2025 Risk Assessment Mitigation Phase

(Chapter SDG&E-Risk-5)

Electric Infrastructure Integrity

May 15, 2025

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I. INTRODUCTION

The purpose of this chapter is to present San Diego Gas & Electric Company's (SDG&E or Company) risk control and mitigation plan for the Electric Infrastructure Integrity (EII) Risk. This chapter contains information and analysis for this risk that meet the requirements of the California Public Utilities Commission's (Commission or CPUC) Risk-Based Decision-Making Framework (RDF),[1] including the requirements adopted in Decision (D.) 22-12-027 (Phase 2 Decision) and D.24-05-064 (Phase 3 Decision). The EII Risk is included in the 2025 RAMP Report based on a safety risk assessment, further informed by its reliability and financial consequence attributes, consistent with RDF guidance. This risk chapter describes the basis for selection of the EII Risk, the controls and/or mitigations put forth to reduce the likelihood or consequence of this risk, a discussion of alternative mitigations considered but not selected, and a graphic to show historical progress. This chapter also presents cost and unit forecasts for the risk mitigating activities, but it does not request funding. Any funding requests for this risk will be made through the Company's Test Year (TY) 2028 General Rate Case (GRC) application. Finally, this chapter describes the methods applied to estimate the risk's monetized, pre-mitigated risk, the estimated risk reduction benefits of each included control and mitigation, and the calculation of Cost-Benefit Ratios (CBRs) for each control and mitigation, consistent with the method and process prescribed in the RDF.

A. Risk Definition and Overview

1. Risk Definition

For the purposes of this RAMP Report, SDG&E's EII Risk is defined as the risk of an asset failure caused by degradation, age, operation outside of design criteria due to unexpected events or field conditions (*e.g.*, force of nature), or an asset no longer complying with the latest engineering standards, which may result in a public safety or reliability incident.

2. Risk Overview

One of SDG&E's recognized safety risks for employees, customers, and the public pertains to electric infrastructure. SDG&E continually aims to improve its electric infrastructure and educational outreach regarding safety measures related to energized lines, both overhead and

[1] As discussed in Volume 1, Chapter RAMP-1, the RDF Framework broadly refers to the recent modifications to the Commission's Rate Case Plan adopted in Rulemaking (R.) 13-11-006, Safety Model Assessment Proceeding A.15-05-002 *et al*. (cons.), and R.20-07-013 (the Risk OIR), including D.24-05-064, Appendix A.

underground. The residual risk of electric infrastructure failures causing safety, environmental, or major reliability incidents has remained stable over recent years, which is evidenced by SDG&E winning its 19th consecutive ReliabilityOne "Best in the West" award.[2] SDG&E has developed strong controls through programs such as the Corrective Maintenance Program (CMP) and its proactive reliability measures such as the pole, cable, switch and aging substation infrastructure replacement programs. Other controls include the consistent review and updating of its Construction Standards. It is through these controls that SDG&E continues to mitigate its EII Risk and mitigate growth in residual risks.

The EII Risk can be characterized by several potential scenarios, for example the occurrence of an energized wire-down event, which was used for risk impact and frequency scoring that involves asset failures. An energized wire-down event is one of SDG&E's primary concerns with respect to its overhead equipment and involves an energized overhead conductor (*i.e.*, a wire) falling from its support equipment and resting on the ground or on a foreign object. If an employee, contractor, or the public comes into contact with an energized wire, the results can be fatal. Accordingly, SDG&E continues to take proactive measures to determine the cause of any wire-down events and has a dedicated team reviewing all wire-down events to determine the root cause and identify any trends to potentially trigger the development of a new reliability program. There are various Drivers of wire-down events, such as third-party contact, acute weather causing foreign object contact, or extensive stress, aged infrastructure, and degradation of connectors. These Drivers/Triggers are further discussed below. SDG&E's risk control and mitigation plan aims to mitigate these Drivers/Triggers and thereby reduce the incidence of EII risk events.

Asset age and equipment characteristics (*e.g.*, wire type) are relevant attributes with respect to the rate of decline of electric infrastructure integrity. Aged assets can be affected by severe wearing due to weathering and electrical and mechanical forces. They may also consist of outdated technologies, not being able to provide the benefits of various improvements made to equipment over time such as safer design/installation techniques, technology advancements, material quality, and improved functionality. Also, it may be more difficult to maintain and operate aged assets due to a lack of spare parts and vendor support and reduction in internal experience operating the asset. Given these conditions, aged infrastructure generally is operated

[2] SDGE Today, SDG&E receives top honors for outstanding reliability in the west & national system resiliency award (November 14, 2024) available at https://www.sdgetoday.com/R1.

with heightened caution, sometimes using special procedures, for the safety of workers and the public.

SDG&E's risk control and mitigation plan focuses on safety and reliability measures designed to protect its employees, customers, and the public. The controls and mitigations in SDG&E's risk control and mitigation plan are intended to address various EII-related events. Other risks associated with this chapter are discussed in the following risk chapters: Employee Safety, Contractor Safety, and Excavation Damage. These other risk chapters focus on mitigations that address education, communication, training, and other internal procedural enhancements, while this EII Risk chapter focuses on infrastructure improvement risk mitigation activities and costs. Risk reduction benefits from the infrastructure improvements discussed in this chapter also impact the human safety risks addressed in SDG&E's Employee Safety and Contractor Safety chapters.

Certain controls and mitigations presented in this chapter are subject to compliance mandates beyond RDF requirements, such as those from the California Code of Regulations and General Orders (GO). A list of compliance requirements applicable to SDG&E's EII Risk is provided in Attachment A. Certain mitigation programs have value beyond the estimated risk reduction calculated under the RDF, such as enhancing operations, promoting public trust in the communities we operate, and preparing for future capacity needs (such as driven by electrification or climate impacts).

B. Risk Scope

SDG&E's EII Risk analysis considers the risk of an electric asset failure due to internal or external factors, which results in serious injuries, fatalities, and/or reliability impacts, and the associated financial costs of remediation and restoration. This EII Risk chapter focuses primarily on risks and mitigations unrelated to wildfire mitigation, predominately outside of SDG&E's High Fire Threat District (HFTD). Wildfire-related risks and mitigations are covered in SDG&E's "Wildfire and PSPS" risk chapter (SDG&E-Risk-4). However, where the same type of mitigation activities are included in both the Wildfire chapter and this EII chapter, the costs included herein have been allocated according to HFTD and non-HFTD percentages (unless otherwise noted), consistent with SDG&E's Wildfire Mitigation Plan. For example, vegetation management is performed across SDG&E's entire service territory. Vegetation management, therefore, appears as an activity performed to reduce risk in both SDG&E-Risk-4 and this chapter, as a reliability

mitigation. The costs associated with the vegetation management activities in this chapter only include the non-HFTD percentage of costs.

C. Data Sources Used to Quantify Risk Estimates[3]

SDG&E utilized internal data sources to determine the EII Risk's Pre-Mitigation Risk Value and calculate risk reduction estimates for mitigation activities (which enables estimation of Post Mitigation Monetized Risk Values and Cost Benefit Ratios). Where internal data is deemed insufficient, supplemental industry or national data is used, as appropriate, and adjusted to account for the risk characteristics associated with the Company's specific operating locations and service territory. For example, certain types of incident events have not occurred within the SoCalGas and SDG&E service territories. Expanding the quantitative data sources to include industry data where such incidents have been recorded is appropriate to establish a baseline of risk and risk addressed by mitigative activities. Attachment B provides additional information regarding these data resources.

II. RISK ASSESSMENT

In accordance with Commission guidance, this section provides a qualitative description of EII Risk, including a risk Bow Tie, which delineates potential Drivers/Triggers and Potential Consequences, followed by a description of the Tranches determined for this risk.

A. Risk Selection

EII was included as a risk in SDG&E's 2021 RAMP and was included in the 2022, 2023 and 2024 Enterprise Risk Registries (ERR).[4] SDG&E's ERR evaluation and selection process is summarized in Chapter RAMP-2, Enterprise Risk Management Framework and in Chapter RAMP-3 Risk Quantification Framework.

SDG&E selected this risk in accordance with the RDF Row 9.[5] Specifically, SDG&E assessed the top risks from the Company's 2024 ERR based on the Consequence of a Risk Event (CoRE) Safety attribute. The EII Risk was among the risks presented in SDG&E's list of Preliminary 2025 RAMP Risks on December 17, 2024 at a Pre-Filing Workshop. EII was selected

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[3] Copies and/or links to these data resources are provided in the workpapers served with this Report on May 15, 2025.

[4] In the 2021 RAMP Report this risk was called Electric Infrastructure Integrity. The risk definition is unchanged.

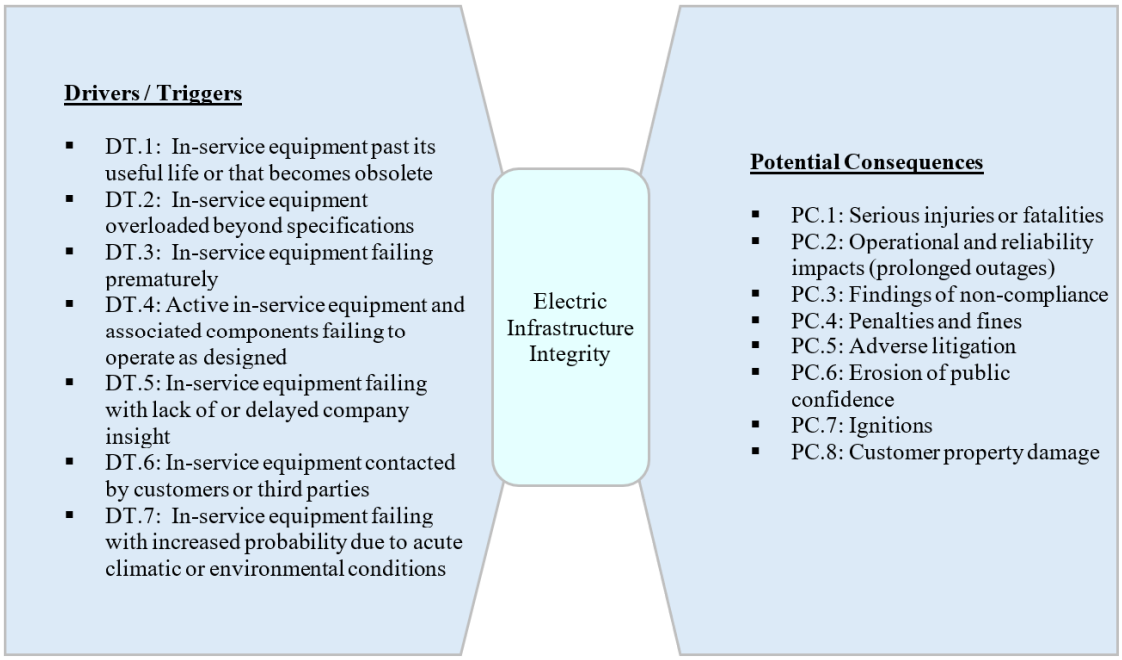
[5] D.24-05-064, RDF Row 9, states that risks to be included in the RAMP Report, at minimum, are those identified in the Company's ERR comprising "the top 40% of ERR risks with a Safety Risk Value greater than zero dollars.".

electively, as it did not qualify based on the Safety attribute alone. Prior to the Workshop, SDG&E provided SPD and interested parties the monetized Risk Value[6] for Electric Infrastructure Integrity, including Reliability and Financial CoRE values, which identified EII as SDG&E's highest valued[7] risk at the time. At the pre-filing workshop, no party expressed opposition to inclusion of this risk in SDG&E's 2025 RAMP Report.

B. Risk Bow Tie

In accordance with Commission requirements, this section describes the risk Bow Tie, possible Drivers, Potential Consequences, and a mapping of the elements in the Bow Tie to the mitigation(s) that addresses it.[8] As illustrated in the risk Bow Tie shown below in Figure 1, the Risk Event (center of the Bow Tie) is Electric Infrastructure Integrity, the left side of the Bow Tie illustrates Drivers/Triggers that could cause an Electric Infrastructure Integrity event, and the right side shows the Potential Consequences of an Electric Infrastructure Integrity event. SDG&E applies this framework to identify and summarize the information provided in Figure 1 below. A mapping of each mitigation to the addressed elements of the risk Bow Tie is provided in Attachment C.

Figure 1
Electric Infrastructure Integrity Risk: Risk Bow Tie



[6] D.24-05-064, RDF Row 12.

