Company:	San Diego Gas & Electric Company (U 902 M)
Proceeding:	2028 General Rate Case
Application:	A.26-06-___
Exhibit:	SDGE-07-Risk

PREPARED DIRECT TESTIMONY OF JONATHAN T. WOLDEMARIAM

(WILDFIRE MITIGATION AND VEGETATION MANAGEMENT: CHAPTER 2 – RISK ANALYTICS)

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

June 2026

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(WILDFIRE MITIGATION AND VEGETATION MANAGEMENT)

I. RISK ANALYTICS

A. Overview

Wildfire outcomes in California show that the largest losses of life, structures, and economic activity are driven by a small number of extreme fires that occur when severe wind, drought, and fuel conditions—factors outside of a utility's control—align. Climate change adds a level of complexity that may increase the frequency and intensity of extreme fire weather conditions. In other words, any consideration of wildfire impacts and risk mitigation must thoughtfully account for tail risk: rare but foreseeable events at the extreme end of a probability distribution. A limited focus on average outcomes that fails to account for these extreme conditions results in ineffective wildfire risk management and hinders of the long-term risk mitigation necessary to promote community safety and resilience, save lives, and allow for continued safe and reliable electric operations.

Aside from the safety impacts of wildfire, the need to consider tail risk is particularly clear when assessing the risks of utility-related catastrophic fire, where, under inverse condemnation and assuming prudent operations, utility ratepayers are financially responsible for damages arising from utility-caused ignitions. Wildfire risk assessment must account for this in assessing the consequences of extreme events, which are largely driven by circumstances outside any utility's control—such as weather and fuel conditions—but for which ratepayers may be held accountable.

Public expectations regarding wildfire accountability are moving in the same direction. Post-fire scrutiny increasingly focus on whether extreme risks were known or reasonably foreseeable, and whether mitigations were commensurate with those risks. The Commission should therefore support a regulatory framework that properly accounts for tail risk to promote safety, reduce community exposure to physical harm and displacement, reduce environmental risk, and reach a balanced mitigation approach that reflects the affordability impacts a catastrophic fire poses to utility customers.

Various industries have adopted similar approaches to mitigation of low-probability but high-risk events with catastrophic consequences. In the aviation field, regulators recognize that reasonable control of tail risk is necessary. For example, engines must be designed to demonstrate that a catastrophic failure is extremely improbable. Operating to the standard of safety that regulators and the public require necessitates that the aviation industry understands the risks and builds, operates, and maintains the system to avoid catastrophic outcomes. The U.S. Aviation industry has been largely successful in these efforts, achieving an extremely low accident and fatality rate. The same approach should be adopted with respect to wildfire risk assessment. Aligning wildfire mitigation investments with this reality is not a departure from California's public safety principles; it is a consistent application of them.

This testimony outlines SDG&E's analytical framework for assessing risks associated with wildfire, Public Safety Power Shutoff (PSPS), and Protective Equipment Device Settings (PEDS), and selecting targeted mitigations that reasonably account for weather, fuel, vegetation, electric assets, and community considerations. Understanding the likelihood of a wildfire caused by utility equipment, including underlying risk drivers and the consequence of an event, is of critical importance to adequately mitigate that risk.

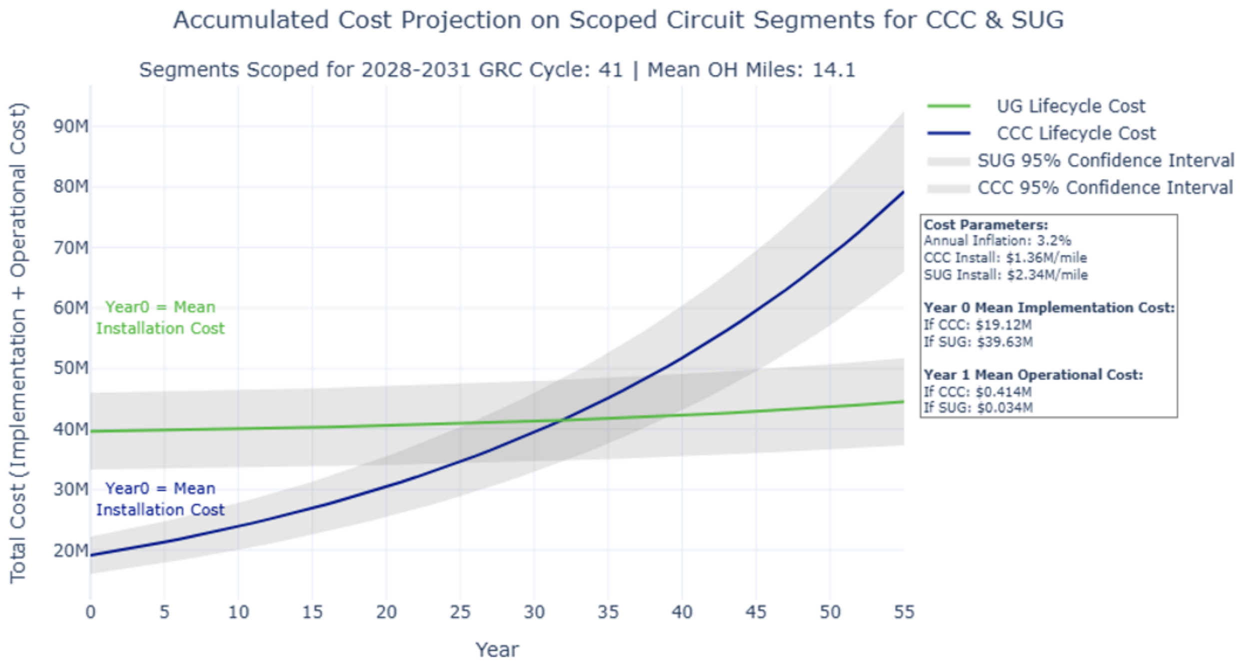
San Diego Gas & Electric's (SDG&E) Enterprise Risk Management Framework (refer to Section I.B) establishes overarching risk management objectives and identifies material risks across the organization. Within this framework, the wildfire mitigation strategy is designed to reduce wildfire-related hazards, reduce the impacts of PSPS de-energizations, and improve long-term system resilience, while maintaining a balance with affordability.

Within the enterprise-wide assessment, SDG&E's Wildfire Risk Modeling Framework (refer to Section I.C) quantifies baseline, residual, and tail Wildfire, PSPS, and PEDS risks (refer to Section I.D) using the Wildfire Next Generation System (WiNGS)-Planning model suite (refer to Section I.C.3). The WiNGS-Planning model suite includes the Lifecycle Cost Assessment (refer to Section I.E) and benefit-cost ratio (BCR) Analyses performed under the Benefit-Cost Ratio Framework (refer to Section I.F).

SDG&E's Lifecycle Cost Assessment evaluates total asset installation, operations, and maintenance costs over a 55-year horizon to compare the cost effectiveness of grid hardening alternatives. This analysis quantifies both upfront capital investment and ongoing operational impacts, including Net O&M savings, to inform Benefit Cost Ratio (BCR) outcomes.

By comparing 41 high-risk segments proposed in this GRC and their lifecycle costs associated with two mitigation scenarios, the results shown in Figure JW-1 demonstrate a clear cost trade-off between mitigation strategies. Strategic Undergrounding (SUG) requires higher upfront capital investment, while overhead solutions such as Combined Covered Conductor (CCC) generally incur higher ongoing operational and maintenance costs. Over time, these cost profiles converge, with a crossover point indicating when cumulative costs between the alternatives become comparable. Beyond this point, options with lower upfront costs but higher recurring expenses may result in greater total lifecycle costs.

Figure JW-1
SUG vs. CCC Annual Nominal Lifecycle Cost Projections



Consistent with this lifecycle cost perspective, SDG&E estimates that an incremental $26.7 million in O&M nominal costs would have been requested in this GRC filing had approximately 236 miles[1] of Strategic Undergrounding not been implemented from 2022 to 2025. These figures reflect the higher ongoing inspection, maintenance, and other operational mitigation costs—such as vegetation management and expenses associated with PSPS—avoided with underground assets compared to overhead. Accordingly, the upfront capital investment in undergrounding results in measurable long-term operational cost avoidance.

