San Diego Gas & Electric Company's Supplemental Filing Addressing 2020 Wildfire Mitigation Plan Quarterly Report Insufficiencies

February 26, 2021

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I. Introduction

Pursuant to the *Wildfire Safety Division Evaluation of San Diego Gas & Electric Company's First Quarterly Report* issued by the Wildfire Safety Division (WSD) on January 8, 2021, San Diego Gas & Electric Company (SDG&E or Company) submits this Supplemental Filing addressing the insufficient elements of its first Quarterly Report (QR or Report) on 2020 Wildfire Mitigation Plan (WMP).[1] The WSD's Evaluation requires SDG&E to address 49 action items to satisfy their identified insufficiencies with the Quarterly Report.

It is important to note that the deficiencies and related action items are generally outdated and that since the filing of the first Quarterly Report, SDG&E has provided additional information in subsequent quarterly reports and in the 2021 WMP Update.[2] To respond to the action items, SDG&E provides additional information by looking back at the Quarterly Report and providing additional context related to that Report at the time it was developed. Where applicable, SDG&E also references updates related to those action items from its recently submitted 2021 WMP Update, which sets forth the most up to date information on SDG&E's wildfire mitigation initiatives and programs.

The responses contained in this Supplemental Filing include clarifying information in instances where SDG&E's Quarterly Report led to a misunderstanding of the content as well as additional quantification based on currently available data. Examples of that include: clarifying what was meant by "Timeline of Ignition Reduction Calculations (Years)," which refers to the duration over which risk reduction benefits would be realized rather than program implementation duration as well as additional quantification on estimated risk reductions where possible. SDG&E's efforts to quantify risk reductions follows the goal of providing meaningful estimates. Where estimates cannot be meaningfully quantified, SDG&E relies on qualitative analysis to respond to the action items. As SDG&E continues to evolve its quantification capabilities, it will be able to provide those updates in future reports. Looking back through SDG&E's prior reports, one can see the evolution in quantification over time. SDG&E will continue to evolve and emphasizes that it takes time to gather the data and provide it in a meaningful way.

This Supplemental Filing is structured according to the deficiencies for which action items were required. Under each deficiency section, action items are structured as sub-sections with content to respond to those action items.

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[1] San Diego Gas & Electric Company's Quarterly Report on 2020 Wildfire Mitigation Plan for Q3 2020 (September 9, 2020).

[2] San Diego Gas & Electric Company 2020-2022 Wildfire Mitigation Plan Update (February 5, 2021).

II. Resolution WSD-002 – Class B Guidance Deficiencies

A. Condition Guidance-1: Lack of Risk Spend Efficiency Information

1. SDGE Action Item-1

SDG&E shall: a) provide an explanation for the "Timeline of Ignition Reduction Calculations (Years)," b) explain why some risk reductions will take SDG&E 40 years to complete, and c) explain why a central data repository is grouped with PSPS and service restoration personnel.

a) The timeline of ignition reduction represents the life of the project, which determines how long the benefit would be realized for, not the time it would take to complete the work. For example, grid hardening projects typically have a long duration of benefits based on the estimated life of new poles (e.g., 40 years) so the benefits of new poles can be realized over the lifetime of the new asset. On the other hand, for initiatives such as inspections that occur on a cyclical basis (e.g., every 3 years), the benefits span the duration of the cycles. These durations do not mean the projects will take that long to implement; they merely reflect the duration of the benefits.

b) Please refer to (a) above.

c) The central data repository initiative was grouped with Public Safety Power Shutoff (PSPS) and service restoration personnel because at the time, it was deemed a foundational function of being able to execute PSPS operations effectively. Quantifying a reduction of ignitions that is attributed to having a central data repository is not meaningful and thus, grouping it with an initiative was deemed appropriate at the time to fulfill the need to provide risk reduction estimates. Since then, in its 2021 WMP Update, SDG&E classified the central data repository as a foundational initiative that is not grouped with any activity.

2. SDGE Action Item-2

SDG&E shall: 1) further describe why either ignition risk or wildfire consequence risk are calculated instead of both, and 2) provide an explanation for each initiative as to why it either reduces ignition risk or wildfire consequence risk, but not both.

1) SDG&E's efforts to quantify risk reduction are focused on finding meaningful ways to measure the estimated reduction to the overall risk. Many of SDG&E's initiatives are primarily aimed at preventing ignitions from starting in the first place. For example, grid hardening initiatives are generally focused on reducing likelihood of ignitions by replacing assets before they fail, however, the wildfire consequences of an ignition occurring at the location of those assets are not directly affected. In general, risk reduction can shift the distribution of risk events thereby affecting both likelihood and consequence. However, due to the way that risk spend efficiency (RSE) calculations are structured, SDG&E had to simplify some of the calculations by selecting the most applicable type of reduction to perform the analysis. While certain mitigations may have potential to affect both wildfire likelihood and consequence, quantifying a reduction in likelihood can be measured more easily and directly than reducing the consequences of a fire. Therefore, where appropriate, the risk reduction is quantified by a reduction in likelihood. In the future, SDG&E will evolve in its thinking regarding how to allocate risk reductions to likelihood and consequences.

2) The following table provides an explanation for each initiative as to why it either reduces ignition risk or wildfire consequence risk, but not both.

Table 1: SDGE Action Item-2

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
C.2	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault	Y	N	System automation equipment is used to prevent faults from leading to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.18.2	Other (LTE Communication Network)			
D.9.2	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone flights and assessments)	Y	N	Drone inspections, and associated repairs, are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
D.9.4	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone Repairs)			
D.6	Intrusive pole inspections	Y	N	Intrusive pole inspections are conducted to pre-emptively detect issues that may lead to pole failures and subsequent ignitions. Pole replacements and reinforcements are similarly conducted to preemptively prevent pole failures and ignitions that may occur as a result of failure. Both activities reduce likelihood but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.6	Distribution pole replacement and reinforcement, including with composite poles			
F.6.2	PSPS events and mitigation of PSPS impacts (Communication practices)	Y	N	PSPS events and associated foundational activities are conducted to de-energize lines and prevent utility equipment from leading to ignitions, thus reducing ignition likelihood. PSPS events do not have a measurable impact on wildfire consequence so no consequence benefit is calculated.
G.1	Centralized repository for data			
I.1	Adequate and trained workforce for service restoration (EOC)			

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
C.1	Capacitor maintenance and replacement program	Y	N	Capacitor maintenance and replacement is conducted to prevent and detect faults and failures that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.17.1	Updates to grid topology to minimize risk of ignition in HFTDs (Distribution OH Hardening)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.3	Covered conductor installation	Y	N	Installation of covered conductor addresses multiple ignition drivers (e.g., foreign object in line, wire-to-wire contact, etc.) and reduces ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.7	Expulsion fuse replacement	Y	N	As part of their normal operation, expulsion fuses vent a discharge of energy and hot particles that have the potential to ignite flammable vegetation. By replacing these expulsion fuses with new more fire safe CAL FIRE approved fuses, SDG&E is reducing the likelihood of ignition due to fuse operations. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
C.10	Maintenance, repair, and replacement of connectors, including hotline clamps	Y	N	Hotline clamps have been identified as potentially leading to weak connections that can results in wire-down events. By replacing hotline clamps and properly maintaining other connectors, the likelihood of wire-down events and potential subsequent ignitions is reduced. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.16	Undergrounding of electric lines and/or equipment	Y	N	Strategic undergrounding is considered to be nearly 100% effective at mitigating both equipment related and foreign object in line related ignition risks. However, undergrounding has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.17.2	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission OH Hardening)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
C.17.3	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission UG Hardening)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.17.4	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission OH distribution underbuilt)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.17.5	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Transmission OH)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
C.17.6	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution underbuilt on Transmission OH)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.17.7	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution OH)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.
C.17.8	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution UG)	Y	N	System hardening initiatives focus on mitigating the failure of SDG&E equipment and building the Company's infrastructure to withstand extreme conditions. Hardening programs reduce the risk of a fault occurring, and if one does occur, reduce the risk of the fault leading to an ignition. These programs reduce the likelihood of ignition but have no measurable impact on wildfire consequence, so no consequence benefit is calculated.

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
C.18.1	Other (Lightning Arrestor Replacement Program 5.3.3.18)	Y	N	Existing lightning arrestors have the potential to become thermally overloaded if the overvoltage duration is too long or too high, thus leading to a potentially ignition causing failure. Replacing these arrestors in strategic locations with more fire safe CAL FIRE approved lightning arrestors reduced the likelihood of a lightning arrestor related ignition. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
D.1	Detailed inspections of distribution electric lines and equipment	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
D.2	Detailed inspections of transmission electric lines and equipment	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
D.4	Infrared inspections of distribution electric lines and equipment	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
D.9.1	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (HFTD Tier 3 Inspections)	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
D.9.3	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Circuit Ownership)	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
D.15	Substation inspections[3]	Y	N	No likelihood or consequence risk reduction calculation was conducted for this initiative
E.2	Detailed inspections of vegetation around distribution electric lines and equipment	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
E.5	Fuel management and reduction of "slash" from vegetation management activities	Y	N	Fuel management activities reduce the availability of fuel in proximity to potential sources of ignition thus reducing the likelihood of ignitions from sparking equipment or wire-down incidents. Although reduced fuel could lead to smaller wildfires, the precise change to that consequence is difficult to accurately predict. For purposes of this report the emphasis was on the reduction of the likelihood of the ignition.
E.9	Other discretionary inspections of vegetation around distribution electric lines and equipment	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.

[3] SDG&E designs and constructs its substations with the steel structures, gravel, and concrete base, which makes it difficult for a fire to spread outside the substation. With very little ignition history, SDG&E performs substation inspection and maintenance more for the importance of substation reliability.

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
E.20	Vegetation management to achieve clearances around electric lines and equipment (Pole Brushing)	Y	N	Pole brushing removes vegetation around poles that could otherwise cause an ignition if any sparks from hardware were to fall on it, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
F.1	Automatic recloser operations	Y	N	Reclosing has the potential to aggregate ignition potential in severe risk event scenarios (e.g., wire down incidents). By disabling distribution reclosing in the HFTD at all times, SDG&E reduces the likelihood of ignitions due to recloser operations. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.
F.2	Crew-accompanying ignition prevention and suppression resources and services	Y	N	Contract Fire Resources' primary objective is to prevent any ignitions from resource activities. They are trained to mitigate small ignitions before they develop into a wildfire-causing ignition. As the activity both prevents wildfire-causing ignitions, it is considered to reduce event likelihood and have no measurable impact on wildfire consequence. Thus, no consequence benefit is calculated.
F.3	Personnel work procedures and training in conditions of elevated fire risk	Y	N	Updating work procedures to include additional mitigation measures in elevated or extreme risk conditions, the likelihood of at-risk SDG&E work activities leading to ignitions. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.

ID	Program/Initiative	Likelihood reduction estimated (Y/N)	Consequence reduction estimated (Y/N)	Explanation
F.6.1	Stationed and on-call ignition prevention and suppression resources and services (Aviation Firefighting Program)	N	Y	SDG&E's aviation firefighting program serves as a wildfire suppression measure to ensure aerial firefighting capabilities always remain available. SDG&E uses reportable ignitions as the risk event to calculate likelihood, and it is believed that the Aviation program will not reduce the number of those ignitions but rather the consequence of them.
F.5.1	Stationed and on-call ignition prevention and suppression resources and services (Industrial Fire Brigade)	Y	N	The Industrial Fire Brigade is trained to suppress ignitions and fires due to electrical equipment. These suppression activities reduce the likelihood of these ignitions from developing into wildfires. However, the initiative has no measurable impact on wildfire consequence, no consequence benefit is calculated.
D.11	Patrol inspections of distribution electric lines and equipment	Y	N	Inspection activities are conducted to pre-emptively detect issues that may lead to ignitions, thus reducing ignition likelihood. This initiative has no measurable impact on wildfire consequence, so no consequence benefit is calculated.

3. SDGE Action Item-3

SDG&E shall: 1) provide a list of all initiatives grouped together within Guidance-1 Table 3, and 2) explain why such initiatives cannot be broken apart when determining risk reduction.

Out of all the initiatives in Guidance-1 Table 3 from SDG&E's Quarterly Report, the following nine initiatives were grouped for purposes of estimating risk reductions. An explanation for each grouping is provided in the table below. It is important to note that the approach for grouping of initiatives for purposes of calculating RSEs has been updated in SDG&E's 2021 WMP Update and some of the prior groupings may no longer apply.

Table 2: SDGE Action Item-3

ID	Program/Initiative	Grouped (Y/N)	Explanation
C.2	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault	Y	The LTE network is considered a foundational initiative that supports wildfire mitigation efforts. The benefits of enhanced communication systems cannot be meaningfully quantified since they cannot be directly tied to reducing specific ignition drivers and as such were grouped with one of the main initiatives the LTE network is intended to support which is Advanced Protection. However, in the 2021 WMP Update, SDG&E ungrouped the LTE network and treated it as a foundational initiative on its own.
C.18.2	Other (LTE Communication Network)		

ID	Program/Initiative	Grouped (Y/N)	Explanation
D.9.2	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone flights and assessments)	Y	The drone assessments and repairs were grouped because the benefit of the program can only be quantified as a combination of both efforts. Evaluating the reduction of ignitions as a result of inspections is meaningless without taking into account the repairs that those inspections result in. As such, it is important to look at the entirety of the program to better quantify its benefits at reducing ignition risk.
D.9.4	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone Repairs)		
D.6	Intrusive pole inspections	Y	Similar to the above explanation, inspections alone cannot have a reduction and the resulting replacements or reinforcement efforts may not have been identified without the inspection effort. As such, these two activities go hand-in-hand when reducing the risk of ignitions and cannot be separately evaluated for risk reduction benefits.
C.6	Distribution pole replacement and reinforcement, including with composite poles		

ID	Program/Initiative	Grouped (Y/N)	Explanation
F.6.2	PSPS events and mitigation of PSPS impacts (Communication practices)	Y	PSPS as a mitigation requires various elements to support effective implementation, this is why two items were grouped with the PSPS mitigation effort to estimate the benefit of the key initiatives that play a role in supporting PSPS operations. In its Quarterly Report, SDG&E grouped PSPS with two initiatives: centralized repository of data and adequate and trained workforce for service restoration. The grouping of data repository was based on the fact that SDG&E relies heavily on its customer and outage databases to manage PSPS operations. Quantifying the benefits of those databases on their own would not have been as meaningful because they do not directly contribute to reduction in ignition drivers, but they support critical mitigations that do. As such, it was deemed appropriate to group it with the PSPS mitigation as an attempt to provide risk reduction estimates. However, since then, in the 2021 WMP Update, SDG&E ungrouped data repository and is treating it as a foundational activity that supports various initiatives. As for the adequate workforce item, EOC resources are critical to supporting PSPS operations and without their support, it would be difficult to appropriately measure the full benefits of PSPS at reducing the risk of wildfires.
G.1	Centralized repository for data		
I.1	Adequate and trained workforce for service restoration (EOC)		

4. SDGE Action Item-4

SDG&E shall: 1) provide a list and explanation of the main PSPS consequences being accounted for within risk calculations, and 2) explain how such consequences have influenced its 2021 WMP.

1) In its 2020 WMP, SDG&E did not quantify PSPS consequences so there was no accounting for PSPS consequences within risk calculations.

2) In its 2021 WMP Update, SDG&E included a preliminary analysis of PSPS consequences into the overall risk score and estimated RSEs using the updated approach to account for reductions in PSPS due to various initiatives. Details about the PSPS assessment are included in Sections 4.2b and 4.2c of SDG&E's 2021 WMP Update. Taking into account PSPS consequences allowed SDG&E to calculate RSEs for initiatives it previously did not have an approach to calculate RSEs for such as microgrids, generators, and sectionalizing enhancements. It also allowed SDG&E to evaluate the effectiveness of other initiatives such as grid hardening from both the lens of reducing fire risk as well as the PSPS impacts to customers. The incorporation of PSPS impacts as a part of SDG&E's new Wildfire Next Generation System (WiNGS) model for segment analysis is informing the scope of covered conductor and part of the scope of undergrounding in 2022 and beyond.

B. Condition Guidance-2: Lack of Alternatives Analysis for Chosen Initiatives

5. SDGE Action Item-5

SDG&E shall: 1) clarify where it prioritizes pole replacement and with what type of pole, and 2) explain whether it considered adding fire resistant materials to existing poles (e.g., by painting or spraying poles, or wrapping them with fire resistant materials).

After the 2007 fires in San Diego County, SDG&E's strategy for grid hardening was and is still focused on reducing the risk of catastrophic wildfires from powerlines. The strategy is not focused on protecting utility assets from wildfires. Adding fire resistant materials to existing poles (e.g., by painting or spraying poles, or wrapping them with fire resistant materials) may protect the poles from damage if a fire burns near the poles, but it does not prevent fires caused by utility assets. For SDG&E, the main purpose for grid hardening is to make the grid more resilient to damage resulting from high winds especially during the seasonal Santa Ana winds. Leveraging weather data and fire science data from its meteorology and fire science team, SDG&E's design and engineering standards were modified to account for known local conditions including wind speed patterns. Steel poles were determined to be the best type of poles as compared to wood or other materials partly due to the already extensive experience SDG&E has with steel poles on the transmission system. In its experience, SDG&E has not had any structural failures due to winds on steel poles as compared to wood poles. Additionally, SDG&E's evaluation of other types of poles did not provide the longevity, consistency in material, or ease of work methods as the steel poles.

Although SDG&E's main goal is not focused on preventing its assets from fire damage, SDG&E has and continues to evaluate adding fire resistant material to existing poles. Initial review of fire resistant material applied to an existing pole have resulted in concerns with longevity of the material, environmental conditions leading to the product no longer being effective, increase in operational & maintenance activities associated with the material, and potentially limited access to perform required maintenance on the pole. SDG&E continues to collaborate with vendors on new products that might be effective. For poles where there are equipment for potential ignitions, SDG&E relies on its current pole brushing program to limit the impact of heat on a pole base and the entire pole being designed to withstand higher heat, rather than applying a fire resistant material to an existing pole.

In addition, SDG&E's analysis has identified replacing a wood pole with steel or fiberglass will provide a greater resistance to starting or adding to a fire, than applying a fire resistant product to an existing wood pole. This was evident during the recent Valley Fire in SDG&E's service territory where all the steel poles remained intact, but 119 of the 264 wood poles in the fire area had to be replaced. In this same fire, 50 of the 84 wood poles that were brushed were not damaged.

6. SDGE Action Item-6

SDG&E shall: 1) disaggregate the backup power alternatives discussed in Table 6 and compare them to one another as alternatives, 2) explain why backup power initiatives were not evaluated as alternatives to one another, 3) evaluate "no action" as an alternative for backup power to the extent CPUC rules do not require such backup power, and 4) evaluate how decreases in scope to PSPS events due to grid hardening acts as an alternative to backup power initiatives.

1) The four backup power initiatives presented in SDG&E's 2020 WMP differ in their unique objectives to enhance customer resiliency, and therefore they also necessarily differ in terms of their optimal backup solutions and the customer groups targeted for each initiative. Due to the mutual exclusivity of the target groups and resulting unique backup solutions, this did not allow for direct comparison of alternatives between the initiatives. The table below shows the "Best Fit Solution" for each initiative. While certain customer groups are present in multiple initiatives, the customer's needs in each group were unique enough to support unique backup solutions.

Initiative (Best Fit Solution)	Customer Types in Scope
Microgrids	• At risk communities • Critical Facilities (e.g., food banks, evacuation centers, fire stations, urgent care centers, schools, and others)
Resiliency Grant Programs (Portable Rechargeable Batteries)	• Medical Baseline (MBL), Access and Functional Needs (AFN)
Generator Grant Program Expansion (Low cost, Portable, Dual Fuel Generators)	• Customers able to utilize portable generators, residing in the HFTD, prior PSPS exposure, Low Income (CARE) customers
Whole Home Generators (Permanent/Fixed Backup Generators)	• Residential homes and Small businesses without any other near term grid hardening options

Each of the four backup power initiatives discussed has one or more suggested alternatives. Below is a description of each of the suggested alternatives per initiative and their respective qualities that can be evaluated when considering alternative backup power solutions. When reviewing backup power alternatives, it is important to acknowledge that most of these initiatives were specifically requested by SDG&E's customers, dating back to feedback received at various 2018 townhalls hosted across SDG&E's back country communities. SDG&E has always valued its customers' perspectives and these initiatives are a direct result of community input.

Microgrids

Different Microgrid Locations

Selecting locations for potential microgrid deployment depends on variety of factors. Key considerations when evaluating the risk that may be prevented by a microgrid include the number of customers served, presence of at-risk communities, critical facilities. Microgrids may also be under consideration when other solutions may not be technically feasible or the most cost-effective solution. For instance, customers may be located in a geographical area that makes digging for undergrounding physically infeasible, whether from hard rock or from an environmental or cultural perspective. Microgrids are a possible solution to reduce PSPS impact in these situations. Due to these various considerations, different microgrid locations may prove more optimal for mitigating PSPS impacts depending on the surrounding circumstances.

Different Microgrid Types

Microgrids can be designed with a variety and different combinations of technologies. Some technologies that can be leveraged include solar, battery energy storage systems, fuel cells, controllable load, and conventional diesel fueled generators. Each microgrid design provides its own set of benefits and drawbacks in compared to other designs. Diesel fueled generator-based solutions can be quicker to implement with lower upfront costs but have negative environmental impacts associated with them. Battery storage solutions, in combination with solar, may be preferred as cleaner, long-term solutions may take a longer time to deploy than fossil fueled solutions. Different microgrid technologies and designs may prove more optimal for mitigating PSPS impacts depending on the surrounding circumstances.

Alternative microgrid locations and designs are not mutually exclusive alternatives and both may be under consideration when evaluating an alternative to a microgrid solution.

Resiliency Grant Programs (Customer Resiliency Programs)

Different Types of Generators

In 2019 and 2020, eligible customers were offered portable battery units with a solar charging capability. However, different generator solutions may be preferred depending on surrounding circumstances. Diesel powered and gas-powered portable generators can serve eligible customers' needs under the scope of the program. While inexpensive, they have high emission rates that may particularly negatively affect medical baseline customers.

Generator Grant Program Expansion

No Expansion
The program would not be expanded if SDG&E believed that the expanded programs would not be effective at reducing customer PSPS impacts or not suitable as a long-term solution. However, in July 2020, SDG&E launched the expanded Generator Grant Program under the name of the Generator Assistance Program (GAP).

Fixed Backup Power (Whole Home Generators)

Different Types of Generators
Different generator solutions can be implemented based on customer needs, feasibility, and other surrounding circumstances. Conventional diesel-powered standby generators can be used in many different residential and commercial customer use case scenarios and are durable solutions. However, they do have high emission rates and have negative environmental impacts associated with them. Solar plus storage solutions are considered cleaner alternatives but can be cost prohibitive for deployment at residential or small business customers and are dependent on weather conditions.

2) Please refer to the response to (1) above. The initiatives target unique sets of customers and as such, could not be considered as alternatives to each other.

3) When comparing different backup power initiatives, selecting a "no action"/status quo option would likely be selected if there were little to no risk reduction benefit or poor RSE values from all the available initiatives. The table below provides estimated program RSE values for the different backup power initiatives that were presented in SDG&E's 2021 WMP Update.

Initiative	Estimated RSE in HFTD Tier 2	Estimated RSE in HFTD Tier 3
Microgrids	30.78	N/A
Resiliency Grant / Customer Resiliency	36.55	73.11
Standby Power Program (Encompasses Whole House Generator Program)	N/A	89.61
Resiliency Assistance / Expanded Generator Grant Program	219.27	438.54

By using the WiNGS model, backup program risk reduction initiatives and their associated RSEs can be compared at a granular segment level to determine which, if any program(s) should be initiated and if so, which initiatives would be optimal. Based on the RSE scores in the table above, the mitigation initiatives resulted in cost-effective benefit reductions and were initiated.

4) Certain grid hardening initiatives, such as undergrounding, reduce the scope of PSPS events. The WiNGS model enables quantitative comparisons between these grid hardening solutions and backup power initiatives (e.g., generators) at a segment level. SDG&E intends to use the model to evaluate PSPS specific risk reduction and RSEs of grid hardening solutions in comparison to backup power initiatives to help with optimal solution planning. In 2020, WiNGS was used to help scope generator deployment for customers.

7. SDGE Action Item-7

SDG&E shall: 1) provide the analysis demonstrating that partnerships with fire agencies and other stakeholders proved to not be a viable alternative to fuels management, as shown in Table 8 of SDG&E's QR, and 2) provide details on all such partnerships SDG&E is pursuing, including the status of such partnerships from the 2020 WMP.

1) SDG&E does not view fuels management as an alternative to building relationships with partners, such as fire agencies. Partner relationships and expertise are essential to the success of the program and the projects it supports. Subject matter expert (SME) input was used in conjunction with fire behavior modeling software outputs to prioritize projects and initiatives. The comprehensive fuels management program is a key initiative that has been implemented in partnership with numerous stakeholders (e.g., fire departments, fire safe councils) and SDG&E is in the process of expanding this program to partner with cooperating agencies (e.g., Caltrans, land management agencies). The work is closely aligned with the priorities of SDG&E's partners in the fire agencies and local fire safe councils.

   For the project analysis itself, during the submittal phase, the projects proposals are to meet/include the following criteria:
   - Community/neighborhood-based project.
   - Has wildland-urban interface component.
   - Supported by local fire agency or other jurisdictional authority.
   - Managed by fire safe council, CERT or other nonprofit entity who can receive grant funds, plan and implement the project.
   - A Community Wildfire Protection Plan (CWPP) has been prepared and approved.
   - Proposed project budget and schedule.

SDG&E also strongly encourages:

- Innovative, creative, and demonstrates transformation potential.
- Collaborative and demonstrates partnership with other community groups (i.e., other non-profit, private, and educational organizations).
- Projects located in or near the High Fire Threat District Tier 2 and Tier 3 areas
- Able to be replicated as a successful model program in other geographic areas, regionally and nationally.

After proposals are received a team of subject matter experts analyzes the project plans and scores each based on the above criteria.

2) Along with responding to and training for incidents with the fire agencies that have jurisdiction within SDG&E's service territory, SDG&E remains an active member of the San Diego Fire Chiefs Association. This Association has representatives from most of the fire departments in SDG&E's service territory and topics that are discussed include fuels management initiatives and opportunities. SDG&E also maintains a strong working relationship with the Greater Fire Safe Council of San Diego and smaller fire safe councils. Partnerships with these groups have led to grants and fuels management projects. In 2020, SDG&E provided five grants for specific fuels management projects. SDG&E also performed QA/QC for these projects and is working toward improving the process in 2021.

8. SDGE Action Item-8

SDG&E shall explain 1) the extent to which LiDAR is being utilized currently, and 2) if it intends to incorporate LiDAR into its "enhanced inspections patrol and trimming" in the future.

1) SDG&E is in the preliminary stages of leveraging LiDAR for vegetation inspection activities along its distribution system within the HFTD. An inherent limitation with LiDAR is the relative infrequency of flights and, thus, the freshness of the data. Ground patrol activities follow a predetermined, routine schedule and occur twice annually within the HFTD. The timing of LiDAR capture and processing is complex, and the delivery of useable data can take a relatively long period of time. In its current state, LiDAR is also limited in the ability to identify structural tree hazards such as included bark, decay, disease, pest infestation, and root deficiencies. Such assessments require a site-specific inspection from the ground by a trained individual.

   The 2020 LiDAR pilot identified a few discrepancies in the data results. Field validation found some inconsistencies in the ability of LiDAR to penetrate dense tree canopy resulting in non-capture of vegetation and electrical facilities. SDG&E also learned that LiDAR data is currently incompatible with SDG&E's work management tool, PowerWorkz, which prohibits SDG&E from syncing LiDAR spatial data with inventory records maintained in PowerWorkz. SDG&E is currently working with its IT development team to enhance the work

management system to leverage LiDAR data in the future. Preliminary findings demonstrate that LiDAR technology can have value in providing empirical clearance data which can inform of non-compliant conditions and help manage work prioritization.