[7] At the December 17, 2024 Pre-Filing Risk Selection Workshop, preliminary SDG&E RAMP Risks were presented without the risk-adjusted scaling function applied.

[8] D.24-05-064, RDF Row 15.

C. Electric Infrastructure Integrity: Risk Bow Tie Potential Risk Event Drivers/Triggers[9]

When performing a risk assessment for the EII Risk, SDG&E identifies potential leading indicators, referred to as Drivers or Triggers, that reflect current and/or forecasted conditions and may include both external actions as well as characteristics inherent to the asset.[10] These Bow Tie Drivers/Triggers inform the Likelihood of a Risk Event (LoRE) component of the risk value. These include:

- **DT.1: In-service equipment past its useful life or that becomes obsolete**: Electric assets are usually in service for several decades and possibly for several years beyond the book life of the asset. The age of a specific asset is a common key indicator for failure of the electric asset because the mechanical strength and characteristics of the asset may have diminished over time. These assets can also be considered obsolete when new or updated safety, construction, and operational standards have been established in the industry or within the Company.

- **DT.2: In-service equipment overloaded beyond specifications**: Electric assets are designed and constructed per SDG&E standards and in accordance with CPUC General Orders and other local or national requirements. Assets often are designed and constructed to exceed the requirements set forth by these standards; however, field conditions, such as excessive forces exerted on poles due to acute natural forces (*e.g.*, high winds above recorded values), may stress the infrastructure and cause failures.

- **DT.3: In-service equipment failing prematurely**: SDG&E's electric assets such as underground cables, substation transformers, and overhead connectors are supplied by various manufacturers. These assets undergo routine quality testing from their respective manufacturers and operate within their design criteria; however, it is reasonable to expect some subsets to fail over time, under conditions near the upper limits of their design ratings, or for reasons unknown to SDG&E.

- **DT.4: Active in-service equipment and associated components failing to operate as designed**: Due to their sensitive nature, electric assets that are expected to operate based on protection settings to mitigate or reduce the impacts of an asset failure can be expected either to fail periodically or not to operate as designed. These failures or delays in operation may cause the assets the protection settings are designed to protect to experience more damage or to extend an expected isolated event.

- **DT.5: In-service equipment failing with lack of or delayed company insight**: Assets outside of design standards or original construction that does not result in an outage or visibility to SDG&E can lead to an extended exposure to the public (*e.g.*,

[9] An indication that a risk could occur. It does not reflect actual or threatened conditions.

[10] D.24-05-064, RDF Row 10-11.

a leaking transformer). Failure of these systems may cause prolonged or undetected risk exposure to the public.

- **DT.6: In-service equipment contacted by customers or third parties**: SDG&E's electric facilities may be contacted by members of the public or other third parties. An incident of this type may involve energized overhead distribution primary conductor during the occurrence of a wire-down event or while the conductor is intact and operating under normal operating conditions.
- **DT.7: In-service equipment failing with increased probability due to acute climatic or environmental conditions**: Although it is reasonable to expect some subsets of in-service electric assets to fail, acute weather events or environmental conditions may pose added risks to SDG&E's operations. Adverse weather events extend the normal outage response time, due to limited resources or unsafe field conditions to assess and mitigate damage.

D. Potential Consequences of Risk Event (CoRE)

Potential Consequences are listed to the right side of the risk Bow Tie. SDG&E identifies the Potential Consequences of this risk by analyzing internal data sources, where available, industry data, and subject matter expertise (SME).[11] These Bow Tie Consequences inform the CoRE component of the risk value. If one or more of the Drivers listed above were to result in an incident, the Potential Consequences, in a plausible worst-case scenario, could include:

- **PC.1:** Serious injuries or fatalities
- **PC.2:** Operational and reliability impacts (prolonged outages)
- **PC.3:** Findings of non-compliance
- **PC.4:** Penalties and fines
- **PC.5:** Adverse litigation
- **PC.6:** Erosion of public confidence
- **PC.7**: Ignitions
- **PC.8:** Customer property damage

These Potential Consequences were used by SDG&E in the scoring of the EII Risk during the development of its 2024 ERR.

E. Evolution of Risk Drivers and Consequences

As specified in the Phase 3 Decision,[12] the following changes to the previous ERR and/or the 2021 RAMP include:

[11] D.24-05-064, RDF Row 10.

[12] D.24-05-064, RDF Row 8.

1. Changes to Drivers/Triggers of the Risk Bow Tie

- **DT.1: In-service equipment past its useful life or that becomes obsolete** – minor grammatical wording change from 2021's "In-service equipment past its useful life or becomes obsolete"
- **DT.2: In-service equipment overloaded beyond specifications** – more descriptive wording change from 2021's "Equipment in-service beyond design specifications"
- **DT.7: In-service equipment failing with increased probability due to acute climatic or environmental conditions** – slightly more emphasis on probability versus just volume from 2021's "In-service equipment failing in large volume due to acute climates or environmental conditions"

2. Changes to Potential Consequences of the Risk Bow Tie

- **PC.2: Operational and reliability impacts (prolonged outages)** – minor plural wording change from 2021's "Operational and reliability impact (prolonged outages)"
- **PC.7: Ignitions** – newly added for 2025
- **PC.8: Customer property damage** – newly added for 2025

F. Summary of Tranches

To determine groups of assets or systems with similar risk profiles, or Tranches, and in accordance with Row 14 of the RDF, SDG&E applied the Homogeneous Tranching Methodology (HTM) as outlined in Chapter RAMP - 3: Risk Quantification Framework. As a result, the following classes, LoRE-CoRE pairs, and resulting number of Tranches were determined:

Table 1: Electric Infrastructure Integrity Risk Tranche Identification

Class	Number of LoRE-CoRE Pairs	Number of Resulting Tranches
Emergency Restoration (Non-UG)	55	12
Overhead	64	16
Substation	22	6
Underground	38	11
Vegetation	22	6
Other	79	18
TOTAL	**280**	**69**

Attachment D illustrates the derivation of the Tranches, as shown in Table 1 above, in accordance with the HTM. The classes were identified by SDG&E as logical groups of assets and systems based on the Company's operations. These classes also align risk treatments with asset

risk profiles reflective of SDG&E's operations. More detailed Tranche information, including risk quantification by LoRE-CoRE pair, Tranche names, and mitigation associations (*i.e.*, cost mapping and risk reduction) to Tranches, is provided in workpapers.

III. PRE-MITIGATION RISK VALUE

In accordance with the RDF Row 19, the table below provides the pre-mitigation risk values for the EII Risk. Further details, including pre-mitigation risk values by Tranche, are provided in workpapers. Explanations of the risk quantification methodology and other higher-level assumptions are provided in Chapter RAMP-3 Risk Quantification Framework.

Table 2: Electric Infrastructure Integrity Risk
Monetized Risk Values
(Direct, in 2024 $millions)

LoRE	CoRE [Risk-Adjusted Attribute Values]			Total CoRE	Total Risk [LoRE x Total CoRE]
	Safety	Reliability	Financial		
1,653.73	<$0.00	$0.22	$0.02	$0.2	$398.05

A. Risk Value Methodology

SDG&E's risk modeling for the EII Risk follows RDF guidance[13] for implementing a Cost Benefit Approach, as described below:

1. **Cost Benefit Approach Principle 1 - Attribute Hierarchy (RDF Row 2):** EII Risk is quantified in a combined attribute hierarchy as shown in the table above, such that Safety, Reliability, and Financial are presented based on available, observable, and measurable data.

2. **Cost Benefit Approach Principle 2 - Measured Observations (RDF Row 3):** EII Risk used observable and measurable data in the estimation of CoRE values. SDG&E utilized internal outage data for the period 2015- 2024 (SAIDIDAT)[14] to represent natural units for incidence of outages within SDG&E electric infrastructure. Additionally, EII Risk leveraged SIF data to estimate safety incidents.

3. **Cost Benefit Approach Principle 3 - Comparison (RDF Row 4):** EII Risk utilized proxy data as **provided** by various sources including, but not limited to, the Center for Disease Control (to determine financial impacts associated with injuries)**.**

4. **Cost Benefit Approach Principle 4 - Risk Assessment (RDF Row 5):** Probabilities of future events were derived based on internal recorded data from past years, as described in the preceding paragraphs.

[13] D.24-05-064, RDF Rows 2-7.

[14] SAIDIDAT is SDG&E's internal database for forced outage records, including key data such as system average interruption duration index (SAIDI) values.

5. **Cost Benefit Approach Principle 5 - Monetized Levels of Attributes (RDF Row 6):** In accordance with D.22-12-027 and D.24-05-064, RDF Row 6, SoCalGas and SDG&E used a California-adjusted Department of Transportation monetized equivalent to calculate the Safety CoRE attribute at a monetized equivalent of $16.2 million per fatality, $4.1 million per serious injury, and $49 thousand for minor injury;[15] the Electric Reliability CoRE attribute is valued at a monetized equivalent of $3.76 per CMI; and the Financial CoRE attribute is valued at $1 per dollar.[16]

Further information regarding SDG&E's quantitative risk analyses, including raw data, calculations, and technical references are provided in workpapers.

6. **Cost Benefit Approach Principle 6-Adjusted Attribute Level (RDF Row 7):**

Table 3: Electric Infrastructure Integrity Risk
Scaled vs Unscaled Value by CoRE Attribute
(Direct, in 2024 $ millions)

	Safety	Reliability	Financial	Total
Unscaled Risk Value	$7.72	$364.07	$26.26	$398.05
Scaled Risk Value	$7.72	$364.07	$26.26	$398.05

The values in the table above are the result of SDG&E applying the risk scaling methodology described in Chapter RAMP-3 to the CoRE attributes for EII Risk.

Further information regarding the risk scaling function, including the risk scaling factor and the loss threshold at which the risk scaling factor begins to apply is provided in Chapter-RAMP-3.

IV. 2024-2031 CONTROL & MITIGATION PLAN

This section identifies and describes the controls and mitigations comprising the portfolio of mitigations for the EII Risk and reflects changes expected to occur from the last year of recorded costs at the time of filing this RAMP Report (2024) through the 2028 GRC cycle (2031). For clarity, a current activity that is included in the plan may be referred to as either a control and/or a mitigation. Table 4 below shows which control activities are in place in 2024, and which are expected to be on-going, completed, or new during the 2025-2031 time period. Because the TY 2024 GRC proceeding established rates through 2027,[17] information through 2027 is

[15] *See* D.22-12-027 at 35 ("We adopt Staff's recommendation to require a dollar valuation of the Safety Attribute in the Cost-Benefit Approach in the RDF using the DOT VSL as the standard value.").

[16] *See* Chapter RAMP-3: Risk Quantification Framework, Section II.

[17] *See* D.24-12-074.

calculated as part of the baseline risk, in accordance with D.21-11-009.[18] For the TY 2028 GRC, SDG&E calculated CBRs beginning with TY 2028 and for each Post-Test Year (PTY) (2029, 2030, and 2031).[19]

Table 4: Electric Infrastructure Integrity Risk
2024-2031 Control and Mitigation Plan Summary

ID	Control/Mitigation Description	2024 Control	2025-2031 Plan
C201	Proactive Overhead Conductor Program	X	Ongoing
C202	Underground Cable Replacement Program (Proactive)	X	Ongoing
C206	Tee Modernization Program	X	Ongoing
C208	Replacement of Live Front Equipment	X	Ongoing
C210	DOE Switch Replacement	X	Ongoing
C212	GO165 Corrective Maintenance Program Underground	X	Ongoing
C215	Electric Public Safety Communications	X	Ongoing
C226	Distribution Substation Proactive Asset Program	X	Ongoing
C234	4 kV Reliability Program	X	Ongoing
C236	Distribution Overhead Switch Replacement Program	X	Ongoing
C240	Avian Protection Program	X	Ongoing
C248	Strategic Pole Replacement Program	X	Ongoing
C250	Substation Reliability for Distribution Components	X	Ongoing
C251	GO165 Corrective Maintenance Program Overhead	X	Ongoing
C252	Management of Overhead Distribution Service (Non-CMP)	X	Ongoing
C253	Restoration of Service	X	Ongoing
C254	Underground Cable Replacement Program - Reactive	X	Ongoing
C256	Management of Underground Distribution Service (Non-CMP)	X	Ongoing
C257	Distribution Substation Responsive Asset Replacement	X	Ongoing
C258	Emergency Equipment Purchase	X	Ongoing
C261	Power Quality Monitor Deployment and Replacement	X	Ongoing

[18] *See,* D.21-11-009 at 136, Conclusion of Law 7 (providing a definition for "baselines" and "baseline risk").

