	20.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Pole Replacement and Reinforcement	2019 plan	$10,600	$16,000	NA	NA	$0.770	Equipment failure, all except for wires	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$11,705		NA		$0.339		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$9,561	$11,575	NA	NA	$0.612		1.2%	24.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$9,561	$11,575	NA	NA	$0.612		1.1%	24.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$9,561	$11,575	NA	NA	$0.612		0.9%	24.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$28,683	$34,725	NA	NA	$1.835		3.1%	24.7	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Expulsion Fuse Replacement Program	2019 plan	$7,800	$11,600	NA	NA	$0.561	Fuse Operation	NA	NA	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$3,716		NA		$0.108		NA	NA	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020	$2,990	$4,484	NA	NA	$0.216		0.24%	107.7	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$3,986	$5,980	NA	NA	$0.288		0.08%	24.5	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$1,522	$2,284	NA	NA	$0.110		0.03%	23.9	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$8,498	$12,748	NA	NA	$0.615		0.35%	53.0	NA	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
PSPS Enhancements - Sectionalizing Devices	2019 plan	$400	$700	NA	NA	$0.032	PSPS impacts	NA	NA	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$1,303		NA	NA	$0.038		NA	NA	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020	$400	$700	NA	NA	$0.032		0	0	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$400	$700	NA	NA	$0.032		0	0	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$400	$700	NA	NA	$0.032		0	0	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$1,200	$2,100	NA	NA	$0.096		0	0	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
Hotline Clamp Replacement Program	2019 plan	$1,200	$1,800	NA	NA	$0.087	Equipment failure, Wire Down	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$922		NA		$0.027		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$2,400	$3,600	NA	NA	$0.174		0.12%	65.9	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$2,400	$3,600	NA	NA	$0.174		0.12%	64.0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$2,400	$3,600	NA	NA	$0.174		0.02%	8.2	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$7,200	$10,800	NA	NA	$0.521		0.25%	46.0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Microgrids	2019 plan	$2,400	$3,600	NA	NA	$0.174	PSPS impacts	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$188		NA	NA	$0.005		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$10,260	$12,420	NA	NA	$0.656		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$7,600	$9,200	NA	NA	$0.486		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$7,600	$9,200	NA	NA	$0.486		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$25,460	$30,820	NA	NA	$1.629		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Customer Resilliancy Programs	2019 plan	$500	$900	NA	NA	$0.041	PSPS impacts	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$1,458		NA	NA	$0.042				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$4,950	$5,470	NA	NA	$0.302				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$5,472	$6,472	NA	NA	$0.346				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$7,530	$8,730	NA	NA	$0.471				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$17,952	$20,672	NA	NA	$1.118				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Generator Grant Program - Expanded	2019 plan	NA	NA	NA	NA	NA	PSPS impacts	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA	NA	NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$200	$300	NA	NA	$0.014		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$200	$300	NA	NA	$0.014		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$200	$300	NA	NA	$0.014		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$600	$900	NA	NA	$0.043		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Whole Home Generators	2019 plan	NA	NA	NA	NA	NA	PSPS impacts	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	Errata: whole home generator cost forecast was incorrect in SDG&E's 02/07/2020 submittal
	2019 actual	NA		NA	NA	NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$2,400	$3,600	NA	NA	$0.174		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$2,400	$3,600	NA	NA	$0.174		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$2,400	$3,600	NA	NA	$0.174		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$7,200	$10,800	NA	NA	$0.521		0	0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Undergrounding of Electric Lines and/or Equipment	2019 plan	$1,200	$1,800	1.2	1.8	$1,000	All equipment failure and foreign object in lines	NA	NA	Reliability	Existing	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$4,727		2.6		$1,818.08		NA	NA	Reliability	Existing	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020	$24,800	$37,200	8	12	$3,100		0.46%	21.6	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$125,600	$188,400	40	60	$3,140		2.15%	21.6	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$150,400	$225,600	48	72	$3,133		2.57%	21.6	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$300,800	$451,200	96	144	$3,133		5.18%	21.6	Reliability	New	NA	FRMMA	Meets and exceeds	P.U. Code § 451	
Overhead Transmission and Distribution Fire Hardening (Transmission OH)	2019 plan	FERC	FERC	6	8	NA	Equipment Failure All	NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2019 actual	FERC		7		NA		NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2020	FERC	FERC	17.1	21.4	NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2021	FERC	FERC	21.2	27.6	NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2022	FERC	FERC	16.4	20.5	NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2020-2022 Plan Total	FERC	FERC	54.7	69.5	NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	

TABLE 23: Grid Design and System Hardening Initiatives																	
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Overhead Transmission and Distribution Fire Hardening (Transmission UG)	2019 plan	FERC	FERC	2	4	NA	All equipment failure and foreign object in lines	NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2019 actual	FERC		3		NA		NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2020	FERC	FERC	0.0	0.0	NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2021	FERC	FERC	4.8	7.2	NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2022	FERC	FERC			NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
	2020-2022 Plan Total	FERC	FERC	4.8	7.2	NA		NA FERC	NA FERC	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	G.O. 95	
Overhead Transmission and Distribution Fire Hardening (Distribution Underbuilt)	2019 plan	$4,400	$6,600	8	12	NA	Equipment Failure All	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	G.O. 95	
	2019 actual	$2,964		10		NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	G.O. 95	
	2020	$5,219	$6,523	10.9	13.6	$479		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	G.O. 95	
	2021	$12,236	$15,294	19.4	24.2	$631		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	G.O. 95	
	2022	$5,396	$6,744	7.0	8.8	$768		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	G.O. 95	
	2020-2022 Plan Total	$22,851	$28,561	37.3	46.6	$613		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	G.O. 95	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
CNF Fire Hardening (Transmission OH)	2019 plan	FERC	FERC	25	31	NA	Equipment Failure All	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	FERC		25		NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	FERC	FERC	23.2	34.8	NA		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	FERC	FERC	0	0	NA		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	FERC	FERC	0	0	NA		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	FERC	FERC	23.2	34.8	NA		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
CNF Fire Hardening (Distribution OH Associated with Transmission)	2019 plan	$47,700	$58,300	20	24	$2,409	Equipment Failure All	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$12,793		26.4		$485		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$14,000	$21,000	20	30	$660		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$0	$0	0	0	$0		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$0	$0	0	0	$0		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$14,000	$21,000	20	30	$700		NA FERC	NA FERC	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
CNF Fire Hardening (Distribution OH)	2019 plan	$47,700	$58,300	20	24	$2,409	Equipment Failure All	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$28,190		26.4		$1,068		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$14,000	$21,000	20	30	$661		1.07%	24.2	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$8,570	$10,570	0.0	2.0	$9,570		0.03%	24.2	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$0	$0	0	0	$0		0.00%	0.0	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$22,570	$31,570	20.0	32.0	$1,041		1.10%	24.2	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
CNF Fire Hardening (Distribution UG)	2019 plan	NA		15	19	NA	All equipment failure and foreign object in lines	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$27,664		8.7		NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$24,000	$36,000	11.2	16.8	$2,143		See CNF OH	See CNF OH	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$0	$1,860	0	1	$1,860		See CNF OH	See CNF OH	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$0	$0	0	0	NA		See CNF OH	See CNF OH	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$24,000	$37,860	11.2	17.8	$2,133		See CNF OH	See CNF OH	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 23: Grid Design and System Hardening Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Lightning Arrestor Replacement Program	2019 plan	NA	NA	NA	NA	NA	NA	NA	NA	NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA	NA	NA	NA	NA	NA	NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020	$0	$0	NA	NA	$0.000	NA	0	0	NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$950	$1,150	NA	NA	$0.061	NA	0.6%	259.7	NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$1,900	$2,300	NA	NA	$0.122	NA	0.6%	259.7	NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$2,850	$3,450	NA	NA	$0.182	NA	0.6%	259.7	NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
LTE Communication Network	2019 plan	$8,800	$13,200	NA	NA	$0.637	NA	This was grouped with Advanced Protection for the purposes of RSE calculation		NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$7,086		NA	NA	$0.205	NA			NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020	$25,200	$37,800	NA	NA	$1.823	NA			NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2021	$25,200	$37,800	NA	NA	$1.823	NA			NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2022	$33,200	$49,800	NA	NA	$2.402	NA			NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$83,600	$125,400	NA	NA	$6.049	NA			NA	Existing	TY 2019 GRC	FRMMA	Meets and exceeds	P.U. Code § 451	

TABLE 23A: Grid Design and System Hardening Initiatives					
Initiative Activity	Year	SCADA Caps installed			
		Low	High		
SCADA Capacitor Program	2019 Plan	NA	NA		
	2019 Actual	NA			
	2020	27	33		
	2021	27	33		
	2022	34	42		
	2020-20222 Plan Totals	88	108		
Initiative Activity	Year	Circuits Enabled		Substations Enabled	
		Low	High	Low	High
Advanced Protection	2019 Plan	6	10	New Metric for post-2019 work	
	2019 Actual	8			
	2020	6	10	4	8
	2021	7	11	6	10
	2022	12	18	4	8
	2020-20222 Plan Totals	25	39	14	26

TABLE 23A: Grid Design and System Hardening Initiatives

OH Hardening 2019 Program Summary		Total per initiative spend		Line Miles to be treated	
		Low	High	Low	High
2019 Plan	FiRM	$49,500	$60,500	81	99
	PRiME	$14,400	$21,600	27.8	41.7
	WiSE	$1,800	$3,000	4	6
	Total	$65,700	$85,100	112.8	146.7
2019 Actual	FiRM	$89,300		83	
	PRiME	$30,880		34.2	
	WiSE	$4,698		5.7	
	Total	$124,878		122.9	

Initiative Activity	Year	Poles Replaced	
		Low	High
Pole Replacement and Reinforcement	2019 Plan	659	1023
	2019 Actual	725	
	2020	600	740
	2021	600	740
	2022	600	740
	2020-20222 Plan Totals	1800	2220

TABLE 23A: Grid Design and System Hardening Initiatives			
Initiative Activity	Year	Total Fuses Replaced	
		Low	High
Expulsion Fuse Replacement Program	2019 Plan	1800	2700
	2019 Actual	2490	
	2020	2400	3600
	2021	3200	4800
	2022	1228	1842
	2020-20222 Plan Totals	6828	10242
Initiative Activity	Year	Sectionalizing Devices Installed	
		Low	High
PSPS Enhancements - Sectionalizing Devices	2019 Plan	6	8
	2019 Actual	7	
	2020	8	12
	2021	8	12
	2022	8	12
	2020-20222 Plan Totals	24	36

TABLE 23A: Grid Design and System Hardening Initiatives

Initiative Activity	Year	Total Hot Line Clamps Replaced	
		Low	High
Hot Line Clamp Replacement Program	2019 Plan	400	600
	2019 Actual	660	
	2020	1320	1980
	2021	1320	1980
	2022	1320	1980
	2020-20222 Plan Totals	3960	5940

Initiative Activity	Year	Micro Grids Installed		Comments
		Low	High	
Micro Grids	2019 Plan	0	1	*Substantial progress was made on the Cameron Quarters Micro Grid Project, it will be completed in 2020.
	2019 Actual	*0		
	2020	2	4	
	2021	2	4	
	2022	0	2	
	2020-20222 Plan Totals	4	10	

Initiative Activity	Year	Generators Provided		Community Resource Centers		Community and Critical Infrastructure Generator Lease	
		Low	High	Low	High	Low	High
Customer Resilliancy Programs	2019 Plan	50	80	8	11	NA	NA
	2019 Actual	65		8		NA	
	2020	1000	1500	8	10	3	5
	2021	1200	1800	10	12	3	5
	2022	1600	2160	10	14	3	5
	2020-20222 Plan Totals	3800	5460	28	36	9	15

TABLE 23A: Grid Design and System Hardening Initiatives			
Initiative Activity	Year	Generators Provided	
		Low	High
Generator Grant Program Expanded	2019 Plan	NA	NA
	2019 Actual	NA	
	2020	104	156
	2021	104	156
	2022	104	156
	2020-20222 Plan Totals	312	468
Initiative Activity	Year	Generators Provided	
		Low	High
Whole House Generators	2019 Plan	NA	NA
	2019 Actual	NA	
	2020	240	360
	2021	240	360
	2022	240	360
	2020-20222 Plan Totals	720	1080

TABLE 23A: Grid Design and System Hardening Initiatives			
Initiative Activity	Year	Lightning Arrestors Replaced	
		Low	High
Lightning Arrestor Replacement Program	2019 Plan	NA	NA
	2019 Actual	NA	
	2020	0	0
	2021	836	1012
	2022	1672	2024
	2020-20222 Plan Totals	2508	3036
Initiative Activity	Year	Base Stations Installed	
		Low	High
LTE Communication Network	2019 Plan	NA	
	2019 Actual		
	2020	20	30
	2021	52	78
	2022	68	102
	2020-20222 Plan Totals	140	210