2) SDG&E is considering utilizing LiDAR data obtained from flights for post-construction data of electric system hardening projects to assist with QA/QC of the vegetation management program. SDG&E has typically only processed a portion of all available LiDAR data from flights to focus on capturing the electrical facilities and limit the size of the files. These files can be several terabytes in size, limiting the ability to store and process the data. SDG&E is working with the vendors to further review and refine LiDAR capture and data processing in 2021 with plans to implement a possible phased approach with its HFTD inspection program. New flights and improved data modeling will enhance the value of this technology.

9. SDGE Action Item-9

SDG&E shall provide explanations of the quantitative methods performed when determining the risk reduction of initiatives.

In its 2020 WMP, SDG&E relied on a combination of SME input and historical data, where available, to estimate risk reductions of initiatives. As SDG&E completed more studies in 2020, it incorporated updated approaches to estimating risk reductions for its initiatives. The table below outlines the latest methodologies and their references in the 2021 WMP Update.

Table 3: SDGE Action Item-9

Initiative	Risk Reduction Quantification Approach	2021 WMP Section Reference
Fault indicators for detecting faults on electric lines and equipment [Wireless fault indicators]	1. Evaluated estimated reduction in SAIDI minutes against historical outage duration and customer impact during fault events 2. Compared number of WFI circuit installations to total circuits to determine percentage of benefits realized in 2020-2022 period of the plan.	7.3.2.3
Capacitor maintenance and replacement program	Evaluation of historical data on faults that could cause ignitions to determine ignition rates and estimating a reduction in ignition rates as a result of capacitor replacements.	7.3.3.1
Covered conductor installation	1. Estimated mitigation effectiveness by evaluating impact on each ignition driver (e.g. 90% effectiveness on foreign object-in line) 2. Determined ignitions reduction by applying effectiveness to the miles of mitigation being completed in WMP timeframe	7.3.3.3

Initiative	Risk Reduction Quantification Approach	2021 WMP Section Reference
Expulsion fuse replacement	Evaluated differences in ignition rates associated with normal expulsion fuses and CAL FIRE fuses during normal operations to determine effectiveness over scope of mitigation deployment	7.3.3.7
PSPS sectionalizing enhancements	1. Decrease in impacted customers between previously used PSPS device and new sectionalizing device 2. Effectiveness is estimated by weather dependency and differences in switch plans	7.3.3.8.1
Microgrids	1. Mitigation deployment is determined via evaluation of risk and feasibility 2. Reduction in PSPS impact estimated by microgrid location and customers they serve	7.3.3.8.2
Installation of system automation equipment (Advanced Protection)	1. Estimated effectiveness by evaluating historical wire down incidents that would not be affected by other mitigation activities (e.g. hot clamps) 2. Effectiveness is combined with HFTD ignition rates and mitigation deployment to arrive at estimated reduction in ignitions	7.3.3.9
Maintenance, repair, and replacement of connectors, including hotline clamps	1. Estimated effectiveness by evaluating historical wire downs associated with connection failures 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.10
Resiliency Grant Programs	Reduction in PSPS impact projected by number of customers that would receive generators and estimated mitigation effectiveness	7.3.3.11.1
Standby Power Programs	Reduction in PSPS impact projected by number of customers that would receive generators and estimated mitigation effectiveness	7.3.3.11.2
Resiliency Assistance Programs	Reduction in PSPS impact projected by expected number of customers that will purchase generators under the program and estimated mitigation effectiveness	7.3.3.11.3
Undergrounding of electric lines and/or equipment (Strategic undergrounding)	1. Undergrounding effectiveness measured by evaluating potential ignition risk after deployment 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.16
Distribution overhead system hardening (Bare Conductor Hardening)	1. Effectiveness measured by evaluating fault rates on unhardened versus hardened distribution lines 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.17.1

Initiative	Risk Reduction Quantification Approach	2021 WMP Section Reference
Overhead transmission fire hardening (Transmission)	1. Effectiveness measured by evaluating fault rates on unhardened versus hardened transmission lines 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.17.2
Underground transmission fire hardening (Transmission)	Estimated effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at projected reduction in ignitions	7.3.3.17.2
Overhead transmission fire hardening (Distribution Underbuilt)	1. Effectiveness measured by evaluating fault rates on unhardened versus hardened distribution lines 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.17.2
Cleveland National Forest fire hardening - Transmission OH	1. Historical reliability data is evaluated on hardened and unhardened transmission lines to determine reduction in fault rates and effectiveness 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.17.3
Cleveland National Forest fire hardening - Distribution OH	1. Effectiveness measured by evaluating fault rates on unhardened versus hardened distribution lines 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.17.3
Cleveland National Forest fire hardening - Distribution UG	1. Undergrounding effectiveness measured by evaluating potential ignition risk after deployment 2. Effectiveness is combined with HFTD ignition rates and mitigation mileage deployment to arrive at estimated reduction in ignitions	7.3.3.17.3
Lightning arrestor removal and replacement	SME informed effectiveness is evaluated in conjunction with pre-mitigation ignitions due to lightning arrestors and planned mitigation deployment to arrive at estimated reduction in ignitions	7.3.3.18.2
Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)	1. Evaluated historical inspection findings by severity tier and projected inspection numbers 2. Estimated failure rates if inspection findings were not remediated within maintenance timeline 3. Avoided faults is combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.1

Initiative	Risk Reduction Quantification Approach	2021 WMP Section Reference
Detailed inspections of transmission electric lines and equipment (Transmission ground inspections)	1. Evaluated historical inspection findings by severity tier and projected inspection numbers 2. Estimated failure rates if inspection findings were not remediated within maintenance timeline 3. Avoided faults is combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.2
Infrared inspections of distribution electric lines and equipment	Pilot inspection numbers and findings data evaluated to estimate effectiveness and used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.4
Infrared inspections of transmission electric lines and equipment	1. Evaluated historical inspection findings by severity tier and projected inspection numbers 2. Estimated failure rates if inspection findings were not remediated within maintenance timeline 3. Avoided faults is combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.5
Intrusive pole inspections	Pilot inspection numbers and findings data evaluated to estimate effectiveness and used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.6
HFTD Tier 3 Inspections	1. Evaluated historical inspection findings by severity tier and projected inspection numbers 2. Estimated failure rates if inspection findings were not remediated within maintenance timeline 3. Avoided faults is combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.9.1
Drone assessments of distribution infrastructure	1. Effectiveness measured by evaluating pilot program inspection numbers and findings in conjunction with estimated failure rates for non-critical inspection findings 2. Effectiveness used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.9.2
Circuit ownership	1. Effectiveness measured by evaluating program findings in conjunction with estimated failure rates for non-critical inspection findings 2. Effectiveness used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.9.3
Drone assessment of transmission	1. Effectiveness measured by evaluating pilot program inspection numbers and findings in conjunction with estimated failure rates for non-critical inspection findings 2. Effectiveness used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.10.1

Initiative	Risk Reduction Quantification Approach	2021 WMP Section Reference
Additional Transmission Aerial 69kV Tier 3 Visual Inspection	1. Evaluated historical inspection findings by severity tier and projected inspection numbers 2. Estimated failure rates if inspection findings were not remediated within maintenance timeline 3. Avoided faults is combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.10.2
Patrol inspections of distribution electric lines and equipment - CMP	1. Evaluated historical inspection findings by severity tier and projected inspection numbers 2. Estimated failure rates if inspection findings were not remediated within maintenance timeline 3. Avoided faults is combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.11
Patrol inspections of transmission electric lines and equipment	1. Evaluated historical inspection findings by severity tier and projected inspection numbers 2. Estimated failure rates if inspection findings were not remediated within maintenance timeline 3. Avoided faults is combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.4.12
Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)	1. Evaluated vegetation contact data pre & post formal program inception to determine risk event reduction and estimated mitigation effectiveness per HFTD tier using tree inventory database 2. Effectiveness used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.5.2
Fuel management and reduction of “slash” from vegetation management activities	SME informed overall program effectiveness which is then allocated to the scope of the program deployment in order to estimate reduction in ignitions	7.3.5.5
Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)	1. Evaluated relationship between high risk species vegetation clearances to fault rates 2. Estimated decrease in vegetation related faults due to enhanced trims & expanded clearances in EVM scope 3. Effectiveness used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.5.9
Vegetation management to achieve clearances around electric lines and equipment (Pole brushing)	SME informed mitigation effectiveness used in conjunction with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.5.20

Initiative	Risk Reduction Quantification Approach	2021 WMP Section Reference
Recloser protocols	Faults isolated by reclosers and potentially caused by automatic reclosing are combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.6.1.1
Sensitive/Fast Protection Settings	Evaluated fault events that occurred downstream of devices enabled with fast protection settings and used	7.3.6.1.2
Crew accompanying ignition prevention and suppression resources and services (Wildfire infrastructure protection teams – Contract fire resources)	Faults caused by crew activity under elevated conditions in the HFTD are combined with HFTD ignition rates to arrive at estimated reduction in ignitions	7.3.6.2
Personnel work procedures and training in conditions of elevated fire risk (Other special work procedures)	SDG&E calculated the risk events per day in the Tier 2 + Tier 3 HFTD that occurred under normal and elevated conditions and then utilizes the HFTD ignition rates to estimate the reduction in ignitions	7.3.6.3
PSPS events and mitigation of PSPS impacts	1. Estimated increase in wildfire risk if PSPS activities were not in place 2. PSPS impact is estimated using historical PSPS event data 3. Risk reduction is measured as (Wildfire Risk Reduced – PSPS Impact)	7.3.6.4
Aviation firefighting program	SME informed mitigation effectiveness is used to quantify the reduction in wildfire consequence	7.3.6.5

C. Condition Guidance-4: Lack of Discussion on PSPS Impacts

10. SDGE Action Item-10

SDG&E shall provide quantitative values for all initiatives for the subparts included in Guidance-4.

In 2020, SDG&E did not quantify PSPS reductions for its initiatives. Generally, forecasting reductions in frequency and duration of PSPS events is largely dependent on weather conditions. As such, the quantification of PSPS reductions from initiatives presented in the 2021 WMP Update were largely focused on reduction in scope because of the ability to directly tie initiatives to customer benefits. SDG&E continues to improve its ability to estimate PSPS impacts and will demonstrate those improvements as they become available.

As stated in its 2021 WMP Update, SDG&E provided quantified values for PSPS scope reduction and the number of customers benefiting from at least six of the initiatives. These include SDG&E's Customer Resiliency Program, Fixed Backup Power Program (formerly referred to as the Whole Home Generator Program), Resiliency Grant Program, microgrids, PSPS sectionalizing enhancement, and undergrounding of electric lines initiatives. While many of SDG&E's other initiatives could also reduce the frequency, scope and/or duration of PSPS, due to inability to quantify their benefit at this time, SDG&E listed the qualitative benefits they provide.

Overall, through the six initiatives mentioned above, SDG&E expects that the mitigations could benefit a total of 32,975 customers. Due to uncertainty about weather conditions and effectiveness, the conservative estimated reduction of PSPS customers used in this analysis is 21,266 customers. This reduced estimate is a result of considering variability in weather conditions and effectiveness of sectionalizing, which can depend on weather patterns as well as partial effectiveness of generator programs that are not designed to provide whole-facility solutions.

As described above, forecasting specific reductions of outage duration based on where these initiatives are implemented is challenging because of the large dependency on weather conditions at those locations and other factors that might impact restoration. However, an overall reduction in duration can be derived by estimating the relationship between scope and duration using historical data. To complete this analysis on duration, SDG&E forecasted the potential PSPS impacts in terms of number of customers impacted and duration of impacts (CMI) based on historical events if no mitigations were to be applied and then estimated reductions in those two metrics based on the estimated benefits for each of the six initiatives listed above. Overall, SDG&E's three-year plan (2020–2022) is estimated to result in a reduction of 17% in the number of customers impacted and 12% in the duration based on this analysis.

In response to the conditions outlined in this deficiency and to provide additional information, SDG&E prepared the following table to identify which initiatives affect PSPS and how they affect PSPS (according to the five conditions outlined in this guidance). Where available for the six initiatives, quantified estimates are provided and if no quantification is available at this point, the qualitative description of the benefits is provided.

Scope reductions are measured in counts of customers that would benefit from the mitigation. Duration reductions are measured in terms of CMI reductions converted to hours. Due to the uncertainty around weather conditions and locations of outages, duration reductions are estimated in ranges. Initiatives that have quantified reductions are highlighted in peach in the table below.

Table 4: SDGE Action Item-10

Line Item	Program/Initiative	Quantitative PSPS Reduction	Qualitative PSPS Reduction
A.1	A summarized risk map that shows the overall ignition probability and estimated wildfire consequence along the electric lines and equipment	N/A	This initiative is focused on enhancing SDG&E's situational awareness and risk assessment capabilities. While it does not directly mitigate PSPS, it is foundational to supporting SDG&E's PSPS decision-making. The increased understanding of the risk via WRRM helps SDG&E focus only on the very high-risk events. High performance computing infrastructure provides a means of obtaining high-resolution weather forecast data that informs both scope and duration of PSPS events.
B.1	Advanced weather monitoring and weather stations	N/A	As described in the 2021 WMP Update, 30 second reads from weather stations can reduce the PSPS potential. The reduction in PSPS impacts were studied in 2020 for the December RFW events where more than 6,000 customers accounts avoided de-energizations during the December 2-4 event and around 20,000 customer accounts during the December 7-9 event.
B.3	Fault indicators for detecting faults on electric lines and equipment	N/A	Primarily a wildfire mitigation - allows for faster identification of faults on the distribution system.
B.4	Forecast of fire risk index, fire potential index, or similar	N/A	As described in the 2021 WMP Update, the FPI an also result in reduction of PSPS. Although the reductions cannot be forecasted at this time because they're heavily dependent on future weather conditions, estimated reductions can be analyzed post events. The reduction in PSPS impacts were studied in 2020 for the December RFW events where more than 19,000 customer accounts avoided de-energizations during the December 23-24, 2020 event.
C.1	Capacitor maintenance and replacement program	N/A	While not solely replacement will reduce PSPS, a combination of this equipment and additional fire hardening installation will reduce.
C.2	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault	N/A	Advanced protection can allow SDG&E to keep lines energized because of the added capability of technologies such as falling conductor. Quantifying those benefits is not available at this time.

Line Item	Program/Initiative	Quantitative PSPS Reduction	Qualitative PSPS Reduction
C.3	Covered conductor installation	N/A	While not entirely eliminating PSPS events because of exposure to other overhead equipment, covered conductor installed in key locations will dramatically reduce ignitions caused by wire to wire slap, foreign object contact and during wire down events. Additionally, circuit-segments with covered conductor could raise the PSPS threshold. However, due to the early implementation of covered conductor, quantified reductions cannot be estimated at this time but will be provided in the future as full segments are completed so that adjustments to threshold and customer impacts can be further analyzed.
C.6	Distribution pole replacement and reinforcement, including with composite poles	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
C.7	Expulsion fuse replacement	N/A	While not solely replacement will reduce PSPS, a combination of this equipment and additional fire hardening installation could reduce PSPS.
C.8.1	Grid topology improvements to mitigate or reduce PSPS events (sectionalizing devices)	Scope Reduction: 7,514 Duration Reduction: 125,568 - 201,069	Benefits of sectionalizing devices are calculated per project by the difference between customers de-energized by the previously used PSPS device and the customers de-energized downstream of the new one. This includes some customers that have never experienced a PSPS but have a probability of PSPS.
C.8.2	Grid topology improvements to mitigate or reduce PSPS events (Micro Grids)	Scope Reduction: 662 Duration Reduction: 8,851 – 14,173	Microgrid benefits are calculated based on the locations of microgrids and the customers they serve.
C.10	Maintenance, repair, and replacement of connectors, including hotline clamps	N/A	While not solely replacement will reduce PSPS, a combination of this equipment and additional fire hardening installation could reduce PSPS.
C.11.3	Mitigation of impact on customers and other residents affected during PSPS event (Generator Grant Program)	Scope Reduction: 2,168	The benefit of generator grant program is calculated based on the count of customers that would receive the generator. Note that although SDG&E is providing generators to 5,420 customers, the effectiveness of the mitigation is estimated to be 40% because the generators provided to customers as a part of this program are not whole-facility solutions but rather smaller units that keep specific equipment energized. The generators provided in this program do not impact the overall duration of outages and thus do not have estimates for reduction in duration.

Line Item	Program/Initiative	Quantitative PSPS Reduction	Qualitative PSPS Reduction
C.11.1	Mitigation of impact on customers and other residents affected during PSPS event (Whole Home Generator Program). In the 2021 WMP Update, this program was renamed as Fixed Backup Power (FBP) Program.	Scope Reduction: 900 Duration Reduction: 12,033 - 19,268	The benefit of whole home generator program is calculated based on the count of customers that would receive the generator. Because the generators provided to customers as a part of this program are whole-facility solutions that are expected to keep the customers energized throughout a PSPS event, the effectiveness of the mitigation is estimated to be 100%.
C.11.2	Mitigation of impact on customers and other residents affected during PSPS event (customer resiliency programs)	Scope Reduction: 2,831	The benefit of the customer resiliency programs is calculated based on the count of customers that are expected to purchase generators through the rebate program. The generators provided in this program do not impact the overall duration of outages and thus do not have estimates for reduction in duration.
C.16	Undergrounding of electric lines and/or equipment	Scope Reduction: 7,192 Duration Reduction: 120,195 - 192,465	The benefits of undergrounding from a PSPS standpoint are calculated based on the count of customers that the underground projects will feed.
C.17.1	Updates to grid topology to minimize risk of ignition in HFTDs (Distribution OH Hardening)	N/A	While not entirely eliminating PSPS events because of exposure to other overhead equipment and unforeseen wind speeds, the effects on PSPS require that entire segments be hardened.
C.17.2	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission OH Hardening)	N/A	2020 efforts did complete a goal of having a hardened segment into all substations within HFTD Tier 3. Extreme weather events with flying debris could lead to PSPS events for hardened lines, but duration would be reduced.
C.17.3	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission UG Hardening)	N/A	Transmission undergrounding hardening 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.
C.17.4	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission OH distribution underbuilt)	N/A	Hardened transmission underbuild lines are designed for known local wind events. Extreme weather events with flying debris could lead to PSPS events for hardened lines, but duration would be reduced. Only affects PSPS if segments are 100% hardened.

Line Item	Program/Initiative	Quantitative PSPS Reduction	Qualitative PSPS Reduction
C.17.5	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Transmission OH)	N/A	2020 efforts did complete a goal of having a hardened segment into all substations within HFTD Tier 3. Extreme weather events with flying debris could lead to PSPS events for hardened lines, but duration would be reduced.
C.17.6	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution underbuilt on Transmission OH)	N/A	Hardened transmission underbuilt lines are designed for known local wind events. Extreme weather events with flying debris could lead to PSPS events for hardened lines, but duration would be reduced. Only affects PSPS if segments are 100% hardened.
C.17.7	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution OH)	N/A	While not entirely eliminating PSPS events because of exposure to other overhead equipment and unforeseen wind speeds, the effects on PSPS require that entire segments be hardened.
C.17.8	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution UG)	N/A	The Cleveland National Forest projects include the hardening of facilities and select undergrounding of several existing electric facilities spread throughout an approximately 880 square-mile area in the eastern portion of San Diego County located in the HFTD. Generally, the CNF program will increase the safety and reliability of SDG&E's system by hardening existing electric infrastructure that currently serves the U.S. Forest Service, emergency service facilities.
C.18.1	Other (Lightning Arrestor Replacement Program)	N/A	While not solely replacement will reduce PSPS, a combination of this equipment and additional fire hardening installation could reduce PSPS.
C.18.2	Other (LTE Communication Network)	N/A	LTE network is necessary for implementing advanced protection that could allow SDG&E to keep lines energized because of the added capability of technologies such as falling conductor protection.
D.1	Detailed inspections of distribution electric lines and equipment	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.2	Detailed inspections of transmission electric lines and equipment	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.4	Infrared inspections of distribution electric lines and equipment	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.

Line Item	Program/Initiative	Quantitative PSPS Reduction	Qualitative PSPS Reduction
D.6	Intrusive pole inspections	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.9.1	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (HFTD Tier 3 Inspections)	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.9.2	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone flights and assessments)	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.9.4	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone Repairs)	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.9.3	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Circuit Ownership)	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.11	Patrol inspections of distribution electric lines and equipment	N/A	Replacing aging and damaged structures reduces risk, but it does so at an asset by asset level. Because SDG&E executes PSPS at the segment level, this typically will not impact PSPS.
D.15	Substation inspections	N/A	Substations are not deenergized due to substation risk. They may be impacted by PSPS due to transmission risk. Inspections can help reduce failures but do not affect PSPS.

Line Item	Program/Initiative	Quantitative PSPS Reduction	Qualitative PSPS Reduction
E.2	Detailed inspections of vegetation around distribution electric lines and equipment	N/A	SDG&E uses VRI and tree strike to determine when to PSPS but performance of tree trimming while important, does not affect decisions of PSPS in the moment. Although it helps reduce the fire risk, it may not have a significant enough impact on VRI polygons due to the density of trees in those polygons.
E.5	Fuel management and reduction of "slash" from vegetation management activities	N/A	Relatively new program. SDG&E will continue to monitor it to see if it could have applications that could affect PSPS.
E.9	Other discretionary inspections of vegetation around distribution electric lines and equipment	N/A	SDG&E uses VRI and tree strike to determine when to PSPS but performance of enhanced inspections patrols and trimming while important, does not affect decisions of PSPS at the moment. Although it helps reduce the fire risk, it may not have a significant enough impact on VRI polygons due to the density of trees in those polygons. However, SDG&E will continue to monitor effects of enhanced clearances to see how they can affect PSPS.
E.20	Vegetation management to achieve clearances around electric lines and equipment (Pole Brushing)	N/A	While not necessarily eliminating PSPS events, removing or modifying ground vegetation within expanded areas adjacent to energized facilities will reduce ignitions associated with wire down events.
F.1	Automatic recloser operations	N/A	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.
F.2	Crew-accompanying ignition prevention and suppression resources and services	N/A	Primary role is to manage consequences of wildfires if they start.
F.3	Personnel work procedures and training in conditions of elevated fire risk	N/A	Primary role is to mitigate potential wildfires.
F.6.2	PSPS events and mitigation of PSPS impacts (Communication practices)	N/A	Communication Practices and Community Engagement are used to inform impacted customers before, during and after PSPS events. It is also used to help educate them about PSPS events and how to be resilient.
F.5.1	Stationed and on-call ignition prevention and suppression resources and services (Industrial Fire Brigade)	N/A	Primary role is to manage consequences of wildfires if they start.

Line Item	Program/Initiative	Quantitative PSPS Reduction	Qualitative PSPS Reduction
F.6.1	Stationed and on-call ignition prevention and suppression resources and services (Aviation Firefighting Program)	N/A	Aviation Services Division (ASD) Program supports CAL FIRE with Firefighting assets ensuring there are capable aerial firefighting assets available to San Diego and southern Orange Counties. Other ASD Helicopters are used for patrols and inspections pre-event and during restoration efforts post PSPS events if they are not utilized to fight fires.
G.1	Centralized repository for data	N/A	While having a centralized repository for data does not directly mitigate PSPS, it is foundational to supporting SDG&E's PSPS decision-making. The increased understanding of the risk and access to critical data allows for improved targeting for PSPS operations.
G.4	Tracking and analysis of near miss data	N/A	Primary role is monitoring and tracking of incidents to mitigate wildfires.
H.1.1	Allocation methodology development and application	N/A	Primary role is to establish leading asset management practices to better inform decision-making.
H.1.2	Allocation methodology development and application - (Wildfire Mitigation Personnel)	N/A	The wildfire mitigation team supports various activities across the company and is not necessarily directly linked to PSPS mitigation though the team may support PSPS reduction initiatives.
H.1.3	Allocation methodology development and application (PSPS Mitigation Engineering Team)	N/A	This team was established to specifically focus on finding ways to mitigate PSPS impacts to customers. While the team itself does not directly mitigate PSPS, the solutions the team proposed and analyzed such as hardening initiatives and additional sectionalizing directly reduce PSPS.
I.1	Adequate and trained workforce for service restoration (EOC)	N/A	A well-established emergency response plan and well trained and certified workforce can expedite restoration.

D. Condition Guidance-5: Aggregation of Initiatives into Programs

11. SDGE Action Item-11

SDG&E shall: 1) provide an update of Appendix A of SDG&E's QR regarding the effectiveness calculations for reducing ignition probability and wildfire consequence, and 2) explain any "NA" values present for effectiveness calculations.

Please refer to Appendix A, which has been updated to reflect the effectiveness calculations for the 2020 WMP initiatives and the actual 2020 costs.

12. SDGE Action Item-12

SDG&E shall provide the information required in Section 5.3 of the WMP Guidelines for all initiatives.

Please refer to Appendix B.

E. Condition Guidance-7: Lack of Detail on Effectiveness of "Enhanced" Inspection Programs

13. SDGE Action Item-13

SDG&E shall: 1) provide detailed explanations, including supporting calculations, as to how estimated fault rates of 25 percent for emergency repairs, 2.5 percent for priority repairs, and 0.21 percent for noncritical repairs were calculated, 2) provide the titles and qualifications of the SMEs used to determine such failure rates, and 3) describe how it has implemented industry standards and best practices in determining such failure rates.

1) In SDG&E's maintenance history, there have been instances where issues identified for repair failed before the repairs were made. Lessons learned from such instances led to the priority system SDG&E uses today. SDG&E calculates an estimated effectiveness by filtering the issues identified to those that could lead to faults and ignitions after which SDG&E categorizes those conditions into emergency, priority, and non-critical. These categories are associated with different repair time frames. Emergency orders must be repaired in 0-3 days, priority within 30 days, and non-critical within one year.

   Using this information, SDG&E developed an estimated fault rate associated with the criticality. All emergencies were expected to cause a fault 25% of the time if not addressed within the next inspection cycle. Given 3 days for emergency and 30 days for priority, SDG&E divided the failure rate by 10 for priority, assuming 2.5% would lead to faults if not repaired before the next cycle. And finally, for non-critical going from 1 month to 12 months, SDG&E divided the 2.5% by 12 to get an assumption of 0.21% of non-critical issues would lead to faults if not addressed before the next inspection cycle.

2) The key SMEs involved in the analysis for the estimated fault rate calculations and their credentials as of February 2021 are provided below.

   a. Tyson Swetek, P.E, Director of Electric Distribution Operations

      Tyson Swetek is currently the Director of Electric Distribution Operations at SDG&E. He has held various positions in the functional areas of Wildfire Mitigation, Transmission Engineering, Substation Construction and Maintenance, Distribution Construction and Maintenance, and Distribution Operations. He earned a Bachelor of Science degree in Electrical Engineering from California Polytechnic State University and a Master of Business Administration degree from San Diego State University. Tyson is a registered Professional Engineer in California.

b. Kevin Galloway, P.E, Transmission Maintenance & Operations Team Lead

Kevin Galloway is currently a Team Lead of Transmission Maintenance and Operations at SDG&E. He has held various positions in the functional areas of Transmission Engineering, Substation Engineering and Design, and Structural Engineering. He earned a Bachelor of Science degree in Civil Engineering and a Master of Science degree in Civil Engineering from California Polytechnic State University. Kevin is a registered Professional Engineer in California.

3) SDG&E continues to evolve its approach to determine its failure rates by using quantitative analysis where possible in place of solely relying on SME input. In its 2021 WMP Update, SDG&E updated its analysis methodology and analyzed historical reliability and corrective maintenance data to determine the relationship between the pending infractions due to inspections and risk events. SDG&E will continue to update this study on an annual basis as new data becomes available and stay in line with industry best practices of continuous improvement.