[19] In the TY 2028 GRC, the last year of recorded costs, or base year, will be 2025. SoCalGas and SDG&E will forecast information for 2026 through 2031, in accordance with the Rate Case Plan.

ID	Control/Mitigation Description	2024 Control	2025-2031 Plan
C262	Distribution Substation SCADA Expansion	X	Ongoing
C263	Wireless Fault Indicator	X	Ongoing
C267	Damage Prevention Activities Electric Underground	X	Ongoing
C268	Substation Inspection and Maintenance Program	X	Ongoing
C269	Distribution Circuit Reliability	X	Ongoing
C270	SCADA Capacitors	X	Ongoing
C551	Prune and Removal (Clearance)	X	Ongoing
C554	Detailed Inspections	X	Ongoing
C578	QA/QC of Veg Management	X	Ongoing
M1	Transformer Load Monitoring Driven Transformer Replacement		New

A. Control Programs

In accordance with Commission guidance, this section "[d]escribe[s] the controls or mitigations currently in place"[20] (*i.e.*, activities in this section were in place as of December 31, 2024). Controls that will continue as part of the risk mitigation plan are identified in Table 4 above.

- **C201: Proactive Overhead Conductor Program:**

The purpose of SDG&E's Proactive Overhead Conductor Program is to systematically identify and upgrade existing overhead electric infrastructure. Failure of the assets could put the public at risk of energized contact with a fallen conductor and result in a significant unplanned outage. The deteriorated assets may also not have the original load carrying capabilities as designed. Further, this proactive replacement of overhead conductors builds on SDG&E's commitment to support electrification goals by providing capacity for expanding electric services delivered to downstream customers.

To identify and prioritize those locations where an overhead conductor upgrade is necessary, this program considers 1) Historical data collected from actual wire-down events and CMP Records, 2) a review of those spans that lack protection, 3) environmental factors including high winds and accelerated corrosion in coastal areas, 4) frequency of wire downs in adjacent or similar locations, and 5) electric load on the conductor relative to its capacity, which not only

[20] D.18-12-014 at 33.

indicate the need for capacity upgrades, but can also be an indicator of mechanical stress (cyclic heating/cooling) and/or premature aging of the conductors (ohmic heating).

This program replaces existing assets with assets that have been designed to current, upgraded construction standards. The assets targeted in this scope (typically small wire copper spans) were designed and constructed decades ago. Current standards call for stronger (*i.e.*, higher tensile strength) and/or covered conductor. The designs may also deploy advanced protection and/or fault detection schemes. The existing assets are replaced with those designed to current construction standards, providing the benefit of improved design techniques.

This program is also intended to proactively replace high-risk overhead conductors prone to wire-down events measured by failure rates, historic wire-down events, CMP records and lack of protection (fuse or advanced technology) that are in proximity to the public (*e.g.*, schools, freeways, high profile areas) that could put the public at risk of energized contact. SDG&E utilizes new construction standards, such as stronger (*i.e.*, higher tensile strength) and/or covered conductor, to decrease the likelihood of a wire-down event, and designs risk mitigation strategies for each circuit with the intent of achieving the greatest risk reduction for energized wire-down events by reconductoring and deploying advanced protection and/or detection schemes. Altogether, this decreases the likelihood of an energized wire-down event while also promoting sufficient capacity of the system.

In other areas, where small-capacity wire may not feasibly be replaced, at-risk connectors, sleeves, and single-phase spans of small wire (*i.e.*, commonly known failure points) are replaced as needed.

- **C202: Underground Cable Replacement Program (Proactive):**

SDG&E currently performs reactive replacement of underground unjacketed and lead-jacketed cable. Underground cable failures have become one of the largest contributors to customer outages in the last few years.

The reactive program (C254, below) identifies and replaces failed equipment. This program (C202) takes a proactive approach by replacing underground cable that has been identified to have a relatively higher probability of failure based on electric reliability circuit analysis and cable failure data.

In the absence of a physical or other system indicator of the location of the failure, the fault-finding process can be lengthy and place undue stress on adjacent components. Through a process colloquially known as “thumping”, the electrical components are exposed to voltage

surges, which, over time, may weaken the insulation of the cable. Ultimately, the stress imposed through the process of finding the fault may prematurely age adjacent, non-faulted components; in turn, the likelihood of failure increases, or at least the expected service life of these components is consequently shortened. Through proactive replacement of underground cable, such testing can be avoided.

This proactive replacement improves service to existing customers by proactively replacing cable in the underground system before an unplanned outage occurs. Planned outages can be resolved more quickly (by removing the time needed to find the faulted cable) and more targeted in their scope, reducing the overall burden on customers compared to an unplanned outage.

- **C206: Tee Modernization Program:**

SDG&E's Tee Modernization Program involves the proactive at-risk identification and replacement of 600-amp tee connectors. Tee connector failures have become the largest contributors to customer outages in the last few years.

600-amp tees are used as underground connections in handholes, manholes, and at switch terminations. Tee failures occur along feeder cables, causing forced outages to large customer counts that require extensive reconstruction to permanently restore the outage.

In a similar manner as discussed for proactive underground cable above, the process of fault-finding related to tee failures can stress non-fault components, increasing or accelerating the risk of failure. Through proactive replacement of 600-amp tee connectors, such hostile testing can be avoided. Additionally, tees can fail violently (*e.g.*, tee failure could lead to an arc flash), which may pose a serious safety risk to our field personnel and the public.

This proactive replacement improves service to existing customers by proactively replacing 600-amp tees in the underground system before an unplanned outage occurs. Planned outages can be resolved more quickly and more targeted in their scope, reducing the overall burden on customers compared to an unplanned outage.

- **C208: Replacement of Live Front Equipment:**

"Live front" equipment has the primary connections exposed with no insulative covering. Thus, when the equipment is opened, there are energized (live) conductors present. The Live Front Equipment Replacement program aims to identify and replace live front equipment.

SDG&E does not permit work on energized live front equipment. As a result, switch plans are used to operate unenergized (dead) front or remote-operated equipment elsewhere on the

system, to create electric isolation for a job or for safe operation of the live front equipment. However, this typically exposes additional customers to outages. Through proactive replacement of this equipment, future outages can be more focused in scope, improving reliability.

- **C210: DOE Switch Replacement:**

SDG&E's "do not operate energized" (DOE) Switch Replacement Program aims to systematically replace underground and overhead switches that are deemed unsafe for energized operation of the internal mechanical units. SDG&E utilizes inspection programs to identify these types of switches. These inspections include visual inspections, infrared (IR) inspection to detect points of potential overheating, measurement of switch lubrication, and physical exercising. Upon inspection, if a switch is found to not be safe for continued operation, field experts will make the determination to replace the switch with an appropriate superior or equivalent asset, depending on field conditions and reliability impact.

Distribution switch inoperability during an outage can extend the impact of an outage to the next upstream protection device, causing a prolonged and expanded outage. Use of the next upstream device adds customers to the outage, *i.e.*, those customers between the corroded switch and the next upstream device. Replacement of these switches allows for a reduced customer impact when isolation devices are needed during planned and unplanned outages.

- **C212: GO165 Corrective Maintenance Program Underground:**

Deterioration of underground equipment could increase likelihood of asset failure (*e.g.*, a broken cable rack) and cause potential risks, including injury or death, to the public and workers. Deteriorated equipment may also increase volume and frequency of forced distribution outages, possibly creating risks for public safety. As this program is mandated per GO 165, non-compliance poses risk of regulatory action, including fines. Underground equipment/connectors are inspected by infrared technology (upon entry of facility) per an internal standard Engineering Standard Practice 120 (ESP 120) and replaced accordingly.

The inspection of AGDF/AGLF (above ground, dead front and live front pad-mounted equipment) consists of a detailed external and internal visual inspection of pad-mounted facilities to identify conditions out of compliance with GO 128. The most obvious types of condition that presents a significant hazard to the public and employees are severe corrosion, possible wire entry, and identifying oil leaks. These are the types of conditions that SDG&E is continually looking for.

Additionally, this program includes detailed inspection of subsurface structures (manholes, vaults, primary hand-holes and subsurface enclosures) containing electric distribution equipment. Structures with only cable taps, splices or pass-throughs are not required by GO 165, but are still inspected as part of SDG&E's inspection program. The program's detailed inspection of these facilities identifies conditions out of compliance with GO 128 (Rules for Construction of Underground Electric Supply and Communication Systems). The most obvious examples of a condition that could present a significant hazard to the public and employees are severe structural deterioration, an unsecure entryway, and working space issues.

SDG&E performs this type of inspection on approximately 25,400 structures per year. The top five conditions found on this type of inspection are as follows:

- EXT/INT High Voltage Sign Missing;
- External Working Space Sign Missing;
- Weeds/Trees/Bushes/Dirt or Obstacle;
- Possible Wire Entry to Energized/Exposed Parts; and
- ID/Circuit/Switch Number Missing or Incorrect.

- **C215: Electric Public Safety Communications:**

Through a dedicated outreach campaign, SDG&E provides education to customers and the general public about the dangers and risks associated with electricity and working in proximity to SDG&E's electrical equipment and delivery infrastructure. This is primarily accomplished through a variety of integrated tactics, including bill messaging, organic and paid social media, television, out-of-home (*e.g.*, billboards & bus shelters), print and digital advertising, press releases, messaging on company website (including internal company employee site, PowerUp) and warning signage near electric facilities. Primary electric safety topics include, but are not limited to: 1) metallic balloons, 2) downed powerlines, 3) 10' powerline clearance, 4) electrical equipment (*i.e.*, pad-mounted equipment) and 5) accessory dwelling unit (ADU) inspections for meter service, rewires and panel upgrades. The annual budget for SDG&E's Natural Gas & Electric Safety marketing campaign is $750,000, with roughly half ($375,000) dedicated to electric safety topics. Due to communications taking many forms as seen above, it was infeasible to develop a single unit of measure for this control.

- **C226: Distribution Substation Proactive Asset Program:**

This is a proactive distribution substation equipment replacement or addition program that will improve safety and reliability related to the replacement of obsolete and problematic

substation equipment with costs under or around roughly $2M. Similar to C250, this program covers individual equipment with limited spare parts which introduces risk to the system. Due to the variety of equipment being replaced, it was infeasible to develop a single unit of measure for this control.

- **C234: 4 kV Reliability Program:**

The purpose of SDG&E's 4 kV modernization program is to systematically improve the reliability for customers currently serviced by 4 kV circuits. The 4 kV system makes up over 20% of SDG&E distribution circuits (by circuit count) and represents approximately 5% of SDG&E system load and overall distribution system length. The 4 kV package or "unit" substation 4 kV substations, half of which are over 50 years old, present a distinct reliability risks for customers serviced by 4 kV circuits due to higher failure rates of those units. Further, when there is an outage on a 4 kV circuit, there are limited options to transfer 4 kV load to adjacent circuits (most of which are 12 kV). All of these factors create the potential for more frequent and extended duration outages on 4 kV circuits.

The scope of the program focuses on removing 4 kV packages or "unit" substations, modernizing other aging substation infrastructure as needed, and provision of new step-down transformers as appropriate. To further improve reliability, customers may be cutover from 4 kV to 12 kV as part of the redesign and rearrangement of the 4 kV Circuit. Where necessary, the scope of the program will also include replacing small and aging wire.

- **C236: Distribution Overhead Switch Replacement Program:**

SDG&E's Distribution Overhead Switch Replacement Program aims to replace overhead distribution switches that have shown signs of severe or quickly advancing corrosion that may lead to catastrophic switch failure. The state of the switch may pose safety risks to field operating personnel, due to potential flash or overexertion by the employee during the physical operation of the switch. To mitigate the likelihood of a catastrophic switch failure, SDG&E may be forced to operate the next upstream protection device instead, causing a prolonged and expanded outage.

SDG&E has identified through quantitative risk modeling various data attributes that characterize high-risk switches and has prioritized several switches that can be removed in the near term to avoid failure. For example, SDG&E's engineering analyses of failed overhead switches have determined that various switches often fail due to excessive corrosion of major components. Switches have failed in as little as eight years of operation along the dense salt fog coast. Specifically, Distribution switches have a higher propensity for failure and/or inoperability

in high corrosion areas, for example, in the area SDG&E identifies as "Contamination District One" (which includes assets within two miles of the coast). While switches within Contamination District One experience the highest rate of failure, failures can and do occur across the service territory.

Distribution switch inoperability during an outage can extend the impact of an outage to the next upstream protection device, causing a prolonged and expanded outage. Use of the next upstream device adds customers to the outage, *i.e.*, those customers between the corroded switch and the next upstream device. Replacement of these switches allows for a reduced customer impact when isolation devices are needed during planned and unplanned outages.