TABLE 24: Asset Management and Inspections Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
SDG&E Corrective Maintenance Program (HFTD)	2019 plan	Base	Base	NA	NA	NA	All equipment failure related (less hot connections)	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets	GO165	*SDG&E's corrective maintenance program inspection costs were not broken out in the previous WMP. SDG&E plans to track inspection costs within the HFTD going forward.
	2019 actual	*Base		NA		NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets	GO165	
	2020	$1,242	$1,862	NA	NA	$0.090		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets	GO165	
	2021	$1,010	$1,514	NA	NA	$0.073		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets	GO165	
	2022	$506	$758	NA	NA	$0.037		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets	GO165	
	2020-2022 Plan Total	$2,757	$4,135	NA	NA	$0.199		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets	GO165	
Transmission System Inspections	2019 plan	FERC	FERC	NA	NA	NA	All equipment failure	NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds	California Public Resources Code (PRC) §§ 4292 and 4293, as well as GO 95 and GO 128 rules.	
	2019 actual	FERC		NA	NA	NA		NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds		
	2020	FERC	FERC	NA	NA	NA		NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds		
	2021	FERC	FERC	NA	NA	NA		NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds		
	2022	FERC	FERC	NA	NA	NA		NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds		
	2020-2022 Plan Total	FERC	FERC	NA	NA	NA		NA	NA	Reliability	Existing	FERC TO5Filing	NA	Meets and exceeds		

TABLE 24: Asset Management and Inspections Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Infrared Corona	2019 plan	NA	NA	NA	NA	NA	Hot Connection Equipment Failure	*		Reliability	NA	NA	FRMMA	Exceeds	GO165	*RSE values for SDG&E's enhanced inspection programs were grouped in the November RAMP filing
	2019 actual	$98		NA		NA				Reliability	NA	NA	FRMMA	Exceeds	GO165	
	2020	$221	$268	NA	NA	$0.014				Reliability	New	NA	FRMMA	Exceeds	GO165	
	2021	$221	$268	NA	NA	$0.014				Reliability	New	NA	FRMMA	Exceeds	GO165	
	2022	$221	$268	NA	NA	$0.014				Reliability	New	NA	FRMMA	Exceeds	GO165	
	2020-2022 Plan Total	$663	$804	NA	NA	$0.042				Reliability	New	NA	FRMMA	Exceeds	GO165	
HFTD Tier 3 Inspections	2019 plan	*Base	Base	NA	NA	NA	All equipment failure related (less hot connections)	*		Reliability	Existing	TY 2019 GRC	NA	Exceeds	GO165	*RSE values for SDG&E's enhanced inspection programs were grouped in the November RAMP filing
	2019 actual	Base		NA	NA	NA				Reliability	Existing	TY 2019 GRC	NA	Exceeds	GO165	
	2020	$333	$403	NA	NA	$0.021				Reliability	Existing	TY 2019 GRC	NA	Exceeds	GO165	
	2021	$333	$403	NA	NA	$0.021				Reliability	Existing	TY 2019 GRC	NA	Exceeds	GO165	
	2022	$333	$403	NA	NA	$0.021				Reliability	Existing	TY 2019 GRC	NA	Exceeds	GO165	
	2020-2022 Plan Total	$999	$1,209	NA	NA	$0.064				Reliability	Existing	TY 2019 GRC	NA	Exceeds	GO165	
Drone Inspections (capital)	2019 plan	NA	NA	NA	NA	NA	All equipment failure related (less hot connections)	*		Reliability	NA	NA	NA	Meets and exceeds	GO 165, GO 95	*RSE values for SDG&E's enhanced inspection programs were grouped in the November RAMP filing, RSE value is listed in Pole Replacement and Reinforcement
	2019 actual	NA		NA		NA				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2020	$2,880	$4,320	NA	NA	$0.208				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2021	$1,944	$2,916	NA	NA	$0.141				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2022	$1,944	$2,916	NA	NA	$0.141				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2020-2022 Plan Total	$6,768	$10,152	NA	NA	$0.490				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	

TABLE 24: Asset Management and Inspections Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Drone Inspections (O&M) *Flights & Assessments	2019 plan	NA	NA	NA	NA	NA	All equipment failure related (less hot connections)	*		Reliability	NA	NA	NA	Meets and exceeds	GO 165, GO 95	*RSE values for SDG&E's enhanced inspection programs were grouped in the November RAMP filing, RSE value is listed in Pole Replacement and Reinforcement
	2019 actual	$13,474		NA		NA				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2020	$21,000	$25,700	NA	NA	$1.352				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2021	$19,200	$22,400	NA	NA	$1.204				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2022	$12,500	$17,800	NA	NA	$0.877				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2020-2022 Plan Total	$52,700	$65,900	NA	NA	$3.432				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
Drone Inspections (O&M) *Enigineering & Construction	2019 plan	NA	NA	NA	NA	NA	All equipment failure related (less hot connections)	*		Reliability	NA	NA	NA	Meets and exceeds	GO 165, GO 95	*RSE values for SDG&E's enhanced inspection programs were grouped in the November RAMP filing, RSE value is listed in Pole Replacement and Reinforcement
	2019 actual	NA		NA		NA				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2020	$25,500	$28,800	NA	NA	$1.571				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2021	$23,000	$25,600	NA	NA	$1.406				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2022	$18,200	$21,350	NA	NA	$1.145				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	
	2020-2022 Plan Total	$66,700	$75,750	NA	NA	$4.123				Reliability	New	NA	FRMMA	Meets and exceeds	GO 165, GO 95	

TABLE 24: Asset Management and Inspections Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Circuit Ownership	2019 plan	NA	NA	NA	NA	NA	All equipment failure related (less hot connections)	*		Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	*RSE values for SDG&E's enhanced inspection programs were grouped in the November RAMP filing, RSE value is listed in Pole Replacement and Reinforcement
	2019 actual	NA		NA		NA				Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$475	$575	NA	NA	$0.030				Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$475	$575	NA	NA	$0.030				Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$475	$575	NA	NA	$0.030				Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$1,425	$1,725	NA	NA	$0.091				Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Substation System Inspections	2019 plan	Base	Base	NA	NA	NA	All equipment failure	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	GO174	
	2019 actual	Base		NA	NA	NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	GO174	
	2020	Base	Base	NA	NA	NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	GO174	
	2021	Base	Base	NA	NA	NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	GO174	
	2022	Base	Base	NA	NA	NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	GO174	
	2020-2022 Plan Total	Base	Base	NA	NA	NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	GO174	

TABLE 24A: Asset Management and Inspections Initiatives

Initiative Activity	Year	5 year Detailed Inspections		Annual Patrols		Wood Pole Intrusive Inspections	
		Low	High	Low	High	Low	High
SDG&E Corrective Maintenance Program (HFTD)	2019 Plan	16,000	17,000	85,000	87,000	18,000	20,000
	2019 Actual	16,329		86,401		19,729	
	2020	17,000	18,000	85,000	87,000	17,000	19,000
	2021	22,000	23,000	85,000	87,000	7,000	9,000
	2022	18,000	19,000	85,000	87,000	300	500
	2020-20222 Plan Totals	57,000	60,000	255,000	261,000	24,300	28,500

Initiative Activity	Year	Transmission Visual Inspections		Transmission Infrared Inspections		Transmission Detailed Inspections		Additional Transmission Aerial 69kV Tier 3 Visual Inspection	
		Low	High	Low	High	Low	High	Low	High
Transmission System Inspections	2019 Plan	94	140	90	136	29	45	21	33
	2019 Actual	116		112		37		27	
	2020	94	140	90	136	33	49	21	33
	2021	94	140	90	136	30	46	21	33
	2022	94	140	90	136	30	46	21	33
	2020-20222 Plan Totals	282	420	270	408	93	141	63	99

TABLE 24A: Asset Management and Inspections Initiatives

Initiative Activity	Year	Infrared/Corona Inspections	
		Low	High
Infrared Corona	2019 Plan	NA	NA
	2019 Actual	NA	
	2020	7000	10000
	2021	7000	10000
	2022	7000	10000
	2020-20222 Plan Totals	21000	30000

Initiative Activity	Year	QA/QC Inspections	
		Low	High
HFTD Tier 3 Inspections	2019 Plan	11000	12000
	2019 Actual	15176	
	2020	11000	12000
	2021	11000	12000
	2022	12000	13000
	2020-20222 Plan Totals	34000	37000

TABLE 24A: Asset Management and Inspections Initiatives

Initiative Activity	Year	Drone Inspections Completed	
		Low	High
Drone Inspections	2019 Plan	9000	11000
	2019 Actual	10400	
	2020	28000	38000
	2021	18000	21,500
	2022	15000	18000
	2020-20222 Plan Totals	61000	77500

Initiative Activity	Year	Substation Inspections	
		Low	High
Substation System Inspections	2019 Plan	300	360
	2019 Actual	301	
	2020	300	360
	2021	300	360
	2022	300	360
	2020-20222 Plan Totals	900	1080

TABLE 25: Vegetation Management and Inspections Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Tree Trimming	2019 plan	*Base	Base	NA	NA	NA	Vegetation Contact	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	*In SDGE's 2019 WMP, Tree Trimming was listed as part of base business and costs for the program were not provided. Going forward, SDG&E will be providing these costs.
	2019 actual	$33,957		NA		NA		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$22,220	$33,330	NA	NA	$1.608		50%	122.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$22,220	$33,330	NA	NA	$1.608		50%	122.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$22,220	$33,330	NA	NA	$1.608		50%	122.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$66,660	$99,990	NA	NA	$4.823		50%	122.5	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 25: Vegetation Management and Inspections Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Fuels Management Program	2019 plan	$400	$600	NA	NA	$0.029	Reduces chance fault becomes an ignition, reduces initial propagation	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$5,093		NA		$0.147		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$4,000	$6,000	NA	NA	$0.289		0.4%	5.2	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$4,000	$6,000	NA	NA	$0.289		0.4%	5.2	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$4,000	$6,000	NA	NA	$0.289		0.4%	5.2	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$12,000	$18,000	NA	NA	$0.868		0.4%	5.2	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 25: Vegetation Management and Inspections Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Enhanced Inspections Patrols and Trimming	2019 plan	$2,400	$3,600	NA	NA	$0.174	Vegetation Contact	NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$7,396		NA		$0.214		NA	NA	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$18,882	$28,324	NA	NA	$1.366		5.0%	14.41	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$18,882	$28,324	NA	NA	$1.366		5.0%	14.41	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$18,882	$28,324	NA	NA	$1.366		5.0%	14.41	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$56,646	$84,972	NA	NA	$4.098		5.0%	14.41	Reliability	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 25: Vegetation Management and Inspections Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Pole Brushing	2019 plan	*Base	Base	NA	NA	NA	Reduces chances that a fault will lead to an ignition	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	*In SDGE's 2019 WMP, Pole Brushing was listed as part of base business and costs for the program were not provided. Going forward, SDG&E will be providing these costs.
	2019 actual	$3,884		NA		NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$4,754	$7,131	NA	NA	$0.344		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$4,754	$7,131	NA	NA	$0.344		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$4,754	$7,131	NA	NA	$0.344		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$14,262	$21,393	NA	NA	$1.032		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 25A: Vegetation Management and Inspections Initiatives			
Initiative Activity	Year	Trees Inspected	
		Low	High
Tree Trimming	2019 Plan	450,000	460,000
	2019 Actual	453,330	
	2020	450,000	460,000
	2021	450,000	460,000
	2022	450,000	460,000
	2020-2022 Plan Totals	1,350,000	1,380,000
Initiative Activity	Year	Trees Trimmed to 25' clearance or removed	
		Low	High
Enhanced Inspections Patrols and Trimming	2019 Plan	7000	8000
	2019 Actual	8310	
	2020	14000	20000
	2021	14000	20000
	2022	14000	20000
	2020-2022 Plan Totals	42000	60000

TABLE 25A: Vegetation Management and Inspections Initiatives			
Initiative Activity	Year	Poles Brushed	
		Low	High
Pole Brushing	2019 Plan	32000	39000
	2019 Actual	34000	
	2020	32000	39000
	2021	32000	39000
	2022	32000	39000
	2020-2022 Plan Totals	96000	117000
Initiative Activity	Year	Poles cleared	
		Low	High
Fuels Management	2019 Plan	400	600
	2019 Actual	511	
	2020	400	600
	2021	400	600
	2022	400	600
	2020-2022 Plan Totals	1200	1800

TABLE 26: Grid Operations and Protocols Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Recloser Protocols	2019 plan	*Base	Base	NA	NA	NA	Reduces chance of fault leading to an ignition	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	Base		NA		NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Wildfire Infrastructure Protection Teams	2019 plan	$700	$1,100	NA	NA	$0.052	Employee Caused Ignitions	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	CFR cost estimates can fluctuate based on the actual conditions that accompany fire season. The Primary contract calls for 8 CFRs a day but in reality there are usually more ordered. Additionally, CFRs used during Extreme weather events and other fire related activations are not included in the above estimates
	2019 actual	$1,790		NA		$0.10		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$1,334	$2,002	NA	NA	$0.097		0.76%	31.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$1,334	$2,002	NA	NA	$0.097		0.76%	31.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$1,334	$2,002	NA	NA	$0.097		0.76%	31.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$4,003	$6,005	NA	NA	$0.290		0.76%	31.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 26: Grid Operations and Protocols Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Other Special Work Procedures	2019 plan	Base	Base	NA	NA	NA	Employee Caused Ignitions	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	Base		NA		NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	Base	Base	NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Strategy for Minimizing Public Safety Risk During High Wildfire Conditions	2019 plan	Base	Base	NA	NA	NA	All	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code §§ 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8.	
	2019 actual	Base		NA		NA	All	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code §§ 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8.	
	2020	Base	Base	NA	NA	NA	All	50%	118.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code §§ 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8.	
	2021	Base	Base	NA	NA	NA	All	50%	118.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code §§ 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8.	
	2022	Base	Base	NA	NA	NA	All	50%	118.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code §§ 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8.	
	2020-2022 Plan Total	Base	Base	NA	NA	NA	All	50%	118.0	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code §§ 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8.	