Once the Lifecycle Cost Analysis is complete, SDG&E performs a BCR analysis. The Grid-Hardening Mitigation Selection Process (refer to Section I.G.1) then uses the baseline and

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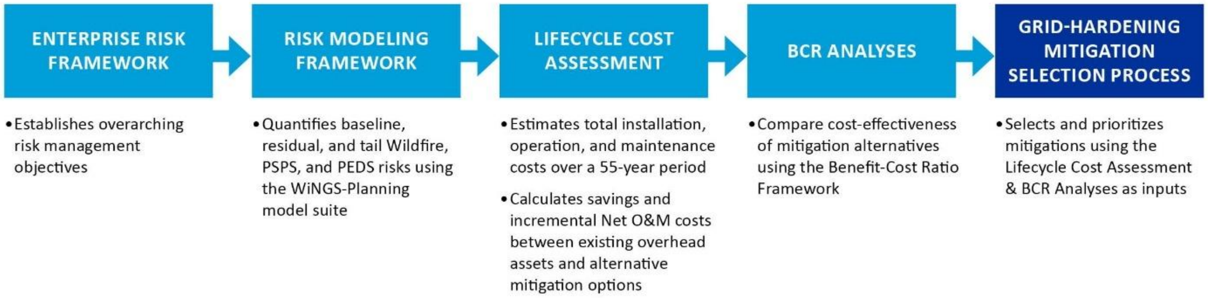
[1] The 236 miles include Strategic Undergrounding projects and do not include the Direct Undergrounding projects.

residual Wildfire, PSPS, and PEDS risks, the Lifecycle Cost Assessment, and the BCR analyses results to select and prioritize mitigations. As shown in Figure JW-2, this sequence provides the analytical basis for comparing alternatives and identifying the mitigation that provides the most cost-effective risk reduction.

The WiNGS-Planning model suite enables the evaluation of mitigation alternatives, including Strategic Undergrounding (SUG), Combined Covered Conductor (CCC), and other operational mitigations, under defined assumptions. The WiNGS-Planning model suite is designed to evaluate all mitigation alternatives on a consistent and comparable basis under a common set of assumptions. The models do not embed preferences for any specific mitigation type (for example, SUG versus CCC); instead, each option is assessed at the feeder-segment level using the same risk and cost evaluation framework and the Grid-Hardening Mitigation Selection Process. Mitigations are recommended by WiNGS-Planning when the analysis shows meaningful risk reduction and cost-effectiveness under the applicable assumptions and decision criteria. In addition, results are evaluated within a sensitivity analysis framework (refer to Section I.H), where a range of reasonable input assumptions is tested to assess the robustness of outcomes. This ensures that mitigation selection reflects not only base-case results but also the stability of those results under varying conditions.

Figure JW-2
High-Level Mitigation Selection Process



Upon model assessment of a recommended mitigation, that recommendation is then subject to further review and validation by SDG&E's wildfire risk analysts and subject matter experts, including but not limited to, engineering, environmental, and construction teams to confirm technical feasibility and implementation readiness.

The Risk Modeling Framework directly informs the grid hardening portfolio proposed in SDG&E's test year (TY) 2028 General Rate Case (GRC) and further described in Chapter 1 of this testimony. After assessing risk, cost, and feasibility, SDG&E has identified a portfolio of grid hardening measures in the locations where those investments provide the most effective reduction in catastrophic wildfire risk in a manner that promotes safety, reliability, and affordability.

This portfolio described in SDG&E's request includes 400 miles of SUG and 200 miles of CCC[2] and assumes a capital cost per mile of $2.32 million for SUG and $1.31 million for CCC, as described in Exhibit (Ex.) SDGE-07, Chapter 1.[3,4] This level of investment reflects the amount of progress that can be reasonably and responsibly achieved within the four-year GRC cycle. Figure JW-3 illustrates the risk reduction achieved by this proposed portfolio. The resulting grid hardening portfolio is described further in Section I.G.2.

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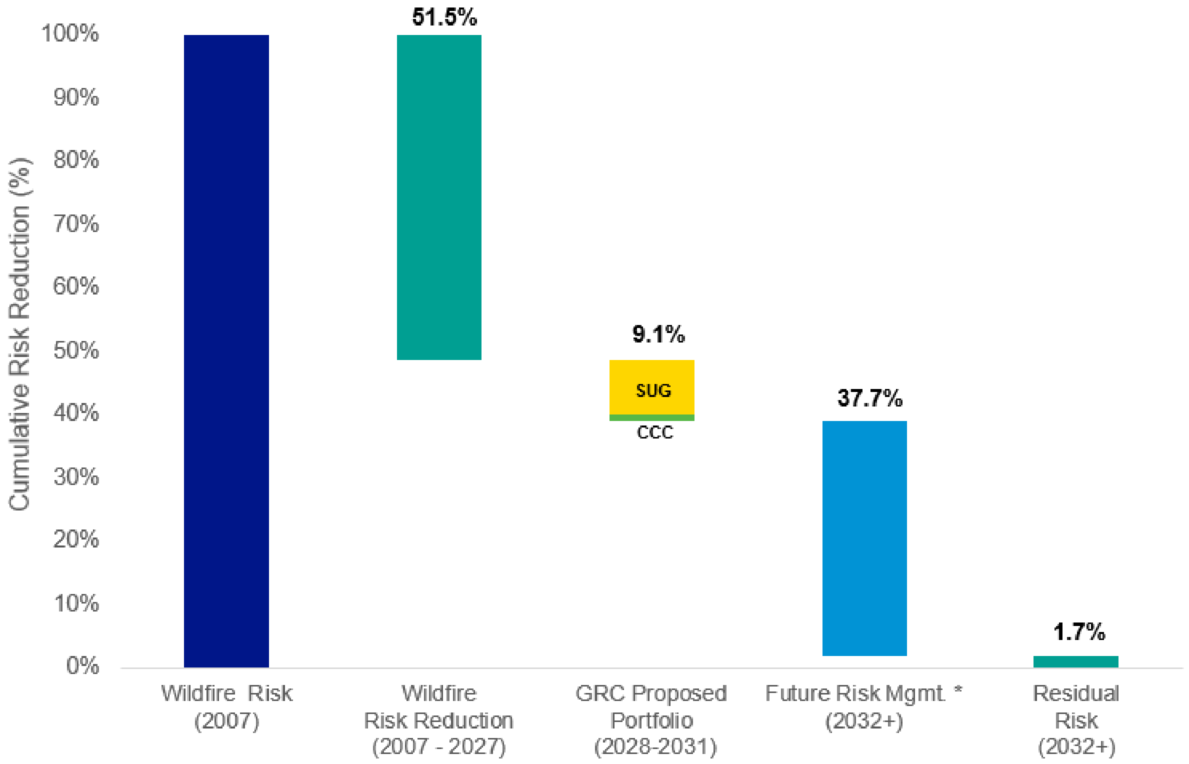
[2] Decision (D.) 24-12-074 at 483 ("In the next GRC, the Commission expects SDG&E to provide more information, as required by its WMP, including the number of miles of electrical lines it has undergrounded and installed with covered conductor in HFTDs, along with the number of miles of electrical lines it proposes to underground and install with covered conductor in HFTDs, and where.")

[3] Exhibit (Ex.) SDGE-07, Chapter 1, Section IV.A.4 Strategic Undergrounding (C510), and Section IV.A.10 Combined Covered Conductor (550).

[4] D.24-12-074, Findings of Fact (FOF) 173 at 990 ("In its next rate case, San Diego Gas & Electric Company must provide cost and mileage data separately for these two components of system hardening and explain and justify its selection of circuit segments for undergrounding based on risk analyses or other factors.").

Figure JW-3
SDG&E Projected Risk Reduction Upon Completion of Portfolio



*Future Grid Hardening, Inspections, PSPS, and Situational Awareness

B. Enterprise Risk Management Framework

SDG&E applies an Enterprise Risk Management Framework to identify, assess, and manage material risks across the enterprise. This framework is based on the International Organization for Standardization (ISO) 31000[5] and establishes governance, roles, and decision objectives for risk management from frontline functions through the Board of Directors.

Within the Enterprise Risk Management Framework, wildfire-related risk objectives for the electric system are established, including reducing catastrophic wildfire tail risk, limiting the scale and frequency of PSPS de-energizations where feasible, minimizing equipment related outage impacts, and enhancing long term system resilience. While the Framework sets these objectives, it does not prescribe the specific mitigations used to achieve them.