14. SDGE Action Item-14

SDG&E shall: 1) evaluate combining its various detailed inspections (i.e., the five-year and three-year cycled inspections) into a single, regularly occurring (e.g., every 2 years), detailed inspection, 2) explain why additional, "enhanced" detailed inspections are not completed in HFTD Tier 2, and whether SDG&E is considering such inspections in HFTD Tier 2 areas moving forward, and 3) explain why an inspector carrying an infrared gun or handheld camera could not obtain a usable thermal image similar to one obtained from an infrared camera mounted on a vehicle or drone.

1) Combining the 3-year cycle incremental detailed inspection for Tier 3 of the HFTD with the General Order required 5-year inspection was considered by SDG&E. While the combination into a 2-year cycle seems to streamline the process, it results in slightly less risk reduction since the calculated average interval for the separate cycle inspections is more frequent than the interval of the combination of inspections. In addition, combining the cycles presents some logistical cost and regulatory risk as the systems and reporting processes currently in place have been perfected over the years and would have to be changed. Therefore, combining the two cycles would not provide additional risk reduction and would require additional cost for changes to controls and systems, leading to a less effective mitigation. The drone inspection will continue on a 5-year cycle, after being completed on Tier 3 of the HFTD as a first pass. Accelerating this cycle is not necessary at this stage given that the findings from the first pass address most historical failures. Because SDG&E is still evaluating the use of drones, it is too early to determine whether combining drone inspection with ground inspection cycles is appropriate given that the resources and capability for this inspection is unique to the technology.

2) SDG&E is prioritizing mitigations in Tier 3 over Tier 2 as the mitigations are generally more effective at this location. The proportion of the risk consequence when normalized by the miles in each HFTD tier, shows that addressing one mile in Tier 3 is much more effective in reducing risk than addressing a mile in Tier 2. Therefore, most mitigations and resources are currently targeted at Tier 3. As risk is reduced in Tier 3, the mitigations could then be expanded to Tier 2 moving forward.

3) The main reason trained thermographers utilize cameras mounted on vehicles or drones in lieu of a lineman or other inspector using an infrared gun or lower quality handheld camera is due to the spot size ratio of the equipment. In its simplest form, the spot size ratio is a ratio used to determine how far an inspector can be from a target or piece of equipment while still able to maintain an accurate measurement. Every piece of equipment has a calculated spot size ratio based on the camera lens' field of vision as well as the pixel count or quality of the camera. As the spot size ratio improves due to higher quality cameras or smaller field of vision with lens sizes, the distance at which an object of a set size can be accurately measured increases. With the infrared gun, the spot size ratio is much lower than the vehicle mounted camera resulting in inaccurate measurements when looking at small components such as attachments at various heights on structures. The drone mounted cameras may not have the same spot size ratio as the vehicle mounted camera or high-quality handheld units but the drone's ability to take photos and readings from closer to the desired attachment point allows for accurate measurements.

   In addition, SDG&E currently utilizes employees who are trained and certified thermographers to perform the analysis in the field and follow-up with the reports in the office. In order to perform an inspection and to analyze the severity of a condition if an issue exists, accurate field conditions must be known and accounted for within the analysis. These field conditions include atmospheric temperature, reflected temperature, emissivity, and impacts from solar loading. Emissivity can alter temperatures by hundreds of degrees Fahrenheit if improperly inputted for the material type.

F. Condition Guidance-9: Insufficient Discussion of Pilot Programs

15. SDGE Action Item-15

SDG&E shall provide the quantitative pass/fail criteria used to determine the success and potential to increase implementation for each of its pilot programs.

Even though SDGE describes some of the initiative as pilots, the effectiveness of these mitigations in reducing risk is not in question. Mitigations described as pilots such as undergrounding, covered conductor, and drones are known to reduce risk successfully. The purpose of piloting them was primarily to gather lessons learned for implementation before expanding their scope. That said, SDG&E has conducted efficacy studies of mitigations after gathering data points from prior implementations and will continue to do so for other programs including programs that were previously categorized as pilot programs. It is worth noting that the pilot programs discussed in 2020 have been updated in the 2021 WMP Update and are no longer considered pilots as they are part of the core programs in the Plan. Estimates for risk reductions for these programs were provided in the 2021 WMP Update and are referenced below. As SDG&E makes progress on the implementation of the programs, it will conduct efficacy studies to validate its assumptions about the program effectiveness and make changes accordingly. Preliminary assumptions about the effectiveness of these programs are provided in response to SDGE Action Item-16 below.

16. SDGE Action Item-16

SDG&E shall provide quantitative risk reduction estimates for its pilot programs, under the assumption that the technology would be adopted and implemented at a broader scale.

Risk reduction estimates for each of the pilot programs are further described below and are drawn from the 2021 WMP Update:

Covered Conductor
Over the three-year period of the SDG&E's 2020 WMP cycle, covered conductor is expected to reduce 0.21 ignitions annually. This estimate is derived by evaluating different causes of ignitions using 5-year ignition data from 2015 – 2019 and estimating a potential reduction in each cause based on estimates of effectiveness of covered conductor (e.g., ignitions caused by animal contact, balloon contact and vegetation contact have an estimated reduction of approximately 90% while ignitions caused by vehicle contact, have an estimated reduction of approximately 0%). This results in an overall estimated effectiveness of 70%.

A summary of the risk reduction estimation methodology is provided in the table below:

Pre-mitigation risk events per 100 miles	12.9
Effectiveness Estimate	70%
Post-mitigation risk events per 100 miles	12.9 – (0.7*12.9) = 3.87
Ignition rate in Tier 3	2.74%
Ignition rate in Tier 2	3.37%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Pre-mitigation Tier 2 ignitions per 100 miles	12.9*3.37% = 0.44
Post-mitigation Tier 3 ignitions per 100 miles	3.87*2.74% = 0.11
Post-mitigation Tier 2 ignitions per 100 miles	3.87*3.37% = 0.13
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.11 = 0.24
Ignitions reduced in Tier 2 per 100 miles	0.44 – 0.13 = 0.31
Miles of mitigation in Tier 3	68.8
Miles of mitigation in Tier 2	13
Ignitions reduced in Tier 3	68.8*0.24/100 = 0.17
Ignitions reduced in Tier 2	13*0.31/100 = 0.04
Total Ignition Reduction Estimate	0.17 + 0.04 = 0.21

Distribution Infrared

Since the distribution infrared inspection program is new, the pilot results from 2020 were utilized to forecast future years. Due to the technology dependency of this inspection type, it was assumed that any issue found would lead to a risk event, as another inspection cycle or patrol would be unable to identify this issue as they are visual and could not detect hot connections. The results of the 2020 pilot showed an estimated 0.055 ignitions reduced in the Tier 3 of the HFTD. A summary of the calculation is provided below:

2020 Inspections completed Tier 3	13077
Emergency Tier 3 Actuals	0
Priority Tier 3 Actuals	2
Non-Critical Tier 3 Actuals	0
Faults Avoided Tier 3	0 + 2 + 0 = 2
Distribution Ignition rate Tier 3	2.74%
Ignitions Reduced Tier 3	2*2.74% = .055

Expanded Generator Grant Program (Resiliency Assistance Program)

Over the three-year period of the SDG&E's 2020 WMP cycle, the Resiliency Assistance Program is expected to reduce PSPS impacts to a total of 3,774 customers. This number is calculated based on the count of customers that are expected to purchase generators through the rebate program and is used to estimate the reduction in PSPS impact to calculate the RSE in Table 12 of the 2021 WMP Update. Because the generators purchased through this program vary depending on the customer's preferences, the effectiveness of the mitigation is estimated to be 75%.

Falling Conductor Protection

Falling Conductor Protection can sense a break in conductor, and isolate a fault before it occurs. This mitigation is then focused mitigating risk events associated with wire downs. To calculate the benefit of this mitigation, SDG&E utilized the five-year average of wire down activities unmitigated by other mitigations such as hot line clamps, the ignition percentages within the Tier 2 and Tier 3 HFTD, and the percent of circuits that would be enabled with falling conductor protection by the end of the 2022 WMP period. This results in an expected 0.35 ignitions reduced per year based on the current deployment forecast after the three-year period of the plan. Details of the calculation are provided below.

Tier 2 wire downs (2015-2019 average)	19.1
Tier 3 wire downs (2015 – 2019 average)	16.5
Ignition rate Tier 2 (2015 – 2019 average)	3.37%
Ignition rate Tier 3 (2015 – 2019 average)	2.74%
Ignitions reduced Tier 2	19.1*3.37% = .65
Ignitions reduced Tier 3	16.5*2.74%=.45
Tier 2 circuits enabled (2020-2022)	0
Tier 3 circuits enabled (2020-2022)	22
Total Tier 2 circuits	54
Total Tier 3 circuits	28
Ignitions reduced Tier 2	(0/54)*.65 = 0
Ignitions reduced Tier 3	(22/28)*.45= .35

Strategic Undergrounding

To calculate the wildfire risk reduction for strategic undergrounding, SDG&E considered the historical ignitions associated with underground equipment to determine effectiveness, the pre-mitigation overhead system risk event rate and ignitions rates, and the underground mileage to be completed within the three-year period. Specifically, the effectiveness of undergrounding was measured by taking total CPUC reportable ignitions associated with underground (of which SDG&E has three, all due to vehicle contacts with pad mounted equipment) and dividing by total ignitions.

Based on this analysis, strategic undergrounding is expected to reduce 0.453 ignitions per year and mitigate PSPS impacts to 7,192 customers by the end of 2022. Below is a summary of the calculation:

Pre-mitigation risk events per 100 miles	12.9
Undergrounding effectiveness	98.1%
Ignition rate in Tier 3	2.74%
Ignition rate in Tier 2	3.37%
Pre-mitigation Tier 3 ignitions per 100 miles	12.9*2.74% = 0.35
Pre-mitigation Tier 2 ignitions per 100 miles	12.9*3.37% = 0.44
Post-mitigation Tier 3 ignitions per 100 miles	.35*(1-98.1%) = .0065
Post-mitigation Tier 2 ignitions per 100 miles	.44*(1-98.1%) = .0081
Ignitions reduced in Tier 3 per 100 miles	0.35 – 0.0065 = 0.346
Ignitions reduced in Tier 2 per 100 miles	0.44 – 0.0081=.435
Miles of mitigation in Tier 3	77.5
Miles of mitigation in Tier 2	43
Ignitions reduced in Tier 3	77.5*0.346/100 = 0.269
Ignitions reduced in Tier 2	43*0.435/100 = 0.184
Total Ignition Reduction Estimate	0.269 + 0.184= 0.453

Drone Assessments – Distribution

The distribution drone program is another new inspection program with the first phase of the pilot completed in 2020 that included aerial flights and assessments for all structures within the Tier 3 HFTD. Forecasts for future years will be based off the results from the pilot until a larger history of data is generated allowing the use of historical averages. For the drone program, SDG&E modified its methodology to ensure the effectiveness of drones was not overstated. SDG&E decided to use the measured 0.31% failure rate for all infractions found, given the unusually high hit rate of issues discovered using this program relative to other inspection programs. Based on the data and assumptions, the drone program will reduce 0.804 ignitions in the HFTD Tier 3. A summary of the calculation is provided below:

2020 Inspections completed Tier 3	37310
Emergency Tier 3 Actuals	132
Priority Tier 3 Actuals	1823
Non-Critical Tier 3 Actuals	7522
Fail Rate Non-Critical	0.31%
Risk events Avoided Tier 3	132 * .31% + 1823 * .31% + 7522 * .31% = 29
Distribution Ignition rate Tier 3	2.74%
Ignitions Reduced Tier 3	29 * 2.74% = .804

Circuit Ownership

The circuit ownership program is different from other inspection programs, as the employees using the tool are not performing inspections, but other tasks such as troubleshooting an electric issue for a customer or performing construction work. There is no required amount of inspections performed, as the issues are submitted by the workforce proactively through a mobile application if they see an issue. SDG&E is still measuring the risk reduced by this program the same way it measures inspections effectiveness, by quantifying the amount of issues found, the severity of the issue, the failure rate, and the ignition rate to calculate an estimated ignitions reduced from the program. Being that only two issues were turned in, only 0.0002 ignitions are expected to be reduced from this program in 2020. And even though those are modest numbers, the application has no maintenance fee, with only future cost forecasts being the repair cost of the items identified. Below is a summary of the calculation:

Emergency Tier 3 Actuals	0
Priority Tier 3 Actuals	0
Non-Critical Tier 3 Actuals	0
Emergency Tier 2 Actuals	0
Priority Tier 2 Actuals	0
Non-Critical Tier 2 Actuals	2
Fail Rate Non-Critical	0.31%
Risk events reduced Tier 2	2*.31% = .0062
Distribution Ignition rate Tier 2	3.37%
Ignitions avoided Tier 2	.0062 * 3.37% = .0002

Vegetation Management LiDAR

SDG&E is in the early stages of working with LiDAR data to inform vegetation management activities. A pilot was conducted in 2020 along a distribution circuit on Palomar Mountain. The pilot provided SDG&E with lessons learned as described in the response to SDGE Action Item-8 above. However, SDG&E does not have enough quantitative data from this pilot flight to apply a risk reduction methodology. With more flights and improvements to the process, it will be possible to define the frequency of risk event reduction in the future.

Ignition Management and Fuels Management Programs

Because SDG&E is relatively new to attempting to quantify the benefits of a Fuels Treatment activity, the risk reduction methodology used is based on subject matter expertise. With more experience with Fuels Treatment, it will be possible to be more certain with future risk analysis. The overall risk approach was to estimate the reduction of likelihood in ignitions and the decrease in consequence. The likelihood of a wildfire is estimated to be decreased by 20% where Fuels Treatment is applied; and the consequences is estimated to be decreased by 50% where Fuels Treatment is applied. These likelihood and consequence decreases were applied in allocated basis depending on the scope of the program, which is about 5% of Tier 3.

Vehicle Tracking

In 2020, SDG&E completed the pilot project installation of the Verizon Telematics vehicle tracking solution on 240 vehicles within Gas Operations, Fleet Services, and Electric Regional Operations. SDG&E collected initial baseline data from the pilot project and enacted reporting standards that focus on vehicle speeding metrics and identified a handful of other metrics that will be targeted in the future. SDG&E is deploying this technology to the remaining Fleet Assets.

SDG&E prioritized employee safety metrics, namely speeding reduction. Since implementing this pilot, there has been a 90% reduction in speeding after enacting reporting standards on this metric. SDG&E will continue to focus on this metric as it expands the technology to additional vehicles. Additionally, SDG&E will work on improving other areas, including: idle time, distracted driving, and improved maintenance response times. Tracking employee location in Tiers 2 and 3 of the HFTD is critical to ensuring their safety and support. As an example, during the recent Valley Fire, SDG&E was able to utilize the vehicle tracking technology to monitor employees entering evacuation areas in support of fire services. SDG&E was able to validate vehicles entering these areas were purposeful and could track these vehicles movement throughout the evacuation areas to ensure they remained at a safe distance from the fire.

In the 2021 WMP Update, SDGE calculated the following RSEs for these programs:

Pilot Program	RSE HFTD Tier 2	RSE HFTD Tier 3
Covered Conductor	42.77	76.73
Distribution Infrared	331.53	433.6
Expanded Generator Grant Program (Resiliency Assistance Program)	219.27	438.54
Falling Conductor Protection	N/A[4]	281.09
Strategic Undergrounding	63.23	55.57
Drone Distribution	9.39	16.35
Circuit Ownership	6.61	13.24
LiDAR	N/A[5]	
Ignition Management & Fuels Management Programs	N/A[6]	28.58
Vehicle Tracking	N/A[7]	

[4] Falling Conductor Protection is only applied in Tier 3 of the HFTD at this point, so it was not applicable to calculate an RSE for it in Tier 2.

[5] Scope of LiDAR use for vegetation management is still under consideration and does not have a quantified estimate for risk reduction or RSE calculation at this time.

[6] The scope of fuel management is focused on Tier 3 of the HFTD at this point, so it was not applicable to calculate an RSE for it in Tier 2.

[7] Vehicle tracking technology is a foundational activity that supports employee safety. Estimating reductions in ignitions as a result of this technology is not meaningful and no RSE was developed for it based on this.

G. Condition Guidance-11: Lack of Detail on Plans to Address Personnel Shortages

17. SDGE Action Item-17

SDG&E shall either a) explain how it plans to start tracking metrics related to the effectiveness of its recruiting programs, or b) explain why it finds it unnecessary to track such metrics.

While SDG&E does not track metrics regarding newly trained, out of state, or the percentage working for other utilities prior to working with us, SDG&E does measure the effectiveness of our recruiting program against offer acceptance rate. Based on results, SDG&E modifies its recruiting strategy accordingly to target organizations as needed. SDG&E's current offer acceptance rate is 96%; according to Gartner, a leading research and advisory company, the average offer acceptance rate is 93%.

H. Condition Guidance-12: Lack of Detail of Long-Term Planning

18. SDGE Action Item-18

SDG&E shall: 1) define what "continue," "increase," "expand," "upgrade," and/or "enhance" means for each instance it is used, and 2) either a) implement quantitative benchmarks that are reasonable and achievable for each such instance, or b) explain how it intends to track progress of each instance if a quantitative benchmark is not provided.

The WSD identified a Class B deficiency concerning a "lack of detail on long term planning." More specifically, the WSD stated that SDG&E in describing a year-by-year timeline for reaching the wildfire mitigation goals that qualitative terms were relied on to describe the achievement of goals. The qualitative terms used in the response were: "continue", "increase", "expand", "upgrade" and "enhance." SDGE Action Item-18 requested SDG&E to define the terms. The table below provides a definition for each term. The blacked-out boxes indicate where there was no reference to the referenced qualitative term in the respective area. Where cells have verbiage, SDG&E has provided additional feedback. It must be recognized that over a ten-year period there can be significant shifts in activities due to issues beyond the control of SDG&E.

Table 5: SDGE Action Item-8

Area/ Qualitative Term	Continue	Increase	Expand	Upgrade	Enhance	Additional Comments or Clarifications	
						Benchmark	Tracking
Definition	Persist in an activity SDG&E has commenced.	Effort to grow an activity that SDG&E has underway.	An SDG&E activity that will become larger or more extensive.	An SDG&E activity that will be raised to a higher standard with the objective of improving the result.	An SDG&E effort that will intensify, or further improve the quality, value, or extent of an activity in order to achieve an appropriate level of maturity.	Can we establish benchmarks for this area? Yes – Opportunity exists to implement quantitative benchmark. No – Opportunity does not exist, but progress can be tracked against the area timeline.	How can progress be tracked?
Risk Assessment & Mapping	SDG&E will persist in the risk assessment & mapping activities from the prior year to the current year.	Opportunities to further implement automation of risk will occur as new technologies become available.	Fire science and climate science is evolving. SDG&E intends to have more partnerships with academics that are capturing the new insights to ensure SDG&E maturity reflects the evolutions.	Existing high-performance computing will evolve in two ways – new generations of computing and replacement of existing computing.	The risk models are evolving based on the changing fire and climate science, the availability of data. The risk models need to reflect these evolving realities.	No	Track the revisions of risk models and approaches being used to assess wildfire risk.
Situational Awareness & Forecasting	SDG&E will persist in the situational awareness & forecasting activities from the prior year to the current year.	The capability will be improved including the use of weather awareness information and the mobile app.	[redacted]	The amount of weather data available to achieve a higher level of maturity will be expanded.	[redacted]	Yes	Track the expansion of data being used to support WMP decisions.

Grid Design & System Hardening	SDG&E will persist in the grid design & system hardening planning and mitigation activities from the prior year to the current year.	[redacted]			No	Track the implementation of grid design and hardening activities.
Asset Management & Inspection	SDG&E will persist in the asset management & inspection activities from the prior year to the current year.				Yes	Track implementation of activities against plan timeline.
Vegetation Management Plan	SDG&E will persist in the vegetation management plans and activities from the prior year to the current year.	The sharing across departments of vegetation management data and information will be broadened.	Fuel Management operations will be expanded in Vegetation Management operations	The quality of vegetation modeling will be improved to move closer to the highest level of maturity.	Yes	Track the implementation of specific vegetation management plan
Grid Operations & Protocols	SDG&E will persist in the grid operations & protocol activities from the prior year to the current year.	Opportunities to increase automation in adjusting grid operations based on risk to achieve a higher level of maturity.	[redacted]	The quality and scope of training, prediction, and consequences of PSPS will be addressed by these activities	No	Track implementation of activities against plan timeline.

Data Governance	SDG&E will persist in the data governance activities from the prior year to the current year.	The capability of accessing historical data trends will broaden to inform decision making.	[redacted]	No	Track implementation of activities against plan timeline.
Resource Allocation Methodology	SDG&E will persist in the resource allocation methodology plans and activities from the prior year to the current year.	[redacted]	SDG&E intends to build tools to assess core wildfire and other mitigations to support the resource allocation methodology.	No	Track implementation of activities against plan timeline.
Emergency Plan & Preparedness	[redacted]			No	Track implementation of activities against plan timeline.
Stakeholder Cooperation & Community Engagement	SDG&E will persist in the stakeholder cooperation & community engagement activities from the prior year to the current year.	[redacted]		No	Track implementation of activities against plan timeline.

III. Resolution WSD-005 – SDG&E Deficiencies

A. Condition SDGE-1: SDG&E Reports a High Number of Ignitions Related to Balloon Contact

19. SDGE Action Item-19

SDG&E shall define what the "draft trial standard" consists of, as being developed by the working group within IEEE.

As explained in its 2021 WMP Update, the draft standard under development by IEEE is: *IEEE PES DRWG P2845 –* "*Trial Use Standard for Testing and Evaluating the Dielectric Performance of Celebratory Balloons in Contact with Overhead Power Distribution Lines Rated up to 38 kV System Voltage."* The IEEE Task Force (includes 2 members from SDG&E) is not expected to release the standard until 2023. The Task Force began their work in September 2020. The Task Force began its work by surveying 33 companies across North America which represented over 40 million customers. The survey focused on the prevalence of mylar balloon contact. The areas to be addressed in the standard testing protocol include: environmental conditions for testing, samples (description, preparation), equipment, instrumentation, setup running (balloon sizes, shapes, configurations, voltage levels, times to applied voltage, voltage waveforms), passing criteria and test report requirements and formats.

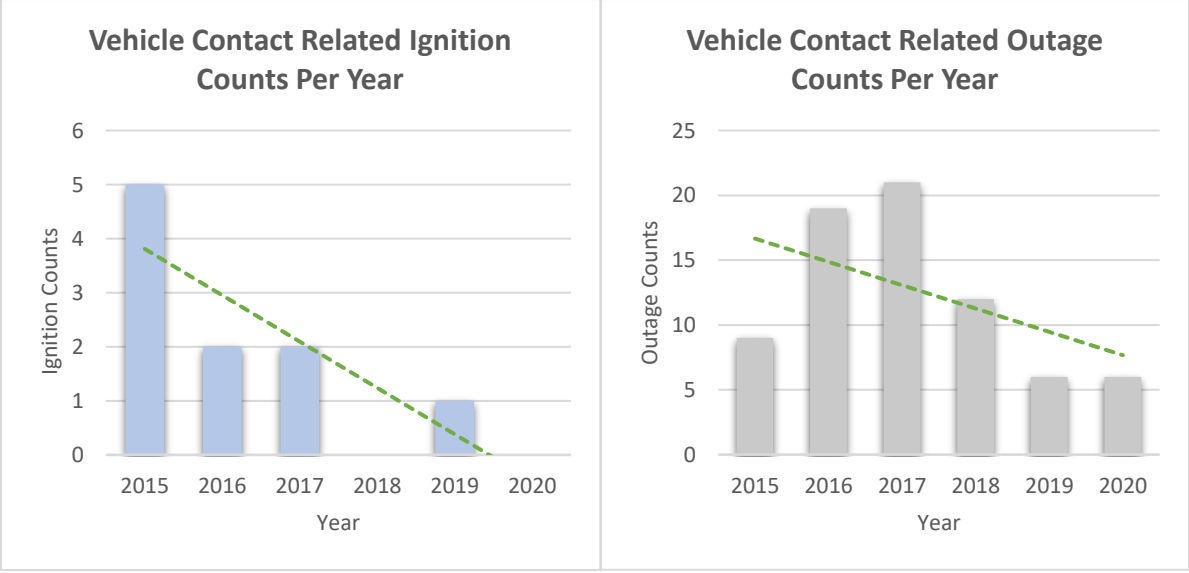
B. Condition SDGE-2: Higher Number of Ignitions Related to Vehicle Contact

20. SDGE Action Item-20

SDG&E shall: 1) explain whether the reduction of vehicle contact related ignitions is the primary factor for implementation of any initiatives in its 2020 WMP and 2) if so, describe how SDG&E prioritized these locations.

SDG&E's strategy for reducing the fire risk aims at reducing all causes of ignitions regardless of their source. While some are outside the control of SDG&E such as vehicle contacts, many of the initiatives offer benefits in terms of enhancing system resiliency against such external causes outside of SDG&E's control. The initiatives implemented (including strategic undergrounding, recloser settings, steel poles, spacers, larger conductor) not only reduce vehicle contact ignitions, but they have a secondary benefit in that they will, where implemented, reduce ignitions related to other causes as well.

Looking at the past 5 year historical vehicle contact related risk events, SDG&E has witnessed a downward trend in both ignition and outage counts related specifically to the cause of vehicle contact, as seen in the charts below. The initiatives detailed above are contributing factors in this downward trend, as such efforts prevent both frequency of vehicle contact (e.g., segment undergrounding implementation) and severity of impact when they do occur (e.g., pole hardening from wood-to-steel).



As stated previously in SDG&E's initial Quarterly Report, vehicle contacts, like balloon contacts are customer driven contacts. Vehicles contacts are typically a result of human error that leads to a crash into a facility, which means this metric is adversely impacted by having a large population density, which SDG&E has relative to the other California electric utilities.

SDG&E performed an analysis for vehicle contacts, the results of which are summarized in the table below.

Summary of Vehicle Ignition Drivers

Performance Metrics	5-year averages		
	SDG&E	PG&E	SCE
Vehicle Contacts (T&D totals from WMP Table 11)	212	1931.4	756.2
Vehicle Contacts per 1,000 circuit miles	25.5	19.5	14.5
Vehicle Contacts per 1,000 circuit miles per OH customer density	0.12	0.14	0.08
Vehicle Ignitions (T&D totals from WMP Table 11)	4	45	9.8
Vehicle Ignitions per 1,000 circuit miles	0.5	0.5	0.2
Vehicle Ignitions per 1,000 circuit miles per OH customer density	0.0022	0.0033	0.0011
Percentage of total ignitions caused by vehicles	18%	10%	9%

As the analysis shows, SDG&E's normalized rates are very similar to PG&E's performance in this area, with SDG&E having more vehicle contacts, but a lower percentage of those contacts leading to ignitions. When normalized against population density, SDG&E does not have the highest incident rate of vehicle ignitions per overhead customer density.

In addition, if SDG&E examines vehicle contacts by overhead circuit miles broken down by the HFTD, the data shows the majority of contacts occur outside the HFTD, where population density is greater.

Summary of Vehicle Ignition Locations

Vehicle Contacts Per 1,000 OH miles	
Non HFTD	58.2
Tier 2	12.6
Tier 3	6.9

21. SDGE Action Item-21

SDG&E shall: 1) provide its procedures, standards, and requirements related to increasing infrastructure visibility for the public (i.e., standards on visibility strips, signage, colorization), and 2) discuss how and whether such standards differ for areas of higher fire risk.

1) SDG&E requires delineator/reflector strip for poles on state highways and provides specific locations to suggest where and when to install them. Appendix C contains SDG&E's Construction Standard outlining the requirement for the installation of the strips and situations, when the strip is not required.
2) SDG&E's standards are the same for both HFTD and non-HFTD and are focused on overall safety, including wildfire risk.

C. Condition SDGE-3: Incorporate Lessons Learned into Updates of its Risk Models

22. SDGE Action Item-22

SDG&E shall: 1) list and explain the 2019 and 2020 PSPS lessons-learned that were incorporated into the development of its WiNGS model, and 2) provide the "near-term scope" changes for PSPS events based on insights provided by the WiNGS model.