TABLE 26: Grid Operations and Protocols Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Mitigating the Public Safety Impact of PSPS Protocols	2019 plan	Base	Base	NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2019 actual	Base		NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2020	Base	Base	NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2021	Base	Base	NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2022	Base	Base	NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2020-2022 Plan Total	Base	Base	NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
Communication Practices (Capital)	2019 plan	NA	NA	NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2019 actual	NA		NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2020	$2,000	$4,000	NA	NA	$0.17	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2021	$0	$0	NA	NA	$0.00	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	

TABLE 26: Grid Operations and Protocols Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
	2022	$0	$0	NA	NA	$0.00	NA	calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2020-2022 Plan Total	$2,000	$4,000	NA	NA	$0.17	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	

TABLE 26: Grid Operations and Protocols Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Communication Practices (O&M)	2019 plan	$2,000	$3,000	NA	NA	$0.15	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2019 actual	$3,057		NA		$0.18	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2020	$4,458	$5,397	NA	NA	$0.29	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2021	$4,458	$5,397	NA	NA	$0.29	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2022	$4,458	$5,397	NA	NA	$0.29	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
	2020-2022 Plan Total	$13,374	$16,191	NA	NA	$0.86	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 399.2(a) and 451, D.12-04-024, and Commission Resolution ESRB-8	
Aviation Firefighting Program (Capital)	2019 plan	NA	NA	NA	NA	NA	Fire Suppression	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$5,760	$8,640	NA	NA	$0.417		See Aviation Firefighting Program (O&M)		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$11,520	$17,280	NA	NA	$0.833				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$0	$0	NA	NA	$0.000				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$17,280	$25,920	NA	NA	$1.250				NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 26: Grid Operations and Protocols Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Aviation Firefighting Program (O&M)	2019 plan	$6,000	$9,000	NA	NA	$0.434	Fire Suppression	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$3,938		NA		$0.114		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$7,202	$8,719	NA	NA	$0.461		5.0%	31.5	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$7,202	$8,719	NA	NA	$0.461		5.0%	31.5	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$7,202	$8,719	NA	NA	$0.461		5.0%	31.5	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$21,606	$26,157	NA	NA	$1.382		5.0%	31.5	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Industrial Fire Brigade	2019 plan	Base	Base	NA	NA	NA	Fire Suppression	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	Base		NA	NA	NA		NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$270	$406	NA	NA	$0.020		0.1%	22.9	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$270	$406	NA	NA	$0.020		0.1%	22.9	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$270	$406	NA	NA	$0.020		0.1%	22.9	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$811	$1,217	NA	NA	$0.059		0.1%	22.9	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 27: Data Governance Initiatives

Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Geographic Information Systems	2019 plan	Base	Base	NA	NA	NA	NA	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	Base		NA		NA	NA	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	Base	Base	NA	NA	NA	NA	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	Base	Base	NA	NA	NA	NA	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	Base	Base	NA	NA	NA	NA	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	Base	Base	NA	NA	NA	NA	NA	NA	NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Ignition Management Program	2019 plan	Base	Base	NA	NA	NA	NA	This was grouped with OH hardening (BC and CC) and Undergrounding for the purpose of calculating RSE's		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$285	$345	NA	NA	$0.018	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$285	$345	NA	NA	$0.018	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$258	$345	NA	NA	$0.017	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$828	$1,035	NA	NA	$0.054	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 28: Resource Allocation Methodology Initiatives																
Initiative Activity	Year	Total per initiative spend (Capital)		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Asset Management (capital)	2019 plan	NA	NA	NA	NA	NA	NA	This was grouped with OH hardening (BC and CC) and Undergrounding for the purpose of calculating RSE's		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$8,774	$10,621	NA	NA	$0.561	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$2,500	$5,000	NA	NA	$0.217	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$3,000	$7,500	NA	NA	$0.304	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$14,274	$23,121	NA	NA	$1.082	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 28: Resource Allocation Methodology Initiatives																
Initiative Activity	Year	Total per initiative spend (Capital)		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Asset Management (O&M)	2019 plan	$1,200	$1,800	NA	NA	$0.087	NA	This was grouped with OH hardening (BC and CC) and Undergrounding for the purpose of calculating RSE's		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$107		NA		$0.003	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$400	$500	NA	NA	$0.026	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$500	$600	NA	NA	$0.032	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$500	$600	NA	NA	$0.032	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$1,400	$1,700	NA	NA	$0.090	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 28: Resource Allocation Methodology Initiatives																
Initiative Activity	Year	Total per initiative spend (Capital)		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Wildfire Mitigation Personnel	2019 plan	NA	NA	NA	NA	NA	NA	This was grouped with OH hardening (BC and CC) and Undergrounding for the purpose of calculating RSE's		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$1,663	$2,013	NA	NA	$0.106	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$1,663	$2,013	NA	NA	$0.106	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$1,663	$2,013	NA	NA	$0.106	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$4,989	$6,039	NA	NA	$0.319	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 28: Resource Allocation Methodology Initiatives																
Initiative Activity	Year	Total per initiative spend (Capital)		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
PSPS Mitigation Engineering Team	2019 plan	NA	NA	NA	NA	NA	NA	This was grouped with OH hardening (BC and CC) and Undergrounding for the purpose of calculating RSE's		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	* Costs for this team have been grouped with Wildfire Mitigation Personnel
	2019 actual	NA		NA		NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	*		NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 29: Emergency Planning and Preparedness Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Customer Support in Emergencies	2019 plan	*		NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	* Costs for this program are included in Emergency Management Operations
	2019 actual			NA		NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Disaster and Emergency Preparedness Plan	2019 plan	*		NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	* Costs for this program are included in Emergency Management Operations
	2019 actual			NA		NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total			NA	NA	NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

TABLE 29: Emergency Planning and Preparedness Initiatives																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with regulations	Cite Associated rule	Comments
		Low	High	Low	High											
Emergency Management Operations (O&M)	2019 plan	$4,000	$6,000	NA	NA	$0.289	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	$4,727		NA		$0.137	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$4,088	$4,654	NA	NA	$0.253	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$4,088	$4,654	NA	NA	$0.253	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$4,088	$4,654	NA	NA	$0.253	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$12,264	$13,962	NA	NA	$0.759	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
Emergency Management Operations (Capital)	2019 plan	NA	NA	NA	NA	NA	NA	This control was grouped with Strategy for Minimizing Public Safety Risk During High Wildfire Conditions for purposes of RSE calculations		NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2019 actual	NA		NA		NA	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020	$3,600	$5,400	NA	NA	$0.260	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2021	$0	$0	NA	NA	$0.000	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2022	$0	$0	NA	NA	$0.000	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	
	2020-2022 Plan Total	$3,600	$5,400	NA	NA	$0.260	NA			NA	Existing	TY 2019 GRC	NA	Meets and exceeds	P.U. Code § 451	

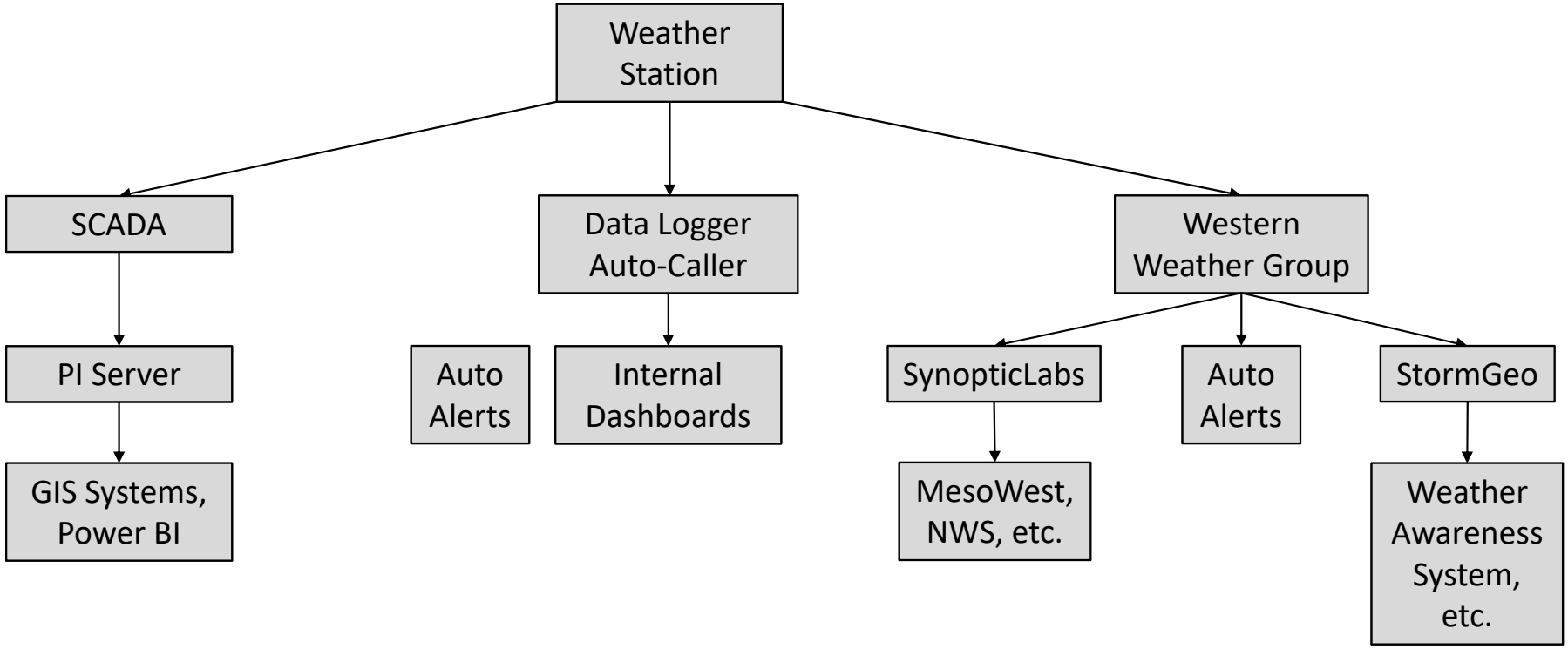
TABLE 30																
Initiative Activity	Year	Total per initiative spend		Line Miles to be treated		Spend per treated line mile	Ignition probability drivers targeted	Risk reduction	Risk-spend efficiency	Other risk drivers addressed	Existing/new	Existing/ What Proceeding	If New: Memorandum account	In / Exceeding Compliance with	Cite Associated rule	Comments
		Low	High	Low	High											
Community Engagement - See Table 26 Customer Communications and Mitigating the Public Safety Impact of PSPS Protocols																

TABLE 31: Change in Drivers of Ignition Probability Taking Into Account Planned Initiatives, For Each Year of Plan												
Incident type by ignition probability driver		Near misses tracked (y/n)?	Number of Incidents per year			Avg % probability of ignition per incident			Number of Ignitions per year			
			2020	2021	2022	2020	2021	2022	2020	2021	2022	
Contact from object	All types of object contact	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Animal contact	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Balloon contact	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Veg. contact	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Vehicle contact	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
All types of equipment / facility failure	All types	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Capacitor bank failure	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Conductor failure - all	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Conductor failure - wires down	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Fuse failure - all	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Fuse failure - conventional blown fuse	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Lightning arrestor failure	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Splice/Clamp/Connector	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Switch failure	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Transformer failure	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Wire-to-wire contact / contamination		Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Vandalism/Theft		Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Other												