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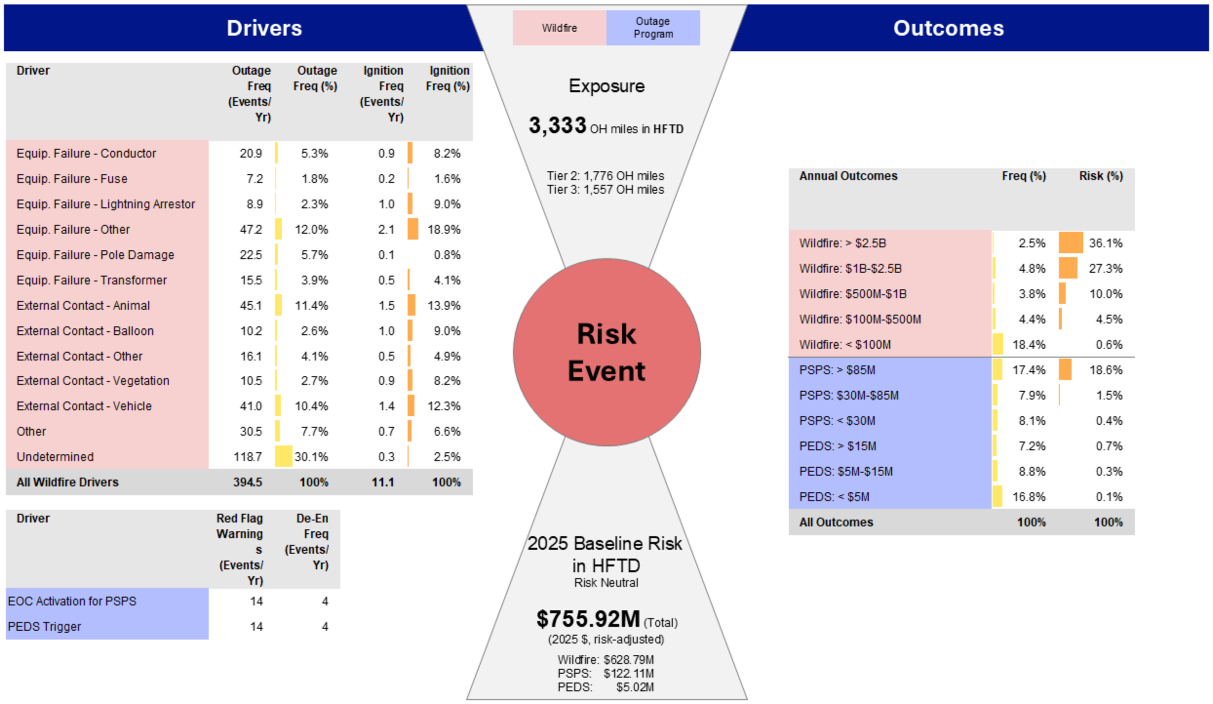
[5] ISO 31000, *available at*: https://www.iso.org/iso-31000-risk-management.html/.

As required by the Commission's Risk-Based Decision-Making Framework,[6] a Risk Bow Tie is used to define each risk event, identify the drivers that could lead to the event, and outline potential outcomes. The left side of the bow tie captures the causes and triggers of a risk event, while the right side describes possible consequences. This structured view provides a consistent method for evaluating wildfire, PSPS, and PEDS risks and guides the selection of effective mitigations.

SDG&E's Wildfire and PSPS Risk Bow Tie includes the system risk, associated drivers, and potential consequences (see Figure JW-4). It provides a clear, structured representation of how wildfire, PSPS, and PEDS risks arise and their frequencies and outcomes.

Figure JW-4
Wildfire, PSPS, and PEDS: Risk Bow Tie



Driver	Outage Freq (Events/ Yr)	Outage Freq (%)	Ignition Freq (Events/ Yr)	Ignition Freq (%)
Equip. Failure - Conductor	20.9	5.3%	0.9	8.2%
Equip. Failure - Fuse	7.2	1.8%	0.2	1.6%
Equip. Failure - Lightning Arrestor	8.9	2.3%	1.0	9.0%
Equip. Failure - Other	47.2	12.0%	2.1	18.9%
Equip. Failure - Pole Damage	22.5	5.7%	0.1	0.8%
Equip. Failure - Transformer	15.5	3.9%	0.5	4.1%
External Contact - Animal	45.1	11.4%	1.5	13.9%
External Contact - Balloon	10.2	2.6%	1.0	9.0%
External Contact - Other	16.1	4.1%	0.5	4.9%
External Contact - Vegetation	10.5	2.7%	0.9	8.2%
External Contact - Vehicle	41.0	10.4%	1.4	12.3%
Other	30.5	7.7%	0.7	6.6%
Undetermined	118.7	30.1%	0.3	2.5%
All Wildfire Drivers	**394.5**	**100%**	**11.1**	**100%**

Driver	Red Flag Warnings (Events/ Yr)	De-En Freq (Events/ Yr)
EOC Activation for PSPS	14	4
PEDS Trigger	14	4

Annual Outcomes	Freq (%)	Risk (%)
Wildfire: > $2.5B	2.5%	36.1%
Wildfire: $1B-$2.5B	4.8%	27.3%
Wildfire: $500M-$1B	3.8%	10.0%
Wildfire: $100M-$500M	4.4%	4.5%
Wildfire: < $100M	18.4%	0.6%
PSPS: > $85M	17.4%	18.6%
PSPS: $30M-$85M	7.9%	1.5%
PSPS: < $30M	8.1%	0.4%
PEDS: > $15M	7.2%	0.7%
PEDS: $5M-$15M	8.8%	0.3%
PEDS: < $5M	16.8%	0.1%
All Outcomes	**100%**	**100%**

The left side of the bow tie identifies drivers that can lead to outages or ignitions associated with SDG&E equipment. These drivers include vegetation contact, downed poles, vehicle contact, equipment failures, and other operational events. Their likelihood is quantified using historical data collected within the High Fire Threat District (HFTD).

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[6] D.25-08-032, Appendix A, RDF Row 15 at A-16.

Where supported by data, broader driver categories are broken into sub-drivers for more precise analysis. For example, "Equipment Failure – Other" may be separated into cross-arm failures, capacitor failures, and other equipment-related issues. Each driver is quantified using the following metrics:

- Outage Frequency: Average number of outages per year
- Outage Frequency (% of total): Percentage of outages attributed to that driver
- Ignition Frequency: Average number of ignition events per year
- Ignition Frequency (% of total): Percentage of ignition events attributed to that driver

Together, these metrics show the contribution of each driver to the overall risk profile. Summing individual driver frequencies provides a total expected number of events per year.

The center of the bow tie represents risk events. These include wildfires involving electrical equipment as well as repeated service interruptions from PSPS or PEDS de-energizations during extreme fire weather conditions. These events can cause major operational disruptions, economic losses, and significant community impacts. Exposure metrics (i.e., overhead circuit miles by location and baseline risk values by risk event) are used to contextualize the magnitude of these risks within the HFTD.

The right side of the bow tie shows the potential monetized annual risk outcomes (consequences), along with their proportional frequencies and risk contributions. Consequence estimates include fatalities, property destruction, financial liabilities, and economic losses associated with Wildfire/PSPS/PEDS risk events, accounting for both frequency and severity of risk event impacts.

Together, the bow tie components form the basis of the wildfire, PSPS, and PEDS risk assessment framework. By focusing resources on drivers that contribute to the most severe consequences, the overall effectiveness of wildfire, PSPS, and PEDS risk reduction strategies is improved.

C. Wildfire Risk Modeling Framework

1. Introduction

Since 2007, SDG&E has proactively addressed the risk of catastrophic wildfires within its service territory. SDG&E has invested in state-of-the-art technologies such as weather monitoring systems, high-definition cameras, and satellite imagery to enhance early detection and response capabilities. Additionally, SDG&E has developed its vegetation management programs, which include regular trimming and removal of hazardous trees, to minimize the risk of power lines contacting energized assets. These operational initiatives are complemented by sustained mitigations, such as the installation of CCC and the strategic undergrounding of power lines in high-risk areas.

As wildfire risk has evolved, the relative limitations of operational mitigations in delivering sustained, long-term risk reduction have become more apparent. A sustainable wildfire mitigation strategy must balance affordability with long-term systemic reduction of catastrophic risk events. SDG&E's Risk Modeling Framework bridges the Commission's directive for operational cost efficiency with the need for long-term risk reduction. Accordingly, it consists of probabilistic risk modeling, mitigation lifecycle cost assessment, and BCR analysis to evaluate mitigation options at the feeder-segment level. This approach supports a transition from short-term, reactive measures toward sustained mitigations where cost-effective, long-term risk reduction is demonstrated, significantly reducing ignition likelihood, PSPS frequency, and customer exposure to high consequence outcomes (see Figure JW-5). As further discussed in my testimony, this approach is primarily advanced through grid hardening achieved through SDG&E's SUG and CCC programs.

Figure JW-5: Long-Term Risk Reduction Approach

Although initial capital requirements for sustained grid hardening, such as SUG, are significant, the Commission's BCR Framework demonstrates the value of these upfront investments. Because mitigations are evaluated over a 55-year asset lifecycle, incremental changes in O&M costs (i.e., Net O&M) are incorporated alongside the avoided financial consequences of catastrophic risk events. Consequently, SUG, rather than operational mitigations or, in some cases, CCC installations that require higher ongoing O&M costs, is the most effective risk-reduction mitigation and provides a more finite endpoint to investment. In many cases, operational efficiency over the lifecycle of the asset offsets the upfront capital needed for sustained grid hardening, supporting selection of SUG as a reasonable grid hardening approach.