1) Lessons learned in 2019 and 2020 that were incorporated into the WiNGS model are:

   a. Targeting individual assets for hardening efforts is beneficial for reducing ignition risk but does not have large benefits for reducing impacts of PSPS. This is because when PSPS is implemented, decision-makers operate switches that de-energize segments (collection of spans between two isolation points/SCADA devices). The process of evaluating a segment for the need to de-energize requires decision-makers to view the collection of overhead system assets that are exposed to the adverse weather condition in the context of the surrounding vegetation and other risk factors. Thus, if only certain assets in a segment are hardened while others are not, the segment may be deemed risky to operate during the strong winds of Santa Ana events. This key learning drove the development of risk assessments at a segment level rather than an asset level to inform more holistic strategies in the future to help reduce the impacts of PSPS.

   b. In the early version of WiNGS, segments were viewed and assessed independent of each other which lead to the model identifying sub-optimal solutions to reduce PSPS risk. This is because the model was only evaluating the probability of a given segment being shut-off on its own rather than incorporating the potential of shut-offs upstream of the segment. By the end of 2020, SDG&E took this lesson learned and incorporated it into the most recent update of the model to enable segment interdependencies and circuit connectivity to be considered in determining the optimal solutions.

   c. The time it takes from assessment, scoping, design to the completion of construction and putting new assets into service spans anywhere between 12-18 months. Knowing this timing allowed SDG&E to set expectations of when projects would be prioritized using updated models. For instance, in 2021, SDG&E will be scoping work that will not be put into place until 2023 so it is important to account for these time constraints when considering how quickly a new tool can be implemented to inform decisions.

   d. Mitigations recommended by the model can differ from the ultimate mitigations that get implemented. This is because factors such as permitting, and land constraints are critical to determining the feasibility of implementing solutions and are taken into account in the scoping phase of grid hardening projects.

e. In 2020, SDG&E recognized the need for an approach to quantify impacts to customers as a result of PSPS. This need resulted in the development of a preliminary approach for quantifying impacts in terms of safety, reliability and financial to be able to evaluate PSPS using the Company's consistent Risk Quantification Framework. The WiNGS model considers these PSPS impacts as well as wildfire risks.

2) Assuming the action item is in reference to the 2020 objective "*Preliminary implementation of WiNGS to identify and prioritize near-term (3-5 years) scope of PSPS mitigation initiatives*," the scope of PSPS mitigation initiatives referenced here is the scope of work for grid hardening including the implementation of covered conductor and strategic undergrounding for the distribution system. As segments are evaluated in WiNGS, each evaluated initiative such as covered conductor or undergrounding is assessed based on quantifying how much it could reduce PSPS impacts by. For example, when a segment is assessed for potential undergrounding, the analysis assumes that if the segment was converted from overhead to underground, there would no longer be a need to shut off that particular segment.

23. SDGE Action Item-23

SDG&E shall: 1) provide a list of initiatives incorporated into the WiNGS model in 2020 and planned to be integrated in 2021, and 2) the status of each initiative's integration.

The following table provides a list of initiatives that are either currently being evaluated as mitigation options for segments in WiNGS or are being considered for integration into the model to evaluate their effectiveness in the future.

Initiative	Timeline for Integration into WiNGS	Status
Bare conductor hardening	2020	Complete
Covered conductor hardening	2020	Complete
Strategic undergrounding	2020	Complete
Whole-facility customer generators	2020	Complete
Microgrids	2022	Has not started yet – will be explored in 2021 to determine whether it is applicable on a segment level
Vegetation management	2022	

24. SDGE Action Item-24

SDG&E shall: 1) describe how it intends to pilot the WiNGS-Ops for PSPS decision-making, including the scope of the pilot, 2) explain how SDG&E will analyze the results of the pilot to determine appropriate usage and necessary changes to WiNGS-Ops, and 3) include a detailed timeline of the pilot.

1) SDG&E is still at the early conceptual stages of exploring the potential implementation of a WiNGS-Ops solution to support PSPS decision-making. Recognizing the criticality and sensitivity of the PSPS decision-making process, SDG&E's plan is to take a steady and measured approach of evaluating WiNGS-Ops before implementation. One potential way to explore the use of WiNGS-Ops includes testing the tool by dynamically evaluating the wildfire risk during a certain timeframe and comparing it to potential PSPS impacts using a consistent risk evaluation framework. The results of this testing would be evaluated using the following high-level approaches and adjusting them as necessary:
    a. Evaluation of forecasted risk vs actual risk
    b. Evaluation of damages found post-PSPS events to determine whether WiNGS-Ops predictions of potential failures were reasonably estimated
    c. Evaluation of PSPS impacts post-PSPS events to determine whether WiNGS-Ops predictions of potential PSPS impacts were reasonably estimated
2) Timeline:
    a. Development of necessary tools to test WiNGS-Ops (integration of weather data and fire behavior modeling capability): 2021
    b. Testing WiNGS-Ops based on actual events: 2022
    c. Potential solution implementation: 2023

D. Condition SDGE-4: Detail on Strategic Undergrounding Pilots

25. SDGE Action Item-25

SDG&E shall provide the projected cost and schedule of projects, even if the project is not yet completed.

As the Strategic Undergrounding (SUG) program continues to evolve, new updates will be provided in the recurring WMP Quarterly Reports. The project completion dates are influx beyond the Company's control due to issues such as COVID, permitting, easement acquisition, tribal and BIA land, weather conditions, and unforeseen subsurface conditions like blue granite rocks and other environmental issues and concerns during construction. Provided below is the overall project schedule and cost estimates for the 2020-2022 SDG&E's SUG Program. It should be noted that the cost estimates provided below for the 2020 pilot projects were based on $3.25M/mile direct cost. For 2021 and beyond, the cost estimates were baselined on $2.6M/miles direct cost from 2020 actual cost average.

					Planned Construction Date		Actual Construction Date		
Year	Circuit #	Project Description	Status	# UG Miles	Start	Finish	Start	Finish	Cost
2020	C1021	Quick Win- Lilac	Energized	0.20	Jun-20	Aug-20	Jun-20	Oct-20	$ 1,055,214
2020	C1030	Phase 1 (Skyline Ranch)	Energized	6.63	Jul-20	Dec-20	Aug-20	Dec-20	$ 11,185,615
2020	C221	Phase 1 (Cape Horn)	Energized	0.53	Nov-19	Mar-20	Nov-19	Sep-20	$ 1,393,384
2020	C221	Phase 2 (Banner Rd)	Energized	0.90	Jan-20	Mar-20	Jun-20	Sep-20	$ 1,358,101
2020	C357	Quick Win Job#1 and Job#2-- E. Victoria Rd	Energized	0.83	Jun-20	Sep-20	Jun-20	Sep-20	$ 2,409,248
2020	C75	DUG to Jamul Tribe	Energized	6.80	Sep-20	Nov-20	Oct-20	Dec-20	$ 4,960,330
2020	C754	Quick Win- Vallecitos	Energized	0.30	Feb-20	May-20	Feb-20	May-20	$ 463,622
2021	C1030	Phase 2A (Paradise Mtn.)	In Construction	6.00	Jul-20	Jul-21	Oct-20	NA	$ 15,592,200
2021	C1030	Phase 2B (Hell Hole Canyon)	In Construction	4.45	Jul-20	Mar-21	Oct-20	NA	$ 11,570,000
2021	C1030	DUG Ph.1 Valley Center	In Construction	3.88	Aug-20	Jul-21	Jan-21	NA	$ 10,077,600
2021	C1030	Ph.1A Service Conversion Private	In Design	3.10	Jun-21	Nov-21	NA	NA	$ 8,060,000
2021	C1030	Ph.1B Service Conversion Tribal	In Design	3.29	Jul-21	Dec-21	NA	NA	$ 8,554,000
2021	C1030	DUG Phase 2 N Wohlford Rd.	In Design	1.69	Jun-21	Sep-21	NA	NA	$ 4,394,000
2021	C1458	Quick Win PH.1A W. Victoria Rd	In Construction	2.30	Sep-20	May-21	Nov-21	NA	$ 5,980,000
2021	C1458	Quick Win PH.1B Across Caltrans	In Design	0.10	May-21	Jun-21	NA	NA	$ 260,000
2021	C1458	Quick Win PH.2 AL Elem School	In Design	0.24	Jun-21	Jul-21	NA	NA	$ 624,000
2021	C216	DUG PH.2	In Design	1.75	Sep-21	Dec-21	NA	NA	$ 4,550,000
2021	C216	DUG PH.1 to Rincon's Harrah's Casino	In Design	3.11	Jul-21	Dec-21	NA	NA	$ 8,086,000
2021	C221	DUG PH.2 (ST to Dudley's)	In Design	0.41	May-21	Jun-21	NA	NA	$ 1,066,000
2021	C221	DUG PH.1 (Dwntn Julian Connection)	In Design	1.68	Apr-21	Jul-21	NA	NA	$ 4,360,200
2021	C221	DUG PH.4 (Spencer Sch to Hwy 79)	In Design	2.52	May-21	Aug-21	NA	NA	$ 6,546,800
2021	C357	Quick Win Job#3-- E. Victoria Rd (FIRM)	In Design	0.10	Jul-21	Sep-21	NA	NA	$ 260,000
2021	C445	DUG (Old Hwy 80)	In Design	3.04	Apr-21	Sep-21	NA	NA	$ 7,911,280
2021	C448	DUG (Buckman Spring Rd)	In Design	1.59	Apr-21	Jul-21	NA	NA	$ 4,125,160
2021	C448	Microgrid Solution partnership w/ SUG	In Design	0.82	Mar-21	May-21	NA	NA	$ 2,132,000
2021	C79	DUG - Oak Grove Drive	In Construction	3.09	Aug-20	May-21	Jan-21	NA	$ 8,041,800
2021	C908	DUG- Cole Grade Rd	In Design	2.00	Jul-21	Sep-21	NA	NA	$ 5,200,000

Note: Cost for 2020 projects are actual cost, and cost for 2021 projects are estimated based on study of 2020 actual prices.

26. SDGE Action Item-26

SDG&E shall: 1) provide the number and percentage of miles affected by delays exclusively due to COVID-19 impacts, 2) a list of the project(s) affected, and 3) the increase in project completion time due to COVID-19.

1) All planned projects and associated mileage were affected by the COVID-19 pandemic. It should be noted that even a delay on a small scale or portion of the underground line affects the ability to complete the project. Being this began as a pilot program, SDG&E does not have data to compare to a baseline on what is an increased time delays due to COVID-19. However, SDG&E is able to describe the challenges experienced, which include:

   a. Attaining access to customer property was much more complicated; SDG&E had to call, leave messages, send mail notifications, and drop off door hangers to set an appointment. This impact can stretch from 2 weeks to months.

   b. Attaining status and process clarifications from permitting agencies was also impacted due to the follow ups with emails and calls to reach them remotely. Other permitting agencies still relied on paper copy design prints and submittal applications to be mailed/dropped off, and this made it challenging during the pandemic.

2) Below are some of the projects still pending permits from last year

Community	Circuit	Description	# UG Miles	Design % Complete	Status
Santa Ysabel	C221	DUG PH.2 (ST to Dudley's)	**0.41**	**95%**	**Pending Caltrans**
Julian	C221	DUG PH.1 (Dwntn Julian Connection)	**1.68**	**93%**	**Pending Caltrans**
Julian/Santa Ysabel	C221	DUG PH.4 (Spencer Sch to Hwy 79)	**2.52**	**89%**	**Pending Caltrans**
Alpine	C357	Quick Win Job#3-- E. Victoria Rd	**0.10**	**90%**	**Pending Caltrans**
Boulevard	C445	DUG (Old Hwy 80)	**3.04**	**95%**	**Pending Caltrans**
Cameron	C448	DUG (Buckman Spring Rd)	**1.59**	**95%**	**Pending Caltrans**
Cameron	C448	Microgric Solution partnership w/ SUG	**0.82**	**90%**	**Pending Caltrans**

3) As explained in 1) above, the data to provide a quantitative increase in completion time specific to COVID-19 is not available. The table provided in response to SDGE Action Item-25 above provides insights of the schedule, but it should be noted that SDG&E's Strategic Undergrounding team had made extreme efforts to complete the 2020 project accomplishments.

27. SDGE Action Item-27

SDG&E shall provide a table similar to Table 19 of its QR for all 70 miles scoped for underground projects, as mentioned on p. 111.

SDG&E's initial high-level scope showed 70 miles, however, as the program continues to expand and develop additional scope is included in the table below.

Table 6: SDGE Action Item-27

Year	Community	Circuit #	Project Description	# UG Miles	Customers/Critical Facility
2020	Valley Center	C1021	Quick Win- Lilac	0.20	Lilac School
2020	Valley Center	C1030	Phase 1 (Skyline Ranch)	6.63	1 master meter serving 225 mobile home customers (Elderly Community), water pump station, and Valley Center Water District, AT&T cell site
2020	Julian	C221	Phase 1 (Cape Horn)	0.53	Julian Elementary School, Julian Charter School, Julian Union High School, 1 pump station, Friends of the Julian Library
2020	Julian	C221	Phase 2 (Banner Rd)	0.90	Post Office, Fire station, County Maintenance Yard, State of Cal Office, Bus Yard, Caltrans office
2020	Alpine	C357	Quick Win Job#1 and Job#2-- E. Victoria Rd	0.83	Padre Dam, 3 Comm sites: Sprint Nextel Corporation, T-Mobil West LLC, and Verizon Wireless.
2020	Jamul Tribe	C75	DUG Ph.1 to Jamul Tribe	6.80	Steele Canyon High School, 7-11 Gas Station, Vet Clinic, other convenience stores and business between Steele Canyon Rd and Via Las Faldas Rd, San Diego County Fire Station 36, Jamul Casino
2020	Vallecitos Water Dist.	C754	Quick Win- Vallecitos	0.30	Vallecitos Water District, 5 poles removal; 4 CIP and 1 complete removal
2021	Valley Center	C1030	Phase 2A (Paradise Mtn.)	6.00	Residential customers
2021	Valley Center	C1030	Phase 2B (Hell Hole Canyon)	4.45	Residential customers
2021	Valley Center	C1030	DUG Ph.1 Valley Center	3.88	Valley Center Middle School, San Diego County Sherriff's Department, Valley Center Fire Protection District Station 73, Solar Farm
2021	Valley Center	C1030	Ph.1A Service Conversion Private	3.10	Residential customers
2021	Valley Center	C1030	Ph.1B Service Conversion Tribal	3.40	Residential customers

Year	Community	Circuit #	Project Description	# UG Miles	Customers/Critical Facility
2021	Valley Center	C1030	DUG Phase 2 N Wohlford Rd.	1.69	Valley View Casino & Hotel, San Pasqual Reservation Fire, police department, education Dept/School
2021	Alpine	C1458	Quick Win PH.1A W. Victoria Rd	2.30	Residential customers
2021	Alpine	C1458	Quick Win PH.1B Across Caltrans	0.10	Residential customers
2021	Alpine	C1458	Quick Win PH.2 AL Elem School	0.24	Alpine Elementary School, Alpine Union School district office, US Post Office, Alpine Special Treatment Center, and 98 non-key customers
2021	Rincon Tribe	C216	DUG PH.2	1.75	Rincon Band of Luiseno Indians Building, Charging Stations, Rincon General Services Building, Rincon Fire Department
2021	Rincon Tribe	C216	DUG PH.1 to Rincon's Harrah's Casino	3.11	All Tribes Charter School, Harrah's Resort and Casino, Rincon Market (UG service), Harrah's Solar Field, Rincon Education & Youth Service Center, Indian Health Council Medical Clinic, Red Cross Shelter, Government Well Pump NS3 and NS2, Rincon Gas Station and Market, (Church existing UG)
2021	Santa Ysabel	C221	DUG PH.2 (ST to Dudley's)	0.41	Bakery, Julian Pie, Market/ATM, Charging Station, Restaurants, Post Office, Art Gallery, Self Storage, Other Commercial shops
2021	Julian	C221	DUG PH.1 (Dwntn Julian Connection)	1.68	The whole entire downtown Julian at its critical facilities
2021	Julian/Santa Ysabel	C221	DUG PH.4 (Spencer Sch to Hwy 79)	2.52	The whole entire downtown Julian as its critical facilities
2021	Alpine	C357	Quick Win Job#3--E. Victoria Rd	0.10	Residential customers
2021	Boulevard	C445	DUG (Old Hwy 80)	3.04	San Diego County Sheriff's Department, Clover Flat Elementary School, US Post Office, San Diego County Fire Station 47, Boulevard Border Patrol Station
2021	Cameron	C448	DUG (Buckman Spring Rd)	1.59	Campo Elementary School
2021	Cameron	C448	Microgrid Solution partnership w/ SUG	0.82	Campo-Moreno Village Library, Campo Cal fire Station 40, Mountain Health and Community Services (Clinic), Camp Lockett Middle School, 3 residential on existing UG service, and K-Circle and Sinclair gas stations

Year	Community	Circuit #	Project Description	# UG Miles	Customers/Critical Facility
2021	Valley Center	C908	DUG- Cole Grade Rd	2.00	Valley Center High School, Oak Glen High School, Valley Center Primary School, Valley Center Elementary School, Valley Center - Pauma Unified School District, Valley Center Friends Library, Boys and Girls Club of Greater San Diego, US Post Office, Solar Farm, museum, San Diego County Roads Department,
2021	Descanso	C79	DUG - Oak Grove Drive	3.09	Descanso Elementary School, US Post Office, Descanso Branch Library, Descanso Townhall Association, San Diego County Fire Station, Descanso Fire Department Station 1, Gas Station. Note: Gas Station/convenience store are in the same service and parcel land owner.
2022	Valley Center	C1030	Ph.3 Santee Ln.	5.00	Residential customers
2022	Valley Center	C1030	Ph.4 South Kiavo	8.50	Residential customers
2022	Santa Ysabel	C220	DUG	3.42	Santa Ysabel Tribal Office, Intermountain Fire Rescue-Station 54, Indian Health Council, Santa Ysabel Clinic
2022	Julian/Santa Ysabel	C221	DUG PH.3 (ST to Spencer Sch.)	2.92	1 school on the pathways, and The whole entire downtown Julian as its critical facilities
2022	Alpine	C358	DUG	2.50	Descanso Ranger District, Viejas Casino & Resort
2022	Glencliff	C441	DUG	4.90	Mountain Empire Unified School, County Facility (truck stop/rest stock, sewage pump system), SDGE CNF Laydown Yard (not sure if these two qualifies as critical facility
2022	Glencliff	C442	DUG	3.10	Pine Valley Elementary School, Pine Valley Academy, San Diego County Sheriff's Office, San Diego County Fire Station 44, Pine Valley Branch Library, US Postal Office
2022	Jamul	C75	DUG Ph. 2	1.70	Old Grove Middle School, some residential, can pick up Jamul Dulz middle school and Jamul Dulz Elementary School from C524
2022	Descanso	C79	Ph.1 Sherilton Valley	8.08	Residential customers
2022	Ramona	C970	DUG	6.44	James Dukes Elementary School
2022	Ramona	C972	DUG	2.00	Ramona Elementary School, Montecito High School, Ramona Unified District School Office,
2022	Ramona	C975	DUG	4.30	Barnett Elementary School

28. SDGE Action Item-28

SDG&E shall: 1) provide a list of all system hardening alternatives being evaluated as alternatives to undergrounding, if those system hardening alternatives differ from SDG&E's response to Guidance-2, 2) explain how SDG&E determines alternatives to not be sufficient over undergrounding, and 3) explain how SDG&E is prioritizing undergrounding projects in comparison to other system hardening alternatives.

1) SDG&E considers several system hardening alternatives to undergrounding as described in the original response to Guidance-2. These include bare conductor hardening, application of covered conductor and where appropriate, the potential installation of microgrids or customer generation.

2) When looking at alternatives, SDG&E evaluates various factors to select its mitigations. While undergrounding in general has lower RSE scores compared to other alternatives, SDG&E balances the consideration of RSEs with desired risk reduction and the impacts to customers from PSPS while ensuring that cost-effective undergrounding projects are selected. In general, undergrounding has a higher effectiveness rate at reducing both the wildfire risk as well as PSPS impacts and as such, is strategically selected to target specific high-risk areas in the HFTD. In 2020, SDG&E considered undergrounding over other alternatives based on three key factors:

    a. Focusing on critical facilities such as schools, fire stations, and police stations via direct underground projects.

    b. Focusing on fire prone communities and undergrounding those pockets that experience constant PSPS.

    c. Leveraging existing underground facilities to see how to keep them energized during extreme weather conditions.

3) Recently, SDG&E's investment decisions are informed by the output of the WiNGS model as defined in Section 4.5.1.4. of SDG&E's 2021 WMP Update. This model evaluates both wildfire and PSPS impacts at the sub-circuit/segment level to determine which initiatives provide the greatest benefit per dollar spent in reducing both wildfire risk and PSPS impact. SDG&E plans to utilize its WiNGS model to inform the deployment of undergrounding at the sub-circuit/segment level. As described above, SDG&E will evaluate several factors including RSE scores, desired level of risk mitigation as well as PSPS customer impacts to determine where undergrounding should be prioritized and targeted to achieve higher benefits while continuing to select cost-effective projects.

E. Condition SDGE-6: Detail on Plans for Reinforcing Transmission Lines

29. SDGE Action Item-29

SDG&E shall: 1) explain the reason for the increase in scope from 66 miles to 119.6 miles for system hardening, if in fact there is an increase, and 2) if there is an increase, explain any change in the plans to nearly double the number of line miles hardened, including prioritization of which lines to harden first.

WSD staff calculated that SDG&E plans to harden 119.6 miles of transmission lines by November 2022, however, SDG&E's 2020 WMP states 66 miles for system hardening.

1) There was no material increase in scope, the 119.6 miles refers to the total miles including the Cleveland National Forest (CNF) work, while the 66 miles refers to the total miles excluding CNF. The table that totaled 119.6 miles included CNF lines, which have historically been separated out of the transmission hardening numbers into its own category for reporting purposes. That would leave the remaining transmission lines equaling approximately 65 miles and therefore no material scope change between reports.

2) As stated in 1) above there was no material increase in scope.

F. Condition SDGE-7: Potential Redundancies in Vegetation Management Activities

30. SDGE Action Item-30

SDG&E shall describe how it measures VM processes outside of completed VM work.

The processes of pre-inspection and brushing are assessed using pass/fail percentages estimated during QA/QC evaluations. These processes, including QA/QC, undergo internal yearly audits that serve as a secondary check. QA/QC documents are reviewed by vegetation management staff and shared with field personnel.

31. SDGE Action Item-31

SDG&E shall: 1) provide a comparison between the number of General Order 95, Rule 18 Priority Level 1, 2, and 3 findings found in each vegetation management inspection, including pre-inspection, enhanced inspections, and any audits conducted by SDG&E or its third-party evaluator, for each of SDG&E's Vegetation Management Areas (VMA) and 2) describe whether and how SDG&E has consolidated or considered consolidating standard and augmented inspection and tree-trimming programs (identified in Guidance-6) (e.g., combining pre-inspection with enhanced inspections, instead of preforming enhanced inspections six month post-trim to avoid a second deployment of vegetation crews).

1) Priority levels 1, 2, and 3 findings are not part of vegetation management inspections. Inspections done for purposes of electrical maintenance are done by qualified electrical workers. Tree trimmers, in general, do not have these qualifications.
2) In vegetation management, routine and targeted inspections are performed. Every line segment undergoes routine inspections. Before fire season, a targeted inspection in HFTD areas is performed for safety reasons to ensure that emerging, hazardous conditions are remediated. Additional off-cycle inspections are done on bamboo and century plants to ensure that electrical conflicts are remediated for safety reasons. These latter two sets of inspections are targeted in nature and ensure that changes in conditions and plant growth are promptly detected and addressed. The time separation between routine and targeted inspection adds a level of redundancy that serves as an extra layer of public protection. There is no plan to consolidate these inspections.

G. Condition SDGE-8: Consideration of Environmental Impacts, Local Community Input

32. SDGE Action Item-32

SDG&E shall: 1) indicate where on its public website SDG&E makes the monitoring program documents related to the implementation of its NCCP available, and 2) discuss how or if implementation of the plan has changed because of increased wildfire mitigation activities.

1) SDG&E does not post project related documents associated with implementing its permits on its public website. Public postings are not required per SDG&E's Subregional Natural Community Conservation Plan (NCCP) or permit authorizations issued by the United States Fish and Wildlife Service and California Department of Fish and Wildlife (CDFW). Annual reports are filed with the permitting agencies who are responsible for ensuring that SDG&E complies with its plan and permit conditions. In addition, the NCCP is available for review on CDFW's website at the following location:

   https://wildlife.ca.gov/Conservation/Planning/NCCP/Plans/San-Diego-GE

2) The steps necessary to implement the plan have not changed because of the increased wildfire mitigation activities.

33. SDGE Action Item-33

SDG&E shall: 1) detail how community outreach efforts and stakeholder input, such as the ones described in its response, affect the scope of work of VM, 2) how and when stakeholders are engaged about the pending VM work in their community or on/adjacent to their property, 3) how stakeholder comments are documented and analyzed, and 4) how SDG&E ensures stakeholder input is relayed to and implemented by vegetation crews, both internal and contracted.

There are two general types of stakeholders: (a) residential and commercial customers, and (b) government agencies (local, county, state and federal). Mailers and in-person notification are the primary means of contact prior to doing vegetation management work. Follow-up contacts are in the form of door knock by tree trim crew in case customer has questions and contractors may also set appointments with customers.

Customer feedback and information is recorded and might result in modified instructions for contractor personnel (ex. Access instructions, special modifications). For public agencies, the engagement process involves permitting and notifications. There can also be more generalized outreach in the form of town hall events prior to fire season.

34. SDGE Action Item-34

SDG&E shall: 1) explain what is meant by "Utility line clearance operations are a unique niche within the green industry and, therefore, its scope needs to be addressed and incorporated within easement language, city tree ordinances, permits, local codes, etc." and 2) explain whether and how SDG&E has changed incorporation of this language into its permitting as a result of its enhanced vegetation management work.

The language is meant to incorporate rights that facilitate future vegetation management activities. For permitting purposes, language is added related to enhanced vegetation management requirements. These activities are managed by the permitting department in coordination with vegetation management.

H. Condition SDGE-9: Explain how Investments in Undergrounding Reduce Planned Vegetation Management Spend

35. SDGE Action Item-35

SDG&E shall provide the calculation of cost-effectiveness for undergrounding, broken down by line items showing both costs of undergrounding and costs avoided by undergrounding (e.g., vegetation management – inspections and trims).

SDG&E has the ability to quantify the number of inventory trees along the lines scheduled to go underground and provide average historic costs of trimming and removals per unit, however, because the number of trees on a line can vary significantly, calculating average trimming and removal costs per mile would not be appropriate. Therefore, it is not appropriate to calculate a single average cost effectiveness figure to capture the avoided vegetation management costs due to undergrounding. However, this information can be calculated per mile of undergrounding conducted. The number of units that would otherwise be trimmed or need to be removed over the lifetime of the undergrounded segment can be determined once the undergrounding scope is determined.

The table below provides a sample list of vegetation management costs that could be avoided throughout the lifetime of the undergrounded segment. For analysis purposes, the estimated cost of undergrounding is assumed to be $4.5M and the expected lifetime of the segment is assumed to be 40 years.