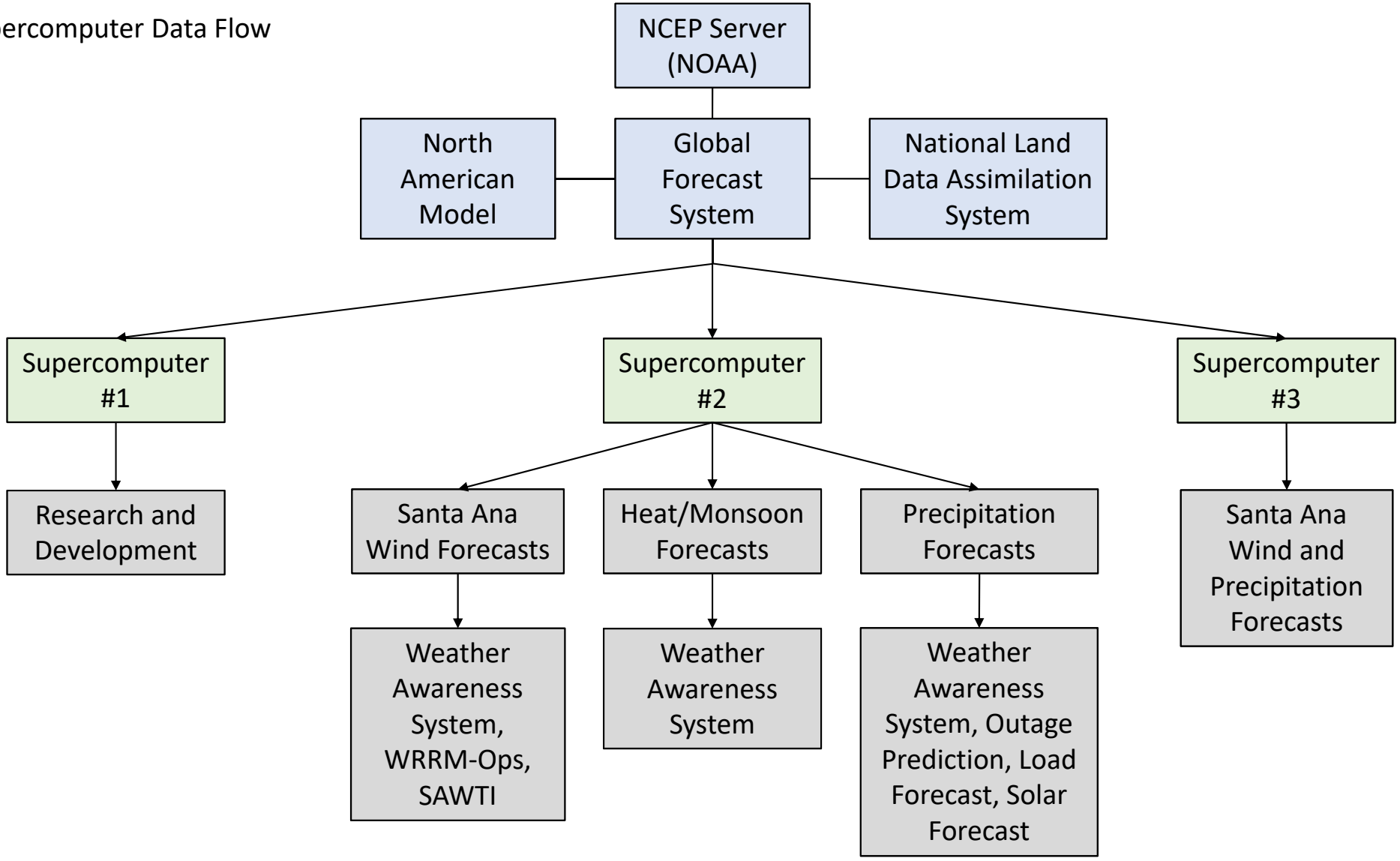
Appendix B

Data Flow for SDG&E's Weather Network Data and Supercomputer Simulations

Weather Network Data Flow



Supercomputer Data Flow



Website Data Flow

Weather Awareness System

- sdgeweather.com
- Hosted and managed by MJD Interactive

Components:

- Current weather data (StormGeo)
- Forecast data (SDG&E Meteorology)
- Radar (StormGeo)
- Lightning (StormGeo)
- FPI (SeaSpace, SDG&E Meteorology)
- OPI (ADS, SeaSpace, SDG&E Meteorology)

Weather Station Site

- weather.sdgeweather.com
- Hosted and managed by StormGeo

Components:

- Current weather data (StormGeo)
- Forecast data (ADS)
- Radar (StormGeo)

Appendix C

List of Priority Essential Services

Appendix C

A listing of entities that SDG&E considers to be priority essential services is provided in Appendix C. This list is current as of February 2020 and given the dynamic nature of some categories, is subject to change.

Priority Essential Services SDG&E Customer List

Entity Name	Category
SAN DIEGO BLOOD BANK	BLOOD BANKS
AMERICAN RED CROSS	BLOOD BANKS
DYNAMIC DESIGN PHARMA INC	CHEMICAL
FIZZIQUE LLC	CHEMICAL
METACRINE INC	CHEMICAL
NATURAL THOUGHTS INC	CHEMICAL
NEOMPS INC	CHEMICAL
ACADIA PHARMACEUTICALS	CHEMICAL
AMERICAN FIRE COATING INC	CHEMICAL
TAO OF MAN LLC	CHEMICAL
RECYCLED AGGREGATE MATERIALS	CHEMICAL
FX LABS	CHEMICAL
COMBI BLOCKS INCORPORATION	CHEMICAL
ILLUMINA INC	CHEMICAL
AMERIWEST TECH INC	CHEMICAL
LIFE TECHNOLOGIES	CHEMICAL
TOTAL POWER INC	CHEMICAL
SENTE	CHEMICAL
NEWOPP BIO PHARMACEUTICALS	CHEMICAL
KUNHUA CHEN	CHEMICAL
CP KELCO	CHEMICAL
GREATSOIL LLC	CHEMICAL
EPICUREN DISCOVERY INC	CHEMICAL
SHIRE PHARMACEUTICAL COMPANY	CHEMICAL
BRENNTAG PACIFIC INC	CHEMICAL
GLOBAL PLASTICS LP	CHEMICAL
XCOVERY BETTA PHARMA INC	CHEMICAL
INTERNATIONAL STEM CELL CORP	CHEMICAL
SUNREZ CORP	CHEMICAL
STRATUM MEDICAL INC	CHEMICAL
OTONOMY	CHEMICAL
STA PHARMACETICAL US LLC	CHEMICAL
PACK LAB INC	CHEMICAL
COOLA SUN CARE	CHEMICAL
ALL ONE GOD FAITH INC	CHEMICAL
AZTEC PERLITE COMPANY INC	CHEMICAL
ALICHEM	CHEMICAL
KBI BIOPHARMA INC	CHEMICAL

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CALASIA PHARMACEUTICALS	CHEMICAL
NICOPHARM PHARMACEUTICAL SOL	CHEMICAL
EMERALD HEALTH PHARMA	CHEMICAL
SYNTHETIC PROTEOMICS INC	CHEMICAL
GINOLIS INC	CHEMICAL
JAMES S PYER	CHEMICAL
PROMETHEUS LABS INC	CHEMICAL
CHONTECH INC	CHEMICAL
RECYCLING TECH KNOWLEDGE	CHEMICAL
AMERICAN PHARMA CORP	CHEMICAL
NEURELIS INC	CHEMICAL
SCANTIBODIES LAB INC	CHEMICAL
SHELBY J STANFILL	CHEMICAL
PROCHEM SPECIALTY PROD	CHEMICAL
BIOTICS RESEARCH CORP	CHEMICAL
XTRACTA PHARMA	CHEMICAL
O A L ASSOC INC	CHEMICAL
FOODAROM USA INC	CHEMICAL
PURETY COSMETICS	CHEMICAL
AMPLYX PHARMACEUTICALS	CHEMICAL
PLANT DEVAS INC	CHEMICAL
ABOVCHEM LLC	CHEMICAL
CW SAN DIEGO LLC	CHEMICAL
GREEN-GO RECYCLING INC	CHEMICAL
SPOERRI INC	CHEMICAL
BIO D PRODUCTS	CHEMICAL
RHINO LININGS USA INC	CHEMICAL
DUN EDWARDS CORP	CHEMICAL
ARA CHEM	CHEMICAL
ARGONAUT MANUFACTURING SRV	CHEMICAL
AMERICAN POWDER COAT LLC	CHEMICAL
INVIVOSCRIBE TECH	CHEMICAL
INNOMINATA	CHEMICAL
HYDRO AGRI	CHEMICAL
ARENA PHARMACEUTICALS INC	CHEMICAL
CARLSBAD MANUFACTURING CORP	CHEMICAL
AA BLOCKS LLC	CHEMICAL
ANGIONETICS INC	CHEMICAL
AMERICAN PEPTIDE COMPANY INC	CHEMICAL

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Priority Essential Services SDG&E Customer List

GABRIEL COSTILLA	CHEMICAL
SALIS INTERNATIONAL INC	CHEMICAL
EPIGEN BIOSCIENCES INC	CHEMICAL
HYDROGENICS USA INC	CHEMICAL
ELEMENTARY DESIGN	CHEMICAL
INNOVATIVE BIOSCIENCES INC	CHEMICAL
STAR HEALTH LLC	CHEMICAL
WESTAIR GASES & EQUIPMENT	CHEMICAL
ATLAS CHEMICAL CO	CHEMICAL
WONDFO USA CORPORATION LTD	CHEMICAL
NITTO BIO PHARMA	CHEMICAL
AVISTA TECHNOLOGIES INC	CHEMICAL
VERTEX PHARMACEUTICALS LLC	CHEMICAL
RETROPHIN INC	CHEMICAL
ALDILA GOLF DBA VICTORY ARCH	CHEMICAL
PACIFIC BIOPHARMA LOGISTICS	CHEMICAL
BEN REDLICH	CHEMICAL
STEMELL INC	CHEMICAL
XERIS PHARMACEUTICALS INC	CHEMICAL
HARRELLS LLC	CHEMICAL
PHASEBIO PHARMACEUTICALS INC	CHEMICAL
PFENEX INC	CHEMICAL
PATHWAY GENOMICS CORP	CHEMICAL
PARKER HANNIFIN CORP	CHEMICAL
LATITUDE PHARM INC	CHEMICAL
EBERT COMPOSITES CORP	CHEMICAL
CALIFIA PHARMA INC	CHEMICAL
STEROGENE BIO SEPR INC	CHEMICAL
CARLSBAD TECHNOLOGY INC	CHEMICAL
J & D LABORATORIES INC	CHEMICAL
VERSUM MATERIALS US LLC	CHEMICAL
H AND M DIST INC	CHEMICAL
JACOB RUBENSTEIN	CHEMICAL
MC BRADFORD INC	CHEMICAL
STEGO INDUSTRIES LLC	CHEMICAL
INNOVUS PHARMACEUTICALS INC	CHEMICAL
QPEX BIOPHARMA	CHEMICAL
ARMOR CONTRACT GLAZING	CHEMICAL
IMMUNO ACTIVA	CHEMICAL

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Priority Essential Services SDG&E Customer List

CAROMATECH INC	CHEMICAL
COLORESCIENCE INC	CHEMICAL
AT SCIENTIFIC	CHEMICAL
SENSIENT COLORS LLC	CHEMICAL
INOVA DIAGNOSTICS	CHEMICAL
PHARMAFIND	CHEMICAL
CA BOTANA INT'L INC	CHEMICAL
SCRIPPS LABORATORIES INC	CHEMICAL
QUIDEL CORP	CHEMICAL
CURTIS TECHNOLOGY INC	CHEMICAL
IRISYS LLC	CHEMICAL
BELOTECA INC	CHEMICAL
RENEO PHARMACEUTICALS INC	CHEMICAL
SUN BUM LLC	CHEMICAL
EMERGING PHARMACIES LLC	CHEMICAL
BIOFUELS ENERGY LLC	CHEMICAL
NEW LEAF BIOFUEL LLC	CHEMICAL
REJUVENATION THERAPEUTICS	CHEMICAL
INK SYSTEMS INC	CHEMICAL
JESSUP SERVICES	CHEMICAL
BIOMAX HEALTH PRODUCTS INC	CHEMICAL
ENERGY SUSPENSION	CHEMICAL
ENERGY SUSPENSIONS	CHEMICAL
BIOSETTIA INC	CHEMICAL
TENOVA PHARMACEUTICALS	CHEMICAL
NEURMEDIX	CHEMICAL
HEMPEL USA INC	CHEMICAL
FOLEXPORT INC	CHEMICAL
TRIPLE BEST LLC	CHEMICAL
TARSAL PHARMACEUTICALS	CHEMICAL
SENTISS PHARMACEUTICALS	CHEMICAL
SYNTHETIC GENOMICS	CHEMICAL
BIOFILM INCORPORATED	CHEMICAL
WESTBRIDGE AGRICULTURAL	CHEMICAL
ARTIFICIAL TURF SUPPLY LLC	CHEMICAL
TRICITY PAINT	CHEMICAL
SPECIALTY MANUFACTURING INC	CHEMICAL
PLASTIFAB INC	CHEMICAL
ALLERMED LABS INC	CHEMICAL