Wildfire risk and constructability are highly localized. Thus, making operational, engineering, and financial decisions at the segment level, rather than broader tranches, yields the greatest reduction in tail risk while efficiently allocating ratepayer capital. Recent modeling enhancements support this approach by incorporating mutually exclusive risk drivers to avoid double-counting. The enhancements also integrate Net O&M directly into BCR calculations and apply a transparent decision process to select the most appropriate mitigation for each segment.

Ultimately, the Risk Modeling Framework provides a transparent, data-driven methodology for prioritizing sustained grid hardening over perpetual operational spending. By evaluating risk over a 55-year horizon, directing capital to the highest-risk feeder segments, and optimizing mitigation selection for maximum cost-effectiveness, SDG&E presents a sustainable approach to materially reduce catastrophic wildfire risk, decrease reliance on PSPS de-energizations, and protect long-term ratepayer affordability through electrical system resilience.

2. Overview of Risk Modeling Framework

The Risk Modeling Framework utilizes risk assessment methodologies covering baseline risk, risk reduction, and tail risk evaluation, follows the Risk-Based Decision-Making Framework (RDF) and modeling requirements imposed by the Office of Energy Infrastructure Safety (Energy Safety), and incorporates intervenor and stakeholder feedback where appropriate. This framework provides consistent, transparent, and auditable results to support strategic planning and mitigation decisions for wildfire-related risk, which encompasses wildfire, PSPS, and PEDS risks:

- Wildfire Risk: Annualized monetized impacts from asset related ignitions at a specific location for both the expected value and upper percentiles (tail values).
- PSPS Risk: Annualized monetized impacts from a PSPS de-energization at a specific location for both the expected value and upper percentiles (tail values), influenced by feeder topology, weather station associations, customer characteristics, enterprise assumptions, and de-energization specific assumptions.
- PEDS Risk: Annualized monetized impacts from PEDS at a specific location for both the expected value and upper percentiles (tail values), intended to minimize or prevent asset-related ignitions during line faults, with settings reviewed and

updated annually to maximize wildfire risk reduction and improve reliability where possible.

These risk definitions align with the 2026-2028 Wildfire Mitigation Plan Guidelines[7] and inform the evaluation of pre-mitigation (baseline) risk, estimation of post-mitigation (residual) risk, and the assessment of each strategy's cost effectiveness. They also support scenario analyses that test how mitigation options perform under a wide range of assumptions, including low-probability, high-impact (tail risk) scenarios. This approach considers both risk-neutral and risk-adjusted scenarios and evaluates tradeoffs among cost, risk reduction, operational feasibility, and community impacts to identify mitigation investments that provide the greatest overall benefit.

WiNGS provides the core analytical framework used by SDG&E to evaluate wildfire and outage risk. WiNGS consists of two integrated model suites, WiNGS-Planning and WiNGS-Operations (WiNGS-Ops):

The WiNGS-Planning model suite establishes baseline wildfire, PSPS, and PEDS risk; quantifies expected risk reduction for grid hardening strategies; evaluates both expected-value and tail-risk (upper percentiles) reductions; and incorporates BCR analysis to support mitigation selection. Further details on WiNGS-Planning are provided in Section I.3.

The WiNGS-Ops model suite evaluates event-specific wildfire and PSPS risk to determine when proactive de-energization outweighs potential safety risks during extreme fire-weather conditions, supporting real-time decision-making during high-risk conditions. The model:

- Quantifies wildfire and PSPS risk at the feeder-segment level using 3-day weather forecasts.
- Integrates simulated wildfire spread and intensity at each asset location.
- Identifies wind gust thresholds where de-energization yields a safer overall outcome for customers.
- Incorporates segment-specific factors including local weather, vegetation, customer types and counts, asset characteristics, enterprise assumptions, and event-specific parameters.

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[7] OEIS, *Wildfire Mitigation Plan Guidelines – 2/24/25, available at*: https://energysafety.ca.gov/what-we-do/electrical-infrastructure-safety/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2026-28-wildfire-mitigation-plan-guidelines/.

WiNGS-Planning and WiNGS-Ops rely on a shared set of Machine Learning submodels for Probability of Failure (PoF) and Conditional Probability of Ignition (PoI|F), maintaining uniform assumptions and alignment across both model suites. Figure JW-6 details the relationship between the WiNGS-Planning and WiNGS-Ops model suites.

WiNGS-Planning and WiNGS-Ops support both strategic planning and real-time operational decision-making across the wildfire mitigation portfolio. WiNGS-Planning informs forward-looking activities, including long-term grid hardening investments, mitigation prioritization, and risk-based capital planning, while WiNGS-Ops supports operational decisions such as PSPS de-energization. Collectively, these tools enable transparent, stable, and consistent risk-informed decision-making across planning and operations. Additional details on key risk modeling assumptions and limitations are provided in Appendix B.

3. WiNGS-Planning Model Suite

The WiNGS-Planning model suite evaluates wildfire mitigation alternatives by estimating baseline and post-mitigation wildfire risk at both expected (mean) and tail (low probability, high consequence) levels for each feeder segment within the service territory. It also evaluates mitigation lifecycle cost and BCRs for each mitigation scenario (CCC, SUG, and operational mitigations) at the feeder-segment level across the HFTD (see Figure JW-6 and Table JW-1). Together, these analyses support long-term grid-hardening and capital-planning decisions by identifying durable, cost-effective mitigations that reduce wildfire risk, PSPS de-energization impacts, and PEDS-driven outages while improving overall grid resilience.

The current version of the WiNGS-Planning model suite (Version 5.0), used to support SDG&E’s 2028 GRC request, incorporates updated assumptions and a probabilistic risk assessment framework aligned with the Commission’s BCR Framework. The model is designed to support consistent, data-driven evaluation of mitigation strategies and to remain responsive to evolving regulatory expectations. This supports alignment with recent and forthcoming wildfire and risk assessment submissions, including the 2026-2028 Base Wildfire Mitigation Plan

(WMP)[8] and the 2025 Risk Assessment and Mitigation Phase (RAMP) filing.[9] Wildfire, PSPS and PEDS risk is first quantified for each power-line span as a range of potential wildfire-related financial outcomes, capturing specific criteria such as weather, customer demographics, equipment characteristics, vegetation, and event-specific assumptions. Results are then aggregated at the feeder segment level and used to identify mitigation options that deliver the greatest risk reduction relative to cost.

Grid-hardening priorities are periodically updated using the most recently validated version of the model, incorporating updated assumptions, new regulatory requirements, and input from intervenors and the Commission. This iterative process supports forward-looking planning and enables mitigation activities to be scheduled several years in advance—a process necessary to support timelines for engineering, permitting, design, and construction—while maintaining alignment with evolving guidance and system conditions. The current version of the WiNGS-Planning model suite identifies mitigation recommendations at the feeder segment level for implementation over the 2028–2031 planning horizon, providing a structured basis for prioritization and execution.

As shown in Figure JW-6, multiple data sources are used to generate PoF submodels (i.e., Conductor PoF, Vegetation PoF, Vehicle Contact PoF, and Other Equipment & Foreign Object PoF) that are aggregated into an overall PoF submodel. This overall PoF submodel is then paired with a PoI|F submodel that feeds into a Monte Carlo Risk Assessment model, which is a set of risk submodels (i.e., Wildfire Likelihood, Wildfire Consequence, PSPS Likelihood, PSPS Consequence, PEDS Likelihood, PEDS Consequence, Wildfire Risk, PSPS Risk, PEDS Risk, and Overall Risk). The Monte Carlo Risk Assessment model generates wildfire, PSPS, and PEDS risks, which are aggregated to determine the overall risk. The results of the WiNGS-Planning model suite are evaluated in conjunction with lifecycle cost estimates and BCR metrics to identify the mitigation option that is most effective from a risk-reduction and cost-effectiveness standpoint under the specified modeling assumptions. This analytical step