Antiquated single phase disconnect switches are targeted to be replaced with 1) newer model disconnects with superior material specifications, 2) three-phase gang-operated switches (mitigating ferro resonance over-voltages and flashovers), or 3) three-phase remote operable switches. Switch replacements may also require simultaneous or subsequent upgrades to relevant equipment such as poles, crossarms, wires, guys, and other hardware.

- **C240: Avian Protection Program:**

SDG&E's Avian Protection Program involves identifying and retro-fitting, rearranging, or building-to standard distribution poles in SDG&E's service territory to prevent electrocution and potential collisions of birds with our facilities and to facilitate compliance with the following federal and state laws: (1) Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), (2) Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d), and (3) the California Fish and Game Code (Cal. Fish and Game Code §§ 3503, 3503.5, 3511, 3513). The project will also harden the system and reduce the risk of wire-down events associated with avian electrocutions, improve SDG&E reliability and customer service, and align with Avian Power Line Interaction Committee (APLIC) Guidelines. The plan will primarily address known bird contacts, in which case we will identify and resolve potential avian risk.

- **C248: Strategic Pole Replacement Program:**

The Strategic Pole Replacement Program focuses on the replacement of gas-treated poles that are in proximity to the public (*e.g.*, schools, freeways, high profile areas) that could put the public at risk of energized contact. The purpose of this program is to target high-risk poles located throughout the service territory that are gas treated and are set in concrete and steel reinforced, steel reinforced and set in soil, or set in soil, and are not being addressed by other programs. These poles are nearing the end of their useful life and are known to have a higher failure

potential. Gas treated poles have a higher propensity for dry rot due to the pole's interaction with the moisture in the soil, and poles set in concrete are more difficult to inspect and determine the integrity of the pole.

This program replaces the existing assets with assets that have been designed to current and updated construction standards. The assets targeted in this scope were designed and constructed decades ago. Therefore, the replacement of these assets with those designed to current construction standards provides the benefit of improved design techniques and modern equipment and construction methods. Replacement of these assets will also avoid unplanned outages that would result from the failure of the pole during normal operation.

- **C250: Substation Reliability for Distribution Components:**

The following projects focus primarily on distribution substation transformers, capacitors, and circuit breaker replacements. Substations are essential to the daily operation of the electric system and must be kept in reliable condition. Modern substation infrastructure can rely on protective relaying devices to operate correctly and strategically isolate substation equipment in order to minimize the impact of an outage and increase reliability. Failure to maintain a substation in reliable condition can impact reliability and limit operational flexibility. Qualified Electric Workers (QEW) can also be subject to electric safety hazards such as arcing, high voltage induction stray voltages, and mechanical safety hazards associated with working with heavy equipment (*e.g.*, circuit breakers) and in confined spaces, such as in metal clad switchgear.

Proactive planning is therefore required for the replacement of equipment that has exhausted its useful life. Proactive planning and replacement will allow the distribution system to continue operating at optimum conditions and maintain its reliability, shorten outage times, and allow for operational flexibility to the system. The following substations have been identified as having limited operational flexibility and needing work to be performed under this program. Below is a list of individual substations planned to perform a proactive replacement:

- Chicarita 12 kV Breaker and Capacitor Replacements;
- Laguna Niguel 12 kV Breaker and Capacitor Replacements;
- Scripps 12 kV Breaker and Capacitor Replacements;
- Coronado 69/12 kV Transformer Replacement;
- Batiquitos 12 kV Breaker and Capacitor Replacements;
- Cabrillo 12 kV Switchgear Replacements;
- Ash 12 kV Breaker and Transformer Replacement;

- Genessee 12 kV Replacements;
- Trabuco 12 kV Replacements;
- Rincon 12 kV Bus tie and Transformer Replacements;
- Vista Remove from Service; and
- Granite 12 kV Breaker and Switchgear Replacements.

Due to the variety of equipment being replaced and the variances per project, it was infeasible to develop a single unit of measure for this control.

- **C251: GO165 Corrective Maintenance Program Overhead:**

SDG&E's GO 165 Distribution Inspect and Repair program replaces wood poles after identifying compromised poles from GO 165 wood pole intrusive inspections. In lieu of the existing program, short- and long-term deterioration of overhead equipment could increase the likelihood of asset failure (*e.g.*, broken poles) and cause potential risks, including injury or death, to the public and workers. Degraded equipment could also increase the volume and frequency of forced distribution outages, potentially creating risks for public safety. As this program is mandated per GO 165, non-compliance poses a risk of regulatory action, including fines. SDG&E's Overhead (OH) Visual Inspection program utilizes GO 95, Rules for Overhead Electric Line Construction, as its basis for identifying non-conformances. The OH Visual Inspection looks for a variety of conditions that could impact public and employee safety, structural integrity, and system reliability. The OH Visual Inspection consists of a detailed, walk-around inspection of all distribution poles, pole-mounted facilities with primary and secondary conductors, Communication Infrastructure Provider (CIP) attachments, and distribution equipment on transmission poles. These inspections identify conditions that are out of compliance with GO 95. On average, SDG&E performs approximately 45,000 OH visual inspections on its electric distribution system per year. For an OH visual inspection, the top five conditions found are as follows:

- Damaged/Missing Sign;
- Damaged/Missing/Incorrect Station Pole ID;
- Damaged Ground Molding;
- Damaged/Missing High Voltage signs; and
- Pole steps lower than 10 feet.

SDG&E also performs a Pole Intrusive Inspection on each wood electric distribution pole. Any pole 15 years of age or older is inspected intrusively. The form of the intrusive inspection is

normally an excavation about the pole base and/or a sound and bore inspection of the pole at ground line. Currently, treatment is applied in the form of ground-line pastes and/or internal pastes. SDG&E performs these inspections on a 10-year cycle. The 10-year cycle fulfills the requirements of GO 165, which are: (1) all poles over 15 years of age are intrusively inspected within ten years; and (2) all poles that previously passed intrusive inspection are to be inspected intrusively again on a 20-year cycle.

SDG&E is responsible for performing the wood pole integrity inspections, applying wood preservative treatments, and installing mechanical (steel) reinforcements. The type of treatment is dependent upon the age of the pole, the individual inspection history, and the overall condition of the structure. SDG&E's Vegetation Management group administers the wood pole intrusive inspection and treatment program. For this program, SDG&E performs approximately 20,000 wood pole intrusive inspections annually. There are three findings from this type of inspection. They are:

- Pole replacement;
- Pole reinforcement (with steel); and
- No corrective action needed.

- **C252: Management of Overhead Distribution Service (Non-CMP):**

This project is required to reinforce the electric overhead distribution system infrastructure by responsive action to system damages, deterioration, and unsafe conditions outside normal restoration of service. The overall objective is to maintain continuity of safe and reliable customer service. This project provides for the reconstruction of existing overhead distribution facilities as necessary, to:

- Correct improper voltage conditions.
- Replace overhead facilities that are non-compliant with OH safety and reliability standards.
- Make emergency repairs not normally associated with restoration of service.
- Repair or replace deteriorated or unsafe equipment not found through the "Corrective Maintenance Program."
- Install fault indicators/fusing/switching equipment, as necessary.
- Install a barrier around the pole to prevent reoccurrence.

- **C253: Restoration of Service:**

SDG&E, as an investor-owned utility, has an obligation to serve. This control is required to accomplish restoration of electric service due to system interruptions caused by severe inclement weather conditions, fires, equipment failures, damages caused by a third party and any other event that results in a customer loss of power caused by assets owned by SDG&E. This project provides for the reconstruction of existing overhead and underground distribution facilities as necessary to restore electric service to customers. The funds within this budget cover all costs associated with the following factors:

  - Storm Damage (rain/wind/fire, for example).
  - Extensive damage to electric distribution facilities by others (car/equipment contacts, for example).
  - Emergency repairs of facilities required for service restoration (e.g., cable or equipment failures).

- **C254: Underground Cable Replacement Program – Reactive:**

SDG&E's underground cable replacement program is designed to identify and reactively replace equipment during outages on the distribution system. This project is required to support SDG&E's obligation to serve, by funding the restoration of electric service after system interruptions caused by underground cable failures involved in severe inclement weather conditions, equipment failures and damages caused by a third party.

- **C256: Management of Underground Distribution Service (Non-CMP):**

This project is required to reinforce the electric underground distribution system infrastructure by responsive action to system damages, deterioration, and unsafe conditions outside normal restoration of service. The overall objective is to maintain continuity of safe and reliable customer service. This project provides for the reconstruction of existing underground distribution facilities as necessary to:

  - Correct improper voltage conditions.
  - Replace non-compliant underground facilities.
  - Make emergency repairs not normally associated with restoration of service.
  - Repair or replace deteriorated or unsafe equipment not found through the Corrective Maintenance Program or C254: Underground Cable Replacement Program - Reactive.

- Install fault indicators, fusing, or switching equipment as necessary to maintain service reliability.

- **C257: Distribution Substation Responsive Asset Replacement:**

This is a reactive project for electrical distribution substation facilities that have failed, intended to maintain the integrity and reliability of the distribution substation. General project categories include:

- Safety related improvements; and
- Replacement of failed equipment

Due to this control being reactive and the variety of equipment addressed, it was infeasible to develop a single unit of measure for this control.

- **C258: Emergency Equipment Purchase:**

This is a reactive spare/portable project intended for a speedier restoration of service to our customers following outages caused by equipment failures. The number of aging transformers and switchgear on the SDG&E system is at a level for which additional failures can be expected, despite efforts to replace the equipment before failure. In addition, there can be lengthy lead times for replacement units, during which time the spares and portable equipment are necessary. This project addresses long lead time by purchasing emergency spare and mobile equipment as needed.

Due to this control being reactive and the variety of equipment addressed, it was infeasible to develop a single unit of measure for this control.

- **C261: Power Quality Monitor Deployment and Replacement:**

SDG&E's Power Quality (PQ) Monitor Deployment and Replacement project is the continued deployment of power quality monitors that can remotely monitor and capture data that support incipient fault detection, distribution and substation asset management, operations, and power quality investigations. These devices are foundational to SDG&E's ability to monitor the system, develop root cause analysis to investigate issues on the system, and locating and identifying faulty equipment before it fails. Applications are under development to support advanced capabilities, including predictive fault analytics and automated fault locating, which will have a direct positive impact on the system reliability, customer service and asset management. The PQ monitoring system provides benefits, as follows:

- Provides distribution system power quality health information, including RMS voltage, voltage and current transient events, system harmonics (including spectra), real and reactive power flow, power factor, flicker, and

others.

- Provides logging and notification for events occurring on transmission, distribution and customer systems that are perceptible at the distribution substation.
- Provides advanced analytics processes, including incipient fault detection (fault anticipation or predictive fault analysis) and advanced fault locating.
- Provides a data source with analytics for historical events and steady state trends.
- Provides data collected via the substation PQ monitoring system that is regularly utilized by several engineering and other departments within the company.

- **C262: Distribution Substation SCADA Expansion:**

This program installs, upgrades, and expands Supervisory Control and Data Acquisition (SCADA) systems at SDG&E's distribution substations, which is foundational to how SDG&E monitors the system, enhances SDG&E's situational awareness, and improves response to adverse circuit conditions. Benefits of installing SCADA within the substation includes faster faulted circuit identifications, faster isolation of faulted electric distribution circuits, higher accuracy fault locating, and improved system performance. This program replaces aging and obsolete remote terminal units (RTUs), relays, and associated interdependent equipment with state-of-the art devices, which improve SCADA integration and protection features in a small footprint, providing for more cost-effective design, installation, and maintenance.

- **C263: Wireless Fault Indicator:**

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

SDG&E routinely reviews results of sensitive relay outages to identify the need and locations for new wireless fault indicator locations. Locations may change based on new information and past findings. Wireless fault indicators are typically placed on bifurcations in SDG&E's system or midway on a section of conductor that does not have SCADA devices to provide real-time notification of loss of current or faults downstream. Examples include a location where a feeder splits but only has a SCADA switch in one direction downstream. Adding a

wireless fault indicator to the other direction provides more complete information on the status of all conductors downstream. Overhead to underground and underground to overhead unfused transitions and downstream of non-SCADA substations are also valuable applications.

- **C267: Damage Prevention Activities Electric Underground:**

The purpose of the Damage Prevention Activities – Underground Electric is to prevent damage to electric infrastructure caused by third-party excavators. Two primary locate-and-mark activities are listed below:

  - Locating and marking underground electric facilities before excavation occurs.
  - Providing staff support for compliance and improvement.