Appendix C

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Priority Essential Services SDG&E Customer List

BIOMED REALTY LP	CHEMICAL
AVISYN PHARMA INC	CHEMICAL
SUNSET PHARMECUTICALS INC	CHEMICAL
INTERNATIONAL BUS ENT	CHEMICAL
XEN BIOFLUIDX INC	CHEMICAL
HOCKING INTERNATIONAL LABS	CHEMICAL
DIVERSIFIED NANO SOLUTIONS	CHEMICAL
AIRGAS WEST INC	CHEMICAL
LEEMARC INDUSTRIES	CHEMICAL
NATURAL ALTERNATIVES INTNL	CHEMICAL
ACADIA PHARMACEUTICALS	CHEMICAL
CLINIQA CORP	CHEMICAL
AT&T MOBILITY	COMMUNICATIONS
T-MOBILE WEST LLC	COMMUNICATIONS
LEVEL 3 COMMUNICATIONS	COMMUNICATIONS
XO COMMUNICATIONS	COMMUNICATIONS
SPRINT NEXTEL CORPORATION	COMMUNICATIONS
AT&T SERVICES INC	COMMUNICATIONS
COX COMMUNICATIONS CALIF LLC	COMMUNICATIONS
VERIZON WIRELESS	COMMUNICATIONS
CALIFORNIA COX PCS	COMMUNICATIONS
COX COMMUNICATIONS INC	COMMUNICATIONS
AT&T	COMMUNICATIONS
WILLIAMS COMMUNICATIONS	COMMUNICATIONS
VOICE STREAM WIRELESS	COMMUNICATIONS
T W TELECOM	COMMUNICATIONS
CRICKET COMMUNICATIONS INC	COMMUNICATIONS
CHARTER COMMUNICATIONS HLDG	COMMUNICATIONS
SPECTRASITE COMMUNICATIONS	COMMUNICATIONS
ATC TOWER CORP	COMMUNICATIONS
CRICKET COMMNICATIONS INC	COMMUNICATIONS
TELEPORT COMMUNICATIONS	COMMUNICATIONS
U S SPRINT CO	COMMUNICATIONS
T-MOBILE USA INC	COMMUNICATIONS
A T & T COMM OF CA INC	COMMUNICATIONS
DAVITA INC	DIALYSIS CENTERS
SAN DIEGO DIALYSIS SRV	DIALYSIS CENTERS
FRESENIUS MEDICAL CARE	DIALYSIS CENTERS
INNOVATIVE DIALYSIS OF LJ	DIALYSIS CENTERS

Appendix C

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Priority Essential Services SDG&E Customer List

HOME DIALYSIS THERAPIES SD	DIALYSIS CENTERS
RENAL ADVANTAGE INC	DIALYSIS CENTERS
AMERICAN ACCESS CARE OF SD	DIALYSIS CENTERS
SATELLITE HEALTH CARE	DIALYSIS CENTERS
LP SCRIPPS LOT I LLC	DIALYSIS CENTERS
NORTH COUNTY KIDNEY CTR	DIALYSIS CENTERS
DIALYSIS NEWCO INC	DIALYSIS CENTERS
FMC SAN JUAN CAPISTRANO LLC	DIALYSIS CENTERS
BIO-MEDICAL APPL OF CALIF	DIALYSIS CENTERS
SAN DIEGO DIALYSIS SVC	DIALYSIS CENTERS
SAN DIEGO DIALYSIS CTR	DIALYSIS CENTERS
CITY OF CORONADO	EMERGENCY OPERATING CNTRS
CITY OF ENCINITAS	EMERGENCY OPERATING CNTRS
CITY OF CHULA VISTA	EMERGENCY OPERATING CNTRS
CITY OF SAN MARCOS	EMERGENCY OPERATING CNTRS
CITY OF SOLANA BEACH	EMERGENCY OPERATING CNTRS
US BORDER PATROL	FEDERAL ACCOUNTS
NAVY EXCHANGE	FEDERAL ACCOUNTS
C O MCAS MIRAMAR	FEDERAL ACCOUNTS
NAVY WARNER SPRINGS TRNG GRP	FEDERAL ACCOUNTS
CMDR NAVAL SPEC WARFARE GRP1	FEDERAL ACCOUNTS
NAVFAC SOUTHWEST	FEDERAL ACCOUNTS
COMMANDER NAVY REGION SW	FEDERAL ACCOUNTS
NAVY RESOURCE MGMT OFFICE	FEDERAL ACCOUNTS
USMC MAINTNCE OFFICER	FEDERAL ACCOUNTS
USN CMDG OFF CODE N8	FEDERAL ACCOUNTS
GSA	FEDERAL ACCOUNTS
NATIONAL MARINE FISHERIES	FEDERAL ACCOUNTS
MCAS MIRAMAR RESERVE CENTER	FEDERAL ACCOUNTS
USN CMDG OFF CODE 5	FEDERAL ACCOUNTS
NAVAL MEDICAL CENTER	FEDERAL ACCOUNTS
US NAVY SHIP SUPPORT UNIT SD	FEDERAL ACCOUNTS
MCAS MIRAMAR EXCHANGE	FEDERAL ACCOUNTS
CBP AIR	FEDERAL ACCOUNTS
MCAS MIRAMAR COMMISSARY	FEDERAL ACCOUNTS
US IMM & NAT SER	FEDERAL ACCOUNTS
NAVY REGIONL PLANT EQUIP OFC	FEDERAL ACCOUNTS
CUSTOMS & BORDER PROTECTION	FEDERAL ACCOUNTS
NOAA MARINE OPS PACIFIC	FEDERAL ACCOUNTS

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C O NAVAL CONSOLID BRIG	FEDERAL ACCOUNTS
FAA	FEDERAL ACCOUNTS
US RADIO STA CODE 611	FEDERAL ACCOUNTS
US COAST GUARD	FEDERAL ACCOUNTS
USMC CPEN M00681	FEDERAL ACCOUNTS
STATE OF CALIFORNIA	FIRE STATIONS
CITY OF OCEANSIDE	FIRE STATIONS
CITY OF SAN DIEGO	FIRE STATIONS
CITY OF SANTEE	FIRE STATIONS
CITY OF LA MESA	FIRE STATIONS
LAKESIDE FIRE PROTECTION DIS	FIRE STATIONS
PAUMA BAND MSN INDIANS	FIRE STATIONS
BLACK CONTRACTORS ASSOC SD	FIRE STATIONS
RANCHO SANTA FE FIRE DIST	FIRE STATIONS
CALIFORNIA DEPT FORESTRY	FIRE STATIONS
CITY OF POWAY	FIRE STATIONS
CITY OF DEL MAR	FIRE STATIONS
ORANGE COUNTY FIRE AUTHORITY	FIRE STATIONS
CAMPO FIRE DEPT	FIRE STATIONS
SAN MIGUEL FIRE PRO DST	FIRE STATIONS
RHO STA FE FIRE DEPT	FIRE STATIONS
USDA-FOREST SERVICE	FIRE STATIONS
CAMPO IND RES/FIRE STN	FIRE STATIONS
SYCUAN KUYEYAAY INDIANS	FIRE STATIONS
LAKESIDE FIRE PROTECTN	FIRE STATIONS
RANCHO SANTA FE ASSOC	FIRE STATIONS
RHO SANTA FE FIRE DEP	FIRE STATIONS
RSF FIRE PROTECTION DISTRICT	FIRE STATIONS
POTRERO COMM CTR FOUNDATION	FIRE STATIONS
BARONA FIRE DEPARTMENT	FIRE STATIONS
BO SUNNYSIDE FIRE PROTECTION	FIRE STATIONS
LAKESIDE FIRE DEPT	FIRE STATIONS
SAN PASQUAL ACADEMY	FIRE STATIONS
STATE OF CALIFORNIA DEPT	FIRE STATIONS
U S FOREST SERVICE	FIRE STATIONS
CITY OF EL CAJON	FIRE STATIONS
MANZANITA FIRE DEPT	FIRE STATIONS
ALPINE FIRE PROTECTION DIST	FIRE STATIONS
CITY OF LAGUNA NIGUEL	FIRE STATIONS

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CAPSTONE FIRE MANAGEMENT INC	FIRE STATIONS
JULIAN COMM SERV DIST	FIRE STATIONS
JULIAN VOLUNTEER FIRE CO	FIRE STATIONS
JULIAN CUYMCA FIRE DIST	FIRE STATIONS
BORREGO SPGS FIRE DEPT	FIRE STATIONS
VLY CTR FIRE PROTECTION	FIRE STATIONS
DEER SPRINGS FIRE PROTECTION	FIRE STATIONS
NORTH COUNTY FIRE	FIRE STATIONS
SN MIGUEL FIRE PRO DIST	FIRE STATIONS
SANTA YSABEL BAND OF DIEGUEN	FIRE STATIONS
DE LUZ VOLL FIRE DEPT	FIRE STATIONS
R R IVY	FIRE STATIONS
STATE OF CALIF	FIRE STATIONS
VIEJAS BAND OF KUMEYAAY IND	FIRE STATIONS
SD CITY FIRE FIGHTERS	FIRE STATIONS
ELFIN FOREST VLNTEER FD	FIRE STATIONS
DEER SPGS VOL FIRE DEPT	FIRE STATIONS
SAN DIEGO RURAL FIRE PROTECT	FIRE STATIONS
MOUNTAIN HEALTH & COMM SRVCS	HEALTHCARE/PUBLIC HEALTH
GIL Q GALLOWAY MD INC	HEALTHCARE/PUBLIC HEALTH
SEVA PROPERTY HOLDINGS LLC	HEALTHCARE/PUBLIC HEALTH
ALVARADO PKWY INSTITUTE	HEALTHCARE/PUBLIC HEALTH
EXODUS RECOVERY INC	HEALTHCARE/PUBLIC HEALTH
SERVING SENIORS	HEALTHCARE/PUBLIC HEALTH
SAN DIEGO FACE & NECK	HEALTHCARE/PUBLIC HEALTH
EMERALD TRIUNE HOME HEALTH	HEALTHCARE/PUBLIC HEALTH
LA MAESTRA FOUNDATION	HEALTHCARE/PUBLIC HEALTH
SAN DIEGO ENDOSCOPY CTR	HEALTHCARE/PUBLIC HEALTH
ALTERNATIVES PREGNANCY	HEALTHCARE/PUBLIC HEALTH
ST PAULS EPISCOPAL HOME	HEALTHCARE/PUBLIC HEALTH
BEST START BIRTH CENTER	HEALTHCARE/PUBLIC HEALTH
BENJAMIN CAMACHO	HEALTHCARE/PUBLIC HEALTH
JOHN QIAN MD INC	HEALTHCARE/PUBLIC HEALTH
AESTHETICARE MED CORP	HEALTHCARE/PUBLIC HEALTH
GARDEN VIEW COURT LLC	HEALTHCARE/PUBLIC HEALTH
MSN AMBULATORY SURGICAL	HEALTHCARE/PUBLIC HEALTH
AT HOME CARE SOLUTIONS	HEALTHCARE/PUBLIC HEALTH
SPECIALTY OBSTETRICS OF SD	HEALTHCARE/PUBLIC HEALTH
SC PROFESSIONAL PLAZA LLC	HEALTHCARE/PUBLIC HEALTH