Vegetation Management Activity	**Cost per Unit**	**Estimated Frequency over Undergrounding Lifetime (40 years)**
VMP - Unit - Brush Trim	73.22	13 – 40 depending on individual unit growth rates
Unit Price Palm-Feather(1)-Large Removal	370.09	N/A
Unit Price Palm-Fan (2)- Large-Removal	816.84	N/A
VMP - Unit - Tree Removal - Cat 1	105.21	N/A
Unit Price Palm-Date (3)-Large-Removal	1532.70	N/A
Unit Price Palm-Date (3)-Small-Removal	786.22	N/A
VMP - Unit - Tree Removal - Cat 2	266.41	N/A
VMP - Unit - Tree Removal - Cat 3	439.59	N/A
VMP - Unit - Tree Removal - Cat 4	565.74	N/A
VMP - Unit - Tree Removal - Cat 5	1192.48	N/A
VMP - Unit - Tree Trim	96.33	13 – 40 depending on individual unit growth rates

I. Update on Condition SDGE-12: Details of Quality Assurance, Quality Control

36. SDGE Action Item-36

SDG&E shall provide the percentage of vegetation management work that undergoes a QA/QC audit and constitutes a "representative sample population," and include the associated qualities for the respective percentage (i.e., population size, crews, and voltage type).

A 10% to 12% population sample for all completed work is used to perform a QA/QC evaluation. The elements included in the evaluation are work quality, compliance requirements, completion to standards, crew, and work accuracy.

37. SDGE Action Item-37

SDG&E shall provide the quantitative values and thresholds utilized during the QA/QC audits for "trim clearance, cleanup, correct pruning practices, tree data, and compliance." If quantitative data are not used, provide a description of what constitutes as a "pass" for each criteria.

The following table provides the requested information:

ACTIVITY	UNIT OF MEASURE	THRESHOLD
Trimming	Clearance Achieved	Pass/Fail
Cleanup	Debris removed	Pass/Fail
Documentation	Condition Code – was right code entered, and correct clearance entered	Pass/Fail
Pruning practice	ANSI Standards	Pass/Fail

38. SDGE Action Item-38

SDG&E shall: 1) explain all internal audit activities it performs regarding VM practices, and 2) explain how internal audit activities differ from the third-party auditing.

An internal audit has the following characteristics and details:

- Annual audit from Internal Audit Services for vegetation management
- Checks for existence/application of procedures, and may check for adherence to compliance standards
- Uses population sample for verification

Third-party QA/QC audits have the following characteristics and details:

- QA/QC is focused more on the trimming work itself, the actual completion of work activities – this is ongoing throughout the year
- Checks for work quality and compliance with standards
- Audit less focused on procedures
- Uses population sample for verification

39. SDGE Action Item-39

SDG&E shall provide a table depicting the following for all VM QA/QC activities: a) type of audit, b) whether executed by internal or third-party resources, c) quantitative results from the audit for 2019 and 2020, and d) criteria for audit "pass".

The following table provides the requested information:

Year	Audit type	Resource	Criteria	Result
2019	Field QA/QC	Contractor	*P/F*	98.045% pass
2020	Field QA/QC	Contractor	*P/F*	97.8025% pass

A pass rate of 99% is exceeding performance expectations, and a pass rate of less than 95% would be considered sub-par and may warrant additional follow up.

40. SDGE Action Item-40

SDG&E shall provide the average annual audit results for 2020 broken down by audit type (pre-inspection, tree trim, and pole brush).

The following table provides the requested information:

ACTIVITY	RESULT
Pre inspection	96.68%
Trimming	98.23%
Brushing	99.36%

41. SDGE Action Item-41

SDG&E shall: 1) explain whether the three examples provided here are only examples of changes intended to illustrate the types of changes that are made based on audit findings, or if there are any other changes made through lessons learned from audit findings, and 2) provide an exhaustive and updated list of any changes made as a result of QA/QC audit findings.

If there are QA/QC findings, vegetation management contractors make corrections and record the corrective activity in a database, this is done at no cost to the company.

There are three general forms of improvement that take place. Repeated issues trigger more field visits from supervisors, emphasized training can also take place, and any lesson learned is added to the practical experience of an impacted crew.

There is no list of issues that is formally tracked; however, corrective actions are documented, as previously stated.

42. SDGE Action Item-42

SDG&E shall: 1) provide the pass rate for sufficient clearances of fast-growing species before implementing site specific criteria, and 2) provide the site-specific criteria used to determine the time-of-trim clearances.

The criteria SDG&E uses to determine time-of-trim clearances include species, growth rate, proper pruning practices, hazard potential, minimum clearance required, and the annual trim cycle. This criteria has been in place for at least the last 15 years. Since that time, SDG&E has achieved on average approximately 10-12 feet of clearance. In 2019 SDG&E began to increase its time-of-trim clearances beyond 12 feet where appropriate. SDG&E audits a sample population of all completed trimming and removal work. In 2019 the trimming clearance pass rate was 95%, and the pass rate in 2020 was 97%.

43. SDGE Action Item-43

SDG&E shall define what "more frequent and robust internal auditing and refresher training"40 consists of, with frequency and details comparing before and after changes were made for both pre-inspection and pole brushing.

More robust and frequent means:

- Auditing on all HFTD lines during the post-trim audit activity
- Auditing 100% of completed hazard tree prunes and removals within HFTD
- Auditing 100% of completed off-cycle work within HFTD, including fast growing species
- Auditing 100% of all failed retrim work within HFTD
- Annual hazard tree refresher training
- Completing work with certified arborists

J. Condition SDGE-14: Granularity of "At Risk Species"

44. SDGE Action Item-44

SDG&E shall: 1) present a table, similar to Table 24 in its QR, of vegetation-caused outage history broken down by species (i.e., not by type, grouping, or genus), 2) include normalized outage data when determining "at risk" species based on total vegetation inventory, and 3) include outage data based on species in comparison to the time-of-trim clearance used prior to the event, both before and after extended clearances were implemented.

Please refer to Section 4.4.2.9 of the 2021 WMP Update. Data on the five species of trees, the number of outages by year, and the number of trees trimmed by year is provided. The data is also analyzed for additional insights.

45. SDGE Action Item-45

SDG&E shall: 1) explain why it does not incorporate information from long-term species vulnerability assessments (i.e., climate change, water stress/drought) into its evaluation of a tree species' risk status, and 2) explain why it does not include a species' non-native or invasive status as an "at-risk" attribute.

Tree health and posed risks are dependent upon multiple factors. Long-term conditions such as climate change, water stress and drought certainly impact risk factors. An analysis of contact risks that are dependent on these conditions is already included in the vegetation assessment.

Invasiveness is not an impactful characteristic when evaluating electrical safety. The characteristics of the species is more important.

46. SDGE Action Item-46

SDG&E shall define quantitative threshold values (whether a standard value, a range of values, or an example of a typical value) for the criteria used to define a tree as "at-risk."

An evaluation is based more on qualitative factors rather than quantitative. These include:

- Species, their shape and lifecycle transformation
- Growth characteristic – fast or slow
- Site-specific environmental factors (positioning of tree in relation to conductor, soil, water, invasive pests)
- Structural integrity – root systems/branches
- Slope in surrounding area
- Propensity to blow pieces into conductors

K. Condition SDGE-15: Details of Centralized Data Repository

47. SDGE Action Item-47

SDG&E shall provide a list of the systems that will produce the data for the repository.

The table below presents the list of data systems that are currently or in a future state, producing data for the centralized data repository and the type of data each system is hosting.

Source System	**Data Area**
Powerworkz	Vegetation Management Data
Fire Science Coordination Spreadsheet	Ignition Data
FPI & RFW Spreadsheet	National Weather Service Data
FTSAutocaller (San Diego Weather)	Weather Station Data
SAIDIDAT	Distribution Outage, Wire Down Data
OUA (Oracle Utility Analytics)	Outage, PSPS Data
Electric Grid Ops Transmission Extract	Transmission Outage Data
TCM (Transmission Construction Maintenance)	Transmission Inspection Data
GIS	Current Service Territory Data
SAP PM (Plant Maintenance), CMP (Corrective Maintenance Program)	Distribution Inspection Data
CISCO via Customer Data Warehouse	Customer Data
ENS (Emergency Notification System)	Customer Notification Data
Manual Input	Data points not/newly being tracked
Finance	Project/mitigation initiative specific financial data

48. SDGE Action Item-48

SDG&E shall provide a list of update frequency for all defined metrics within the centralized repository data.

For the Central Data Repository (CDR), the refresh frequency is determined by the source data system rather than an individual metric basis. Data metrics are still in the process of being defined along with the development of the WMP Data Governance Framework (DGF) and an automated CDR. To date, SDG&E has completed approximately 25% of the effort needed to implement the DGF and CDR, and anticipates the completion of data related to the all the metrics tables contained in the WMP by the end of 2021.

The below table lists the future state metric update frequency for each source data system and the type of data each system will be hosting.

Source System	**Data Area**	**Future Metric Frequency**
Powerworkz	Vegetation Management Data	Daily
Fire Science Coordination Spreadsheet	Ignition Data	Monthly
FPI & RFW Spreadsheet	National Weather Service Data	Monthly
FTSAutocaller (San Diego Weather)	Weather Station Data	Daily
SAIDIDAT	Distribution Outage, Wire Down Data	Monthly
OUA (Oracle Utility Analytics)	Outage, PSPS Data	Daily
Electric Grid Ops Transmission Extract	Transmission Outage Data	Monthly
TCM (Transmission Construction Maintenance)	Transmission Inspection Data	Daily
GIS	Current Service Territory Data	Daily
SAP PM (Plant Maintenance), CMP (Corrective Maintenance Program)	Distribution Inspection Data	Daily
CISCO via Customer Data Warehouse	Customer Data	Daily
ENS (Emergency Notification System)	Customer Notification Data	Unknown
Manual Input	Data points not/newly being tracked	Unknown
Finance	Project/mitigation initiative specific financial data	Unknown

L. Condition SDGE-16: Details of Cooperative Fuel Reduction Work

49. SDGE Action Item-49

SDG&E shall: 1) provide a status update on its discussion(s) with the USFS related to establishing collaborative fuel reduction programs and/or agreements, including a timeline, and 2) any resulting goals, targets, or plans related to fuel reduction.

SDG&E has not had any further discussions with U.S. Forest Service. There have been general discussions with federal, state, local, and tribal authorities regarding fuels management but no agreements are in place.

Appendix A

Appendix A – Guidance 5

A. Risk Mapping and simulation

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX (000)	Actual 2020 WMP (000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
A.1	A summarized risk map that shows the overall ignition probability and estimated wildfire consequence along the electric lines and equipment	Yes	Foundational Supporting Risk Mitigation Activity	$1,191	$ -	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.

B. Situational awareness and forecasting

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX (000)	Actual 2020 WMP (000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
B.1	Advanced weather monitoring and weather stations	Yes	Foundational Supporting Risk Mitigation Activity	$1,083	$-	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.
B.3	Fault indicators for detecting faults on electric lines and equipment	Yes	Customer Impact Mitigation	$835	$-	To calculate the benefits of wireless fault indicators, SDG&E considered the 5-year customer minute impacts of risk event data set. Using the reliability data, SDG&E calculated the average duration and customer impact by Tier 3 HFTD, Tier 2 HFTD, and non-HFTD. SDG&E then assumes that the installation of wireless fault indicators will reduce the duration of an outage by 10 minutes. SDG&E calculated the customer minutes using the 10-minute reduction per outage. SDG&E converted both numbers to annual SAIDI and calculated the savings per HFTD tier. Finally, SDG&E compared the number of WFI circuit installations to total circuits to see what percentage of benefits would be realized in the 2020- 2022 period of the plan. Tier 3 was not considered in the benefits, because Tier 3 is 100% complete. Tier 2 will be 100% complete by 2021. The total SAIDI benefit of WFI's for the WMP timeframe is estimated at 0.311 SAIDI minutes. A summary of the calculation is shown below: 5-year average SAIDI Non-HFTD: 29.9 5-year average SAIDI Tier 2: 9.03 5-year average SAIDI Non-HFTD with WFI's: 28.3 5-year average SAIDI Tier 2 with WFI's: 8.68 SAIDI Minutes saved Non-HFTD: 29.9 - 28.3 = 1.63 SAIDI Minutes saved Tier 2: 9.03 - 8.68 = .358 Circuits Tier 2: 168 Circuits Non HFTD: 820 Circuits planned for WFI's (2020-2022) Tier 2: 90 Circuits planned for WFI's (2020-2022) Non-HFTD: 60 SAIDI minutes saved Tier 2: .358 * 90/168 = .192 minutes SAIDI minutes saved Non-HFTD: 1.63 * 60/820 = .119 minutes Total SAIDI minutes saved: .192 + .192 = .311	Data Sources: • 5-year customer minute impacts Metrics: • Ignitions reduced • SAIDI minutes removed SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
B.4	Forecast of a fire risk index, fire potential index, or similar	Yes	Foundational Supporting Risk Mitigation Activity	$-	$-	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.

C. Grid design and system hardening

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX (000)	Actual 2020 WMP (000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
C.1	Capacitor maintenance and replacement program	Yes	Foundational Supporting Risk Mitigation Activity	$992	$ -	Capacitors currently cause an average of 0.2 ignitions annually in the HFTD based on SDG&E's ignition data from 2015-2019. This program is estimated to reduce capacitor caused HFTD ignitions by 0.16 per year once completed in 2022. This estimate is derived by evaluating historical data on faults that could cause ignitions to determine ignition rates and estimating a reduction in ignition rates as a result of capacitor replacements. A summary of the risk reduction estimation methodology is provided in the table below: Risk Events (average 2015 – 2019): 9 Pre-mitigation Ignitions (average 2015 – 2019): 0.2 Effectiveness Estimate: 80% Pre-mitigation ignition rate: 0.2/9 = 0.022 Post-mitigation ignition rate: 0.022 – (0.8*0.022) = 0.004 Post-mitigation ignitions: 0.004*9 = 0.04 Ignition Reduction Estimate: 0.2 – 0.04 = 0.16 Capacitors in the Tier 3 HFTD: 27 Capacitors in the Tier 2 HFTD: 75 Ignitions reduced Tier 3 HFTD: .16*(27/102) = .04 Ignitions reduced Tier 2 HFTD: .16*(75/102) = .12	Data Sources: • 2015 – 2019 SDG&E ignition data Metrics: • Ignitions reduced • Faults in HFTD There is no absolute threshold to determine effectiveness., but a relative comparative evaluation for the mitigations considered. As the RSE process matures as part of S-MAP SDGE will consider using an absolute threshold based on RSE. SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.2	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault	Yes	Direct Wildfire Mitigation Activity	$-	$ -	(NA) Scope is captured within the Substation inspections initiative activity (See D.15). Substation 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. Combined with the fact that while substation equipment failure can cause ignition of equipment inside a substation, it is rare for it to travel outside of the substation, the initiative does not have an effectiveness calculated.	(NA) See response for calculating the mitigation effectiveness for this initiative.
C.3	Covered conductor installation	Yes	Direct Wildfire Mitigation Activity	$ 1,798	$ -	Over the three-year period of the SDG&E's 2020 WMP cycle, covered conductor is expected to reduce 0.21 ignitions annually. This estimate is derived by evaluating different causes of ignitions using 5-year ignition data from 2015 – 2019 and estimating a potential reduction in each cause based on estimates of effectiveness of covered conductor (e.g., ignitions caused by animal contact, balloon contact and vegetation contact have an estimated reduction of ~90% while ignitions caused by vehicle contact, have an estimated reduction of ~0%). This results in an overall estimated effectiveness of 70%. A summary of the risk reduction estimation methodology is provided in the table below: Pre-mitigation risk events per 100 miles: 12.9 Effectiveness Estimate: 70% Post-mitigation risk events per 100 miles: 12.9 - (0.7*12.9) = 3.87 Ignition rate in Tier 3: 2.74%	Data Sources: • 2015 – 2019 SDG&E ignition data Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

						Ignition rate in Tier 2 | 3.37% Pre-mitigation Tier 3 ignitions per 100 miles | 12.9*2.74% = 0.35 Pre-mitigation Tier 2 ignitions per 100 miles | 12.9*3.37% = 0.44 Post-mitigation Tier 3 ignitions per 100 miles | 3.87*2.74% = 0.11 Post-mitigation Tier 2 ignitions per 199 miles | 3.87*3.37% = 0.13 Ignitions reduced in Tier 3 per 100 miles | 0.35 – 0.11 = 0.24 Ignitions reduced in Tier 2 per 100 miles | 0.44 – 0.13 = 0.31 Miles of mitigation in Tier 3 | 68.8 Miles of mitigation in Tier 2 | 13 Ignitions reduced in Tier 3 | 68.8*(0.24/100) = 0.17 Ignitions reduced in Tie 2 | 12*(0.31/100) = 0.04 Total Ignition Reduction Estimate | 0.17 + 0.04 = 0.21	
C.6	Distribution pole replacement and reinforcement, including with composite poles	Yes	Grouped Mitigation	$	$ -	(NA) Grouped with risk reduction calculations for the various inspection programs. (See Category D)	(NA) See response for calculating the mitigation effectiveness for this initiative.
C.7	Expulsion fuse replacement	Yes	Direct Mitigation Activity	$ 6,521	$ -	SDG&E performed a research study to measure to effectiveness of CAL FIRE approved expulsion fuses compared to other expulsion fuses at reducing ignitions due to normal fuse operations. SDG&E utilized its GIS database to identify the locations and installation dates of new CAL FIRE approved fuses. SDG&E then reviewed risk event data from 2015 through 2019 to identify all risk events isolated by an overhead fuse. SDG&E then performed a comparison of the risk event isolating device structure and the risk event date to the GIS database to determine if the risk event was isolated by an expulsion fuse or a CAL FIRE approved fuse. Finally, SDG&E compared the fuse operation data to the ignition database data to determine which fuse operations had led to an ignition to find a reduction in ignition percentage from 0.11% to 0% # of time normal fuse operated to isolate the fault | 3498 Ignition with normal fuse: | 4 Ignition rate: | 0.11% # of time cal fire fuse operated to isolate the fault | 139 Ignition with cal. fire fuse: | 0 Ignition Rate: | 0.00% Normal fuse operation by tier | Ignitions | Ignition Rate Non-HFTD | 2308 | 1 | 0.04% Tier 2 | 716 | 2 | 0.28% Tier 3 | 602 | 1 | 0.17% Cal Fire fuse operation by tier | Ignitions | Ignition rate Non-HFTD | 11 | 0 | 0.00% Tier 2 | 47 | 0 | 0.00% Tier 3 | 81 | 0 | 0.00% Over the three-year period of the SDG&E's 2020 WMP cycle, covered conductor is expected to reduce 0.6 ignitions annually. Based on the early results of the study described above, SDG&E is utilizing a 100% effectiveness measure for CAL FIRE approved fuses. Because SDG&E plans to complete this mitigation, replacing all expulsion fuses within the HFTD by 2022, it is calculated that all ignitions from this cause will be mitigated.	Data Sources: • 2015 – 2019 risk events isolated by overhead expulsion fuse • 2015 – 2019 risk events isolated by overhead CAL FIRE approved fuse • 2015 – 2019 ignitions caused by expulsion fuse operation • Ignitions caused by CAL FIRE approved fuses Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.8.1	Grid topology improvements to mitigate or reduce PSPS events (sectionalizing devices)	Yes	Customer Impact Mitigation	$ 5,111	$ -	Over the three-year period of the SDG&E's 2020 WMP cycle, the PSPS Sectionalizing Program is expected to reduce PSPS impacts by a total of 15,027 customers. This number includes the 5,773 customers mitigated by 2020 sectionalizing projects during 2020 PSPS events as well as the new sectionalizing projects planned for 2021 and 2022 with estimated customer savings of 5,145 and 4,109 respectively. This is calculated per project by the difference between customers de-energized by the previously used PSPS device and the customers de-energized downstream of the new one. This includes some customers that have never experienced a PSPS but have a probability of PSPS. Because sectionalizing customer savings vary due to weather-dependency and resulting differences in switch plans, the effectiveness of this mitigation is estimated to be 50%	Data Sources: • Historic PSPS events Metrics: • Reduced number of customers facing PSPS impacts SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.8.2	Grid topology improvements to mitigate or reduce PSPS events (Microgrids)	Yes	Customer Impact Mitigation	$ 3,542	$ -	Over the three-year period of the SDG&E's 2020 WMP cycle, microgrids are expected to reduce PSPS impacts to a total of 662 customers. SDG&E uses a combination of data including, but not limited to, the risk of wildfire from overhead infrastructure, feasibility of alternative solutions such as undergrounding distribution infrastructure, and historical PSPS impact data to guide the targeted customers. This number is calculated based on the locations of microgrids and the customers they serve and is used to estimate the reduction in PSPS impact. Because microgrids are designed to keep those customers energized throughout the duration of a PSPS event, the effectiveness of the mitigation is estimated to be 100%	Data Sources: • Historic PSPS events • Critical facilities identification • AFN customer identification Metrics: • Reduced number of customers facing PSPS impacts SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.10	Maintenance, repair, and replacement of connectors, including hotline clamps	Yes	Direct Mitigation Activity	$ -	$ 3,299	SDG&E estimated the risk reduction from this program by considering the historical wire downs associated with connection failures, the ignition percentages within the HFTD, and the amount of replacement expected completed by the end of 2022. Below is a summary of the calculation that shows .052 ignitions reduced over the three-year WMP period. Tier 2 wire downs (2015-2019 average for connector failures) | 1.27 Tier 3 wire downs (2015-2019 average for connector failures) | 1.13 Ignition rate Tier 2 (2015 – 2019 average) | 3.37% Ignition rate Tier 3 (2015 – 2019) | 2.74% Ignitions reduced Tier 2 | 1.27*3.37% - 0.43 Ignitions reduced Tier 3 | 1.13*2.74% = 0.31 % Tier 2 HCL replaced (2020-2022) | 88.1% % Tier 3 HCL replaced (2020-2022) | 53.3% Ignitions reduced Tier 2 | .043*88.1% = 0.36 Ignitions reduced Tier 3 | .032*53.3%= .016 Total ignitions reduced | .016 + .036 = .052	Data Sources: • Historic wire downs associated with connection failures • Ignitions percentages within HFTD • Amount of replacement expected completed by the end of 2022 Metrics: • Ignitions reduced SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.11.1	Mitigation of impact on customers and other residents affected during PSPS event (Resiliency Grant Programs)	Yes	Customer Impact Mitigation	$ -	$ 5,076	Over the three-year period of the SDG&E's 2020 WMP cycle, the Resiliency Grant Program is expected to reduce PSPS impacts to a total of 5,420 customers. This number is calculated based on the count of customers that would receive the generator and is used to estimate the reduction in PSPS impact. Because the generators provided to customers as a part of this program are not whole-facility solutions but rather smaller units that keep specific equipment energized, the effectiveness of the mitigation is estimated to be 40%.	Data Sources: • Medical Baseline Customers (MBL) customer identification • Historical PSPS events Metrics: • Reduced number of customers facing PSPS impacts SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.11.2	Mitigation of impact on customers and other residents affected during PSPS event (Standby Power Programs)	Yes	Customer Impact Mitigation	$ -	$ 1,754	Over the three-year period of the SDG&E's 2020 WMP cycle, the Standby Power Program is expected to reduce PSPS impacts to a total of 900 customers. This number is calculated based on the count of customers that would receive the generator and is used to estimate the reduction in PSPS impact. Because the generators provided to customers as a part of this program are whole-facility solutions that are expected to keep the customers energized throughout a PSPS event, the effectiveness of the mitigation is estimated to be 100%.	Data Sources: •Historical PSPS events Metrics: • Reduced number of customers facing PSPS impacts SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.11.3	Mitigation of impact on customers and other residents affected during PSPS event (Resiliency Assistance Programs)	Yes	Customer Impact Mitigation	$ -	$ 761	Over the three-year period of the SDG&E's 2020 WMP cycle, the Resiliency Assistance Program is expected to reduce PSPS impacts to a total of 3,774 customers. This number is calculated based on the count of customers that are expected to purchase generators through the rebate program and is used to estimate the reduction in PSPS impact. Because the generators purchased through this program vary depending on the customer's preferences, the effectiveness of the mitigation is estimated to be 75%.	Data Sources: • Residential, small business, & CARE customer identification • Historical PSPS events Metrics: • Reduced number of customers facing PSPS impacts SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.16	Undergrounding of electric lines and/or equipment	Yes	Direct Mitigation Activity	$ 38,850	$ -	To calculate the wildfire risk reduction for strategic undergrounding, SDG&E considered the historical ignitions associated with underground equipment to determine effectiveness, the pre mitigation overhead system risk event rate and ignitions rates, and the underground mileage to be completed within the three-year period. Specifically, the effectiveness of undergrounding was measured by taking total CPUC reportable ignitions associated with underground (of which SDG&E has three, all due to vehicle contacts with pad mounted equipment) and dividing by total ignitions. Based on this analysis, strategic undergrounding is expected to reduce 0.453 ignitions per year and mitigate PSPS impacts to 7,192 customers by the end of 2022. Below is a summary of the calculation: Pre-mitigation risk events per 100 miles | 12.9 Undergrounding effectiveness | 98.1% Ignition rate in Tier 3 | 2.74% Ignition rate in Tier 2 | 3.37% Pre-mitigation Tier 3 ignitions per 100 miles | 12.9*2.74% = 0.35 Pre-mitigation Tier 2 ignitions per 100 miles | 12.9*3.37% = 0.44 Post-mitigation Tier 3 ignitions per 100 miles | .35*(1-98.1%) = .0065 Post-mitigation Tier 2 ignitions per 100 miles | .44*(1-98.1%) = .0081 Ignitions reduced in Tier 3 per 100 miles | 0.35 – 0.0065 = 0.346 Ignitions reduced in Tier 2 per 100 miles | 0.44 – 0.0081=.435 Miles of mitigation in Tier 3 | 77.5 Miles of mitigation in Tier 2 | 43 Ignitions reduced in Tier 3 | 77.5* (0.346/100) = 0.269 Ignitions reduced in Tier 2 | 43* (0.435/100) = 0.184 Total Ignition Reduction Estimate | 0.269 + 0.184 = 0.453	Data Sources: • Historic wire downs associated with underground equipment • Pre-mitigation OH system risk event rate & ignitions rates • Underground mileage to be completed within the three-year period • Amount of replacement expected completed by the end of 2022 Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.17.2	Updates to grid topology to minimize risk of ignition in HFTDs (Distribution OH Hardening)	Yes	Direct Mitigation Activity	$ 138,378	$ 3,446	SDG&E conducted a research study to understand the effectiveness of OH distribution hardening at reducing the occurrence of OH Faults. SDG&E gathered a list of completed overhead hardening projects from the FIRM program that began hardening work in 2014. This data set included 214 completed projects representing 227 miles of completed overhead hardening. This dataset also included the structure number for every hardened structure and the completion date for each project. The next set of data utilized was the risk event data set. SDG&E pulled reliability data from 2000 through 2019. The risk event data includes the location where the risk event occurred in the to and from structure fields. This does represent one limitation of this study, as risk events of undetermined cause have no specific risk event structure ID to compare to and are therefore omitted from this study by necessity. For risk events with causes however, SDG&E compared the to and from	Data Sources: • 2010 – 2019 unhardened risk events (distribution OH) • 2010 – 2019 hardened risk events (distribution OH) Metrics: • Ignitions reduced • Faults in HFTD