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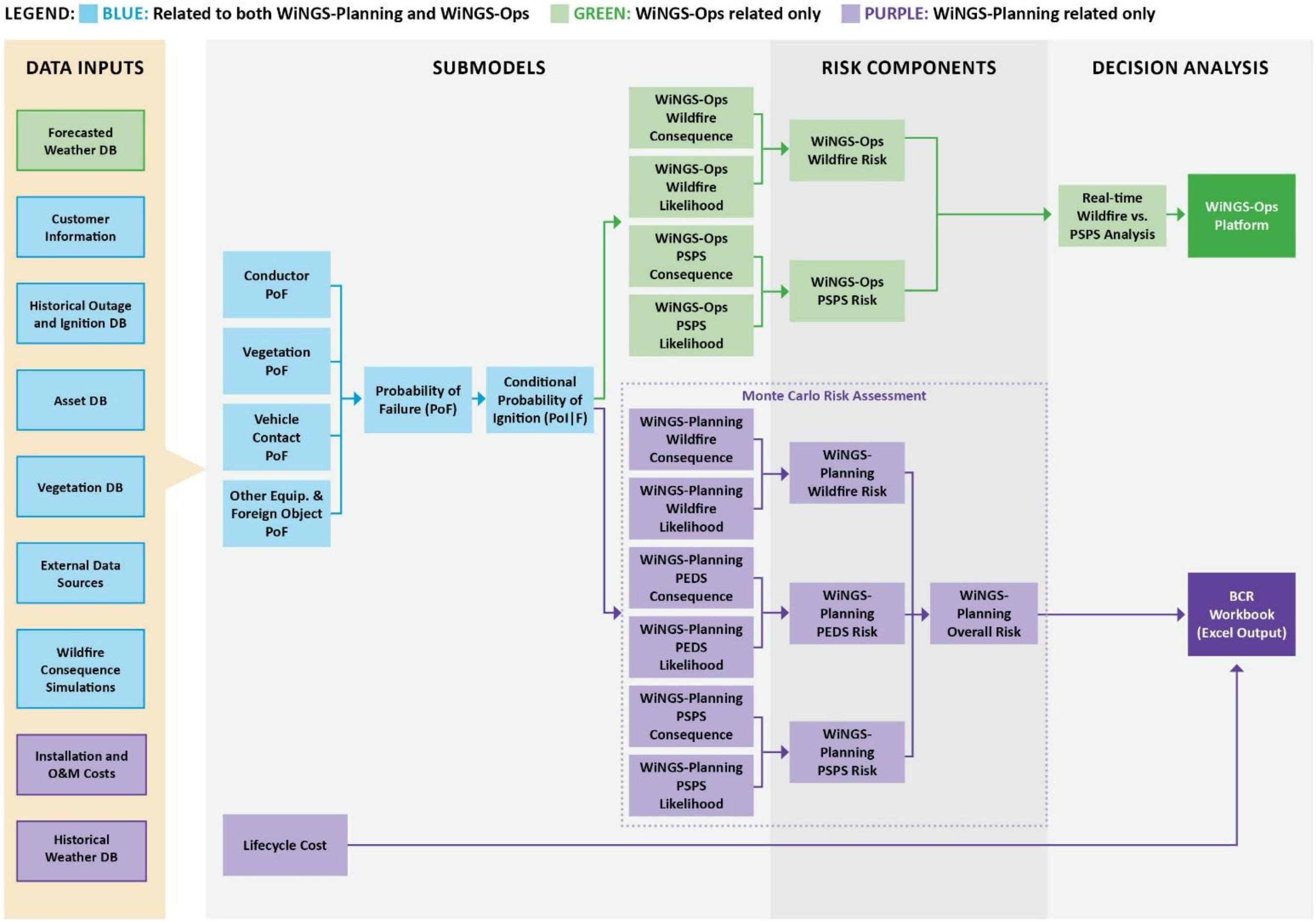
[8] SDG&E, *2026-2028 Base WMP* (2026-2028 Base WMP), *available at*:https://www.sdge.com/2026-2028-wildfire-mitigation-plan

[9] *See* D.24-12-074, Ordering Paragraph (OP) 45 at 1099 ("San Diego Gas & Electric Company shall coordinate its risk analysis for its Wildfire Mitigation Plans with its Risk Assessment and Mitigation Phase, to the extent possible.").

provides a consistent, data-driven basis for comparing alternatives across locations and conditions.

Model-identified mitigations are subsequently reviewed by subject matter experts across meteorology, engineering, and risk analytics, who analyze detailed, location-specific insights, including terrain characteristics, historical weather patterns, asset-level conditions, operational constraints, and observed wildfire ignition and fire behavior data, to assess feasibility, refine recommendations, and support selection of mitigations that are practically implementable and aligned with real-world system conditions.

FIGURE JW-6
WiNGS Model Flowchart[10]



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[10] For a more detailed schematic showing more comprehensive details on model inputs and interactions, refer to SDG&E 2026-2028 Base WMP R2, Section 5.2.2, "Risk and Risk Components Calculation," Figure 5-6, "WiNGS-Planning and Ops Calculation Schematic," at 38.

TABLE JW-1
Summary of WiNGS-Planning Model Suite Submodels

Submodel	Purpose	Key Features	Risk Category	GRC Section(s)
PoF (various)	Calculates PoF for each asset (span, pole, etc.)	• Uses statistical and machine-learning models to estimate hourly / span-level failure likelihood for conductor, vegetation, vehicle contact, and "other equipment / foreign object" modes. • Trained on historical outage events, weather (wind gust, direction), vegetation inventory, asset condition, and road network data (only for vehicle contact). • Produces span- and pole-level PoF rates that are aggregated into an overall PoF model, which feeds into the Monte Carlo Risk Assessment model.	Wildfire	I.D.1.b.i.1 (Probability of Failure Submodel)
Conditional Probability of Ignition (PoI|F)	Calculates PoI|F for each span/pole	• Estimates the likelihood of an ignition for each type of potential failure event (i.e., Conductor, Vegetation, Vehicle Contact, and Other). • Integrates weather (gust, temp, humidity), fuels dryness, vegetation flammability, and ignition history. • Combines PoF submodel outputs with ignition ratios derived from reportable ignitions and evidence-of-heat records reviewed by engineering and fire coordination teams. • Produces hourly and annual ignition rates (PoI) for every span/pole used in the Monte Carlo simulation.	Wildfire	I.D.1.b.i.2 (Probability of Ignition Submodel)

Submodel	Purpose	Key Features	Risk Category	GRC Section(s)
Wildfire Likelihood	Simulates annual frequency of ignition events that could lead to a wildfire	• Aggregates the hourly PoI values to annual span-level ignition rates based on multiple years of hourly weather condition. These rates are used in combination with historical ignition data to determine a span's likelihood of an ignition. • Leverages probability distributions, Monte Carlo simulations, and return period assessments (percentile). • Normalized to annual risk event counts.	Wildfire	I.D.1.b.i (Wildfire Likelihood)
Wildfire Consequence	Uses simulations of potential wildfire impacts in the service territory based on historical fire weather and forecasted weather conditions	• Analyzes the consequences of an ignition at one or more discrete points based on Technosylva's wildfire modeling software FireSight^{TM}, which incorporates weather variables, detailed fuel layers, and fire-spread models. • Wildfire consequence metrics include the number of structures damaged or destroyed, acres burned, estimated serious injuries and fatalities, the expected number of electrical assets impacted, and customer outage minutes.	Wildfire	I.D.1.b.ii (Wildfire Consequence)

Submodel	Purpose	Key Features	Risk Category	GRC Section(s)
PSPS Likelihood	Estimates the probability that a given feeder-segment would be proactively de-energized due to PSPS on a given high-fire day	• Uses historical wind speeds measured at all upstream weather stations and considers grid-hardening state of the full upstream trace of a circuit segment. • Forecasts the number of PSPS de-energizations and the number of customers de-energized per event. • For WiNGS-Ops, a PSPS Likelihood of 1, or 100%, is assumed.	PSPS	I.D.1.c.i (PSPS Likelihood)
PSPS Consequence	Assesses the potential consequences of utility-caused PSPS de-energizations for each Supervisory Control and Data Acquisition (SCADA) sectionalizing device in the HFTD	• Uses customer data and subject matter expert assumptions. • The model output is costs incurred in the event that a given circuit segment would be proactively de-energized due to a PSPS de-energization.	PSPS	I.D.1.c.ii (PSPS Consequence)
PEDS Likelihood	Simulates annual frequency of PEDS outage event impact occurrences in a specific location of the grid	• Uses historical event information to estimate the probability of a sectionalizing device experiencing an outage due to a PEDS event. • Relies on historical records of PEDS outages and their durations.	PEDS	I.D.1.d.i (PEDS Likelihood)
PEDS Consequence	Assesses the potential consequences of utility-caused PEDS outages for each SCADA sectionalizing device in the HFTD	• Uses customer data and subject matter expert assumptions. • The model output is costs incurred in the event that a given circuit segment would be shut off due to a PEDS event.	PEDS	I.D.1.d.ii (PEDS Consequence)