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W A T INVESTMENTS LLC	HEALTHCARE/PUBLIC HEALTH
LAGUNA NIGUEL SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
EYE PHYSICIANS MED GRP	HEALTHCARE/PUBLIC HEALTH
NAVAJO LLC	HEALTHCARE/PUBLIC HEALTH
TOGETHER WE GROW	HEALTHCARE/PUBLIC HEALTH
AIJ INC	HEALTHCARE/PUBLIC HEALTH
AMBULATORY CARE SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
DEL MAR MEDICAL IMAGING	HEALTHCARE/PUBLIC HEALTH
SOUTH EAST MEDICAL CENTER	HEALTHCARE/PUBLIC HEALTH
KARI J KNOWLES	HEALTHCARE/PUBLIC HEALTH
SAN DIEGO FERTILITY CENTER	HEALTHCARE/PUBLIC HEALTH
TRIUMSHIRE MANAGEMENT INC	HEALTHCARE/PUBLIC HEALTH
ROCHELLE MCLEAN	HEALTHCARE/PUBLIC HEALTH
NORTH COUNTY SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
CAMINO HEALTH CENTERS	HEALTHCARE/PUBLIC HEALTH
R K MASSENGILL MD	HEALTHCARE/PUBLIC HEALTH
CARMEL VALLEY ENDODONTICS	HEALTHCARE/PUBLIC HEALTH
GROSSMONT SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
JASON CARPADAKIS	HEALTHCARE/PUBLIC HEALTH
FRIENDSHIP DEVELOPMENT SVCS	HEALTHCARE/PUBLIC HEALTH
STUART B KIPPER MD	HEALTHCARE/PUBLIC HEALTH
SD COMPREHENSIVE PAINMGMT	HEALTHCARE/PUBLIC HEALTH
LA JOLLA ORTHOPAEDIC SURGERY	HEALTHCARE/PUBLIC HEALTH
PRICE CHARITIES	HEALTHCARE/PUBLIC HEALTH
SEVILLE PLAZA PROPCO LLC	HEALTHCARE/PUBLIC HEALTH
ALICIA SURGERY CENTER LLC	HEALTHCARE/PUBLIC HEALTH
THERAPY SPECIALISTS	HEALTHCARE/PUBLIC HEALTH
ESCONDIDO CARE CTR	HEALTHCARE/PUBLIC HEALTH
ASSISTED HEALTH SYSTEMS	HEALTHCARE/PUBLIC HEALTH
CLEARCHOICE SAN DIEGO	HEALTHCARE/PUBLIC HEALTH
RAZAVI CORP	HEALTHCARE/PUBLIC HEALTH
CATH CHARITIES DIOCESE OF SD	HEALTHCARE/PUBLIC HEALTH
JAMES A DAVIES MD	HEALTHCARE/PUBLIC HEALTH
SURGICAL CENTER OF SAN DIEGO	HEALTHCARE/PUBLIC HEALTH
LA MAESTRA FAMILY CLINIC INC	HEALTHCARE/PUBLIC HEALTH
THE A R C OF SAN DIEGO	HEALTHCARE/PUBLIC HEALTH
LINDA VISTA HEALTH CARE CTR	HEALTHCARE/PUBLIC HEALTH
NORTH COAST SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
THE CTR FOR ENDOSCOPY	HEALTHCARE/PUBLIC HEALTH

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NO CTY GASTROENTEROLOGY	HEALTHCARE/PUBLIC HEALTH
PACIFIC SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
DR TAWFILIS	HEALTHCARE/PUBLIC HEALTH
UCMP LLC	HEALTHCARE/PUBLIC HEALTH
UTC SURGI CENTER	HEALTHCARE/PUBLIC HEALTH
COAST SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
SOLUTIONS IN RECOVERY	HEALTHCARE/PUBLIC HEALTH
LUIS A CONTRERAS	HEALTHCARE/PUBLIC HEALTH
HERALD CHRISTIAN HEALTH CNTR	HEALTHCARE/PUBLIC HEALTH
CENTRO DE SALUD DE SY	HEALTHCARE/PUBLIC HEALTH
MISSION MEDICAL INVES LLC	HEALTHCARE/PUBLIC HEALTH
NEW RESTORATION MINISTRIES	HEALTHCARE/PUBLIC HEALTH
SAN CLEMENTE MEDICAL BLDG	HEALTHCARE/PUBLIC HEALTH
S C MEDICAL PLAZA	HEALTHCARE/PUBLIC HEALTH
SCHOEMANN PLASTIC SURGERY	HEALTHCARE/PUBLIC HEALTH
THE VINE	HEALTHCARE/PUBLIC HEALTH
MUNISH BATRA MDPC	HEALTHCARE/PUBLIC HEALTH
ALFA SURGERY CENTER LLC	HEALTHCARE/PUBLIC HEALTH
CRESTWOOD BEHAVIORAL HEALTH	HEALTHCARE/PUBLIC HEALTH
PACIFIC ONCOLOGY	HEALTHCARE/PUBLIC HEALTH
CPMS MEDICAL GROUP INC	HEALTHCARE/PUBLIC HEALTH
SD MUSCULOSKELETAL INSTITUTE	HEALTHCARE/PUBLIC HEALTH
EYE SURGERY CTR	HEALTHCARE/PUBLIC HEALTH
BORREGO COMM HLTH FOUNDATION	HEALTHCARE/PUBLIC HEALTH
SURGE CENTER OF SD LLC	HEALTHCARE/PUBLIC HEALTH
CARLSBAD VILLAGE ORTHO	HEALTHCARE/PUBLIC HEALTH
UCSD	HEALTHCARE/PUBLIC HEALTH
OTAY LAKES SURGERY CENTER	HEALTHCARE/PUBLIC HEALTH
DEL RIO MEDICAL & DENTAL PLZ	HEALTHCARE/PUBLIC HEALTH
SO CALIFORNIA LIVER CENTERS	HEALTHCARE/PUBLIC HEALTH
SACRED HEART HLTHCR PROV INC	HEALTHCARE/PUBLIC HEALTH
CALIFORNIA FERTILITY EXPERTS	HEALTHCARE/PUBLIC HEALTH
VISTA COMMUNITY CLINIC	HEALTHCARE/PUBLIC HEALTH
ENCOMPASS FAMILY & INTERNAL	HEALTHCARE/PUBLIC HEALTH
CAL CTR FOR REPRODUCTIVE SCI	HEALTHCARE/PUBLIC HEALTH
EGOSCUE	HEALTHCARE/PUBLIC HEALTH
MISSION VALLEY OPSC LP	HEALTHCARE/PUBLIC HEALTH
NORTH CTY HEALTH SERV	HEALTHCARE/PUBLIC HEALTH
AL NOUR CENTER INC	HOSPICE FACILITIES

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MARGUERITE HOLDINGS LLC	HOSPICE FACILITIES
ANC CORPORATION	HOSPICE FACILITIES
SH & PC-SD LLC	HOSPICE FACILITIES
STONECREST CA HOLDING LLC	HOSPICE FACILITIES
THE ELIZABETH HOSPICE	HOSPICE FACILITIES
ESC CHIROPRACTIC OFFICE	HOSPICE FACILITIES
HOME OF GUIDING HANDS	HOSPICE FACILITIES
UNI CARE HOME HEALTH INC	HOSPICE FACILITIES
UNICARE HOSPICE INC	HOSPICE FACILITIES
TERI INC	HOSPICE FACILITIES
ARDENT HOSPICE& PAL CARE INC	HOSPICE FACILITIES
HOSPICE OF THE COAST INC	HOSPICE FACILITIES
CULTURE OF LIFE FAMILY SVCS	HOSPICE FACILITIES
WESTCOAST HEALTHCARE LLC	HOSPICE FACILITIES
DUNYA ANTWAN	HOSPICE FACILITIES
PHILIP D SZOLD MD INC	HOSPICE FACILITIES
VITAS HEALTHCARE	HOSPICE FACILITIES
PT LOMA CONVALESCENT HSPTL	HOSPITALS
SHARP MEMORIAL HOSPITAL	HOSPITALS
SCRIPPS MERCY HOSP	HOSPITALS
SADDLEBACK MEMORIAL MED CTR	HOSPITALS
VENCOR HOSPITALS OF CALIFORN	HOSPITALS
SHARP CHULA VISTA M C	HOSPITALS
MISSION HOSPITAL	HOSPITALS
VA MEDICAL CTR	HOSPITALS
SCRIPPS MERCY HOSP - CV	HOSPITALS
SCRIPPS MEM - ENCINITAS	HOSPITALS
PALOMAR HEALTH	HOSPITALS
SHARP CORONADO HOSPITAL	HOSPITALS
UCSD MEDICAL CENTER	HOSPITALS
ALVARADO HOSPITAL LLC	HOSPITALS
GROSSMONT HOSPITAL CORP	HOSPITALS
PARADISE VALLEY HOSP	HOSPITALS
KAISER PERMANENTE	HOSPITALS
TRI CITY MEDICAL CTR	HOSPITALS
SCRIPPS MEM HOSP - LJ	HOSPITALS
SCRIPPS-GREEN HOSPITAL	HOSPITALS
RADY CHILDREN'S HOSPITAL-SD	HOSPITALS
SHARP HEALTHCARE	HOSPITALS

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CO OF SAN DIEGO	POLICE STATIONS
LOS COYOTES INDIAN RESVRN	POLICE STATIONS
COUNTY OF ORANGE	POLICE STATIONS
SD UNIFIED PORT DIST	POLICE STATIONS
CITY OF NATIONAL CITY	POLICE STATIONS
CALIF HIGHWAY PATROL	POLICE STATIONS
CITY OF LEMON GROVE	POLICE STATIONS
CITY OF VISTA	POLICE STATIONS
CALTRANS	POLICE STATIONS
SD UNIF SCH DIST	SCHOOLS
GRSMT UN HI SCH DIST	SCHOOLS
LA MESA SPR VLY SCH DIS	SCHOOLS
OCEANSIDE UNIF SCH DIST	SCHOOLS
SOUTH BAY UN SCH DIST	SCHOOLS
SWTR UN HI SCH DIST	SCHOOLS
LAKESIDE UN SCH DIST	SCHOOLS
SAN MARCOS UNIF SCH DIS	SCHOOLS
LEMON GROVE SCH DIST	SCHOOLS
MT EMPIRE UNIF SCH DIST	SCHOOLS
JAMUL-DULZURA SCH DIST	SCHOOLS
VISTA UNIF SCH DIST	SCHOOLS
ALBERT EINSTEIN ACADEMY	SCHOOLS
POWAY UNIF SCHOOL DIST	SCHOOLS
SOUTHWESTERN COMM COLLEGE	SCHOOLS
SO ORANGE CNTY COM COL DIST	SCHOOLS
HELIX CHARTER HIGH SCHOOL	SCHOOLS
HIGH TECH HIGH	SCHOOLS
CHULA VISTA ELEM SCH DIST	SCHOOLS
GOMPERS CHARTER MIDDLE SCH	SCHOOLS
SD CNTY OFC OF EDUCATN	SCHOOLS
POWAY UNIF SCH DIST	SCHOOLS
CAJON VLY UN SCH DIST	SCHOOLS
THERESA HESSLING CHART PROJ	SCHOOLS
CAPISTRANO UNIF SCHOOL DIST	SCHOOLS
ESCONDIDO UN HI SCH DIS	SCHOOLS
ESCONDIDO UN SCH DIST	SCHOOLS
NATIONAL SCHOOL DIST	SCHOOLS
ESCONDIDO CHARTER	SCHOOLS
PALOMAR COMM COLLEGE	SCHOOLS

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KING CHAVEZ PRIM A&A ACADEMY	SCHOOLS
SOLANA BEACH SCH DIST	SCHOOLS
ESCONDIDO CHARTER HIGH SCHL	SCHOOLS
BONSALL UNION SCHOOL DIST	SCHOOLS
ALPINE UNION SCH DIST	SCHOOLS
DEHESA SCHOOL DISTRICT	SCHOOLS
NATIONAL UNIVERSITY	SCHOOLS
RHO STA FE SCHOOL DIST	SCHOOLS
SADLBK VLY UNF SCH DST	SCHOOLS
DARNALL SCHOOL	SCHOOLS
SANTEE SCH DIST	SCHOOLS
HARRIET TUBMAN VLG CHARTER	SCHOOLS
MIRACOSTA COMM COL DIST	SCHOOLS
SAN PASQUAL UN SCHL DIS	SCHOOLS
HERITAGE DIGITAL ACADEMY	SCHOOLS
CARDIFF SCHOOL DIST	SCHOOLS
GRSMT CUY COM COLL DIST	SCHOOLS
ENCINITAS UN SCH DIST	SCHOOLS
VLY CTR PAUMA UNIF SCH DIST	SCHOOLS
SDCCD	SCHOOLS
MCGILL SCHOOL OF SUCCESS	SCHOOLS
SAN DIEGUITO HI SCH DIS	SCHOOLS
RAMONA UNIF SCH DIST	SCHOOLS
SPENCER VALLEY SCHOOL	SCHOOLS
JULIAN UNION SCHOOL DISTRICT	SCHOOLS
JULIAN U HIGH SCH DIST	SCHOOLS
SAN YSIDRO SCH DIST	SCHOOLS
CARLSBAD UNIF SCH DIST	SCHOOLS
BORREGO UNIF SCH DIST	SCHOOLS
WARNER UN SCH DIST	SCHOOLS
SPRINGALL ACADEMY	SCHOOLS
CORONADO UNIF SCH DIST	SCHOOLS
JULIAN CHARTER SCHOOL	SCHOOLS
MISSION SAN ANTONIO	SCHOOLS
VALLECITOS SCHOOL	SCHOOLS
FALLBROOK UN SCH DIST	SCHOOLS
L J COUNTRY DAY SCHOOL	SCHOOLS
DEL MAR UNION SCH DIST	SCHOOLS
FALLBROOK UN HI SCH DIS	SCHOOLS