						fields in the risk event data set to the project structure field in the project data set. When the structures match, SDG&E checked the risk event date against the project completion date to determine if the risk event occurred before or after the overhead hardening project was completed. For each project, SDG&E totaled the number of risk events that occurred before and after the hardening project. SDG&E also calculated the operating years before and after the hardening, as well as the project miles for the purposes of normalizing the dataset. SDG&E then calculated averages for the number of unhardened risk events per project, the number of unhardened operating years per project, the number of hardened risk events per project, the number of hardened operating years per project, and the number of miles per project. Utilizing these averages, SDG&E then calculated the average risk event per operating year per 100 miles before hardening and compared it to the average risk event per operating year per 100 miles after hardening. On average, the unhardened system saw an average of 9.24 risk events per 100 miles per operating year while the hardened system saw an average of 4.92 risk events per 100 miles per operating year. This represents a 47% reduction in risk. To determine the estimated ignition reduction for overhead system hardening, SDG&E considered the average historical pre-mitigation risk events, the mitigation effectiveness, the historical ignition rates, and the amount of overhead hardening planned to be completed in the 2020-2022 timeframe. Based on this analysis, this mitigation is estimated to reduce ignitions by 0.365 per year by the end of 2022. Below is a summary of the calculation. Pre-mitigation risk events per 100 miles: 12.9 Effectiveness Estimate: 47% Post-mitigation risk events per 100 miles: 12.9 – (0.47*12.9) = 6.91 Ignition rate in Tier 3: 2.74% Ignition rate in Tier 2: 3.37% Ignition rate Non HFTD: 1.46% Pre-mitigation Tier 3 ignitions per 100 miles: 12.9*2.74% = 0.35 Pre-mitigation Tier 2 ignitions per 100 miles: 12.9*3.37% = 0.44 Pre-mitigation Non HFTD ignitions per 100 miles: 12.9*1.46% = .019 Post-mitigation Tier 3 ignitions per 100 miles: 6.91*2.74% = 0.189 Post-mitigation Tier 2 ignitions per 100 miles: 6.91*3.37% = 0.233 Post-mitigation Non HFTD ignitions per 100 miles: 6.91*1.46%=0.101 Ignitions reduced in Tier 3 per 100 miles: 0.35 – 0.189 = 0.164 Ignitions reduced in Tier 2 per 100 miles: 0.44 – 0.233 = 0.202 Ignitions reduced in Non HFTD per 100 miles: 0.19 - 0.101 = .087 Miles of mitigation in Tier 3: 103.8 Miles of mitigation in Tier 2: 92.7 Miles of mitigation in Non HFTD: 8 Ignitions reduced in Tier 3: 103.8* (0.164/100) = 0.170 Ignitions reduced in Tier 2: 92.7* (0.202/100) = 0.187 Ignitions reduced in Non HFTD: 8.0* (.087/100) = .007 Total Ignition Reduction Estimate: 0.170 + 0.187 + .007 = .365	SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.17.3	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission OH Hardening)	Yes	Direct Mitigation Activity	FERC	FERC	SDG&E utilized the same research study approach that was used for distribution hardening (See C.17.2 effectiveness section) and applied transmission line historic event data to determine the effectiveness value. SDG&E reviewed 20 years of reliability performance from 2000 to 2019. SDG&E compared reliability performance in risk events per operating year per 100 miles before and after overhead transmission hardening and found an 83% reduction in risk events on hardened infrastructure. Below is a summary of the calculations for the number of ignitions reduced by the initiative: Pre-mitigation risk events per 100 miles: 6.27 Effectiveness Estimate: 83% Post-mitigation risk events per 100 miles: 6.27*(1 - 83%) = 1.08 Transmission Ignition Rate HFTD: 9.00% Pre-mitigation HFTD ignitions per 100 miles: 6.27*9% = 0.564 Post-mitigation HFTD ignitions per 100 miles: 1.08*9% = 0.097 Ignitions reduced HFTD: .564 - .097 = .467 Miles of mitigation Tier 3: 3.5 Miles of mitigation Tier 2: 63.4 Ignitions reduced Tier 3: .467*3.5/100 = .016 Ignitions reduced Tier 2: .467*63.4/100 = .296 Total Ignitions reduced OH: .016+.296 = .312	Data Sources: • 2010 – 2019 unhardened risk events (transmission OH) • 2010 – 2019 hardened risk events (transmission OH) • Historical transmission ignition rate Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.17.4	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission UG Hardening)	Yes	Direct Mitigation Activity	FERC	FERC	For the underground component of transmission hardening, SDG&E utilized a 100% effectiveness rating, as underground transmission does not have pad mounted equipment that could be struck by vehicles. Below is a summary of the calculations for the number of ignitions reduced by the initiative: Pre-mitigation risk events per 100 miles: 6.27 Effectiveness Estimate: 100% Transmission Ignition Rate HFTD: 9.00% Pre-mitigation HFTD ignitions per 100 miles: 6.27*9% = 0.564 Post-mitigation HFTD ignitions per 100 miles: 0 Ignitions reduced HFTD: 0.564 Miles of mitigation Tier 2: 5.5 Ignitions reduced Tier 2: .564* (5.5/100) = .031	Data Sources: • 2010 – 2019 unhardened risk events (transmission OH) • 2010 – 2019 hardened risk events (transmission OH) • Historical transmission ignition rate Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.17.5	Updates to grid topology to minimize risk of ignition in HFTDs (Transmission OH distribution underbuilt)	Yes	Direct Mitigation Activity	$ 5,030	$ -	For distribution underbuilt, SDG&E utilized the same historic information & research study used for distribution hardening (See C.17.2 effectiveness section) and used an effectiveness of 47%. Below is a summary of the calculations for the number of ignitions reduced by the initiative: Pre-mitigation risk events per 100 miles: 12.9 Effectiveness Estimate: 47% Post-mitigation risk events per 100 miles: 12.9 – (0.47*12.9) = 6.91 Ignition rate in Tier 3: 2.74% Ignition rate in Tier 2: 3.37% Pre-mitigation Tier 3 ignitions per 100 miles: 12.9*2.74% = 0.35 Pre-mitigation Tier 2 ignitions per 100 miles: 12.9*3.37% = 0.44 Post-mitigation Tier 3 ignitions per 100 miles: 6.91*2.74% = 0.189 Post-mitigation Tier 2 ignitions per 100 miles: 6.91*3.37% = 0.233 Ignitions reduced in Tier 3 per 100 miles: 0.35 – 0.189 = 0.164 Ignitions reduced in Tier 2 per 100 miles: 0.44 – 0.233 = 0.202 Miles of mitigation in Tier 3: 3.5 Miles of mitigation in Tier 2: 36.2 Ignitions reduced in Tier 3: 3.5* (0.164/100) = 0.006 Ignitions reduced in Tier 2: 36.2* (0.202/100) = 0.073 Total Ignition Reduction Estimate: .006+.073 = .079	Data Sources: • 2010 – 2019 unhardened risk events (transmission OH) • 2010 – 2019 hardened risk events (transmission OH) • 2010 – 2019 hardened risk events (distribution OH) • 2010 – 2019 hardened risk events (distribution OH) • Historical transmission ignition rate Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.17.6	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Transmission OH)	Yes	Direct Mitigation Activity	FERC	FERC	SDG&E utilized the same research study approach that was used for distribution hardening (See C.17.2 effectiveness section) and applied transmission line historic event data to determine the effectiveness value. SDG&E reviewed 20 years of reliability performance from 2000 to 2019. SDG&E compared reliability performance in risk events per operating year per 100 miles before and after overhead transmission hardening and found an 83% reduction in risk events on hardened infrastructure. Below is a summary of the calculations for the number of ignitions reduced by the initiative: Pre-mitigation risk events per 100 miles: 6.27 Effectiveness Estimate: 83% Post-mitigation risk events per 100 miles: 6.27*(1 - 83%) = 1.08 Transmission Ignition Rate HFTD: 9.00% Pre-mitigation HFTD ignitions per 100 miles: 6.27*9% = 0.564 Post-mitigation HFTD ignitions per 100 miles: 1.08*9% = 0.097 Ignitions reduced HFTD: .564 - .097 = .467 Miles of mitigation Tier 3: 29 Ignitions reduced Tier 3: .467* (29/100) = .0135 Total Ignition Reduction: .0135	Data Sources: • 2010 – 2019 unhardened risk events (transmission OH) • 2010 – 2019 hardened risk events (transmission OH) • Historical transmission ignition rate Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.17.7	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution OH)	Yes	Direct Mitigation Activity	$ 46,271	$ -	SDG&E utilized the same historic information & research study used for distribution hardening (See C.17.2 effectiveness section) and used an effectiveness of 47%. Below is a summary of the calculations for the number of ignitions reduced by the initiative: Pre-mitigation risk events per 100 miles: 12.9 Effectiveness Estimate: 47% Post-mitigation risk events per 100 miles: 12.9 – (0.47*12.9) = 6.91 Ignition rate in Tier 3: 2.74% Pre-mitigation Tier 3 ignitions per 100 miles: 12.9*2.74% = 0.35	Data Sources: • 2010 – 2019 unhardened risk events (distribution OH) • 2010 – 2019 hardened risk events (distribution OH) Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

						Post-mitigation Tier 3 ignitions per 100 miles: 6.91*2.74% = 0.189 Ignitions reduced in Tier 3 per 100 miles: 0.35 – 0.189 = 0.164 Miles of mitigation in Tier 3: 53.6 Ignitions reduced in Tier 3: 53.6* (0.164/100) = 0.088 Total Ignition Reduction: 0.088	
C.17.8	Updates to grid topology to minimize risk of ignition in HFTDs (CNF Fire hardening Distribution UG)	Yes	Direct Mitigation Activity	$ 37,973	$ -	SDG&E utilized the same historic information & research study used for strategic undergrounding (See C.16 effectiveness section) and used an effectiveness of 98.1%. Below is a summary of the calculations for the number of ignitions reduced by the initiative: Pre-mitigation risk events per 100 miles: 12.9 Undergrounding Effectiveness Estimate: 98.1% Ignition rate in Tier 3: 2.74% Pre-mitigation Tier 3 ignitions per 100 miles: 12.9*2.74% = 0.35 Post-mitigation Tier 3 ignitions per 100 miles: .35* (1-98.1%) = .0065 Ignitions reduced in Tier 3 per 100 miles: 0.35 – 0.0065 = 0.346 Miles of mitigation in Tier 3: 14.8 Ignitions reduced in Tier 3: 14.8* (0.346/100) = 0.051 Total Ignition Reduction: 0.051	Data Sources: • Historic wire downs associated with underground equipment • Pre-mitigation OH system risk event rate & ignitions rates • Underground mileage to be completed within the three-year period • Amount of replacement expected completed by the end of 2022 Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.18.1	Other (Lightning Arrestor Replacement Program)	Yes	Direct Mitigation Activity	$ 19	$ -	SDG&E will be installing the first of these units in 2021, so no studies have been completed on the effectiveness of this mitigation. SDG&E estimates the mitigation will have an 80% reduction in ignitions, based on the technology and what the product is designed to accomplish. Like all of its equipment mitigations, SDG&E will be installing these new assets in a way where they can be queried for later reporting, so SDG&E can evaluate the effectiveness of these mitigations as new lightning arrestors begin to protect the electric system under overvoltage conditions. The ignitions reduced by 2022 was calculated using the 5-year average risk events caused by lightning arrestors, the five-year average ignitions caused by lightning arrestors, the assumed effectiveness of 80% discussed above, and the planned lightning arrestor installations for the WMP timeframe. Based on this data, a reduction of .018 ignitions is expected by the end of 2022. A summary of the calculation is provided below: Lighting Arrestor risk events HFTD (5-year average): 11 Pre-mitigation ignitions HFTD (5-year average): 0.6 Effectiveness: 80% Post-mitigation ignitions HFTD: 0.12 Ignitions reduced HFTD: 0.6-0.12 = 0.48 Total Arrestors HFTD: 73000 Arrestors Tier 3 (2020-2022): 2772 Ignitions reduced Tier 3: .48* (2772/73000) = .018	Data Sources: • 5-year average risk events caused by lightning arrestors • 5-year average ignitions caused lightning arrestors • Planned lightning arrestor installations for WMP timeframe Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
C.18.2	Other (LTE Communication Network)	Yes	Grouped Mitigation	$ -	$ -	(NA) Grouped with risk reduction calculations with system automation programs.	(NA) See response for calculating the mitigation effectiveness for this initiative.

D. Asset management and inspections

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX ($000)	Actual 2020 WMP ($000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
D.1	Detailed inspections of distribution electric lines and equipment	Yes	Direct Mitigation Activity	$ 8,320	$ 179	SDG&E conducted a research study to measure effectiveness of inspection programs at finding and repairing equipment issues before they fail. SDG&E queried 5 years of reliability data and corrective maintenance data. SDG&E filtered the reliability data set into risk events via the following methodology. Risk events considered to be all OH system faults. SDG&E then created an overhead outage filter. Using the to and from structure fields which represents the outage/fault location, SDG&E filtered to only include structures that represented overhead facilities. A small subset of the data did not use a facility ID in the to or from structure fields but instead utilize an equipment ID. For this subset, SDG&E queried the equipment ID to find the facility ID associated with the equipment, and then applied the overhead filter to those structures. Finally, if the to and from structure fields were blank (which always will be the case for undetermined outages), then SDG&E used the isolation device included with the outage if the isolation device was on an overhead structure. If the isolation device was a circuit breaker and the to and from structure fields were blank, SDG&E checks cause code and includes only outages that are related to overhead. Once the overhead filter was applied, additional cause code filters were applied to remove any additional underground outages the overhead filter may have missed and to remove any outages that were not faults from the risk event data set. This includes codes like "deenergized for safety" which is an outage to customers but not a fault on the system, and "faulted cables" which are underground only. From there, SDG&E further filtered this data set to look at equipment failures only which are the primary target of SDG&E's corrective maintenance programs. SDG&E also queried its corrective maintenance program data to identify all infractions associated with structures, and when those infractions were repaired. Finally, SDG&E utilized the to and from fields of the risk data set to identify structures that had risk events associated with structures that had pending corrective maintenance infractions. 5 year total / Annual Average Risk events with pending infractions: 60 / 12 Total equipment risk events: 1,619 / 324 Risk event rate with pending infractions: 3.71% / 3.71% Infractions Repaired: 19,502 / 3,900 Risk events with pending infractions over repaired infractions: 0.00308 / 0.00308 For the purpose of estimating the effectiveness of inspections, SDG&E will use the .31% of issues that led to failures over issues that were identified and repaired as a forecast of what would fail if issues were not repaired within SDG&E's one year maintenance timelines. These failure rates are scaled based on the severity of the findings (emergency, priority, non-priority). These failure rates are multiplied by 5-year average findings by finding priority to determine the 5-year average faults avoided per inspection program. Depending on the HFTD tier, the inspection is performed, the fault rates are multiplied by the tiered ignition rates below that were determined from another SDG&E research study. Ignition Rate Location / Normal / Elevated / Extreme / All Non-HFTD: 1.17% / 2.91% / 11.00% / 1.48% Tier 2: 2.25% / 5.07% / 10.34% / 3.37% Tier 3: 1.62% / 4.31% / 10.00% / 2.74% HFTD (Tier 2 + Tier 3): 1.92% / 4.69% / 10.19% / 3.07% System: 1.42% / 3.91% / 6.10% / 2.09% For the 5-year detailed inspections, the total ignitions avoided, 0.545, are summarized by the following calculations. 5-year average hit rate Emergency (0-3 days): 0.002 5-year average hit rate Priority (4-30 days): 0.001 5-year average hit rate Non - Critical: 0.06 2022 Inspection Total Tier 3: 6411 2022 Inspection Total Tier 2: 11644 Emergency Tier 3: .002*6411 = 13 Emergency Tier 2: .002*11644 = 23 Priority Tier 3: .001*6411 = 5 Priority Tier 2: .001*11644 = 9 Non-Critical Tier 3: .06 * 6411 = 385 Non-Critical Tier 2: .06*11644 = 700 Fail Rate Emergency: 37% Fail Rate Priority: 4% Fail Rate Non-Critical: 0.31% Risk events avoided Tier 3: 13*37% + 5*4% + 385*.31% = 6 Risk events avoided Tier 2: 23*37% + 9*4% + 700*.31% = 11 Distribution ignition rate Tier 3: 2.74% Distribution ignition rate Tier 2: 3.37% Ignitions avoided Tier 3: 6*2.74% = .168 Ignitions avoided Tier 2: 11*3.37% = .377 Total ignitions avoided: .377 + .168 = .545	Data Sources: • 2015 - 2019 equipment related to risk events • 2015 – 2019 equipment related risk events with a pending infraction • 2015 – 2019 structures with pending infractions • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
D.2	Detailed inspections of transmission electric lines and equipment	Yes	Direct Mitigation Activity	$ 838	$ -	The detailed effectiveness methodology can be found in the calculations for D.1. In summary, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average ignition rate for transmission risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. For 2022, an estimated .182 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the detailed transmission inspection program. The calculations can be seen below: 5-year average hit rate Emergency (0-3 days): 0	Data Sources: • 2015 - 2019 equipment related to risk events • 2015 – 2019 equipment related risk events with a pending infraction • 2015 – 2019 structures with pending infractions • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

						5-year average hit rate Priority (4-30 days) = 0.012 5-year average hit rate Non - Critical = 0.077 2022 Inspection Total Tier 3 = 779 2022 Inspection Total Tier 2 = 1936 Emergency Tier 3 = 0*779 = 0 Emergency Tier 2 = 0*1936 = 0 Priority Tier 3 = .012*779 = 9 Priority Tier 2 = .012*1936 = 23 Non-Critical Tier 3 = .077 * 779 = 60 Non-Critical Tier 2 = .077*1936 = 150 Fail Rate Emergency = 37% Fail Rate Priority = 4% Fail Rate Non-Critical = 0.31% Risk events avoided Tier 3 = 0*37% + 9*4% + 60*.31% = .58 Risk events avoided Tier 2 = 0*37% + 23*4% + 150*.31% = 1.4 Transmission ignition rate HFTD = 9% Ignitions avoided Tier 3 = .58*9% = .052 Ignitions avoided Tier 2 = 1.4*9% = .13 Total ignitions avoided = .052 + .13 = .182	
D.4	Infrared inspections of distribution electric lines and equipment	Yes	Direct Mitigation Activity	$ -	$ 175	Since the distribution infrared inspection program is new, the pilot results from 2020 were utilized to forecast future years. Due to the technology dependency of this inspection type, it was assumed that any issue found would lead to a risk event, as another inspection cycle or patrol would be unable to identify this issue as they are visual and could not detect hot connections. The results of the 2020 pilot showed an estimated .055 ignitions reduced in the Tier 3 HFTD. A summary of the calculation is provided below: 2020 Inspections completed Tier 3 = 13077 Emergency Tier 3 Actuals = 0 Priority Tier 3 Actuals = 2 Non-Critical Tier 3 Actuals = 0 Faults Avoided Tier 3 = 0 + 2 + 0 = 2 Distribution Ignition rate Tier 3 = 2.74% Ignitions Reduced Tier 3 = 2*2.74% = .055	Data Sources: • Infrared pilot data • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
D.6	Intrusive pole inspections	Yes	Direct Mitigation Activity	$ 567	$ 884	The detailed effectiveness methodology can be found in the calculations for D.1. In summary, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average ignition rate for distribution risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. The 10-year intrusive program in particular can vary from year to year, as some cycles do not involve many inspections in the HFTD, and some cycles can be over 90% within the HFTD.For 2022, an estimated .0009 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the intrusive pole inspection program. The calculations can be seen below: 5-year average hit rate Emergency (0-3 days) = 0.002 5-year average hit rate Priority (4-30 days) = 0.001 5-year average hit rate Non - Critical = 0.035 2022 Inspection Total Tier 3 = 0 2022 Inspection Total Tier 2 = 380 Emergency Tier 3 = .002*0 = 0 Emergency Tier 2 = .002*380 = .76 Priority Tier 3 = .001*0 = 0 Priority Tier 2 = .001*380 = .38 Non-Critical Tier 3 = .035 * 0 = 0 Non-Critical Tier 2 = .035*380 = 13 Fail Rate Emergency = 37% Fail Rate Priority = 4% Fail Rate Non-Critical = 0.31% Risk events avoided Tier 3 = 0 Risk events avoided Tier 2 = .76*37% + .38*4% + 13*.31% = .273 Distribution ignition rate Tier 3 = 2.74% Distribution ignition rate Tier 2 = 3.37% Ignitions avoided Tier 3 = 0 Ignitions avoided Tier 2 = .273*3.37% = .009 Total ignitions avoided = 0.009	Data Sources: • 2015 - 2019 equipment related to risk events • 2015 – 2019 equipment related risk events with a pending infraction • 2015 – 2019 structures with pending infractions • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
D.9.1	Other discretionary inspections of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (HFTD Tier 3 inspections)	No	Direct Mitigation Activity	$ 1,248	$ 400	The detailed effectiveness methodology can be found in the calculations for D.1. In summary, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average ignition rate for distribution risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. For 2022, an estimated .0009 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the HFTD Tier 3 Inspections program. The calculations can be seen below: 5-year average hit rate Emergency (0-3 days) = 0.001 5-year average hit rate Priority (4-30 days) = 0.005 5-year average hit rate Non - Critical = 0.035 2022 Inspection Total Tier 3 = 12380 Emergency Tier 3 = .001*12380 = 16 Priority Tier 3 = .005*12380 = 65 Non-Critical Tier 3 = .035 * 12380 = 127 Fail Rate Emergency = 37% Fail Rate Priority = 4% Fail Rate Non-Critical = 0.31% Risk events avoided Tier 3 = 16*37% + 65*4% + 327*.37% = 9 Distribution ignition rate Tier 3 = 2.74% Ignitions avoided Tier 3 = 9*2.74% =0.259 Total ignitions avoided = 0.259	Data Sources: • 2015 - 2019 equipment related to risk events • 2015 – 2019 equipment related risk events with a pending infraction • 2015 – 2019 structures with pending infractions • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
D.9.2	Other discretionary inspections of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone flights and assessments)	Yes	Direct Mitigation Activity	$ 15,901	$ 51,953	The distribution drone program is another new inspection program with the first phase of the pilot completed in 2020 that included aerial flights and assessments for all structures within the Tier 3 HFTD. Forecasts for future years will be based off the results from the pilot until a larger history of data is generated allowing the use of historical averages. For the drone program, SDG&E modified its methodology to ensure the effectiveness of drones was not overstated. SDG&E decided to use the measured .31% failure rate for all infractions found, given the unusually high hit rate of issues discovered using this program relative to other inspection programs. (See D.1 effectiveness calculations for more information) Based on the data and assumptions, the drone program will reduce .804 ignitions in the HFTD Tier 3. A summary of the calculation is provided below: 2020 Inspections completed Tier 3 = 37310 Emergency Tier 3 Actuals = 132 Priority Tier 3 Actuals = 1823 Non-Critical Tier 3 Actuals = 7522 Failure Rate Non-Critical = 0.31% Risk events avoided Tier 3 = 132*.31% + 1823*.31% + 7522*.31% = 29 Distribution ignition rate Tier 3 = 2.74% Ignitions Reduced Tier 3 = 29*2.74% = .055	Data Sources: • Drone assessment pilot data • Estimated HFTD ignition rates Metrics: • Ignitions reduced SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
D.9.3	Other discretionary inspections of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Drone repairs)	Yes	Direct Mitigation Activity	$ -	$ -	(NA) These are the repairs associated with the inspections above. This is grouped with D9.2	(NA) See response for calculating the mitigation effectiveness for this initiative.
D.9.4	Other discretionary inspections of distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Circuit ownership)	Yes	Grouped Mitigation Activity	$ 41	$ -	The circuit ownership program is different from other inspection programs, as the employees using the tool are not performing inspections, but other tasks such as troubleshooting an electric issue for a customer or performing construction work. There is no required amount of inspections performed, as the issues are submitted by the workforce proactively through a mobile application if they see an issue. SDG&E is still measuring the risk reduced by this program the same way it measures inspections effectiveness, by quantifying the amount of issues found, the severity of the issue, the failure rate, and the ignition rate to calculate an estimated ignitions reduced from the program (See effectiveness calculations for D.1 for more information). Being that only two issues were turned in, only 0.0002 ignitions are expected to be reduced from this program in 2020. Below is a summary of the calculation:	Data Sources: • Circuit ownership platform • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

						Emergency Tier 3 Actuals: 0 Priority Tier 3 Actuals: 0 Non-Critical Tier 3 Actuals: 0 Emergency Tier 2 Actuals: 0 Priority Tier 2 Actuals: 0 Non-Critical Tier 2 Actuals: 2 Failure Rate Non-Critical: 0.31% Risk events reduced Tier 2: 2*.31% = .0062 Distribution ignition rate Tier 2: 3.37% Ignitions avoided Tier 2: .0062*3.37% = .0062 Total ignitions avoided: .0062	
D.11	Patrol inspections of distribution electric lines and equipment	Yes	Direct Mitigation Activity	$ 789	$ 295	The detailed effectiveness methodology can be found in the calculations for D.1. In summary, for existing programs, a five year historical average of hit rates (number of issues found at a given priority level/total inspections) was calculated and utilized to forecast future years based on the number of inspections in the HFTD for these programs. SDG&E's failure rate calculations (i.e., how many risk events would occur within a year should SDG&E not have inspected and repaired issues within the prescribed timeframes) are described in the study and utilized to convert issues found into risk events. Finally, the average ignition rate for distribution risk events and ignitions in the HFTD was utilized to convert from risk events avoided to ignitions avoided. The ignitions avoided is calculated on an annual basis, and can change annually depending on the inspection cycle, which determines which structures are scheduled for inspections within the HFTD. For 2022, an estimated .0009 ignitions would occur should SDG&E stop completing inspections and repairs in the prescribed timeframes as part of the patrol inspections program. See summary of calculations below: 5-year average hit rate Emergency (0-3 days): 0.0005 5-year average hit rate Priority (4-30 days): 0.0005 5-year average hit rate Non - Critical: 0.038 2022 Inspection Total Tier 3: 39,371 2022 Inspection Total Tier 2: 46,751 Emergency Tier 3: .0005*39,371 = 21 Emergency Tier 2: .0005*46,751 = 25 Priority Tier 3: .0005*39,371 = 20 Priority Tier 2: .0005*46,751 = 23 Non-Critical Tier 3: .0038*39,371 = 150 Non-Critical Tier 2: .0038*46,751 = 179 Fail Rate Emergency: 37% Fail Rate Priority: 4% Fail Rate Non-Critical: 0.31% Risk events avoided Tier 3: 21*37% + 20*4% + 150*.31% = 9 Risk events avoided Tier 2: 25*37% + 23*4% + 179*.31% = 11 Distribution ignition rate Tier 3: 2.74% Distribution ignition rate Tier 2: 3.37% Ignitions avoided Tier 3: 9*2.74% = .249 Ignitions avoided Tier 2: 11*3.37% = .365 Total ignitions avoided: .365+.249 = .641	Data Sources: • 2015 - 2019 equipment related to risk events • 2015 – 2019 equipment related risk events with a pending infraction • 2015 – 2019 structures with pending infractions • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
D.15	Substation inspections	Yes	Direct Mitigation Activity	$ -	$ -	(NA) Substation 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. Combined with the fact that while substation equipment failure can cause ignition of equipment inside a substation, it is rare for it to travel outside of the substation, the initiative does not have an effectiveness calculated.	(NA) See response for calculating the mitigation effectiveness for this initiative.