The first of these activities, damage prevention activities – underground electric, refers to the physical act of locating and marking underground facilities. SDG&E has been moving towards in-sourcing work related to locate-and-mark activities. In 2024, SDG&E responded to over 210,000 locate and mark ticket requests. By providing a visual indication of the location of underground facilities, the excavator has the necessary information to excavate safely.

The second activity is providing daily damage prevention staff support to operations by interpreting policies, tracking compliance, evaluating tools, equipment, and new technologies, providing refresher training, and tracking and trending locate-and-mark data to proactively identify areas for improvement. This is a critical risk reduction activity that directly supports the field locator personnel in their daily activities and leads to more accurate and timely responses to locate and mark tickets and reduction in damages. This collection of Damage Prevention Activities – Underground Electric ultimately provides the excavator with the necessary information to avoid hitting or damaging electric facilities.

- **C268: Substation Inspection and Maintenance Program:**

SDG&E's Substation Inspection and Maintenance Program promotes safety for SDG&E personnel, SDG&E contractors, and the public by providing a safe operating and construction environment for each substation. Goals of this program include: meeting all of the requirements of GO 174, achieving a level of safety satisfactory to SDG&E's health and safety programs, assuring compliance with all regulatory requirements, and maintaining reliable service for electric customers. This is accomplished through routine inspections at reoccurring cycles and corrective maintenance when issues requiring action are identified. Detailed Substation Inspections are conducted monthly or bimonthly, consisting of thorough visual inspections of individual

equipment condition, attempting to identify any problems such as cracks, leaks, contamination, damage, or nonstandard fluid levels or pressures. Substation Infrared Inspections are conducted annually to identify overheating not visible during typical inspections, which may be indicative of issues or irregularities preceding failure. Corrective Maintenance is performed to repair or otherwise address all issues identified during inspections.

- **C269: Distribution Circuit Reliability:**

This program helps mitigate the EII Risk by expanding the distribution SCADA-switching infrastructure and/or removing reliability deficiencies on a distribution circuit. This program allows for the addition of the equipment necessary and/or the re-arrangement of circuit(s) to improve service reliability of electric customers and maintain reliability standards. Electric service reliability will deteriorate in the absence of comprehensive remedial solutions offered by these projects and consistent review of distribution circuits.

- **C270: SCADA Capacitors:**

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

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

This program focuses on construction outside the HFTD. SDG&E expects that system faults associated with capacitor failures would decrease over time as a result of this program.

- **C551: Prune and Removal (Clearance):**

Tree pruning and removal is the activity of cutting vegetative material (branches, limbs, trunk) for the purpose of maintaining safe, reliable, and compliant clearance between trees and overhead electrical conductors. The Tree Pruning and Removal Activity follows American

National Standards Institute (ANSI) A300 and International Society of Arboricultural (ISA) best management practices. Clearances established at time-of-pruning are determined by multiple factors including species, growth rate, minimum required clearance, wind sway, line sag, proper pruning practices, and tree health. Clearances established at time-of-pruning must be sufficient to provide safety and compliance for at least one annual cycle.

- **C554: Detailed Inspections:**

Detailed Inspections are performed annually throughout the HFTD and consist of a Level 2 inspection. A Level 2 inspection is a 360-degree visual assessment of trees located within the utility strike zone evaluating the crown, trunk, canopy, and above-ground roots for hazards to the overhead electric facilities. Trees in the utility strike zone are assessed for tree growth and hazard potential. The utility strike zone is defined as the area where trees are tall enough to impact the overhead facilities. Detailed inspections are conducted concurrently for distribution and transmission conductors where they are collocated within the utility corridor. Detailed inspections determine whether vegetation will encroach the required minimum clearance distance or otherwise impact the lines within the annual cycle.

Detailed Inspections occur annually based on a Master Schedule, which remains static year to year. Detailed Inspections may be performed by either ISA-Certified or non-ISA Certified Arborists. During inspection activity, the electronic records for inventory trees are updated.

- **C578: QA/QC of Veg Management:**

Quality assurance audits of vegetation management activities are performed to measure work quality, contractual adherence, compliance with regulations and standards, and data accuracy. A third-party contractor performs the quality assurance audits of vegetation management activities. QA/QC of Vegetation Management audits, Detailed Inspections, Pruning and Removal, Pole Clearing activities. Due to the variety of QA/QC tasks completed, it was infeasible to develop a single unit of measure for this control.

B. Changes from 2024 Controls

SDG&E plans to make the following changes through the 2025-2031 period. These changes are reflective of programs that are discontinued, have adjusted scope, or have moved RAMP chapters.

SDG&E plans to discontinue the control previously named “Field SCADA RTU Replacement.” The Field SCADA RTU Replacement Project is anticipated to end prior to the RAMP period starting in 2028. With fewer than six PME switches remaining as potential upgrade

candidates, the project is expected to be completed by 2026, ensuring all necessary upgrades are addressed before the RAMP period begins.[21]

SDG&E has combined the Proactive and Reactive controls for Live Front to Dead Front Conversions into a single control now named "C208 Replacement of Live Front Equipment." Any conversion of live front to dead front equipment will be prioritized based on the reliability impact of each location. "Reactive" work would not be permitted when a comparable location offers greater reliability benefit and could be converted instead.

SDG&E has reduced the number of GO165 controls from three to two. The new controls are C212 GO165 Corrective Maintenance Program Underground and C251 GO165 Corrective Maintenance Program Overhead. These controls replaced "GO165 Corrective Maintenance Program Underground", "GO165 Manhole Vault Restoration Program", and "GO165 Pole Replacement Reinforcement". Since "GO165 Pole Replacement Reinforcement" focused on overhead issues it was just renamed to C251 GO165 Corrective Maintenance Program Overhead. "GO165 Corrective Maintenance Program Underground" and "GO165 Manhole Vault Restoration Program" focused on underground so the controls were combined into C212 GO165 Corrective Maintenance Program Underground.

Control C215 Electric Public Safety Communications was previously captured in the Customer & Public Safety chapter and has been added to the EII chapter to align with the Drivers and Consequences presented in this chapter.

Control C267 Damage Prevention Activities Electric Underground was previously captured in the Excavation Damage (Dig-In) on the Gas System RAMP chapter and has been added to the EII chapter to align with the Drivers and Consequences presented in this chapter.

Control C551 Prune & Removal (clearance), C554 Detailed Inspections, and C578 QA/QC of Veg Management were previously captured as a single control (C6 Vegetation Management) in the EII chapter and has been split into three separate controls to better align with the specific activities that take place under the vegetation management umbrella.

C. Mitigation Programs

SDG&E intends to implement the following new mitigation program:

[21] SDG&E is not funding this project past 2024.

- **M1: Transformer Load Monitoring Driven Transformer Replacement:**

To address the discrepancies and data gaps in our Transformer Load Monitoring (TLM) data, SDG&E has included in this RAMP Report a program aimed at enhancing the reliability of transformer utilization assessments. This initiative will focus on closing existing TLM data gaps, identifying transformers at high risk of overload during major heat events, and proactively replacing or upsizing these transformers. By implementing this program, we aim to mitigate the risk of significant outages and improve our response capabilities, especially in light of current challenges in the electrical equipment supply chain.[22]

D. Climate Change Adaptation

Pursuant to Commission decisions[23] in the Climate Adaptation OIR (R.18-04-019), SDG&E performed a Climate Adaptation Vulnerability Assessment (CAVA) focused on years 2030, 2050, and 2070, with the aim of identifying asset and operational vulnerabilities to climate hazards across the SDG&E system. SDG&E recognizes the need to address climate vulnerabilities to promote safety and reliability of its services and mitigate the increasing climate-related hazards through innovative and community-centric approaches. Some of the climate hazards that will have short- and long-term ramifications in the San Diego region include extreme temperatures, wildfire, inland flooding, coastal flooding and erosion, and landslides. Climate change is recognized as a factor that can drive, trigger, or exacerbate multiple RAMP risks. Implementing climate change adaptation measures and integrating climate vulnerability considerations into RAMP controls and mitigations can enhance system infrastructure longevity and reduce the severity of long-term negative climate impacts. The controls and mitigations described in further detail in this chapter, as shown below, align with the goal of increasing SDG&E's physical and operational resilience to the increasing frequency and intensity of climate hazards. Additional information on the CAVA and a list of climate-relevant controls and mitigations included in RAMP, are provided in Chapter RAMP-5: Climate Change Adaptation.

Table 5: Electric Infrastructure Integrity Risk
Controls and Mitigations that Align with Increasing Resilience to Climate Hazards

Relevant ID	Relevant Control/Mitigation	Potential Climate Hazard(s)
C202	Underground Cable Replacement Program (Proactive)	Wildfires

[22] SDG&E does not present forecasted costs for this mitigation program as it is still identifying the full scope of work needed to accomplish the mitigation and evaluating various solutions.

[23] D.19-10-054; D.20-08-046.

Relevant ID	Relevant Control/Mitigation	Potential Climate Hazard(s)
C250	Substation Reliability for Distribution Components	Extreme Temperatures, Inland Flooding, and Coastal Flooding
C253	Restoration of Service	Extreme Temperatures, Wildfires, Inland Flooding, and Coastal Flooding
C254	Underground Cable Replacement Program - Reactive	Wildfires
C262	Distribution Substation SCADA Expansion	Wildfires
C263	Wireless Fault Indicator	Extreme Temperatures
C269	Distribution Circuit Reliability	Extreme Temperatures
C270	SCADA Capacitors	Wildfires
C551	Prune & Removal (Clearance)	Wildfires
C554	Detailed Inspections	Wildfires
C578	QA/QC of Veg Management	Wildfires
M1	Transformer Load Monitoring Driven Transformer Replacement	Extreme Temperatures

E. Foundational Programs

Foundational Programs are "[i]nitiatives that support or enable two or more mitigation programs or two or more Risks but do not directly reduce the Consequences or reduce the Likelihood of safety Risk Events."[24] The EII Risk chapter determined that there are no foundational programs. C551, C554, and C578 are all vegetation management programs and work together as a whole with the main activity of prune and removal (C551) mitigating the risk. All other controls have the associated costs and activities as part of the control itself.

F. Estimates of Costs, Units, and Cost-Benefit Ratios (CBRs)

The tables in this section provide a quantitative summary of the risk control and mitigation plan for EII Risk, including the associated costs, units, and CBRs. Additional information by Tranche is provided in workpapers. The costs shown are estimated using assumptions provided by SMEs and available data. In compliance with the Phase 3 Decision,[25] for each enterprise risk, SDG&E uses actual results and industry data and when that is not available, supplements the data with SME input. Additional details regarding the data and expertise relied upon in developing these estimates is provided in Attachment B.

[24] D.24-05-064, Appendix A at A-4.

[25] D.24-05-064, RDF Row 10.