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SD CNTY OFC OF EDUCATION	SCHOOLS
GUAJOME PARK ACADEMY	SCHOOLS
FRANCIS W PARKER SCHOOL	SCHOOLS
GRSMT COMM COLL DIST	SCHOOLS
MAR VISTA ADULT SCHOOL	SCHOOLS
SDG&E	SDGE CRITICAL
SDG&E/PACIFIC BELL DLP	SDGE CRITICAL
SDGE	SDGE CRITICAL
SDGE LOAD RESEARCH	SDGE CRITICAL
SDGE/ESCO SUB	SDGE CRITICAL
SDG&E 087500000	SDGE CRITICAL
SDG&E 018461260	SDGE CRITICAL
SDGE/SCE	SDGE CRITICAL
SDG&E 018461240	SDGE CRITICAL
SDG&E 018461241	SDGE CRITICAL
SDG&E 058210000	SDGE CRITICAL
SDG&E 018461211	SDGE CRITICAL
SDG&E 392124100	SDGE CRITICAL
SDG&E 085700000	SDGE CRITICAL
SDG&E 018461310	SDGE CRITICAL
SDG&E 088730000	SDGE CRITICAL
SDGE TES	SDGE CRITICAL
SDG&E 536400000	SDGE CRITICAL
SDG&E SAMPSON SUB UNIT2	SDGE CRITICAL
SDG&E 055200000	SDGE CRITICAL
SDG&E 018461220	SDGE CRITICAL
SDG&E 018461100	SDGE CRITICAL
SDG&E 018461221	SDGE CRITICAL
SDG&E 018461230	SDGE CRITICAL
SDG&E 593021300	SDGE CRITICAL
SDG&E 393515400	SDGE CRITICAL
SDG&E 592124100	SDGE CRITICAL
SDG&E 018461330	SDGE CRITICAL
SDG&E 018461311	SDGE CRITICAL
SDG&E 393515100	SDGE CRITICAL
SDG&E 393511100	SDGE CRITICAL
SDG&E 018461210	SDGE CRITICAL
SDG&E 050600000	SDGE CRITICAL
SDG&E CO OF SAN DIEGO DLP	SDGE CRITICAL

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SDG&E MAG TAPE ID101339	SDGE CRITICAL
SDG&E - SDSU DLP	SDGE CRITICAL
SDG&E 018461270	SDGE CRITICAL
SDG&E 018461380	SDGE CRITICAL
SDG&E 085520000	SDGE CRITICAL
SDGE PRP COMP USE	SDGE CRITICAL
SDG&E 056600000	SDGE CRITICAL
SDGE/OTAY MESA MTRSTA	SDGE CRITICAL
SDG&E 056210000	SDGE CRITICAL
SDG&E 018461740	SDGE CRITICAL
SDG&E 018461500	SDGE CRITICAL
SDG&E 018410400	SDGE CRITICAL
SDG&E 058360000	SDGE CRITICAL
SDG&E 058450000	SDGE CRITICAL
SDG&E SCRIPPS SUB BK 31	SDGE CRITICAL
SDG&E 018461780	SDGE CRITICAL
SDGL CAPITAL LLC	SDGE CRITICAL
SDGE IHD 11	SDGE CRITICAL
SDGE/YARD	SDGE CRITICAL
SDG&E 018461732	SDGE CRITICAL
SDG&E Q HR METER	SDGE CRITICAL
SDG&E KW METER	SDGE CRITICAL
SDG&E CYL 20	SDGE CRITICAL
SUNRISE ASSISTED LIVING	SKLLED NURSING/NURSING HM
BAYSIDE HEALTCARE INC	SKLLED NURSING/NURSING HM
OLIVE HOLDINGS LLC	SKLLED NURSING/NURSING HM
ASD6 LLC	SKLLED NURSING/NURSING HM
ANCHOR DOWN OWNER ASSC INC	SKLLED NURSING/NURSING HM
PALOMAR HEIGHTS CARE CTR	SKLLED NURSING/NURSING HM
REO VISTA HEALTH CARE CENTER	SKLLED NURSING/NURSING HM
ANZA HEALTHCARE INC	SKLLED NURSING/NURSING HM
WEST ESCONDIDO HEALTHCARE	SKLLED NURSING/NURSING HM
GOLDEN LIVING INC	SKLLED NURSING/NURSING HM
MONTERA MSL LLC	SKLLED NURSING/NURSING HM
G H C OF NAT CITY 2 LLC	SKLLED NURSING/NURSING HM
GHC OF SANTEE LLC	SKLLED NURSING/NURSING HM
BRIAN STORRS	SKLLED NURSING/NURSING HM
AAA HOME HEALTH INC	SKLLED NURSING/NURSING HM
XIANG SIX LLC	SKLLED NURSING/NURSING HM

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CITY HEIGHTS HEALTH ASSOC	SKLLED NURSING/NURSING HM
COASTAL THERAPY GROUP	SKLLED NURSING/NURSING HM
GHC OF LA MESA LLC	SKLLED NURSING/NURSING HM
GHC OF NATIONAL CITY I LLC	SKLLED NURSING/NURSING HM
EMERITUS SENIOR LIVING	SKLLED NURSING/NURSING HM
MTN SHADOWS SUPPORT GRP	SKLLED NURSING/NURSING HM
ST PAUL HEALTH CARE CTR	SKLLED NURSING/NURSING HM
CASA PACIFICA ADHC	SKLLED NURSING/NURSING HM
GHC OF KEARNY MESA LLC	SKLLED NURSING/NURSING HM
WINDSOR CARE CTR NC INC	SKLLED NURSING/NURSING HM
JEFFERSON HEALTHCARE INC	SKLLED NURSING/NURSING HM
COVENANT CARE CALIFORNIA LLC	SKLLED NURSING/NURSING HM
REDWOOD SNR HOMES & SERVICES	SKLLED NURSING/NURSING HM
INTERIM HEALTH CARE	SKLLED NURSING/NURSING HM
ALZHEIMER'S FAMILY CTR	SKLLED NURSING/NURSING HM
ESCONDIDO MEDICAL INVESTORS	SKLLED NURSING/NURSING HM
ACCENTCARE HOME HEALTH OF CA	SKLLED NURSING/NURSING HM
FRONT PORCH	SKLLED NURSING/NURSING HM
HERITAGE POINTE	SKLLED NURSING/NURSING HM
LIFE HEALTH SERVICES	SKLLED NURSING/NURSING HM
EC OPCO LAS VILLAS DEL CB LP	SKLLED NURSING/NURSING HM
SEVEN OAKS CARE CENTER	SKLLED NURSING/NURSING HM
MISSION TRAILS HEALTH CARE	SKLLED NURSING/NURSING HM
CHARLES W MATHIS	SKLLED NURSING/NURSING HM
ALPINE SPECIAL TREATMENT CTR	SKLLED NURSING/NURSING HM
THE ROYAL HOME	SKLLED NURSING/NURSING HM
REGUS GROUP	SKLLED NURSING/NURSING HM
CLAYDELLE HEALTHCARE INC	SKLLED NURSING/NURSING HM
GABRIEL PERPETUA	SKLLED NURSING/NURSING HM
JACOB HEALTH CARE CTR	SKLLED NURSING/NURSING HM
VISTA POST ACUTE CENTER LLC	SKLLED NURSING/NURSING HM
ENCINITAS HERITAGE PRTNR LLC	SKLLED NURSING/NURSING HM
BRIGHTSTAR LLC	SKLLED NURSING/NURSING HM
CA DEPT OF VETERAN AFFAIRS	SKLLED NURSING/NURSING HM
ITALIAN MAPLE LLC	SKLLED NURSING/NURSING HM
POMERADO OPERATIONS LLC	SKLLED NURSING/NURSING HM
FRIENDSHIP MANOR LKSIDE	SKLLED NURSING/NURSING HM
CASA PALMERA	SKLLED NURSING/NURSING HM
HILLCREST MANOR SANITARIUM	SKLLED NURSING/NURSING HM

Appendix C

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Priority Essential Services SDG&E Customer List

CASA DE LAS CAMPANAS	SKLLED NURSING/NURSING HM
NAUTILUS HEALTHCARE INC	SKLLED NURSING/NURSING HM
VILLA RHO BRDO HEALTH	SKLLED NURSING/NURSING HM
SAMUEL HOROWITZ INC	SKLLED NURSING/NURSING HM
VILLAGE SQ HEALTHCARE CTR	SKLLED NURSING/NURSING HM
PARKWAY OPERATIONS LLC	SKLLED NURSING/NURSING HM
AEGIS ASSISTED LIVING LLC	SKLLED NURSING/NURSING HM
SUN & SEA ASSISTED LIVING	SKLLED NURSING/NURSING HM
GENTIVA	SKLLED NURSING/NURSING HM
VIBRA HOSPITAL OF SAN DIEGO	SKLLED NURSING/NURSING HM
FALLBROOK HEALTHCARE LLC	SKLLED NURSING/NURSING HM
EAST COUNTY TRANSITIONAL	SKLLED NURSING/NURSING HM
SO CAL PRESBYTERIAN HMS	SKLLED NURSING/NURSING HM
CAPISTRANO BEACH CARE CENTER	SKLLED NURSING/NURSING HM
IGLESIA DEL SENOR JESUS	SKLLED NURSING/NURSING HM
WINDSOR CARE CTR OF SD	SKLLED NURSING/NURSING HM
BERNARDO HEIGHTS HEALTH CARE	SKLLED NURSING/NURSING HM
MYRNA F ARCELAO	SKLLED NURSING/NURSING HM
HEBREW HOME	SKLLED NURSING/NURSING HM
FCAW FOUR POINTS LLC	SKLLED NURSING/NURSING HM
BIRCH HOLDINGS LLC	SKLLED NURSING/NURSING HM
SEACREST VILLAGE RB	SKLLED NURSING/NURSING HM
AMERICAN HEALTH SVCS OF SD	SKLLED NURSING/NURSING HM
BALBOA HEALTHCARE INC	SKLLED NURSING/NURSING HM
ABSOLUTE CARE HEALTH SYSTEMS	SKLLED NURSING/NURSING HM
GLENN M BALFOUR MD	SKLLED NURSING/NURSING HM
MAXIM HEALTHCARE SERVICES	SKLLED NURSING/NURSING HM
ASPIRE HOME HEALTH CARE INC	SKLLED NURSING/NURSING HM
CCW LA JOLLA LLC	SKLLED NURSING/NURSING HM
COMMUNITY CONV HOSPITAL	SKLLED NURSING/NURSING HM
FIVE STAR QUALITY CARE	SKLLED NURSING/NURSING HM
EC OPCO GROSSMONT GARDENS LP	SKLLED NURSING/NURSING HM
BAYVIEW O P CHURCH	SKLLED NURSING/NURSING HM
BORREGO COMM HLTH FOUND	SKLLED NURSING/NURSING HM
VISTA KNOLL	SKLLED NURSING/NURSING HM
ARBA GROUP FACILITIES OPERAT	SKLLED NURSING/NURSING HM
GRANITE HILLS H C	SKLLED NURSING/NURSING HM
GHC OF LAKESIDE LLC	SKLLED NURSING/NURSING HM
PORTSIDE HEALTHCARE INC	SKLLED NURSING/NURSING HM