Submodel	Purpose	Key Features	Risk Category	GRC Section(s)
Monte Carlo Risk Assessment	Calculates baseline and post-mitigation risk for wildfire, PSPS, and PEDS	• Runs millions of simulated wildfire, PSPS, and PEDS event-years using PoF, Conditional PoI|F, and Technosylva's 24-hour fire-spread consequences. • Generates full probability distributions (mean, percentiles, tail risk, etc.) for each segment. • Supports scenario testing (e.g., post-SUG risk, post-CCC risk, alternative assumptions, etc.), enabling comprehensive sensitivity analysis.	Wildfire, PSPS, PEDS	I.D.1.a (Monte Carlo Risk Assessment Model)
Lifecycle Cost Model	Calculates baseline and post-mitigation operation and maintenance cost	• Incorporates implementation costs, long-term O&M costs, and long-term foundational costs to produce a complete cost profile for each mitigation over its expected lifespan. • Version 3.0 produces annualized cost streams aligned with WMP, RAMP, and GRC financial frameworks, including net O&M savings. • Supplies cost inputs directly to the BCR model for each segment and mitigation.	N/A	I.E (Mitigation Lifecycle Cost Assessment)

Submodel	Purpose	Key Features	Risk Category	GRC Section(s)
BCR Workbook (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF)	Calculates BCR metrics for each mitigation option across three discount rates	• Provides Excel workbooks that document the calculation of the present value of risk reduction and capital plus net O&M costs over mitigation lifetimes. • Based on baseline and post-mitigation risk reductions derived from millions of simulations in the Monte Carlo Risk Assessment model. • Incorporates climate change impacts. • Evaluates the effects of including versus excluding risk aversion. • Contains intact formulas with variables and assumptions identified, which allows users to modify key assumptions to perform sensitivity analyses or substitute alternative input values. • Uses mitigation risk-reduction outputs, lifecycle cost modeling (Net O&M), and three discount rates (WACC, societal, hybrid). • Includes segment-level results, LoRE and CoRE values, a comparison of baseline and residual risk, and side-by-side mitigation comparisons. • Creates a clear connection between feeder-segments, mitigation selection, BCRs, and HTM tranches (internal segmentation), as well as LoRE/CoRE quintile-based tranches.	N/A	• I.F (Benefit-Cost Ratio Framework) • I.F.3 (Benefit-Cost Ratio Workbooks)

The WiNGS-Planning model suite uses a broad set of data sources to assess wildfire, PSPS, and PEDS risk as well as lifecycle costs. Historical outage and ignition data (e.g., CPUC-reportable ignitions, non-reportable ignitions, vegetation-related events, and vehicle contacts) are evaluated to identify patterns and causes of electrical failures and fires. Asset-level characteristics, such as conductor size, material, and type, are combined with vegetation data to evaluate how local conditions influence fire risk. Site-specific environmental factors, including historical weather (wind gust speed and direction, temperature, humidity) and vegetation (type, condition, and proximity) are also incorporated to understand their influence on outages and ignitions. In addition, data from Technosylva, a leading provider of wildfire behavior and consequence analytics, is used to estimate potential wildfire impacts at each asset location under varying weather scenarios.

Asset information is aggregated by consolidating electric grid data from multiple sources, such as Geographic Information System (GIS) databases for asset location and configuration, work order systems for maintenance history, and customer systems for service points, into a single, validated dataset. In the past, individual risk models and analytics efforts accessed these sources independently, requiring repeated development of complex data-merging logic and special handling for inconsistencies. Centralizing and standardizing this data reduces redundancy, improves data quality, and enables more efficient and reliable risk analysis.

This aggregation creates a time-stamped, single source that integrates infrastructure data (including poles, conductors, and spans), network connectivity, customer service points, risk factors, and geographic context. Automated processes enrich the source data with calculated attributes, spatial analysis, and network tracing, producing comprehensive and validated datasets. As a result, analysts can reliably recreate the state of the electric grid at specific points in time, supporting consistent analysis and reproducible results.

This centralized approach minimizes duplication of effort, reduces the potential for error, and strengthens version control. It eliminates the need for teams to repeatedly build and maintain complex data connections across multiple source systems when developing models or conducting analyses. Instead, all models rely on a common, validated dataset with standardized definitions and consistent business rules.

Data quality is supported through automated testing, structured version control processes, and peer review, with each model release subject to regression testing to identify and address issues before they impact risk analytics. Collectively, these practices establish a reliable and reusable data foundation that supports consistent, transparent, and scalable wildfire risk and PSPS analysis.

4. Model Governance

To support transparent, consistent, and accountable regulatory decision-making,[11,] the production version of the WiNGS-Planning model suite follows strict software versioning, change management, and cybersecurity controls. The model and its underlying code are deployed only in secure environments that meet cybersecurity and access control requirements.

Risk models and BCR calculations used for grid hardening prioritization are executed years in advance using the current production model version. This forward-looking approach allows mitigation strategies to be planned well before assets are put in service. Because model inputs, assumptions, and grid configurations may evolve over a multi-year planning horizon, the modeling framework is designed to enable controlled "time travel" analyses, including backcasting and backtesting of historical grid configurations using updated knowledge. These capabilities support model validation and continuous improvement, while also establishing a foundation for expanded use of backcasting in future potential analyses. These activities are governed by documented version control, reproducible model runs, comprehensive audit trails, and management approval, ensuring full traceability, transparency, and regulatory compliance.[12]

WiNGS-Planning uses a modular approach that allows individual components of the risk assessment to be independently evaluated, reviewed, and improved (Figure JW-6). This structure supports clear tracking of changes, transparent subject matter expert review, and effective management of how updates to assumptions, inputs, or logic affect overall results. The code base for all models is maintained in version-controlled code repositories to ensure consistency and accountability.

This modular design also improves flexibility and reproducibility of the WiNGS-Planning model suite. All model inputs, assumptions, logic code, and software library versions are time

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[11] See Application (A.) 25-05-010/013 (cons.), SPD Evaluation Report on Sempra's 2025 RAMP Applications (A.) 25-05-010 (October 10, 2025) (SPD Evaluation Report), at 145 *See also* OEIS - Data Analytics Division, *Data Guidelines* (OEIS Data Guidelines)*, available at*: https://energysafety.ca.gov/who-we-are/department-organization/data-analytics-division/.

[12] *Id.*

stamped and securely archived, enabling reproducibility for any given model version or scenario. Metadata for each model run is stored in secure cloud databases, providing full traceability back to the underlying data, assumptions, and code. Cloud data infrastructure supports secure model execution, version tracking, and auditability, complemented by industry best practices such as structured versioning and peer review. Together, these processes provide a reliable, repeatable foundation for accurate wildfire risk analysis and regulatory reporting.

Table JW-2 presents a summary of key updates across model versions since 2020.

TABLE JW-2
Key Updates to the WiNGS-Planning Model Suite

Version	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**
Release Year	2020	2022	2023	2025	2026
Grid Configuration and Customer Counts As Of Date	July 2020	April 2022	Jan 2023	Jan 2025	Jan 2026
System Scope	Distribution Overhead in the HFTD	Distribution Overhead in the HFTD + PSPS-ed Segments	Full Service Territory Distribution Overhead Assets		
Associated Regulatory Filings	2024 GRC 2020-2022 WMP		2023-2025 WMP 2025 WMP Update	2026-2028 WMP 2025 RAMP	2028 GRC
Risk Framework and Cost-Effectiveness Unit	MAVF resulting in RSEs (unitless)			Benefit-Cost Framework resulting in BCRs (monetized risk in dollars)	

5. Continuous Improvements

Wildfire risk models are continuously improved through collaboration with industry experts, academic institutions, and government agencies. These partnerships support ongoing enhancements to risk models, analytical frameworks, and underlying assumptions, with the goal of improving forecast accuracy and optimizing mitigation investment prioritization.

Risk assessments have transitioned to a probabilistic framework that estimates the likelihood of potential consequences for each feeder segment. This transition required upgrading modeling tools, expanding scenario analysis, conducting sensitivity analyses, and evaluating impacts from known extreme events. Many of these improvements are detailed in the 2025 RAMP Report[13] and 2026-2028 Base WMP.[14] Together, they support a long-term strategy to enhance public safety while reducing customer impacts during periods of elevated fire risk.

Improvements further strengthen the risk framework by incorporating climate vulnerability factors, refining analysis of key risk-drivers, and enhancing overall model design and architecture. Current enhancements include improved tracking and validation of model components, formalized independent review processes, and expanded application of risk models to inform mitigation prioritization beyond CCC and SUG. This probabilistic approach aligns with the requirements in D.24-05-064,[15] the 2026-2028 Wildfire Mitigation Plan Technical Guidelines,[16] and additional requirements established by Energy Safety.[17,18]

D. Wildfire, PSPS, and PEDS Risk Assessment

This section describes the baseline (pre-mitigation) risk calculations for Wildfire, PSPS, PEDS, and Overall Risk. A probabilistic modeling approach is used to quantify the likelihood, consequences, and annualized risk for every feeder segment in the service territory. These

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[13] SDG&E2025 RAMP Report (May 15, 2025) (2025 RAMP Report), *available at*: https://www.sdge.com/rates-and-regulations/proceedings/2025-Risk-Assessment-and-Mitigation-Phase-RAMP-Report.