Table 6: Electric Infrastructure Integrity Risk
Risk Control and Mitigation Plan – Recorded and Forecast Costs Summary
(Direct, in 2024 $ thousands)

Control/Mitigation		Adjusted Recorded		Estimated			
ID	**Name**	**2024 Capital**	**2024 O&M**	**2028 O&M**	**2025-2028 Capital**	**PTY Capital**	**PTY O&M**
C201	Proactive Overhead Conductor Program	291	0	0	8,061	24,183	0
C202	Underground Cable Replacement Program (Proactive)	3,308	0	0	5,219	15,657	0
C206	Tee Modernization Program	4,922	0	0	2,419	7,257	0
C208	Replacement of Live Front Equipment	64	0	0	1,878	5,634	0
C210	DOE Switch Replacement	2,325	0	0	4,726	14,178	0
C212	**GO165 Corrective Maintenance Program Underground**	25,917	0	0	88,848	66,636	0
C215	Electric Public Safety Communications	0	395	1,363	0	0	4,089
C226	Distribution Substation Proactive Asset Program	1,731	0	0	2,500	9,146	0
C234	4 kV Reliability Program	223	0	0	456	1,368	0
C236	Distribution Overhead Switch Replacement Program	352	0	0	679	2,037	0
C240	**Avian Protection Program**	14	0	0	21	63	0
C248	Strategic Pole Replacement Program	13	0	0	1,200	3,600	0
C250	Substation Reliability for Distribution Components	3,282	0	0	24,421	37,036	0
C251	**GO165 Corrective Maintenance Program OH**	20,003	0	0	85,612	64,209	0
C252	Management of Overhead Distribution Service (Non-CMP)	10,966	0	0	44,672	33,504	0
C253	Restoration of Service	10,353	0	0	40,116	30,087	0
C254	Underground Cable Replacement Program - Reactive	7,217	0	0	28,468	21,351	0
C256	Management of	6,220	0	0	18,852	14,139	0

Control/Mitigation		Adjusted Recorded		Estimated			
ID	**Name**	**2024 Capital**	**2024 O&M**	**2028 O&M**	**2025-2028 Capital**	**PTY Capital**	**PTY O&M**
	Underground Distribution Service (Non-CMP)						
C257	Distribution Substation Responsive Asset Replacement	1,573	0	0	8,009	10,810	0
C258	Emergency Equipment Purchase	961	0	0	8,430	4,000	0
C261	Power Quality Monitor Deployment and Replacement	285	0	0	2,096	3,622	0
C262	Distribution Substation SCADA Expansion	413	0	0	2,772	3,132	0
C263	Wireless Fault Indicator	0	0	0	160	1,122	0
C267	**Damage Prevention Activities Electric Underground**	0	4,729	5,167	0	0	17,007
C268	**Substation Inspection and Maintenance Program**	0	1,656	2,180	0	0	6,540
C269	Distribution Circuit Reliability	1,729	0	0	1,959	5,877	0
C270	SCADA Capacitors	225	0	0	1,174	3,522	0
C551	**Prune and Removal (Clearance)**	0	30,337	31,423	0	0	101,275
C554	**Detailed Inspections**	0	3,724	4,859	0	0	15,742
C578	**QA/QC of Veg Mgmt**	0	3,206	3,424	0	0	10,778

Bold *indicates a mandated program.*

Table 7: Electric Infrastructure Integrity Risk
Risk Control & Mitigation Plan – Units Summary

Control/Mitigation		Adjusted Recorded Units			Estimated Units			
ID	**Name**	**Units of Measure**	**2024 Capita**	**2024 O&M**	**2028 O&M**	**2025-2028 Capital**	**PTY Capital**	**PTY O&M**
C201	Proactive Overhead Conductor Program	Miles	0	0	0	7	21	0
C202	Underground Cable Replacement Program (Proactive)	Miles	19	0	0	28	84	0
C206	Tee Modernization Program	Terminators	253	0	0	119	357	0

Control/Mitigation		Adjusted Recorded Units			Estimated Units			
ID	**Name**	**Units of Measure**	**2024 Capita**	**2024 O&M**	**2028 O&M**	**2025-2028 Capital**	**PTY Capital**	**PTY O&M**
C208	Replacement of Live Front Equipment	Terminators	0	0	0	34	102	0
C210	DOE Switch Replacement	Switches Replaced	16	0	0	20	60	0
C212	**GO165 Corrective Maintenance Program Underground**	Jobs Completed	1,867	0	0	6,276	4,707	0
C215	Electric Public Safety Communications	No Feasible	0	0	0	0	0	0
C226	Distribution Substation Proactive Asset Program	No Feasible	0	0	0	0	0	0
C234	4 kV Reliability Program	Miles	0	0	0	1	3	0
C236	Distribution Overhead Switch Replacement Program	Switches Replaced	4	0	0	19	57	0
C240	**Avian Protection Program**	Poles	0	0	0	10	30	0
C248	Strategic Pole Replacement Program	Poles Replaced	0	0	0	40	120	0
C250	Substation Reliability for Distribution Components	No Feasible	0	0	0	0	0	0
C251	**GO165 Corrective Maintenance Program OH**	Poles	1,391	0	0	5,624	4,218	0
C252	Management of Overhead Distribution Service (Non-CMP)	Jobs Completed	101	0	0	2,912	2,184	0
C253	Restoration of Service	Jobs Completed	776	0	0	8,300	6,225	0
C254	Underground Cable Replacement Program - Reactive	Jobs Completed	277	0	0	2,420	1,815	0
C256	Management of	Jobs	265	0	0	2,740	2,055	0

Control/Mitigation		Adjusted Recorded Units			Estimated Units			
ID	**Name**	**Units of Measure**	**2024 Capita**	**2024 O&M**	**2028 O&M**	**2025-2028 Capital**	**PTY Capital**	**PTY O&M**
	Underground Distribution Service (Non-CMP)	Completed						
C257	Distribution Substation Responsive Asset Replacement	No Feasible	0	0	0	0	0	0
C258	Emergency Equipment Purchase	No Feasible	0	0	0	0	0	0
C261	Power Quality Monitor Deployment and Replacement	Nodes	7	0	0	98	216	0
C262	Distribution Substation SCADA Expansion	Other	0	0	0	11	18	0
C263	Wireless Fault Indicator	Wireless Faults	0	0	0	75	525	0
C267	**Damage Prevention Activities Electric Underground**	Tickets	0	193,436	232,583	0	0	765,641
C268	**Substation Inspection and Maintenance Program**	Inspections	0	0	2,051	0	0	6,153
C269	Distribution Circuit Reliability	Switches	3	0	0	14	42	0
C270	SCADA Capacitors	Capacitors	0	0	0	14	42	0
C551	**Prune and Removal (Clearance)**	Trees Trimmed	0	90,885	91,336	0	0	274,008
C554	**Detailed Inspections**	Trees Inspected	0	261,975	255,000	0	0	765,000
C578	**QA/QC of Veg Mgmt**	No Feasible	0	0	0	0	0	0

***Bold** indicates a mandated program.*

In the table below, CBRs are presented in summary at the mitigation or control level for the TY 2028 GRC cycle. CBRs are calculated based on scaled, expected values, unless otherwise

noted, and are calculated for each of the three required discount rates[26] in each year of the GRC cycle and for the Post-Test Years in aggregate (2029-2031). Costs and CBRs for each year of the GRC cycle and the aggregated years are provided in workpapers.

Table 8: Electric Infrastructure Integrity Risk
Cost Benefit Ratio Results Summary (2028-2031)
(Direct, in 2024 $ millions)

ID	Control/Mitigation Name	Capital (2028-2031)	O&M (2028-2031)	CBR (Societal)	CBR (Hybrid)	CBR (WACC)
C201	Proactive Overhead Conductor Program	$32.25	$0	0.40	0.16	0.12
C202	Underground Cable Replacement Program (Proactive)	$20.88	$0	16.82	7.89	6.08
C206	Tee Modernization Program	$9.68	$0	8.59	3.36	2.52
C208	Replacement of Live Front Equipment	$7.51	$0	0.14	0.06	0.04
C210	DOE Switch Replacement	$18.90	$0	5.83	2.78	2.10
C212	**GO165 Corrective Maintenance Program – Underground**	**$88.85**	**$0**	**7.83**	**3.64**	**2.83**
C215	Electric Public Safety Communications	$0	$5.45	0.40	0.41	0.38
C226	Distribution Substation Proactive Asset Program	$11.65	$0	1.18	0.51	0.38
C234	4 kV Reliability Program	$1.82	$0	5.26	2.25	1.70
C236	Distribution Overhead Switch Replacement Program	$2.71	$0	113.84	46.55	34.37
C240	**Avian Protection Program**	$0.09	$0	0.98	0.39	0.30
C248	Strategic Pole Replacement Program	$4.80	$0	0.52	0.24	0.18
C250	Substation Reliability for Distribution Components	$48.11	$0	0.30	0.13	0.10
C251	**GO165 Corrective Maintenance Program**	**$85.61**	**$0**	**3.02**	**1.12**	**0.94**

[26] *See* Chapter RAMP-3 for definitions of discount rates, as ordered in the Phase 3 Decision.

ID	Control/Mitigation Name	Capital (2028-2031)	O&M (2028-2031)	CBR (Societal)	CBR (Hybrid)	CBR (WACC)
	-Overhead					
C261	Power Quality Monitor Deployment and Replacement	$5.09	$0	182.85	129.21	108.78
C262	Distribution Substation SCADA Expansion	$4.18	$0	50.95	36.69	30.48
C263	Wireless Fault Indicator	$1.28	$0	136.22	98.61	81.47
C267	**Damage Prevention Activities Underground**	$0	$22.17	1.42	1.46	1.35
C268	**Substation Inspection and Maintenance**	$0	$8.72	2.27	1.93	2.16
C269	Distribution Circuit Reliability	$7.84	$0	86.15	41.06	31.12
C270	SCADA Capacitors	$4.70	$0	0.36	0.30	0.26
C551 C554 C578	**Prune & Removal Detailed Inspections QA/QC of Veg Mngmt**	**$0**	**$167.51**	**0.06**	**0.07**	**0.06**

Bold *indicates a mandated program*

Tranche-level CBRs by year and in aggregate for each mitigation are provided in workpapers.

V. ALTERNATIVE MITIGATIONS

Pursuant to D.14-12-025, D.16-08-018, and D.18-12-014,[27] SDG&E considered two alternatives to the risk mitigation plan for the EII Risk. Typically, analysis of alternatives occurs when implementing activities to obtain the best result or product for the cost. The alternatives analysis for this plan considers changes in risk reduction, cost, reasonableness, current conditions, modifications to the plan and constraints, such as budget and resources.

Table 9: Electric Infrastructure Integrity Risk
Alternative Mitigation Plan –Forecasted Costs Summary
(Direct, in 2024 $ millions)

ID	Alternative Mitigation Name	Forecast Costs			
		2025-2028 Capital	PTY Capital	2025-2028 O&M	PTY O&M
A234	4 kV to 12 kV Conversion Program	$3.3	$9.11	0	0
A210	DVC Switch Program	$0.035	$0.071	0	0

[27] D.18-12-014 at 33-35.

Table 10: Electric Infrastructure Integrity Risk
Alternative Mitigation Cost Benefit Ratio Results Summary
(Direct, in 2024 $ millions)

ID	Alternative Mitigation Name	Capital TY 2028	O&M TY 2028	CBR (Societal)	CBR (Hybrid)	CBR (WACC)
A234	4 kV to 12 kV Conversion Program	$3.1M	0	1.08	0.44	0.34
A210	DVC Switch Program	$0.035	0	207.94	83.69	62.98

A. A234: 4 kV to 12 kV Conversion Program

Control C234 "4 kV Reliability Program" mitigation described above focuses on eliminating the riskiest infrastructure, *i.e.*, 4 kV package substations, and is more cost-effective than the alternative at addressing the most critical reliability and safety risks without the extensive resource requirements of a full circuit upgrade.

The alternative approach described here would remove the 4 kV distribution system from service and replace it and upgrade to modern 12 kV standards, completely rebuilding the circuits. The scope of the program includes both the removal the 4 kV package unit substations and additional upgrades of existing 4 kV assets to 12 kV. These additional upgrades include replacing all service transformers and small and aging wire. While this method ensures comprehensive modernization of the distribution system, it is more costly and resource intensive.

B. A210: DVC Switch Program

The Distribution Overhead Switch Replacement Program replaces overhead distribution switches that have shown signs of severe or quickly emerging corrosion that may lead to catastrophic switch failure. Overhead switches within high corrosion areas (Contamination District One) have the highest propensity for failure.

The cost-benefit calculation for the Distribution Overhead Switch Replacement Program (C236) is a representative value, based on analysis of planned projects. These projects were identified by SDG&E through an analysis of the "worst-performing" circuits (as measured by outage history). The overhead switches on the identified circuits were both prone to corrosion and, if inoperable, could excessively increase the scope of an outage.