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JEFFREY PINE HLDNGS LLC	SKLLED NURSING/NURSING HM
MODERN HOME HEALTH CARE INC	SKLLED NURSING/NURSING HM
PACIFICA EASTLAKE LLC	SKLLED NURSING/NURSING HM
AETAS HEALTH SERVICES	SKLLED NURSING/NURSING HM
LUMBER CYCLE	SKLLED NURSING/NURSING HM
LINERS CORP	SKLLED NURSING/NURSING HM
LEMON GROVE HEALTH ASSOC LLC	SKLLED NURSING/NURSING HM
PAC REGENT CONDO ASSOC	SKLLED NURSING/NURSING HM
MEADOWBROOK VILLAGE	SKLLED NURSING/NURSING HM
CASA PACIFICA	SKLLED NURSING/NURSING HM
CHURCH OF JESUS CHRIST	SKLLED NURSING/NURSING HM
MOUNT MIGUEL COVNT VLG	SKLLED NURSING/NURSING HM
PARKSIDE HEALTHCARE INC	SKLLED NURSING/NURSING HM
AB HOME CARE	SKLLED NURSING/NURSING HM
AMERICARE ADHC INC	SKLLED NURSING/NURSING HM
BRIGHTON PLACE EAST	SKLLED NURSING/NURSING HM
BRIGHTON PLACE SVC	SKLLED NURSING/NURSING HM
THE MUSIC THERAPY CENTER INC	SKLLED NURSING/NURSING HM
ADVANTAGE HEALTH SYSTEMS	SKLLED NURSING/NURSING HM
SUNLAND HOME FOUNDATION	SKLLED NURSING/NURSING HM
SD CHRISTIAN FOUNDATION	SKLLED NURSING/NURSING HM
SAN DIEGO NEW CHURCH	SKLLED NURSING/NURSING HM
JAMES R EASTERLY	SKLLED NURSING/NURSING HM
VISTA DEL MAR CARE CTR	SKLLED NURSING/NURSING HM
CLAIREMONT HEALTHCARE CENTRE	SKLLED NURSING/NURSING HM
EIAD H HADDAD	SKLLED NURSING/NURSING HM
LOVING CARE LLC	SKLLED NURSING/NURSING HM
ELM HOLDINGS LLC	SKLLED NURSING/NURSING HM
YVONNE V LUNA	SKLLED NURSING/NURSING HM
POPLAR HOLDINGS LLC	SKLLED NURSING/NURSING HM
PEPPERBUSH HOLDINGS LLC	SKLLED NURSING/NURSING HM
VOLUNTEERS OF AMERICA	SKLLED NURSING/NURSING HM
KINGDOM HALL	SKLLED NURSING/NURSING HM
THE POOR SISTERS OF NAZ	SKLLED NURSING/NURSING HM
EL DORADO CARE CENTER	SKLLED NURSING/NURSING HM
PREGNANCY CARE CENTER	SKLLED NURSING/NURSING HM
CRESCENT HEALTH CARE	SKLLED NURSING/NURSING HM
MISSION HOME HEALTH INC	SKLLED NURSING/NURSING HM
KOA HOLDINGS LLC	SKLLED NURSING/NURSING HM

Appendix C

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Priority Essential Services SDG&E Customer List

CONTINUING LIFE COMM LLC	SKLLED NURSING/NURSING HM
KATHLEEN PLEASANTS	SKLLED NURSING/NURSING HM
SAN DIEGO HOME HEALTH CARE	SKLLED NURSING/NURSING HM
ANGELICUM HOME HEALTH INC	SKLLED NURSING/NURSING HM
PALA BAND OF MISSION INDIANS	TRIBE
MESA GRANDE INDIAN HOUSING	TRIBE
LA JOLLA BAND OF INDIANS	TRIBE
SYCUAN BAND OF KUMEYAAY	TRIBE
MANZANITA BAND MSN INDIANS	TRIBE
BARONA TRIBAL WATER	TRIBE
BARONA TRIBAL GAMING AUTH	TRIBE
CAMPO INDIAN RESERVATN	TRIBE
CAMPO BAND MSN INDIANS	TRIBE
CAMPO MATERIALS	TRIBE
SYCUAN BAND KUMEYAAY INDIANS	TRIBE
SYCUAN CHURCH	TRIBE
SYCUAN HEALTH CENTER	TRIBE
SYCUAN	TRIBE
SYCUAN DAYCARE	TRIBE
MESA GRANDE BAND MSN INDIANS	TRIBE
HARRAHS RINCON CASINO & RSRT	TRIBE
BARONA CHURCH	TRIBE
BARONA BAND MSN INDIANS	TRIBE
BARONA COMMUNITY CTR	TRIBE
BARONA TRIBAL COUNCIL	TRIBE
VALLEY VIEW CASINO	TRIBE
LA POSTA BAND OF MSN INDIANS	TRIBE
LOS COYOTES GREENHOUSE	TRIBE
MANZANITA INDIAN RES	TRIBE
MANZANITA ACTIVITY CTR	TRIBE
KUMEYAAY WIND LLC	TRIBE
SYCUAN TRIBAL DEVELOPMENT CO	TRIBE
RINCON INDIAN RESERVATION	TRIBE
SAN PASQ BAND OF DIEGUENO MI	TRIBE
PAUMA TRIBAL HALL	TRIBE
PAUMA TRIBE	TRIBE
PALA ENTERTAINMENT CENTER	TRIBE
RINCON GAMING ENTERPRISE	TRIBE
CAMPO BAND OF MSN INDIANS	TRIBE

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CASINO PAUMA	TRIBE
LS POWER ASSOCIATES LP	UTILITIES
OTAY MESA ENERGY CENTER LLC	UTILITIES
SOUTHERN CALIFORNIA EDISON	UTILITIES
ORANGE GROVE ENERGY LP	UTILITIES
CARLSBAD ENERGY CENTER LLC	UTILITIES
ESC ENERGY CENTER LLC	UTILITIES
CALPEAK POWER LLC	UTILITIES
CV ENERGY CENTER LLC	UTILITIES
CITY OF CARLSBAD	WATER & WASTEWATER SYSTMS
VLY CENTER MUN WTR DIST	WATER & WASTEWATER SYSTMS
PADRE DAM MUN WTR DIST	WATER & WASTEWATER SYSTMS
CITY OF S J CAPISTRANO	WATER & WASTEWATER SYSTMS
CITY OF DANA POINT	WATER & WASTEWATER SYSTMS
GOLDEN ACORN CASINO	WATER & WASTEWATER SYSTMS
STA MARGARITA WTR DIST	WATER & WASTEWATER SYSTMS
MOULTON NIGUEL WTR DIST	WATER & WASTEWATER SYSTMS
OTAY WATER DISTRICT	WATER & WASTEWATER SYSTMS
HELIX WATER DISTRICT	WATER & WASTEWATER SYSTMS
CAL DEPT OF FISH & GAME	WATER & WASTEWATER SYSTMS
SDCWA	WATER & WASTEWATER SYSTMS
OLIVENHAIN MUN WTR DIST	WATER & WASTEWATER SYSTMS
RAMONA MUN WTR DIST	WATER & WASTEWATER SYSTMS
RINCON DEL DIABLO MWD	WATER & WASTEWATER SYSTMS
CITY OF ESCONDIDO	WATER & WASTEWATER SYSTMS
JACUMBA COMM SERV DIST	WATER & WASTEWATER SYSTMS
LAKESIDE IRRIG DIST	WATER & WASTEWATER SYSTMS
ZOOLOGICAL SOCIETY SAN DIEGO	WATER & WASTEWATER SYSTMS
POSEIDON RSRCS (CHANNELSIDE)	WATER & WASTEWATER SYSTMS
CITY OF MISSION VIEJO	WATER & WASTEWATER SYSTMS
WEST CUCA MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
LEUCADIA CNTY WATER DIST	WATER & WASTEWATER SYSTMS
VALLECITOS WTR DIST	WATER & WASTEWATER SYSTMS
LAKESIDE WATER DISTRICT	WATER & WASTEWATER SYSTMS
SAN ELIJO JNT PWR AUTH	WATER & WASTEWATER SYSTMS
P V MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
SWEETWATER AUTHORITY	WATER & WASTEWATER SYSTMS
SAN DIEGUITO WATER DIST	WATER & WASTEWATER SYSTMS
RANCHO SANTA TERESA WATER	WATER & WASTEWATER SYSTMS

Appendix C

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Priority Essential Services SDG&E Customer List

HARRISON PARK MUTUAL WATER	WATER & WASTEWATER SYSTMS
BOY SCOUTS - SDIC	WATER & WASTEWATER SYSTMS
BORREGO WATER DISTRICT	WATER & WASTEWATER SYSTMS
RANCHO PAUMA MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
SO COAST WATER DISTRICT	WATER & WASTEWATER SYSTMS
STATE OF CA/PARKS & REC	WATER & WASTEWATER SYSTMS
LOS TULES MUT WATER CO	WATER & WASTEWATER SYSTMS
VISTA IRRIGATION DIST	WATER & WASTEWATER SYSTMS
SUMMIT EST MUTUAL WATER	WATER & WASTEWATER SYSTMS
PALOMAR MTN MUN WTR DST	WATER & WASTEWATER SYSTMS
DESCANSO COMM WATR DIST	WATER & WASTEWATER SYSTMS
YUIMA MUN WATER DIST	WATER & WASTEWATER SYSTMS
RANCHO PAUMA MNT WTR CO	WATER & WASTEWATER SYSTMS
RANCHO PAUMA MUT WTR CO	WATER & WASTEWATER SYSTMS
PAUMA VALLEY COMMUNITY	WATER & WASTEWATER SYSTMS
BORDEN RANCHES	WATER & WASTEWATER SYSTMS
LAZY H WATER COMPANY	WATER & WASTEWATER SYSTMS
PAUMA VLY WATER CO	WATER & WASTEWATER SYSTMS
FPUD - SANITARY	WATER & WASTEWATER SYSTMS
SERJ MUTUAL WATER COMPANY	WATER & WASTEWATER SYSTMS
RHO PAUMA MUTUAL WATER CO	WATER & WASTEWATER SYSTMS
RAINBOW MUN WTR DIST	WATER & WASTEWATER SYSTMS
MESA GRANDE B O M I FIRE DPT	WATER & WASTEWATER SYSTMS
CITY OF IMPERIAL BEACH	WATER & WASTEWATER SYSTMS
BARONA TRIBAL OFC	WATER & WASTEWATER SYSTMS
CITY OF SAN CLEMENTE	WATER & WASTEWATER SYSTMS
QUEST HAVEN MUN WTR	WATER & WASTEWATER SYSTMS
CPUC	Public Safety Partner
CALFIRE	Public Safety Partner
SD County OES	Public Safety Partner
SD County Sheriff	Critical First Responder
SD Sheriff Dispatch	Critical First Responder
North Comm Dispatch	Critical First Responder
Heartland Fire Dispatch	Critical First Responder
San Diego Fire Dispatch	Critical First Responder
Monte Vista Fire Dispatch	Critical First Responder
City of Carlsbad	Critical First Responder
City of Carlsbad	Critical First Responder
City of Chula Vista	Critical First Responder

Appendix C

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Priority Essential Services SDG&E Customer List

City of Chula Vista	Critical First Responder
City of Coronado	Critical First Responder
City of Coronado	Critical First Responder
City of El Cajon	Critical First Responder
City of El Cajon	Critical First Responder
City of La Mesa	Critical First Responder
City of La Mesa	Critical First Responder
City of Lemon Grove	Critical First Responder
City of Lemon Grove	Critical First Responder
City of Encinitas	Critical First Responder
City of Encinitas	Critical First Responder
City of Del Mar	Critical First Responder
City of Solana Beach	Critical First Responder
City of Escondido	Critical First Responder
City of Imperial Beach	Critical First Responder
City of Imperial Beach	Critical First Responder
City of National City	Critical First Responder
City of Oceanside	Critical First Responder
City of Poway	Critical First Responder
City of Poway	Critical First Responder
City of San Diego	Critical First Responder
City of San Marcos	Critical First Responder
City of San Marcos	Critical First Responder
City of Santee	Critical First Responder
City of Santee	Critical First Responder
City of Vista	Critical First Responder
City of Vista	Critical First Responder
City of Aliso Viejo	Critical First Responder
City of Aliso Viejo	Critical First Responder
City of Dana Point	Critical First Responder
City of Dana Point	Critical First Responder
City of Laguna Beach	Critical First Responder
City of Laguna Hills	Critical First Responder
City of Laguna Niguel	Critical First Responder
City of Mission Viejo	Critical First Responder
City of Rancho Santa Margarita	Critical First Responder
City of San Clemente	Critical First Responder
City of San Juan Capistrano	Critical First Responder
Orange County OES	Public Safety Partner

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Priority Essential Services SDG&E Customer List

Orange County Fire Authority	Critical First Responder

Appendix D

SDG&E Field Resources

Summary of SDG&E's Field Resources (as of January 31, 2020)

Resource Type	Number	Description
Distribution Field Crews		
Journeyman Troubleman Working Foreman	152 41 38	Trained resources to work on SDG&E's high voltage, overhead and underground distribution system. They perform inspections and maintenance, assess system damages, make repairs to restore service, and serve as SDG&E's first responders.
Apprentice Lineman Line Assistants	46 27	Compliments the field crews as part of their training, working under direct supervision of Journeyman Lineman and Working Foreman.
Total	**304**	
Distribution Field Supervision		
Construction Supervisor Temporary Supervisor	30 5	Provides management, field safety, and operational oversight and technical support for field crews in each of SDG&E's nine districts.
Total	**35**	
Transmission Field Crews		
Journeyman Working Foreman Patroller Wash Crew Line Assistant Equipment Operator	9 4 1 2 2 6	Trained resources to work on SDG&E's transmission system, performing inspections and maintenance, assessing system damages, making repairs to restore service, and serving as SDG&E's first responders.
Total	**24**	
Transmission Field Supervision		
Construction Supervisor Temporary Supervisor	4 0	Provides management, field safety, and operational oversight and technical support for transmission field crews.
Total	**4**	