[14] *See* 2026-2028 Base WMP.

[15] D.24-05-064.

[16] OEIS, *2026-2028 Wildfire Mitigation Plan Technical Guidelines*, *available at*: https://energysafety.ca.gov/what-we-do/electrical-infrastructure-safety/wildfire-mitigation-and-safety/wildfire-mitigation-plans/2026-28-wildfire-mitigation-plan-guidelines/

[17] SDG&E, *2023-2025 Base WMP*, *available at*: https://www.sdge.com/2023-wildfire-mitigation-plan

[18] 2026-2028 Base WMP, Appendix D: Areas for Continued Improvement.

calculations use the WiNGS-Planning Monte Carlo framework, which incorporates span-level PoF and Conditional PoI|F, segment-level consequence modeling, and millions of simulated event-years to produce distributions that capture both average outcomes and tail risk. Baseline risk serves as the foundation for evaluating operational activities, long-term grid-hardening strategies, and investment decisions.

When determining baseline risk, evolving risk factors are evaluated, including extreme weather and climate change. Each factor can influence future wildfire exposure, consequences, and overall risk. Although the WiNGS-Planning model suite is primarily grounded in historical weather and ignition data, it is enhanced with fire-spread simulations and climate-informed research to assess how changing environmental conditions affect long-term wildfire risk.

Societal risk aversion principles are also included to reflect society's attitude towards low-frequency, high-consequence catastrophic events that have the potential to cause loss of lives, significant property damage, and economic harm. Baseline risk is calculated both with and without risk aversion, which provides a more comprehensive understanding of potential events within the service territory. The results help guide long-term grid-hardening decisions in areas with the most severe potential consequences, even if events are infrequent.

This section also details how risk reductions are quantified for sustained grid hardening mitigations and operational mitigations. These risk reduction estimates are core inputs to the BCR Framework, and the outputs are integrated into the BCR Workbooks (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF). This approach enables transparent and reproducible comparisons of alternatives, scenario-based sensitivity analyses, and a data-driven approach to prioritizing grid-hardening investments.

1. Baseline Risk

Baseline risk reflects the likelihood and consequence of a risk event occurring under existing conditions, i.e., before mitigations are applied. Baseline risk is influenced by dynamic variables including weather, vegetation, asset conditions, and topography as well as external factors such as man-made debris, animal contacts, vehicle incidents, and human activities.

To calculate the Baseline Wildfire, PSPS, and PEDS Risk, probability distributions are generated that are used to estimate the Likelihood of a Risk Event (LoRE) and the Consequence of Risk Event (CoRE) for each feeder segment. The probability risk assessment output is created using Monte Carlo simulations of up to 5 million simulated years per asset, to calculate monetized risk impacts.

For Wildfire and PEDS Risk, events are assessed at the conductor-span level. For PSPS Risk, events are assessed at the feeder-segment level, as PSPS de-energizations inherently impact groupings of downstream feeder segments. Using the Commission's RDF,[19] WiNGS-Planning produces a monetized risk value for each simulated Wildfire, PSPS, and PEDS Risk event. Annual distribution statistics (e.g., the mean, median, or 99th percentile) of those simulated events are then produced and analyzed.

For each risk category (Wildfire, PSPS, and PEDS), likelihood, consequence, and risk are mathematically modeled in alignment with SDG&E's 2025 RAMP Report.[20] The variables and equations used are summarized as follows:

Variables

- c denotes the risk category (i.e., Wildfire, PSPS, PEDS)
- i denotes the index for events
- n^c denotes the number of simulated events for risk category c
- s denotes the number of simulated years (5 million years)
- $E_i^{c_{saf}}$ denotes the monetized safety (*saf*) risk of event i in risk category c
- $E_i^{c_{rel}}$ denotes the monetized reliability (*rel*) risk of event i in risk category c
- $E_i^{c_{fin}}$ denotes the monetized financial (*fin*) risk of event i in risk category c

Equations

The total monetized risk of an event i in risk category c is the sum of the monetized safety of the event ($E_i^{c,saf}$), reliability ($E_i^{c,rel}$), and financial risks ($E_i^{c,fin}$), as shown in the following equation for each event i:

$$E_i^c = E_i^{c^{saf}} + E_i^{c^{rel}} + E_i^{c^{fin}}$$

For a given risk category c *(Wildfire, PSPS, and PEDS)*, the average annual monetized risk ($Risk^c$) is calculated as the ratio of the sum of total monetized risk of all risk category c events across the number of simulated years, as shown below.

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[19] D.22-12-027, Appendix A.

[20] 2025 RAMP Report, Chapter RAMP-3: Risk Quantification Framework.

$$Risk^c = \frac{\sum_{i=1}^{n^c} E_i^c}{s}$$

where *s* again denotes the number of simulations in 5 million years. The likelihood of a risk event in risk category *c* ($LoRE^c$) is calculated as the ratio of the number of simulated events in that risk category to the number of simulated years, as shown below.

$$LoRE^c = \frac{n^c}{s}$$

Given the calculated values of $Risk^c$ and $LoRE^c$, the average consequence of a risk event in risk category *c* ($CoRE^c$) can then be calculated as the ratio of $Risk^c$ to $LoRE^c$:

$$CoRE^c = \frac{Risk^c}{LoRE^c}$$

These formulas for $Risk^c$, $LoRE^c$, and $CoRE^c$ are consistent with the general formulation of risk as the product of likelihood and consequence:

$$Risk^c = LoRE^c \times CoRE^c$$

Once the Risk metric is calculated for all three risk categories (Wildfire, PSPS, PEDS), the total monetized risk (*Overall Risk*) can be calculated as the sum of each category. Namely:

$$\text{Overall Risk} = \text{Wildfire Risk} + \text{PSPS Risk} + \text{PEDS Risk}$$

Figure JW-7 shows the range of possible annual monetized risks for each risk category along with the Overall Risk, without accounting for risk aversion.[21] Table JW-3 provides the related summary statistics tied to Figure JW-7. The vertical axis in this figure shows how likely that annual monetized risk will exceed a given dollar amount in any year. The horizontal axis shows the monetized risk in dollars, ranging from millions to billions. To present this information clearly across this wide range, smaller costs are shown on a standard scale and larger costs are compressed, allowing both moderate and extreme outcomes to be viewed on the same chart.

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[21] Risk aversion is discussed in more detail in Section I.D.1.l.

FIGURE JW-7
Probability of Exceedance of Monetized Baseline Risk without Risk Aversion

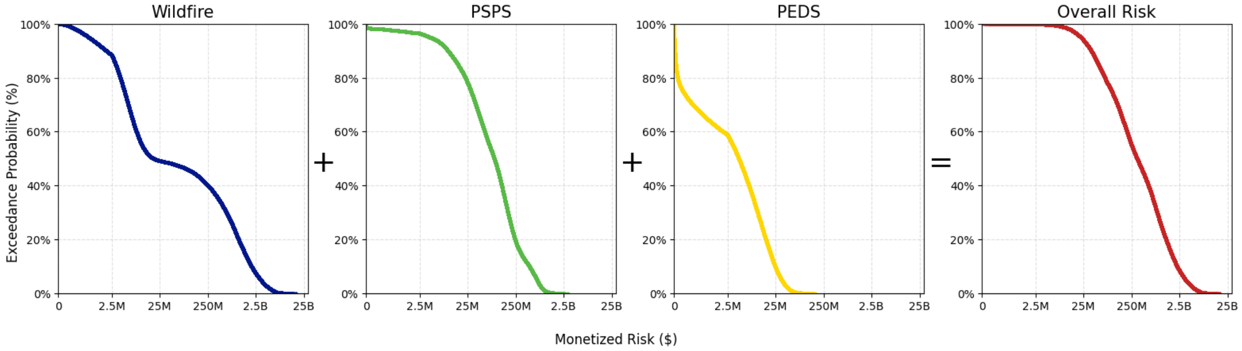

TABLE JW-3
Monetized Risk Estimates without Risk Aversion

Percentile	Annual Return Period (Years)	Wildfire Risk (M$)	PSPS Risk (M$)	PEDS Risk (M$)	Overall Utility Risk (M$)
p50	2	$ 19	$ 90	$ 4	$ 326
P95	20	$ 3,134	$ 688	$ 33	$ 3,331
p98	50	$ 4,635	$ 865	$ 45	$ 4,828
p99	100	$ 5,681	$ 983	$ 53	$ 5,871
Max	---	$ 17,496	$ 3,084	$ 171	$ 17,515
AAL	1	$ 648	$ 169	$ 9	$ 826

This type of chart (i.e., an exceedance curve) is commonly used in risk modeling because it shows both the magnitudes of monetized risk associated with potential risk events and how likely that monetized risk is to occur in a given year. Displaying the distributions of monetized risk for individual risk categories (Wildfire, PSPS, and PEDS) alongside Overall Risk shows the relative contribution of each risk category to the total monetized risk. As indicated by the differing shapes of the exceedance curves for each risk category, how often risk events occur and how severe they may be varies, with each risk category contributing differently to the total monetized risk. Wildfire Risk shows the largest range of potential monetized risk and the greatest extreme values, reflecting the influence of rare but highly damaging wildfire events. These infrequent, but high-consequence events account for much of the most severe risk and therefore also strongly influence the overall risk profile. In contrast, PSPS and PEDS typically result in more moderate impacts and contribute less to the most extreme monetized risk values.