In this alternative, SDG&E considered a program that would replace distribution overhead switches that benefit customers living within the Disadvantaged and Vulnerable Communities

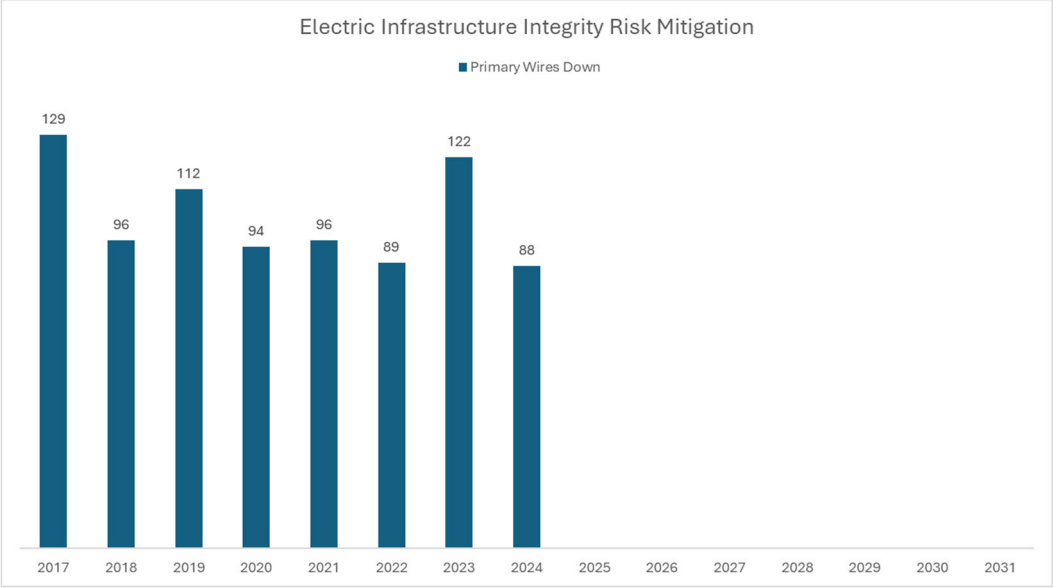
(DVCs) only as opposed to the general service territory to which this control would apply.[28] The limited scope of this alternative program was used a subset of those projects described in the preceding paragraph. While the cost-benefit calculation on a per project basis is higher for this small subset of projects within the DVC, the total risk mitigated through the alternative DVC Switch program is much lower. The increased reduction in total risk mitigated of C236 vs. the Alternative Program (DVCs Only) is attributable to the fact that the safety and outage risk are not bound nor isolated within DVC boundaries. To optimize the amount of risk mitigated, SDG&E would prioritize the replacements based on a review of circuit performance (outage history) and circuit layout (those circuits with limited switching capabilities).

Ultimately, this DVC Switch Program is not included in SDG&E's risk control and mitigation plan for EII Risk because limiting the scope of the program would hamper SDG&E's ability to thoroughly address the safety and outage risks due to inoperability of overhead switches.

VI. HISTORICAL GRAPHICS

As directed by the Commission in the Phase 2 Decision, this section illustrates the accomplishments in safety work and the progress in mitigating safety risks over the two immediately preceding RAMP cycles. A bar chart graphic is employed to depict historical progress. This graphic uses a key metric that aligns with Company safety goals to illustrate trends in historical progress and identify remaining tasks necessary to continue mitigating risks.

Figure 2
Electric Infrastructure Integrity Risk: Safety Progress 2016-2024



[28] *See* Chapter RAMP-Appendix 4: Environmental Social Justice (ESJ) Pilot Study.

The historical safety work activities completed using the above metric from 2016-2024 include:

- SDG&E continuously invests in public safety communications, including the "Don't touch downed wires. Call 911." campaign and the annual safety training for firefighters and police.
- SDG&E publishes ESP-007, ensuring systematic review for every wire down event.
- SDG&E established the Electric Risk Analysis Review Committee, requiring investigations to determine the root cause of a wire down event, as well as identify system improvements or work methods changes needed to proactively reduce the risk of wire downs.
- 2018 SDG&E revises the Design Manual to encourage the elimination of light duty wire, especially in high wind areas.
- 2020 SDG&E proactively replaces 2 miles of Conductor as part of 4 kV Modernization.
- 2021 SDG&E proactively replaces 8 miles of OH Conductor via the OPS Budget.
- 2021 SDG&E discontinues purchasing single-strand #6 Copper Wire and moves in-service equipment to Field Maintenance Only.
- 2021 SDG&E proactively replaces 7 miles of Conductor as part of 4 kV Modernization.
- 2022 SDG&E enhances the existing Equipment Failure Report Process, ensuring hands-on inspection of failed components by qualified personnel.
- 2022 SDG&E proactively replaces 7 miles of OH Conductor via the OPS Budget.
- 2023 SDG&E proactively replaces 1 mile of Conductor as part of 4 kV Modernization.
- 2024 SDG&E proactively replaces 4.33 miles of OH Conductor via the OPS Budget.

The safety work that remains to be done for the above metric in 2025-2031 Control and Mitigation Plan includes:

- 2028 SDG&E plans to invest in early fault detection through the power quality program to target failing OH equipment.
- 2028-2030 SDG&E plans to replace 26.76 miles of OH Conductor via the EII Programs.
- 2031-2032 SDG&E plans to replace 17.84 miles of OH Conductor via the EII Programs.

ATTACHMENTS

ATTACHMENT A

CONTROLS AND MITIGATIONS WITH REQUIRED COMPLIANCE DRIVERS

The table below indicates the compliance Drivers that underpin identified controls and mitigations.

ID	Control/Mitigation Name	Compliance Driver
C212	GO165 Corrective Maintenance Program Underground	GO-165
C240	Avian Protection Program	Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, California Fish and Game Code
C251	GO165 Corrective Maintenance Program Overhead	GO-165
C267	Damage Prevention Activities Electric Underground	California Code of Regulations Section 4216, GO-128
C268	Substation Inspection and Maintenance Program	GO-174
C551	Prune and Removal (Clearance)	GO-95, GO-165, Public Resources Code Section 4293, NERC FAC-003, OSHA
C554	Detailed Inspections	GO-95, GO-165, Public Resources Code Section 4293, NERC FAC-003, OSHA
C578	QA/QC of Veg Management	GO-95, GO-165, Public Resources Code Section 4293, NERC FAC-003, OSHA

ATTACHMENT B

ELECTRIC INFRASTRUCTURE INTEGRITY - REFERENCE MATERIAL FOR QUANTITATIVE ANALYSES

The Phase 3 Decision RDF Row 10 and Row 29 directs each utility to identify Potential Consequences of a risk event using available and appropriate data.[29] Appropriate data may include Company specific data or industry data supplemented by the judgment of subject matter experts. Provided below is a listing of the inputs utilized as part of this assessment and a description of the data.

Risk Data	Source Type	Source Information
Pre-Mitigation Risk Value: LoRE	Internal Data	Source Name: SAIDIDAT Description: 10-year outage history provided expansive representation of nearly all failure modes in electric distribution.
Post-Mitigation Risk Value: LoRE	Internal, External Data, and Internal SME	Description: Previous installations for similar technologies was utilized for effectiveness estimations. External data was leveraged for newer technologies with limited internal data supplanted with SME input with territory specific expertise.
Pre-Mitigation Risk Value: CoRE, Safety	External Data, SIF Data	Department: Department of Transportation (DOT) Description: Value per Statistical Life (VSL) value is derived by replicating DOT's methodology. VSL is leveraged to estimate Safety Consequence based on the severity of injury.
Pre-Mitigation Risk Value:	Internal, External Data	Source Name: SAIDIDAT and

[29] D.24-05-064, RDF Row 10 and Row 29.

Risk Data	Source Type	Source Information
CoRE, Reliability		Lawrence Berkeley National Laboratory (LBNL) Description: 10-year outage history provided expansive representation of nearly all failure modes in electric distribution. LBNL estimates monetized value of CMI.
Pre-Mitigation Risk value: CoRE, Financial	External, Internal Data	Agency: CDC Source Name: Statistics Query and Reporting System, Internal Cost of Restoration Data Description: CDC data used to estimate the financial impacts of safety events. Internal Cost of restoration data is used to estimate financial costs to restore service based on fault type.

ATTACHMENT C

ELECTRIC INFRASTRUCTURE INTEGRITY - SUMMARY OF ELEMENTS OF BOW TIE

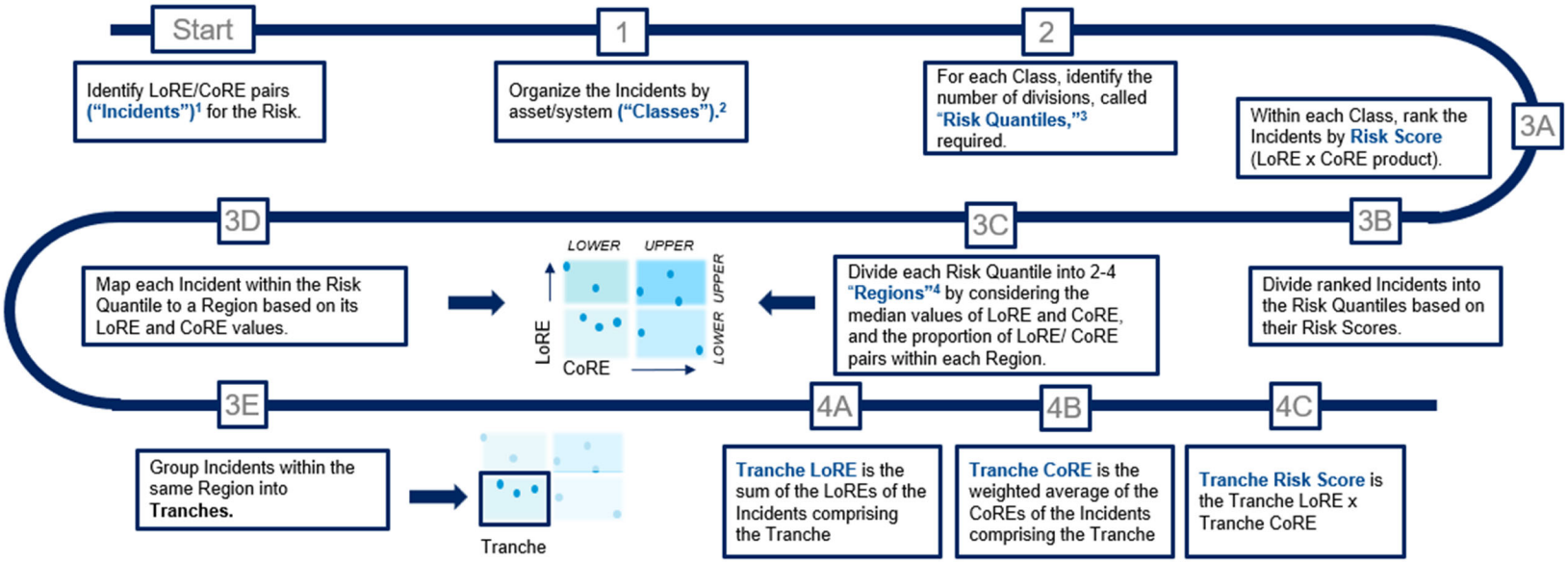
SUMMARY OF ELEMENTS OF BOW TIE			
ID	**Control/Mitigation Name**	**Drivers Addressed**	**Consequences Addressed**
C201	Proactive Overhead Conductor Program	1,2,3,6,7	1,2,6,7,8
C202	Underground Cable Replacement Program (Proactive)	1,2,3,7	2,6
C206	Tee Modernization Program	1,2,3,7	2,6
C208	Replacement of Live Front Equipment	1,6	1,2,6
C210	DOE Switch Replacement	1,2,3,4	1,2,6
C212	GO165 Corrective Maintenance Program Underground	1,2,3,5,7	1,2,3,4
C215	Electric Public Safety Communications	6	1,2,5,6
C226	Distribution Substation Proactive Asset Program	1,2,3,4,5	2
C234	4 kV Reliability Program	1,2,3,4,5,6,7	1,2,6,7
C236	Distribution Overhead Switch Replacement Program	1,2,3,4,7	1,2,6
C240	Avian Protection Program	6	2,3,4,6,7
C248	Strategic Pole Replacement Program	1,3,6,7	1,2,6,8
C250	Substation Reliability for Distribution Components	1,2,3,4,5	2
C251	GO165 Corrective Maintenance Program Overhead	1,2,3,5,6,7	1,2,3,4,5,6
C252	Management of Overhead Distribution Service (Non-CMP)	1,2,3,5,6,7	1,2
C253	Restoration of Service	1,2,3,4,5,7	2,3,6
C254	Underground Cable Replacement Program - Reactive	1,2,3,7	2,6
C256	Management of Underground Distribution Service (Non-CMP)	1,2,3,5,7	1,2
C257	Distribution Substation	1,2,3,4,5	2

SUMMARY OF ELEMENTS OF BOW TIE			
ID	**Control/Mitigation Name**	**Drivers Addressed**	**Consequences Addressed**
	Responsive Asset Replacement		
C258	Emergency Equipment Purchase	1,2,3,4,5	2,6
C261	Power Quality Monitor Deployment and Replacement	1,2,3,4,5,7	1,2
C262	Distribution Substation SCADA Expansion	5	2
C263	Wireless Fault Indicator	5	2
C267	Damage Prevention Activities Electric Underground	6	1,2,5,6
C268	Substation Inspection and Maintenance Program	1,2,3,4,5	1,2,3
C269	Distribution Circuit Reliability	1,2	2
C270	SCADA Capacitors	1,4,5	1,2,7,8
C551	Prune & Removal (Clearance)	3,4,7	1,3,5,6,7,8
C554	Detailed Inspections	See C551	See C551
C578	QA/QC of Veg Management	See C551	See C551
M1	Transformer Load Monitoring Driven Transformer Replacement	1,2,3,4,5,7	1,2,5,6,7