E. Vegetation Management and inspection

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX (000)	Actual 2020 WMP (000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
E.2	Detailed inspections of vegetation around distribution electric lines and equipment	Yes	Direct Mitigation Activity	$ -	$ 57,791	To determine the effectiveness of SDG&E's current vegetation management program, SDG&E reviewed historical vegetation contact data going back to 1995 before the formal vegetation management program was established in 1998. During this period, SDG&E increased its post trim clearance standards to 10-12 feet of clearance and saw dramatic reductions in vegetation contacts. SDG&E then utilized the tree inventory location as a method to approximate the location of the risk events, and then utilized the five-year average ignition rates to estimate the ignitions avoided (See effectiveness calculations for D.1 for more information on ignition rates). Based on the calculations, 7.41 ignitions are avoided by completing vegetation management activities according to SDG&E's current process. Below is a summary of the calculations: Average vegetation risk events pre-mitigation (1995-1998): 402 Average vegetation risk events post mitigation (1999-2010): 82 Risk events reduced: 320 Tier 3 Trees: 109,732 Tier 2 Trees: 132,300 Non-HFTD Trees: 216,806 Total Trees: 458,838 Risk events avoided Tier 3: 320 * (109,732/458,838) = 76.5 Risk events avoided Tier 2: 320* (132,300/458,838) = 92.2 Risk events avoided Non-HFTD: 320* (216,806/458,838) = 151.2 Ignition rate Tier 3: 2.74% Ignition rate Tier 2: 3.37% Ignition rate Non-HFTD: 1.46% Ignitions avoided Tier 3: 76.5 * 2.74% = 2.09 Ignitions avoided Tier 2: 92.2 * 3.37% = 3.11 Ignitions avoided Non-HFTD: 151.2 * 1.46% = 2.21 Total Ignitions avoided: 2.09 + 3.11 + 2.21 = 7.41	Data Sources: • 1995 - 1998 vegetation risk events pre-mitigation • 1999 - 2010 vegetation risk events post mitigation • 2015 – 2019 structures with pending infractions • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
E.5	Fuel management and reduction of "slash" from vegetation management activities	Yes	Direct Mitigation Activity	$ -	$ 5,805	Because SDG&E is relatively new to attempting to quantify the benefits of a Fuels Treatment activity, the risk reduction methodology used is based on subject matter expertise. With more experience with Fuels Treatment, it will be possible to be more certain with future risk analysis. The overall risk approach was to estimate the reduction of likelihood in ignitions and the decrease in consequence. The likelihood of a wildfire is estimated to be decreased by 20% where Fuels Treatment is applied. This likelihood decrease was applied in allocated basis depending on the scope of the program, which is about 5% of Tier 3.	Data Sources: • SME input Metrics: • Ignitions reduced SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
E.9	Other discretionary inspections of vegetation around distribution electric lines and equipment	No	Direct Mitigation Activity	$ -	$ 10,235	SDG&E conducted a research study to measure the effectiveness of its Enhanced Vegetation Management Program (EVM). Its first quarterly report demonstrated that as clearances from vegetation to electric conductors increase, risk events decrease. This study demonstrates that the results hold true for SDG&E's highest risk species located in the HFTD. In fact, from 2002- 2020, SDG&E is unable to identify a single instance of a high-risk species contact in the HFTD when clearances of 20 feet or above have been met. SDG&E's enhanced vegetation management program is trimming trees from its current standard of 10 to 12 feet to its new standard of up to 25 feet where feasible on targeted species within the HFTD. Based on the data, the contact rate of 0.14 per 1,000 trees moves to zero. If SDG&E were to complete its entire scope of enhanced vegetation management work, this would result in 6.3 less vegetation risk events per year in the HFTD and 0.19 less ignitions per year utilizing the five-year average historical ignition rate for the HFTD. (See effectiveness calculations in D.1 for more information on historical ignition rate). Utilizing this information as a baseline, SDG&E combined the risk events reduced information from the study with the estimated number of enhanced trims to be completed through WMP timeframe, the number of targeted species located within Tier 2 & Tier 3 to approximate where the risk reduction would occur, and finally the average ignition rates to calculate ignitions reduced. Based on the results, the EVM program is estimated to reduce 0.126 ignitions by the end of 2022. A summary of the calculation is shown below: Risk events reduced total from study: 6.3 Trees trimmed to enhanced levels (2020 – 2022): 51,095 Targeted species Tier 3: 36,090 Targeted species Tier 2: 42,716 Total targeted species: 78,806 % Tier 3: 45.8% % Tier 2: 54.2% Risk events reduced in Tier 3: 6.3* (51,095/78,806)*45.8% = 1.9 Risk events reduced in Tier 2: 6.3* (51,095/78,806)*54.2% = 2.2 Ignition rate Tier 3: 2.74% Ignition rate Tier 2: 3.37% Ignitions reduced Tier 3: 1.9*2.74% = .051 Ignitions reduced Tier 2: 2.2*3.37% = .075 Total ignitions reduced (2020 – 2022): .051 + .075 = .126	Data Sources: • 2002 – 2020 vegetation contact rates • Estimated HFTD ignition rates • Vegetation inventory database Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

E.20	Vegetation management to achieve clearances around electric lines and equipment (Pole Brushing)	Yes	Yes	$ -	$ 5,433	To calculate the effectiveness of pole brushing in terms of ignitions prevented, SDG&E began by analyzing the five-year historical risk event history focused on equipment failures within the HFTD that require pole brushing. Pole brushing does not prevent equipment failures, but if the energy/heat generated by a risk event occurs within the brushed area (no fuel) it is assumed an ignition is prevented. SDG&E is aware that pole brushing is not 100% effective as nearly 80 ignitions since 2014 have been occurred on poles that have been brushed. However, SDG&E questioned how many more ignitions would have occurred had SDG&E not brushed the poles. If distance from pole to ignition origin was captured as a data point, SDG&E would have more insight into the effectiveness of pole brushing, however, that data is not currently available and not always clear from ignition investigations. SDG&E instead utilized subject matter expertise to estimate that pole brushing is 40% effective at reducing the ignition rate of equipment failures associated with brushed poles. This assumption leads to an estimated 1.25 ignitions avoided from pole brushing annually. A summary of the calculation is provided below: Tier 2 equipment failures (average 2015 – 2019): 33.4 Tier 3 equipment failures (average 2015 -2019): 28 Ignition rate Tier 2: 3.37% Ignition rate Tier 3: 2.74% Post-mitigation Ignitions Tier 2: 33.4*3.37% = 1.13 Post-mitigation Ignitions Tier 3: 28 * 2.74% = .755 Assumed effectiveness: 40% Ignition rate without mitigation Tier 2: 3.37% / (1 - 40%) = 5.62% Ignition rate without mitigation Tier 3: 2.74% / (1 - 40%) = 4.56% Pre-mitigation Ignitions Tier 2: 33.4 * 5.62% = 1.88 Pre-mitigation ignitions Tier 3: 28 * 4.56% = 1.26 Ignitions avoided Tier 2: 1.88 - 1.12 = .75 Ignitions avoided Tier 3: 1.26 - .755 = .50 Ignitions avoided: .75 + .50 = 1.25 See effectiveness calculations in section D.1 for more information regarding ignition rates.	Data Sources: • 2015 – 2019 equipment failures • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

F. Grid operations and protocols

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX ($000)	Actual 2020 WMP ($000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
F.1	Automatic recloser operations	No	Yes	$ -	$ -	SDG&E performed a research study to understand the effectiveness of research protocols. For this study, SDG&E began by converting the five-year reliability data set into the five-year risk event data set, and filtering into HFTD tiers as well as FPI days. HFTD tiers are filtered by using structure fields were used to identify the structure where the risk event occurred by querying the GIS HFTD layer to determine whether the structure was in the Tier 3 HFTD, the Tier 2 HFTD, or the non-HFTD. To apply the normal, elevated, and extreme filter, SDG&E simply applied FPI data per district to district location within the risk event data set to organize the faults into the appropriate categories. From there, SDG&E filtered that data set by isolating device, to only identify risk events that were isolated by reclosers. When automatic reclosing is enabled, SDG&E will close into a fault two additional times to see if the fault had cleared itself before the device locks out leaving the sustained outage. It is assumed in this study, that every time a fault occurs when reclosing is disabled, two additional faults are avoided through this policy. SDG&E then utilizes the ignition percentage per HFTD tier to calculate the average annual ignitions avoided through this control (See effectiveness calculations in section D.1 for more information regarding ignition rates.). **Recloser Protocols** — **Faults by Tier Fire Potential Index** Faults isolated by reclosers: year | Non-HFTD: Normal | Elevated | Extreme | Tier 2: Normal | Elevated | Extreme | Tier 3: Normal | Elevated | Extreme 2015: 153 | 25 | 0 | 47 | 22 | 0 | 37 | 24 | 0 2016: 167 | 13 | 1 | 62 | 14 | 2 | 43 | 25 | 0 2017: 155 | 29 | 3 | 48 | 23 | 4 | 34 | 16 | 2 2018: 86 | 22 | 5 | 29 | 22 | 5 | 34 | 25 | 2 2019: 141 | 24 | 0 | 47 | 35 | 2 | 35 | 31 | 1 **5 yr avg: 140.4 | 22.6 | 1.8 | 46.6 | 23.2 | 2.6 | 36.6 | 24.2 | 1** **Ignition Rate** Tier 2: Normal | Elevated | Extreme; Tier 3: Normal | Elevated | Extreme 2.30% | 5.07% | 10.34% | 1.62% | 4.31% | 10.00% **Estimated Faults Avoided** — **Ignitions Avoided** Adjusted for application of mitigation to calculate faults year | Tier 2: Normal | Elevated | Extreme | Tier 3: Normal | Elevated | Extreme | Tier 2 IA | Tier 3 IA | Total IA Applied DOP 3017 as written: 2015: 44 | 0 | 48 | 0 | 2.23 | 2.07 | 4.30 2016: 28 | 4 | 50 | 0 | 1.83 | 2.16 | 3.99 2017: 46 | 8 | 32 | 4 | 3.16 | 1.78 | 4.94 All reclosing left off in the HFTD year round, above and beyond policy requirements: 2018: 58 | 44 | 10 | 68 | 50 | 4 | 4.54 | 3.65 | 8.19 2019: 94 | 70 | 4 | 70 | 62 | 2 | 6.03 | 4.00 | 10.03 **5 yr avg: 76 | 46.4 | 5.2 | 69 | 48.4 | 2 | 4.56 | 3.40 | 7.96** Based on the results of the study, SDG&E prevents nearly eight ignitions per year through the use of this mitigation.	Data Sources: • 2015 – 2019 risk events • Estimated HFTD ignition rates Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
F.2	Crew-accompanying ignition prevention and suppression resources and services	Yes	Yes	$ -	$ - 2,588	SDG&E performed a research study to understand the effectiveness of crew-accompanying ignition prevention & suppression resources / infrastructure protection teams. For the analysis, SDG&E filtered its reliability data set to convert it to a risk event/OH fault dataset. From there, this data was filtered again to only include risk events caused by SDG&E crews performing work on the system. SDG&E filtered these crew caused contracts by normal, elevated, and extreme FPI, as well as Tier 2 & Tier 3 HFTD. To calculate the benefits, SDG&E looked at 5-year average number of crew caused risk events under elevated conditions in the HFTD and multiplied by the calculated ignition rates per HFTD tier (See effectiveness calculations in section D.1 for more information regarding ignition rates.) to arrive at a benefit of 0.176 reduced ignitions. See below for a summary of the calculations for reduced ignitions: Risk events Tier 3: 2.2 Risk events Tier 2: 1.6 Ignition rate Tier 3: 4.31% Ignition rate Tier 2: 5.07% Ignitions reduced Tier 3: 0.095 Ignitions reduced Tier 2: 0.081 Total ignitions reduced: 0.095 + 0.081 = 0.176	Data Sources: • 2015 – 2019 risk events • Estimated HFTD ignition rates • FPI days Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
F.3	Personnel work procedures and training in conditions of elevated fire risk	No	Yes	$ -	$ -	SDG&E performed a research study to understand the effectiveness of personnel work procedures & training in elevated fire risk conditions. For the analysis, SDG&E filtered its reliability data set to convert it to a risk event/OH fault dataset. SDG&E does not perform work in the HFTD on extreme days, so to determine the benefit of this program, SDG&E calculated the risk events per day in the Tier 2 and Tier 3 HFTD that occurred under normal and elevated conditions. SDG&E assumed the same fault per day rate would apply under extreme conditions, had SDG&E not followed its mitigation procedure to cancel all work in the HFTD under extreme conditions. SDG&E then utilizes the ignition percentage per HFTD tier to calculate an average figure of 0.036 annual ignitions avoided through this control (See effectiveness calculations in section D.1 for more information regarding ignition rates.). See below for a summary of the calculations for reduced ignitions: Normal + Elevated 5 year average: Days 350.2; Tier 2: 3.2; Tier 3: 5.2; Faults per day Tier 2: 0.0091; Faults per day Tier 3: 0.0148 Risk events avoided per day Tier 3: .0148 Risk events avoided per day Tier 2: .0091 Risk events avoided Tier 3: .0148*365=.2198 Risk events avoided Tier 2: .0091*365=.1352 Ignition rate Tier 3: 10.00% Ignition rate Tier 2: 10.34% Ignitions reduced Tier 3: .0220 Ignitions reduced Tier 2: .0140 Total ignitions reduced: .0220 + .0140 = 0.036	Data Sources: • 2015 – 2019 risk events • Estimated HFTD ignition rates • FPI days Metrics: • Ignitions reduced • Faults in HFTD SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.
F.5	PSPS events and mitigation of PSPS impacts (Communication practices)	Yes	Yes	$ -	$ -	The effectiveness of the PSPS program is based on several factors and assumption regarding wildfire and PSPS. PSPS reduces wildfire risk by lowering the likelihood of a significant fire but introduces PSPS impacts. The amount of wildfire risk reduced due to PSPS is estimated at 40% of overall wildfire risk. This value was estimated based on many factors, with special consideration of not double-counting risk reductions from various other programs. In other words, the Wildfire Risk score would be higher it wasn't for the PSPS activities bringing it down 40% to its current level. The amount of risk introduced by PSPS is measured by historical PSPS events. For risk calculations, SDG&E defines a PSPS event as a "PSPS Activation" which is a contiguous span of time where at least one customer is experiencing PSPS. In 2019 there were 4 PSPS activations that fit that definition. SDG&E also knows the number of customers who were affected by each activation, the duration of their time affected, and certain customer characteristics such as medical baseline. There are assumptions regarding PSPS impacts for each of the attributes of safety, reliability, financial, and stakeholder impact across three distinct customer types. To calculate the PSPS impact under the current PSPS operational methods, the year 2019 was utilized. The resulting formula for risk reduction due to PSPS is the following: (WF Reduced - PSPS Impact). WF reduced is estimated to be 8,192 point, and the PSPS impact is estimated to be 5,462. Therefore, the risk reduction from PSPS is the difference of 8,192 and 5,462, which is 2,730. Another way of saying is that the PSPS program lowers the Total Wildfire Risk Score by 2,730 points. SDG&E is currently improving its ability to estimate Wildfire risk and PSPS impacts and will demonstrate those improvements as they become available. WiNGS modeling will allow SDG&E to have consider segment-based estimates around both the wildfire risk and the PSPS impacts. One important future enhancement is to understand more fully the relationship between the amount of PSPS and the amount of wildfire risk reduced.	Data Sources: • Historic PSPS events • Various industry research • Historic FFW days • Historic weather conditions Metrics: • Risk points reduced SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

F.6.1	Stationed and on-call ignition prevention and suppression resources and services (Industrial Fire Brigade)	Yes	No	$ -	$ -	The effectiveness was a result of reducing consequences of wildfires and as estimated by subject matter experts. Note that this initiative has been removed from the WMP in the 2021 update.	This initiative is no longer part of the WMP as of the 2021 update.
F.6.2	Stationed and on-call ignition prevention and suppression resources and services (Aviation Firefighting Program)	Yes	Yes	$ 7,092	$ 6,766	SDG&E's Aviation Program provides risk reduction not only to fires associated with SDG&E equipment but also to the entire community for all causes of wildfire. However, the risk reduction discussed here, and the RSE for the program, only focuses on wildfire risk associated to the utility. Similar to other risk-reducing programs, quantifying aviation risk reduction is complex. The goal is to understand how the aviation program reduces wildfire likelihoods and consequences. From a likelihood standpoint, the Aviation Program is not focused on preventing CPUC reportable ignitions. As defined by D.14-02-015, a reportable ignition is one that starts at utility equipment and travels a meter in vegetation. The helicopters are not dispatched to an ignition site before the fire spreads one meter. As such, the ignition count will not be decrease. The Aviation Program focuses on reducing the consequences of wildfires through suppression of fire spread and protection of assets. Thus, the risk reduction can be found in the CoRE portion of the risk score assessment. The risk assessment asks the question of how much less impact do wildfires have with its aviation program versus without one. This is a complex question to solve. Each fire is different, and there is no known general rule to apply to SDG&E specific program. Fire behavior modeling is not accurate enough to suggest what would have happened without suppression activities compared to with. There is, however, anecdotal evidence that recent non-utility wildfires benefitted from aviation resources. Strong evidence of the benefit is reflected in the regularity that local fire agencies use the resource. What follows is a brief discussion on how the Aviation Program is effective against wildfires in different types of weather. It is known that on low wind days, aviation resources are excellent tools to prevent prolonged spread; and SDG&E's aviation resources are regularly dispatched in these situations. The effectiveness of aviation resources to assist general fire suppression activities is significant in these situations. However, most wildfire risk that exists to the community is not due to these calmer weather days. On the other end of the weather perspective, in high wind, the benefit of aviation resources is likely to have more constraints. On extremely windy days, wildfires can grow in size even in the first 10 minutes, and although overcome. Additionally, on extremely windy days, there are situations and locations when helicopters are not safe to operate. Generally, helicopters that drop water need to be relatively close to their target, and the stronger the wind the more dangerous it becomes to fly close to the ground. Importantly, strong winds can help dissipate the water from the aircraft and lead to ineffective water drops. SDG&E will continue to analyze the most effective way to run its Aviation Program, and to determine the effectiveness of that program; using internal and external data to assist in the analysis. For the time being, subject matter experts believe that the program reduces overall wildfire consequence, and therefore wildfire risk, by approximately 4%; based solely on the knowledge of the equipment and operations, coupled with anecdotal evidence of recent history. Importantly, this 4% is only the measure of utility associated wildfires, and the overall benefit of the program is much larger than what that 4% represents.	Data Sources: • SME input Metrics: • Overall wildfire consequence reduced SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

G. Data governance

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX ($000)	Actual 2020 WMP ($000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
G.1	Centralized repository for data	Yes	Foundational Supporting Risk Mitigation Activity	$ 5,272	$ -	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.
G.4	Tracking and analysis of near miss data	Yes	Foundational Supporting Risk Mitigation Activity	$ -	$ -	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.

H. Resource allocation methodology

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX ($000)	Actual 2020 WMP ($000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
H.1.1	Allocation methodology development and application (Asset management)	Yes	Foundational Supporting Risk Mitigation Activity	$ 1,623	$ 329	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.
H.1.2	Allocation methodology development and application – (Wildfire Mitigation Personnel)	Yes	Foundational Supporting Risk Mitigation Activity	$ -	$ 3,389	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.
H.1.3	Allocation methodology development and application – (PSPS Mitigation Engineering Team)	Yes	Foundational Supporting Risk Mitigation Activity	$ -	$ -	(NA) This initiative is foundational to supporting wildfire mitigation efforts. Quantifying the risk reduction for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver. It supports various initiatives by providing better information to make risk-informed decisions.	(NA) See response for calculating the mitigation effectiveness for this initiative.

I. Emergency planning and preparedness

Number	Initiative	Tracked Separately	Mitigation Category	Actual 2020 CAPEX ($000)	Actual 2020 WMP ($000)	Effectiveness of mitigation at reducing ignition probability or wildfire consequence	List all data and metrics used to evaluate effectiveness described in iii, including thresholds values used to differentiate between effective and ineffective initiatives
I.1	Adequate and trained workforce for service restoration (EOC)	Yes	Direct Mitigation Activity	$ -	$ -	SDG&E assumed a 50% decrease in risk as a control for the execution of PSPS events	Going forward, SDG&E could estimate the number of ignition and the consequence of those ignitions through the post event damage patrols and match drop simulations SDG&E performs efficacy studies to evaluate whether a mitigation is effective or not and continues to study mitigation benefits using quantitative data.

Appendix B

Notes:
Risk-Spend-Efficiency (RSE) is defined as "An estimate of the cost-effectiveness of initiative, calculated by dividing the mitigation risk reduction benefit by the mitigation cost estimate based on the full set of risk reduction benefits estimated from the incurred costs."
CAPEX = Capital expenditure; OPEX = Operating expenditure. In future submissions update planned spend, line miles treated, RSE, etc. with updated projections and actuals. Additional instructions can be found in QR information.