ATTACHMENT D

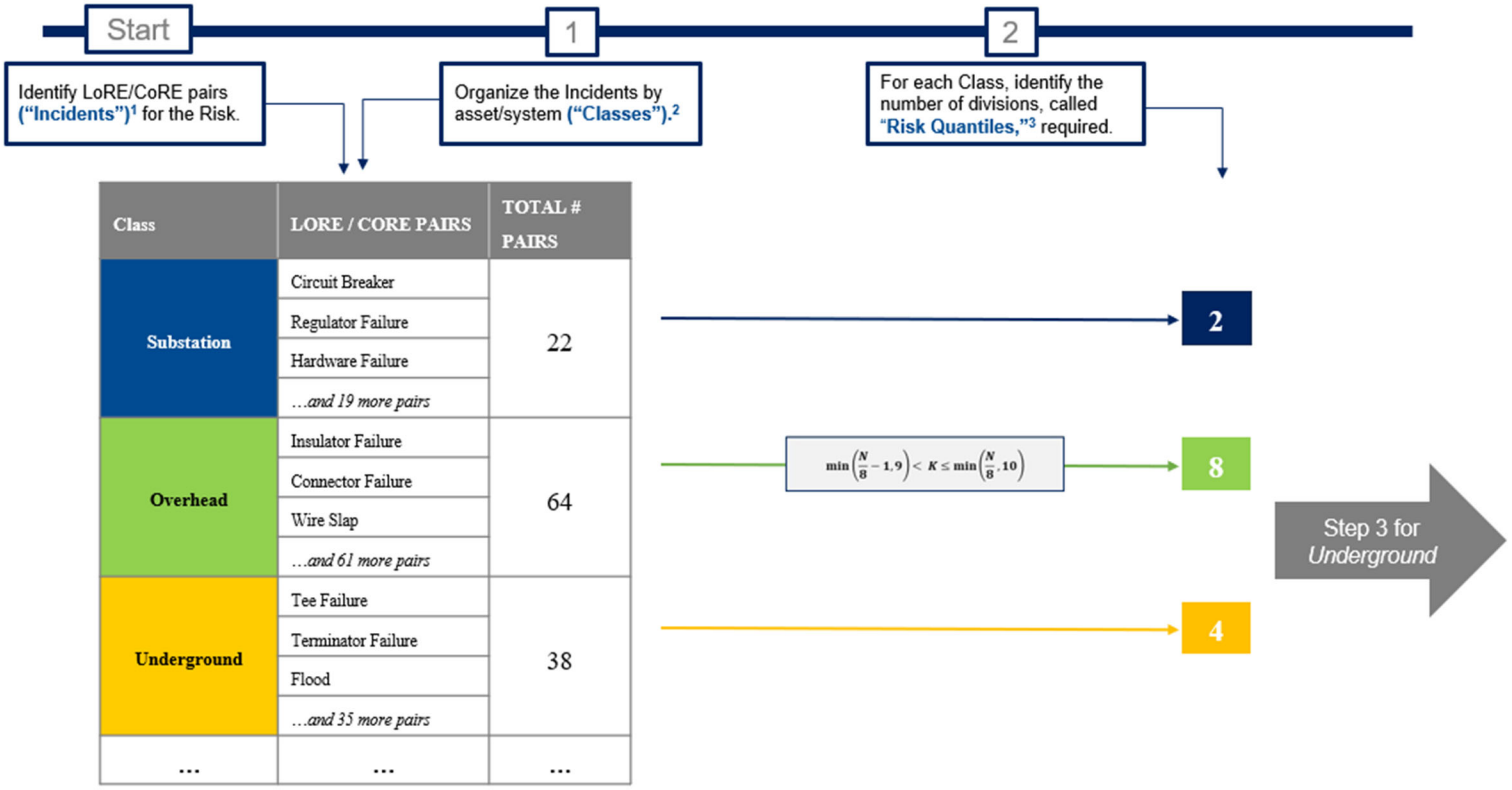
ELECTRIC INFRASTRUCTURE INTEGRITY - APPLICATION OF TRANCHING METHODOLOGY

A sample walkthrough of the Homogeneous Tranching Methodology (HTM) as outlined in Volume 1, Chapter RAMP - 3: Risk Quantification Framework is provided.



NOTES

[1]*For example, **Incidents (or "Risk Incidents")** for Electric Infrastructure Integrity (EII) are generally fault types.*
[2]*For example, **Classes (or "Asset Classes")** for EII include Overhead Lines/Components, Underground Lines/Components, and Substations.*
[3]***Quantiles** are divisions of equal numbers of incidents (quartiles have 4 divisions, quintiles have 5, etc.) The number of incidents dictates the number of quantiles needed.*
[4]*The four **Regions** are: 1. Lower LoRE-Lower CoRE (LL-LC), 2. Lower LoRE-Upper CoRE (LL-UC), 3. Upper LoRE-Lower CoRE (UL-LC), and 4. Upper LoRE-Upper CoRE (UL-UC).*


Start
1
2
Identify LoRE/CoRE pairs ("Incidents")[1] for the Risk.
Organize the Incidents by asset/system ("Classes").[2]
For each Class, identify the number of divisions, called "Risk Quantiles,"[3] required.
Class
LORE / CORE PAIRS
TOTAL # PAIRS
Substation
Circuit Breaker
Regulator Failure
Hardware Failure
…and 19 more pairs
22
Overhead
Insulator Failure
Connector Failure
Wire Slap
…and 61 more pairs
64
Underground
Tee Failure
Terminator Failure
Flood
…and 35 more pairs
38
…
…
…
2
$\min\left(\frac{N}{8}-1,9\right) < K \leq \min\left(\frac{N}{8},10\right)$
8
4
Step 3 for Underground

Within each Class, rank the Incidents by **Risk Score** (LoRE x CoRE product). 3A

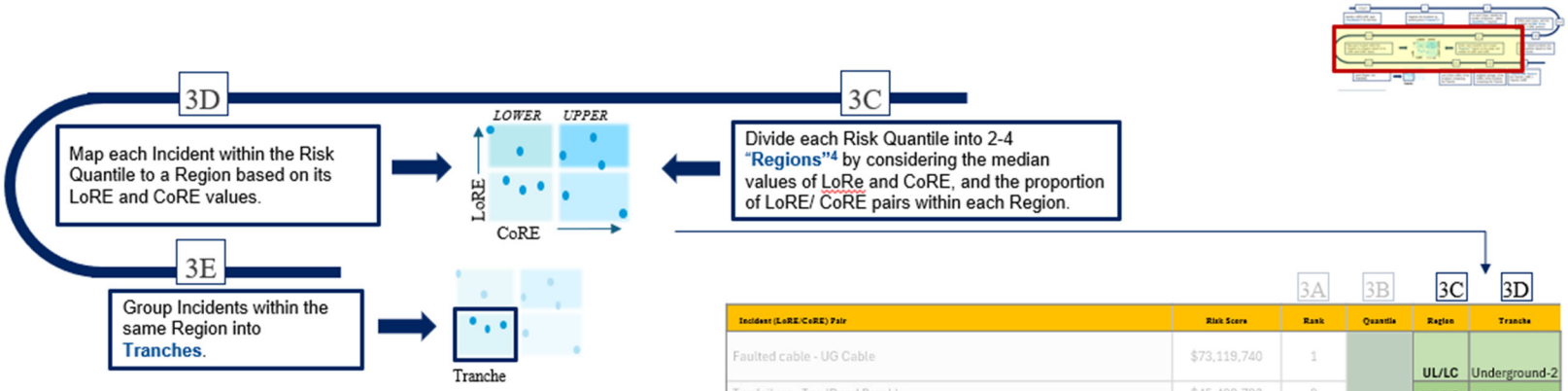
3B

Divide ranked Incidents into the Risk Quantiles based on their Risk Scores.

4

From Step 2 for *Underground*

		3A	3B
Incident (LoRE/CoRE) Pair	**Risk Score**	**Rank**	**Quantile**
Faulted cable - UG Cable	$73,119,740	1	#1
Tee failure - Tee (Dead Break)	$45,463,730	2	
Tee failure - T-Connector	$24,613,000	3	
Heavy equipment contact/dig-in - UG Cable	$5,411,415	4	
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Bushing	$3,041,075	5	
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Connector	$2,182,681	6	
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - LBE	$2,064,993	7	
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Cable Rack	$1,749,512	8	
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - SPLICE	$1,524,344	9	
Tee failure - Other	$1,184,403	10	
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Elbow	$976,652	11	#2
SDG&E contractor heavy equipment contact/dig-in - UG Cable	$948,685	12	
SDG&E crew heavy equipment contact/dig-in - UG Cable	$789,001	13	
Pothead failure - UG Cable	$673,989	14	
Undetermined (severe weather) - UG Cable	$630,126	15	
Flashover due to contamination/overload/tracking - UG Cable	$544,072	16	
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Tee (Dead Break)	$517,002	17	
Terminator failure/contact - TERMINATOR	$458,565	18	
Go-back (additional outage taken to complete repairs) - UG Cable	$360,286	19	



		3A	3B	3C	3D
Incident (LoRE/CoRE) Pair	Risk Score	Rank	Quantile	Region	Tranche
Faulted cable - UG Cable	$73,119,740	1	#1	UL/LC	Underground-2
Tee failure - Tee (Dead Break)	$45,463,730	2		UL/UC	Underground-1
Tee failure - T-Connector	$24,613,000	3		UL/UC	Underground-1
Heavy equipment contact/dig-in - UG Cable	$5,411,415	4		UL/UC	Underground-1
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Bushing	$3,041,075	5		LL/UC	Underground-4
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Connector	$2,182,681	6		LL/LC	Underground-3
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - LBE	$2,064,993	7		UL/LC	Underground-2
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Cable Rack	$1,749,512	8		LL/LC	Underground-3
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - SPLICE	$1,524,344	9		LL/LC	Underground-3
Tee failure - Other	$1,184,403	10		LL/UC	Underground-4
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Elbow	$976,652	11	#2	LL/UC	Underground-5
SDG&E contractor heavy equipment contact/dig-in - UG Cable	$948,685	12		UL/LC	Underground-6
SDG&E crew heavy equipment contact/dig-in - UG Cable	$789,001	13		UL/LC	Underground-6
Pothead failure - UG Cable	$673,989	14		LL/UC	Underground-5
Undetermined (severe weather) - UG Cable	$630,126	15		LL/UC	Underground-5
Flashover due to contamination/overload/tracking - UG Cable	$544,072	16		LL/UC	Underground-5
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Tee (Dead Break)	$517,002	17		LL/UC	Underground-5
Terminator failure/contact - TERMINATOR	$458,565	18		UL/LC	Underground-6
Go-back (additional outage taken to complete repairs) - UG Cable	$360,286	19		UL/LC	Underground-6

4A — **Tranche LoRE** is the sum of the LoREs of the Incidents comprising the Tranche

4B — **Tranche CoRE** is the weighted average of the CoREs of the Incidents comprising the Tranche

4C — **Tranche Risk Score** is the Tranche LoRE x Tranche CoRE

Incident (LoRE/CoRE) Pair	Quantile	Tranche	4A Tranche LoRE	4B Tranche CoRE	4C Tranche Risk Score
Tee failure - Tee (Dead Break)	#1	Underground-1	111.2	$678,850	$75,488,146
Tee failure - T-Connector					
Heavy equipment contact/dig-in - UG Cable					
Faulted cable - UG Cable		Underground-2	374.2	$200,921	$75,184,733
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - LBE					
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Connector		Underground-3	23.6	$231,209	$5,456,536
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Cable Rack					
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - SPLICE					
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Bushing					
Tee failure - Other		Underground-4	4.1	$1,030,604	$4,225,477
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Elbow	#2	Underground-5	4	$835,460	$3,341,841
Pothead failure - UG Cable					
Undetermined (severe weather) - UG Cable					
Flashover due to contamination/overload/tracking - UG Cable					
UG connector failure (splice/rack/tap/shoofly/sleeve/probe/LBE/bushing) - Tee (Dead Break)					
SDG&E contractor heavy equipment contact/dig-in - UG Cable		Underground-6	16.9	$151,274	$2,556,536
SDG&E crew heavy equipment contact/dig-in - UG Cable					
Terminator failure/contact - TERMINATOR					
Go-back (additional outage taken to complete repairs) - UG Cable					