Date Modified	2/5/2021

Metric type	WMP Table # / Category	2021 WMP Initiative #	Initative activity	2020 WMP Initiative #	Primary driver targeted	Secondary driver targeted	Year initiated	Estimated RSE in non-HFTD region	Estimated RSE in HFTD Zone 1	Estimated RSE in HFTD Tier 2	Estimated RSE in HFTD Tier 3	If existing: most recent proceeding that has reviewed program	If new: memorandum account	Current compiance status - In / exceeding compliance with regulations	Associated rule(s) - if multiple, separate by semi-colon - ";"	If spend not disaggregated by category, note spend category or mark general operations	Alternative units in which initiative is reported (if not line miles); still required to report line miles	Comments	Actual CAPEX ($ thousands) 2020	Actual OPEX ($ thousands) 2020	Actual Line miles to be treated 2020	Actual Alternative units (if used) 2020	Projected CAPEX ($ thousands) 2021	Projected OPEX ($ thousands) 2021	Projected Line miles to be treated 2021	Projected Alternative units (if used) 2021	Projected CAPEX ($ thousands) 2022	Projected OPEX ($ thousands) 2022	Projected Line miles to be treated 2022	Projected Alternative units (if used) 2022	Notes
Other	Risk Assessment & Mapping	7.3.1.1	A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment [WRRM-Ops]	5.3.1.1.			2012	NA	NA	NA	NA	2019 GRC	NA	Exceeds	P.U. Code § 451				1,191	-	NA	NA	1,539	-	NA	NA	1,881	-	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Risk Assessment & Mapping	7.3.1.2	Climate-driven risk map and modelling based on various relevant weather scenarios	5.3.1.2.			2012									A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment [WRRM-Ops]			-	-			-	-			-	-			
Other	Risk Assessment & Mapping	7.3.1.3	Ignition probability mapping	5.3.1.3.			2012									A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment [WRRM-Ops]			-	-			-	-			-	-			
Other	Risk Assessment & Mapping	7.3.1.4	Initiative mapping and estimation of wildfire and PSPS risk-reduction impact	5.3.1.4.			2012									A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment [WRRM-Ops]			-	-			-	-			-	-			
Other	Risk Assessment & Mapping	7.3.1.5	Match drop simulations	5.3.1.5.			2012									A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment [WRRM-Ops]			-	-			-	-			-	-			
Other	Risk Assessment & Mapping	7.3.1.6	Weather driven risk map and modelling	5.3.1.6.			2012									A summarized risk map showing the overall ignition probability and estimated wildfire consequence along electric lines and equipment [WRRM-Ops]			-	-			-	-			-	-			
Other	Situational Awareness & Forecasting	7.3.2.1	Advanced weather monitoring and weather stations [Advanced weather station integration]	5.3.2.1.			2010	NA	NA	NA	NA	2019 GRC	NA	Exceeds	P.U. Code § 451		Weather Stations		1,083	-	NA	30	483	-	NA	20	558	0	NA	20	
Other	Situational Awareness & Forecasting	7.3.2.2	Continuous monitoring sensors	5.3.2.2.			NA												-	-			-	-			-	-			
Other	Situational Awareness & Forecasting	7.3.2.3	Fault indicators for detecting faults on electric lines and equipment [Wireless fault indicators]	5.3.2.3.	PSPS - for sectionalization, etc.		2011	131.86	NA	122.84		2019 GRC		Exceeds	P.U. Code § 451		Fault Indicators		835	-	NA	502	656	-	NA	500	656	-	NA	500	
Other	Situational Awareness & Forecasting	7.3.2.4.1	Fire science and climate adaptation department	5.3.2.4.1.			2009					2019 GRC		Exceeds	P.U. Code § 451				608	3,363	NA	NA	3,486	3,289	NA	NA	303	3,618	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Situational Awareness & Forecasting	7.3.2.4.2	Fire potential index	5.3.2.4.2.			2012									Fire science and climate adaptation department			-	-			-	-			-	-			
Other	Situational Awareness & Forecasting	7.3.2.4.3	Santa Ana wildfire threat index	5.3.2.4.3.			2014									Fire science and climate adaptation department			-	-			-	-			-	-			
Other	Situational Awareness & Forecasting	7.3.2.4.4	High-performance computing infrastructure	5.3.1.7.			2012					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				-	-	NA	NA	-	-	NA	NA	7,310	-	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Situational Awareness & Forecasting	7.3.2.5.	Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions [Observers]	5.3.2.5.	Equipment failure	Other contact with object	2008									Other - Emergency management Operations			-	-			-	-			-	-			
Other	Situational Awareness & Forecasting	7.3.2.5.	Weather forecasting and estimating impacts on electric lines and equipment	5.3.2.6.			2009									Fire science and climate adaptation department			-	-			-	-			-	-			
Grid hardening	Grid Design & System Hardening	7.3.3.1	Capacitor maintenance and replacement program [SCADA capacitors]	5.3.3.1.	Equipment failure		2016			408.85	932.76	2019 GRC		Exceeds	G.O. 95		Capacitors		992	-	NA	30	1,587	-	NA	32	1,791	-	NA	40	
Grid hardening	Grid Design & System Hardening	7.3.3.2	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault				1997									Substation inspections			-	-			-	-			-	-			
Grid hardening	Grid Design & System Hardening	7.3.3.3	Covered conductor installation	5.3.3.4.	Other contact with object	Equipment failure	2020			42.77	76.73	2020 WMP	WMPMA	Exceeds	G.O. 95				1,798	-	1.9	NA	55,000	1,500	20	NA	96,000	2,500	60	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.4	Covered conductor maintenance				1997									Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)			-	-			-	-			-	-			
Grid hardening	Grid Design & System Hardening	7.3.3.5	Crossarm maintenance, repair, and replacement	5.3.3.5.			1997									Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)			-	-			-				-				
Grid hardening	Grid Design & System Hardening	7.3.3.6	Distribution pole replacement and reinforcement, including with composite poles (Pole replacement and reinforcement)	5.3.3.6.			1997									Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)															Grouped with RSE calculations for the various inspection programs. Pole replacement and reinforcment activities can be identified as a part of any of the inspection programs in section 7.3.6. We replace poles based on the inspection results.
Grid hardening	Grid Design & System Hardening	7.3.3.7	Expulsion fuse replacement	5.3.3.7.	Equipment failure		2019			274.83	1417.2	2020 WMP	WMPMA	Exceeds	G.O. 95		Fuses		6,521	-	NA	3179	10,178	-	NA	3970	3,079	-	NA	906	
Grid hardening	Grid Design & System Hardening	7.3.3.8.1	PSPS sectionalizing enhancements	5.3.3.8.1.	PSPS - for sectionalization, etc.		2019	610.11		473.43	1159.86	2020 WMP	WMPMA	Exceeds	G.O. 95		Sectionalizing Devices		5,111	-	NA	23	2,272	-	NA	10	1,542	-	NA	10	
Grid hardening	Grid Design & System Hardening	7.3.3.8.2	Microgrids	5.3.3.8.2.	PSPS - for sectionalization, etc.		2019			30.78		2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Micro Grids		3,542	371	NA	4	18,943	1,427	NA	2	12,912	1,427	NA	1	
Grid hardening	Grid Design & System Hardening	7.3.3.9	Installation of system automation equipment (Advanced Protection)	5.3.3.2.	PSPS - for sectionalization, etc.		2011				281.09	2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Circuits		9,119	-	NA	6	11,092	-	NA	8	10,953	-	NA	8	
Grid hardening	Grid Design & System Hardening	7.3.3.10	Maintenance, repair, and replacement of connectors, including hotline clamps	5.3.3.10.	Equipment failure		2019	NA	NA	43.25	108.44	2020 WMP	WMPMA	Exceeds	G.O. 95		Hot Line Clamps		-	3,299	NA	2061	-	5,343	NA	2250	-	4,321	NA	1650	
Grid hardening	Grid Design & System Hardening	7.3.3.11.1	Resiliency Grant Programs	5.3.3.11.1.	PSPS - for sectionalization, etc.		2020	36.55		36.55	73.11	2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Generators		-	5,076	NA	1420	-	7,900	NA	2000	-	7,900	NA	2000	
Grid hardening	Grid Design & System Hardening	7.3.3.11.2	Standby Power Programs	5.3.3.11.3.	PSPS - for sectionalization, etc.		2020				89.61	2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Generators		-	1,754	NA	75	-	10,350	NA	413	-	10,350	NA	412	
Grid hardening	Grid Design & System Hardening	7.3.3.11.3	Resiliency Assistance Programs	5.3.3.11.2.	PSPS - for sectionalization, etc.		2020			219.27	438.54	2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Generators		-	761	NA	1274	-	1,828	NA	1250	-	1,828	NA	1250	
Grid hardening	Grid Design & System Hardening	7.3.3.12	Other corrective action	5.3.3.12.			1997									Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)			-	-			-	-			-	-			
Grid hardening	Grid Design & System Hardening	7.3.3.13	Pole loading infrastructure hardening and replacement program	5.3.3.13.			2011									Distribution overhead system hardening (Bare Conductor Hardening)			-	-			-	-			-	-			
Grid hardening	Grid Design & System Hardening	7.3.3.14	Transformers maintenance and replacement	5.3.3.14.			1997									Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)			-	-			-	-			-	-			
Grid hardening	Grid Design & System Hardening	7.3.3.15	Transmission tower maintenance and replacement	5.3.3.15.			1997									Detailed inspections of transmission electric lines and equipment (Transmission ground inspections)			-	-			-	-			-	-			
Grid hardening	Grid Design & System Hardening	7.3.3.16	Undergrounding of electric lines and/or equipment (Strategic undergrounding)	5.3.3.16.	Other contact with object	Equipment failure	2019			63.23	55.57	2020 WMP	WMPMA	Exceeds	G.O. 95				38,850	-	15.58	NA	120,256	3,127	25	NA	197,199	5,127	80	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.17.1	Distribution overhead system hardening (Bare Conductor Hardening)	5.3.3.3.	Equipment failure	Other contact with object	2011	1.05		32.63	58.1	2019 GRC		Exceeds	G.O. 95				138,378	3,446	99.5	NA	92,000	2,000	100	NA	5,000	130	5	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.17.2	Overhead transmission fire hardening (Transmission)	5.3.3.17.1.	Equipment failure	Other contact with object	2009					FERC		Exceeds	G.O. 95					-	21.6	NA		-	6.7	NA		-	38.6	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.17.2	Underground transmission fire hardening (Transmission)	5.3.3.17.1.	Other contact with object	Equipment failure	2009					FERC		Exceeds	G.O. 95						0	NA			0	NA			5.5	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.17.2	Overhead transmission fire hardening (Distribution Underbuilt)	5.3.3.17.1.	Equipment failure	Other contact with object	2009					2019 GRC		Exceeds	G.O. 95				5,030	-	9.4	NA	5,914	-	2.7	NA	24,015	-	27	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.17.3	Cleveland National Forest fire hardening - Transmission OH	5.3.3.17.2.	Equipment failure	Other contact with object	2009					FERC		Exceeds	G.O. 95					-	29.07	NA		-	0	NA	-	-	0	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.17.3	Cleveland National Forest fire hardening - Distribution OH	5.3.3.17.2.	Equipment failure	Other contact with object	2009				52.44	2019 GRC		Exceeds	G.O. 95				46,271	-	46.75	NA	6,965	-	6.8	NA	-	-	0	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.17.3	Cleveland National Forest fire hardening - Distribution UG	5.3.3.17.2.	Other contact with object	Equipment failure	2009				38.2	2019 GRC		Exceeds	G.O. 95				37,973	-	14.37	NA	6,051	-	0	NA	-	-	0	NA	
Grid hardening	Grid Design & System Hardening	7.3.3.18.1	Distribution communications reliability improvements	5.3.3.18.1.			2010					2019 GRC		Exceeds	P.U. Code § 451		Base Stations		35,473	-	NA	15	50,328	-	NA	10	70,946	-	NA	25	Upon further consideration of this initiative, it is now deemed a foundational initiative that is important for supporting various wildfire mitigation initiatives. Enhanced communication systems support the implementation of Advanced Protection as well as other systems such as weather monitoring.
Grid hardening	Grid Design & System Hardening	7.3.3.18.2	Lightning arrestor removal and replacement	5.3.3.18.2.	Equipment failure		2020	NA	NA	NA	41.89	2020 WMP	WMPMA	Exceeds	G.O. 95		Lighting Arrestors		19	-	NA	0	1,297	-	NA	924	2,611	-	NA	1848	
Asset inspection	Asset Management & Inspections	7.3.4.1	Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)	5.3.4.1.	Equipment failure		1997			45.24	63.8	2019 GRC		Meets	G.O. 95		Inspections	Inspections	8,320	179	NA	17977	7,484	2,852	NA	22269	7,629	2,190	NA	18055	
Asset inspection	Asset Management & Inspections	7.3.4.2	Detailed inspections of transmission electric lines and equipment (Transmission ground inspections)	5.3.4.2.	Equipment failure		1997					FERC		Meets	G.O. 95		Inspections		838	-	NA	2679	787	-	NA	2715	725	-	NA	2715	
Asset inspection	Asset Management & Inspections	7.3.4.3	Improvement of inspections	5.3.4.3.			2019									Drone assessments of distribution infrastructure			-	-			-				-	-			
Asset inspection	Asset Management & Inspections	7.3.4.4	Infrared inspections of distribution electric lines and equipment	5.3.4.4.	Equipment failure		2020			331.53	433.6	2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Inspections		-	175	NA	13077	-	175	NA	18000	-	175	NA	18000	
Asset inspection	Asset Management & Inspections	7.3.4.5	Infrared inspections of transmission electric lines and equipment	5.3.4.5.	Equipment failure		2010					FERC		Meets	P.U. Code § 451		Inspections		-	-	NA	6481	-	-	NA	6565	-	-	NA	6565	
Asset inspection	Asset Management & Inspections	7.3.4.6	Intrusive pole inspections	5.3.4.6.	Equipment failure		1997			26.4	106.67	2019 GRC		Meets	G.O. 95		Inspections		567	884	NA	14450	1,521	633	NA	9796	1,550	837	NA	380	
Asset inspection	Asset Management & Inspections	7.3.4.7	LiDAR inspections of distribution electric lines and equipment	5.3.4.7.			2011					2019 GRC		Exceeds	G.O. 95				-	-	NA	NA	-	1,800	NA	NA	-	1,548	NA	NA	LiDAR inspections on distribution and transmission lines are primarily used for grid hardening design efforts rather than for identifying issues like the other inspection programs. As such, quantifying a reduction in igition risk for these inspections is not possible.
Asset inspection	Asset Management & Inspections	7.3.4.8	LiDAR inspections of transmission electric lines and equipment	5.3.4.8.			2009					FERC		Exceeds	P.U. Code § 451				-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	
Asset inspection	Asset Management & Inspections	7.3.4.9.1	HFTD Tier 3 Inspections	5.3.4.9.1.	Equipment failure		2009			17.18	106.81	2019 GRC		Exceeds	G.O. 95		Inspections		1,248	400	NA	11864	2,459	381	NA	10815	2,507	384	NA	12380	
Asset inspection	Asset Management & Inspections	7.3.4.9.2	Drone assessments of distribution infrastructure	5.3.4.9.2.	Equipment failure		2019			9.39	16.35	2020 WMP	WMPMA	Exceeds	G.O. 95		Inspections		15,901	51,953	NA	37310	13,595	35,358	NA	22000	11,205	28,664	NA	22000	
Asset inspection	Asset Management & Inspections	7.3.4.9.3	Circuit ownership	5.3.4.9.3.	Equipment failure		2019			6.61	13.24	2020 WMP	WMPMA	Exceeds	G.O. 95				41	-	NA	NA	-	125	NA	NA	-	125	NA	NA	
Asset inspection	Asset Management & Inspections	7.3.4.10.1	(Drone assessment of transmission)	5.3.4.10.	Equipment failure		2020					FERC		Exceeds	G.O. 95		Inspections		-	-	NA	2679	-	-	NA	2715	-	-	NA	2715	
Asset inspection	Asset Management & Inspections	7.3.4.10.2	Additional Transmission Aerial 69kV Tier 3 Visual Inspection		Equipment failure		2010					FERC		Exceeds	G.O. 95		Inspections		-	-	NA	1957	-	-	NA	1792	-	-	NA	1792	
Asset inspection	Asset Management & Inspections	7.3.4.11	Patrol inspections of distribution electric lines and equipment - CMP	5.3.4.11.	Equipment failure		1997			285.9	440.92	2019 GRC		Meets	G.O. 95		Inspections		789	295	NA	86075	910	277	NA	86000	927	279	NA	86000	
Asset inspection	Asset Management & Inspections	7.3.4.12	Patrol inspections of transmission electric lines and equipment	5.3.4.12.	Equipment failure		1997					FERC		Meets	G.O. 95		Inspections		-	-	NA	6940	-	-	NA	7024	-	-	NA	7024	
Asset inspection	Asset Management & Inspections	7.3.4.13	Pole loading assessment program to determine safety factor	5.3.4.13.			2011									Distribution overhead system hardening (Bare Conductor Hardening)			-	-			-	-			-	-			
Asset inspection	Asset Management & Inspections	7.3.4.14	Quality assurance / quality control of inspections (Monitoring and auditing of inspections)	5.3.4.14.			1997									Detailed inspections of distribution electric lines and equipment (5-year detailed inspections)			-	-			-	-			-	-			

Metric type	WMP Table # / Category	2021 WMP Initiative #	Initative activity	2020 WMP Initiative #	Primary driver targeted	Secondary driver targeted	Year initiated	Estimated RSE in non-HFTD region	Estimated RSE in HFTD Zone 1	Estimated RSE in HFTD Tier 2	Estimated RSE in HFTD Tier 3	If existing: most recent proceeding that has reviewed program	If new: memorandum account	Current compliance status - In / exceeding compliance with regulations	Associated rule(s) - if multiple, separate by semi-colon - ";"	If spend not disaggregated by category, note spend category or mark general operations	Alternative units in which initiative is reported (if not line miles); still required to report line miles	Comments	CAPEX ($ thousands) 2020	OPEX ($ thousands) 2020	Line miles to be treated 2020	Alternative units (if used) 2020	CAPEX ($ thousands) 2021	OPEX ($ thousands) 2021	Line miles to be treated 2021	Alternative units (if used) 2021	CAPEX ($ thousands) 2022	OPEX ($ thousands) 2022	Line miles to be treated 2022	Alternative units (if used) 2022	Notes
Asset inspection	Asset Management & Inspections	7.3.4.15	Substation inspections	5.3.4.15.			1997			0	0				G.O. 174				-	-	NA	405	-	-	NA	330	-	-	NA	330	The way SDG&E designs and constructs its substations, with the steel structures and gravel and concrete base makes it difficult for a fire to spread outside the substation. With very little ignition history, SDG&E performs substation inspection and maintenance more for the importance of substation reliability.
Vegetation management project	Vegetation Management & Inspections	7.3.5.1	Additional efforts to manage community and environmental impacts	5.3.5.1.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.2	Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)	5.3.5.2.	Contact with vegetation		1998	3.04		128.44	230.3	2019 GRC		Meets	P.U. Code § 451		Inspections		-	57,791	NA	451207	-	49,765	NA	455000	-	49,765	NA	455000	
Vegetation inspection	Vegetation Management & Inspections	7.3.5.3	Detailed inspections of vegetation around transmission electric lines and equipment	5.3.5.3.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.4	Emergency response vegetation management due to red flag warning or other urgent conditions	5.3.5.4.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.5	Fuel management and reduction of "slash" from vegetation management activities	5.3.5.5.	Contact with vegetation		2019				28.58	2020 WMP	WMPMA	Exceeds	P.U. Code § 451		Sturctures Cleared		-	5,805	NA	324	-	6,206	NA	500	-	6,206	NA	500	
Vegetation inspection	Vegetation Management & Inspections	7.3.5.6	Improvement of inspections	5.3.5.6.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.7	LiDAR inspections of vegetation around distribution electric lines and equipment (vegetation management technology)	5.3.5.7.			2019									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.8	LiDAR inspections for vegetation around transmission electric lines and equipment	5.3.5.8.			2019									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.9	Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)	5.3.5.9.	Contact with vegetation		2019			66.93	119.84	2019 GRC		Exceeds	P.U. Code § 451		Trees Trimmed to enahced levels		-	10,235	NA	17095	-	10,235	NA	17000		10,235	NA	17000	
Vegetation inspection	Vegetation Management & Inspections	7.3.5.10	Other discretionary inspection of vegetation around transmission electric lines and equipment, beyond inspections mandated by rules and regulations	5.3.5.10.			2019									Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.11	Patrol inspections of vegetation around distribution electric lines and equipment	5.3.5.11.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.12	Patrol inspections of vegetation around transmission electric lines and equipment	5.3.5.12.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.13	Quality assurance / quality control of vegetation inspections	5.3.5.13.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.14	Recruiting and training of vegetation management personnel	5.3.5.14.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.15	Remediation of at-risk species	5.3.5.15.			2019									Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations (Enhanced inspections, patrols, and trims)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.16	Removal and remediation of trees with strike potential to electric lines and equipment (Hazard tree removal and Right Tree-Right Place)	5.3.5.16.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation inspection	Vegetation Management & Inspections	7.3.5.17	Substation inspections	5.3.5.17.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.18	Substation vegetation management	5.3.5.18.			1998									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.19	Vegetation inventory system (Tree database)	5.3.5.19.			2002									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Vegetation management project	Vegetation Management & Inspections	7.3.5.20	Vegetation management to achieve clearances around electric lines and equipment (Pole brushing)	5.3.5.20.	Contact with vegetation		1998			162.48	272.48	2019 GRC		Meets	P.U. Code § 451		Poles Brushed		-	5,433	NA	36563	-	5,433	NA	35500	-	5,433	NA	35500	
Other	Grid Operations & Operating Protocols	7.3.6.1.1	Recloser protocols	5.3.6.1.	Other contact with object	Equipment failure	2008	NA	NA	372838.28	532348.21	2019 GRC		Exceeds	P.U. Code § 451				-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.1.2	Sensitive/Fast Protection settings		Other contact with object	Equipment failure	2015			47363.6	106433.39	2019 GRC		Exceeds	P.U. Code § 451				-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.2	Crew accompanying ignition prevention and suppression resources and services (Wildfire infrastructure protection teams – Contract fire resources)	5.3.6.2.	Equipment failure	Other contact with object	2009			68.58	69.69	2019 GRC		Exceeds	P.U. Code § 451				-	2,588	NA	NA	-	2,936	NA	NA	-	2,936	NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.3	Personnel work procedures and training in conditions of elevated fire risk (Other special work procedures)	5.3.6.3.	Equipment failure	Other contact with object	2008			61.9	84.57	2019 GRC		Exceeds	P.U. Code § 451				-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	
Other	Grid Operations & Operating Protocols	7.3.6.4	Protocols for PSPS re-energization	5.3.6.4.	Other contact with object	Equipment failure	2013					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				663	-	NA	NA	-	-	NA	NA	-	-	NA	NA	This is an activity that is foundational to supporting wildfire mitigation efforts and is part of core PSPS operations. Costs for protocols cannot be separated out and evluating benefits for having protocols cannot be meaningfully measured.
Other	Grid Operations & Operating Protocols	7.3.6.5	PSPS events and mitigation of PSPS impacts	5.3.6.5.	Other contact with object	Equipment failure	2013			92.98	93.89					Other - Emergency management Operations			-	-			-	-			-	-			
Other	Grid Operations & Operating Protocols	7.3.6.6.1	Aviation firefighting program	5.3.6.6.1.	Equipment failure	Other contact with object	2008	1.1		15.72	26.07	2019 GRC		Exceeds	P.U. Code § 451				7,092	6,766	NA	NA	10,185	7,610	NA	NA	2,463	10,320	NA	NA	
Other	Data Governance	7.3.7.1	Centralized repository for data	5.3.7.1.			2019					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				5,272	-	NA	NA	19,004	-	NA	NA	12,890	-	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Data Governance	7.3.7.2	Collaborative research on utility ignition and/or wildfire (Innovation lab and other collaboration)	5.3.7.2.			2012									Fire science and climate adaptation department			-	-			-	-			-	-			
Other	Data Governance	7.3.7.3	Documentation and disclosure of wildfire-related data and algorithms	5.3.7.3.			2020					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				2,208	-	NA	NA	3,689	-	NA	NA	3,689	-	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Data Governance	7.3.7.4.1	Ignition management program	5.3.7.4.1.			2019									Fire science and climate adaptation department			-	-			-	-			-	-			
Other	Data Governance	7.3.7.4.2	Reliability database	5.3.7.4.2.			2000									Centralized repository for data			-	-			-	-			-	-			
Other	Resource Allocation Methodology	7.3.8.1	Allocation methodology development and application (Asset management)	5.3.8.1.			2019					2019 GRC		Exceeds	P.U. Code § 451				1,623	329	NA	NA	2,845	387	NA	NA	-	387	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Resource Allocation Methodology	7.3.8.2	Risk reduction scenario development and analysis	5.3.8.2.			2019									Allocation methodology development and application (Asset management)			-	-			-	-			-	-			
Other	Resource Allocation Methodology	7.3.8.3	Risk spend efficiency analysis - not to include PSPS	5.3.8.3.			2019									Allocation methodology development and application (Asset management)			-	-			-	-			-	-			
Other	Resource Allocation Methodology	7.3.8.4.1	Wildfire mitigation personnel	5.3.8.4.1.			2019					2020 WMP		Exceeds	P.U. Code § 451				-	3,389	NA	NA	-	4,155	NA	NA	-	5,230	NA	NA	This initiative is foundational to supporting wildfire mitigation efforts. Quantifying an RSE for such a mitigation would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring the effectiveness of that reduction. It supports various initiatives by providing better information to make risk-informed mitigation decisions.
Other	Resource Allocation Methodology	7.3.8.4.2	PSPS mitigation engineering team	5.3.8.4.2.			2020									Wildfire mitigation personnel			-	-			-	-			-	-			
Other	Emergency Planning & Preparedness	7.3.9.1	Adequate and trained workforce for service restoration	5.3.9.4.1			2013									Other - Emergency management Operations			-	-			-	-			-	-			
Other	Emergency Planning & Preparedness	7.3.9.2	Community outreach, public awareness, and communications efforts	5.3.9.4.2			2013									Other - Emergency management Operations			-	-			-	-			-	-			
Other	Emergency Planning & Preparedness	7.3.9.3	Customer support in emergencies	5.3.9.4.3			2013									Other - Emergency management Operations			-	-			-	-			-	-			
Other	Emergency Planning & Preparedness	7.3.9.4	Disaster and emergency preparedness plan (CERP)	5.3.9.4.4			2013									Other - Emergency management Operations			-	-			-	-			-	-			
Other	Emergency Planning & Preparedness	7.3.9.5	Preparedness and planning for service restoration (Mutual assistance and contractors)	5.3.9.4.5			2013									Other - Emergency management Operations			-	-			-	-			-	-			
Other	Emergency Planning & Preparedness	7.3.9.6	Protocols in place to learn from wildfire events (After action reports)	5.3.9.4.6			2017									Other - Emergency management Operations			-	-			-	-			-	-			
Other	Emergency Planning & Preparedness	7.3.9.7	Other - Emergency management Operations	5.3.9.4.7			2013					2019 GRC		Exceeds	P.U. Code § 451				2,140	12,214	NA	NA	5,473	12,153	NA	NA	3,078	12,153	NA	NA	
Other	Stakeholder Cooperation & Community Engagement	7.3.10.1	Community engagement	5.3.10.1.			2013					2020 WMP	WMPMA	Exceeds	P.U. Code § 451				-	448	NA	NA	-	448	NA	NA	-	448	NA	NA	This initiative is primarily around educating the community about wildfire safety, resiliency and emergency preparedness. Quantifying an RSE for it would be difficult and not beneficial because it cannot be directly tied to reducing a risk driver and measuring effectiveness of that reduction.
Other	Stakeholder Cooperation & Community Engagement	7.3.10.1.1	PSPS communication practices	5.3.6.5.3.			2013					2019 GRC		Exceeds	P.U. Code § 451				4,474	8,227	NA	NA	3,302	9,386	NA	NA	2,656	9,189	NA	NA	
Other	Stakeholder Cooperation & Community Engagement	7.3.10.2	Cooperation and best practice sharing with agencies outside California	5.3.10.2.			2013									PSPS communication practices			-	-			-	-			-	-			
Other	Stakeholder Cooperation & Community Engagement	7.3.10.3	Cooperation with suppression agencies	5.3.10.3.			2013									PSPS communication practices			-	-			-	-			-	-			
Other	Stakeholder Cooperation & Community Engagement	7.3.10.4	Forest service and fuel reduction cooperation and joint roadmap	5.3.10.4.			2019									Detailed inspections of vegetation around distribution electric lines and equipment (tree trimming)			-	-			-	-			-	-			
Other	Stakeholder Cooperation & Community Engagement	7.3.10.5	Mylar Balloon Alternative				2012					2021 WMP Update	WMPMA	Exceeds	P.U. Code § 451				-	86	NA	NA	-	86	NA	NA	-	86	NA	NA	The current scope of this initiative is focused on outreach efforts to drive adoption of the alternative technology for Mylar balloons. No current deployment of this technology is in place to allow for a calculation of RSEs based on measureable indicators of effectiveness.

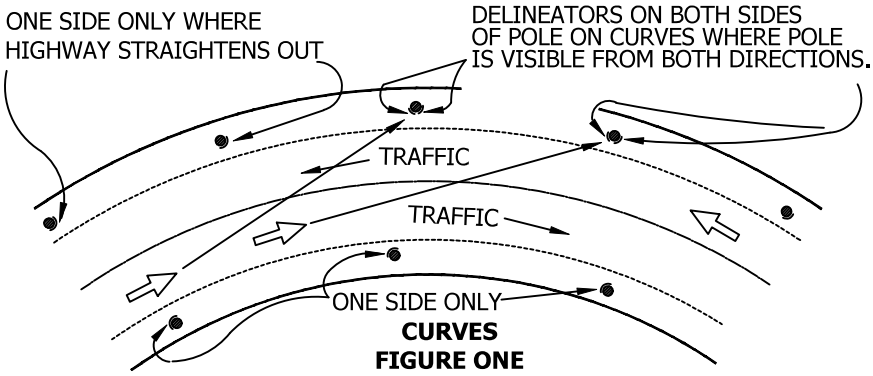
Notes:

1) Amounts shown above are CPUC-jurisdiction direct costs

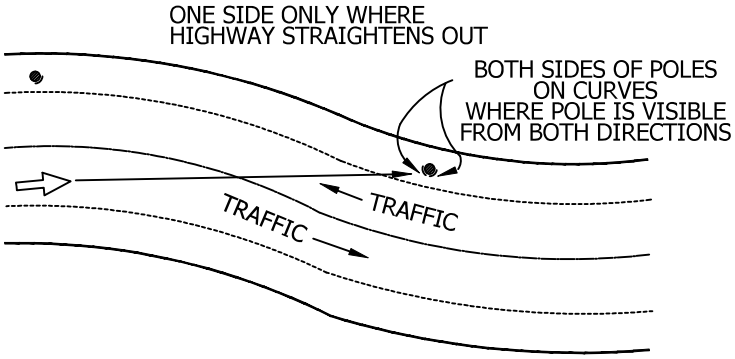
2) Only CPUC-related costs are recorded in the Wildfire Mitigation Plan Memorandum Account for recovery.

Appendix C

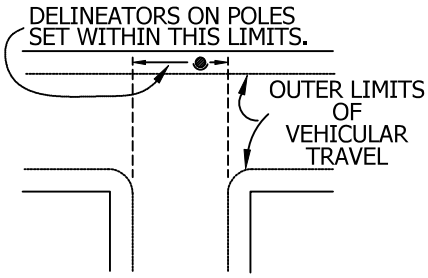
SCOPE: THIS STANDARD SHOWS VARIOUS EXAMPLES OF POLE DELINEATOR INSTALLATION.



CURVES
FIGURE ONE



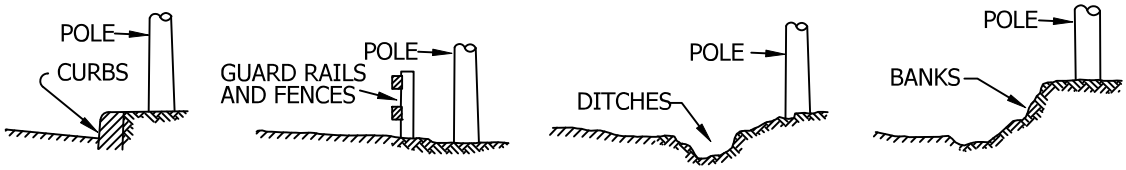
"S" TURNS AND JOGS
FIGURE TWO



DEAD END
STREETS AND ROADS
FIGURE THREE

ATTENTION:

DELINEATORS ARE REQUIRED ON ALL POLES ON STATE HIGHWAYS WITH THE FOLLOWING EXCEPTION: DELINEATORS ARE NOT REQUIRED ON POLES THAT DO NOT PRESENT A POSSIBLE TRAFFIC HAZARD (SEE EXAMPLES BELOW) AND MAY BE EXEMPTED UPON APPROVAL OF A WRITTEN REQUEST SUBMITTED WITH THE REQUEST FOR THE ENCROACHMENT PERMIT TO THE DIVISION OF HIGHWAYS, STATE OF CALIFORNIA. (SEE CALIFORNIA STATE TRAFFIC MANUAL SECTION)



POLES NOT REQUIRING DELINEATORS

REV	CHANGE	BY	DSGN	APPV	DATE	REV	CHANGE	BY	DSGN	APPV	DATE
C						F					
B	DRAWING UPDATE	JIK	JES	CZH	02/10/2020	E					
A	EDITORIAL CHANGES	JS	IL	MDJ	06/15/2016	D					

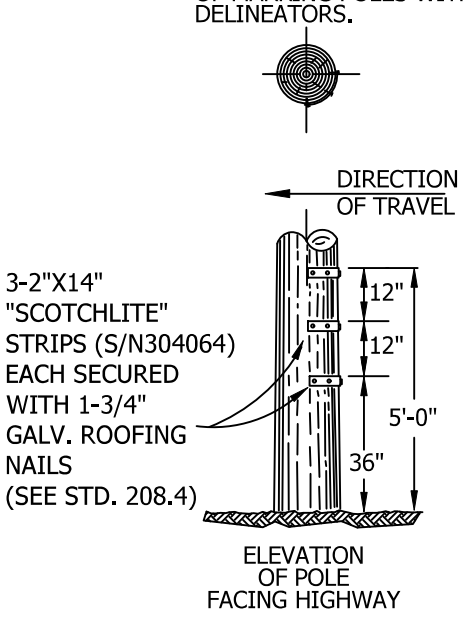
Indicates Latest Revision | Completely Revised | New Page [X] | Information Removed

SDG&E ELECTRIC OVERHEAD CONSTRUCTION STANDARDS

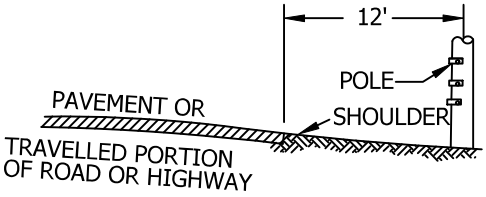
POLE MARKING INSTALLATION OF DELINEATORS

OH217.1

SKETCH SHOWING METHOD OF MARKING POLES WITH DELINEATORS.



ELEVATION OF POLE FACING HIGHWAY



DELINEATORS ARE REQUIRED WHERE POLE IS:
1. WITHIN 12' OF TRAVELED ROADWAY, OR;
2. IN AN ALLEY.

INSTALLATION: NONE

BILL OF MATERIALS: NONE

NOTES: NONE

REFERENCE: NONE

REV	CHANGE	BY	DSGN	APPV	DATE	REV	CHANGE	BY	DSGN	APPV	DATE
C						F					
B	DRAWING UPDATE	JIK	JES	CZH	02/10/2020	E					
A	EDITORIAL CHANGES	JS	IL	MDJ	06/15/2016	D					

X Indicates Latest Revision | Completely Revised | New Page | Information Removed

SDG&E ELECTRIC OVERHEAD CONSTRUCTION STANDARDS

POLE MARKING INSTALLATION OF DELINEATORS

SHEET 2 OF 2

OH217.2