Figure JW-8 shows the range of possible annual monetized risk for each risk category with risk aversion factored in, while Table JW-4 provides summary statistics of these distributions. Including risk aversion captures a more risk averse attitude towards events with severe impacts (as discussed in Section I.D.1.l). When risk aversion is factored in, the range of monetized costs for each risk category is much greater, reflecting a higher intolerance for catastrophic events.

FIGURE JW-8
Probability of Exceedance of Monetized Baseline Risk with Risk Aversion

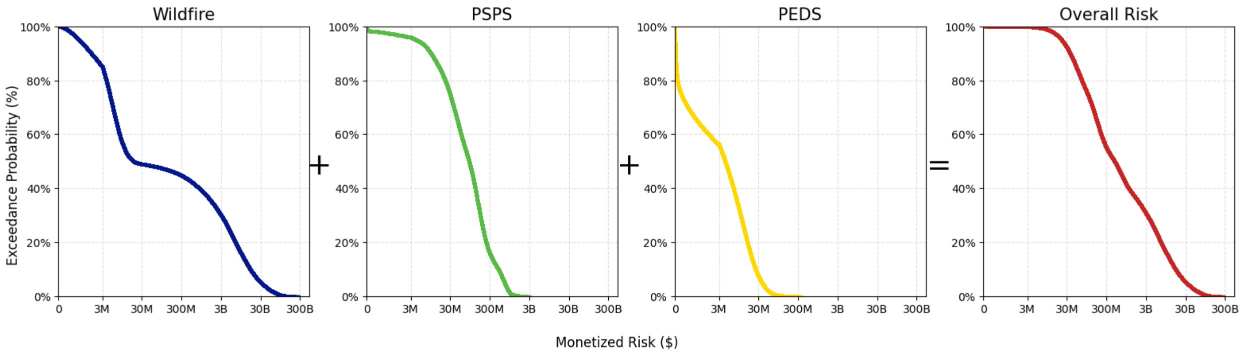

TABLE JW-4
Monetized Risk Estimates with Risk Aversion

Percentile	Annual Return Period (Years)	Wildfire Risk (M$)	PSPS Risk (M$)	PEDS Risk (M$)	Overall Utility Risk (M$)
p50	2	$ 19	$ 90	$ 4	$ 481
p95	20	$ 31,033	$ 707	$ 36	$ 31,210
p98	50	$ 55,703	$ 887	$ 53	$ 55,881
p99	100	$ 75,325	$ 1,006	$ 67	$ 75,508
Max	---	$ 281,307	$ 3,189	$ 379	$ 281,403
AAL	1	$ 5,748	$ 172	$ 10	$ 5,930

a. Monte Carlo Risk Assessment Model

A Monte Carlo simulation is a modeling technique that works by running thousands (or more) "what if" scenarios using random values for uncertain inputs, often leveraging weighted assumptions to reflect their relative likelihood, then analyzing the results to quantify probabilities, assess potential outcomes, and evaluate the range of variability.[22] The Monte Carlo Risk Assessment model within WiNGS-Planning simulates potential wildfire, PSPS, and PEDS events to capture uncertainty across risk events and a wide range of operating conditions. These simulations produce full probability distributions that reflect both expected outcomes and low-probability, high-consequence events at the feeder-segment level, enabling robust estimation of baseline risk, residual risk, tail risk, risk reductions, and BCRs. The Monte Carlo results serve as the analytical foundation for assessing mitigation strategies and guiding the prioritization of grid-hardening investments.

For modeling wildfire risk, the Monte Carlo Risk Assessment model builds on upstream asset failure and ignition submodels trained on a decade of historical outage and ignition data. These submodels estimate failure and ignition probabilities at the pole and span levels by incorporating asset characteristics, vegetation conditions, site-specific factors, and weather variables. Model results are generated across representative five-year weather, vegetation, and fuel scenarios, while historical risk-event data and ignition-spread simulations from Technosylva's FireSight™ inform consequence modeling. Failure and ignition probabilities are then combined with consequence estimates to assess the potential impacts of outages and ignitions.

Separate probability distributions are developed for wildfire, PSPS, and PEDS risks, producing annual cost estimates for each of the three risk categories at the feeder-segment level. The feeder-segment granularity reflects variations in weather, conductor characteristics, customer counts, fire potential, and ignition outcomes. This level of granularity is necessary to accurately evaluate the impacts of wildfires and outages for current baseline conditions and potential grid-hardening options. The use of Monte Carlo simulations for each of the risk categories is described in more detail within Sections I.D.1.b, I.D.1.c, and I.D.1.d. The outputs produced by the model are reviewed by risk data scientists and subject matter experts across Risk Analytics, Meteorology, and Engineering teams to validate performance, identify key risk drivers, and guide ongoing improvements.

The WiNGS-Planning model suite integrates multiple disparate data sources with complex interactions, resulting in the millions of simulated wildfire, PSPS, and PEDS

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[22] Statology, *The Concise Guide to Monte Carlo Simulation* (September 26, 2025), *available at*: https://www.statology.org/the-concise-guide-to-monte-carlo-simulation/

event-years. The set of simulated events associated with an individual circuit segment consists of tens of millions of data points, which increase drastically when performing sensitivity analysis across variations of select parameters, such as the risk aversion factor (see Section I.D.l). Managing, processing, and analyzing data at this scale requires data solutions and specialized analytical platforms capable of handling large, complex data structures. These platforms must support standardized, transparent, reliable, and repeatable workflows, while also complying with OEIS data governance guidelines[23] and stringent cybersecurity requirements, particularly because portions of the data used in the models are classified as confidential or sensitive.

To address these needs, SDG&E has invested significant resources in a cloud-based data management and analytics ecosystem. Within this environment, data sources are systematically identified, migrated, documented, validated, and governed throughout their lifecycle. This approach eliminates ad hoc and siloed datasets by integrating disparate source systems into a single, centrally governed, and standardized data environment, thereby establishing a single source of truth to support regulatory reporting and advanced analytics. In parallel, SDG&E has led the migration of analytical models to cloud computing platforms, enabling materially improved computational performance, faster model runtimes, and scalable processing capabilities that are essential for Monte Carlo-based risk assessment frameworks. These investments ensure that the modeling process remains robust, transparent, and reproducible as model complexity and data volumes continue to increase.

By contrast, the Microsoft Excel platform is not well suited to support these applications due to inherent technical limitations, including strict caps on the number of rows and columns, performance and memory constraints, susceptibility to instability when handling very large datasets, and challenges related to version control, auditability, and traceability. Given the magnitude, complexity, and sensitivity of the modeled simulations, providing the complete simulation output in an editable Microsoft Excel format is neither feasible nor practical. At the same time, SDG&E recognizes the importance of transparency, auditability, and regulatory reviewability of its risk modeling results. To balance these objectives, SDG&E has implemented a hybrid solution within its BCR workbooks (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF)

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[23] *See* OEIS Data Guidelines.

that is designed to provide meaningful transparency without exposing the full underlying simulation datasets.

Under this approach, outputs from the WiNGS-Planning model are curated, aggregated, and structured as inputs to the BCR workbooks, where key assumptions, intermediate calculations, and final results are clearly documented and reproducible. This framework enables reviewers to trace risk metrics under both risk-neutral and risk-averse assumptions, perform ad hoc sensitivity analyses, and evaluate how changes in inputs or modeling assumptions propagate through to benefit-cost ratios at the circuit-segment level.

This approach appropriately balances the goals of transparency and auditability with the practical realities of managing large-scale, confidential, and computationally intensive datasets. It enables well-documented summaries and decision-relevant results that support regulatory oversight and informed decision-making, without compromising system integrity, analytical performance, or data security.[24,25,26]

b. Wildfire Risk

WiNGS-Planning evaluates wildfire risk mitigation alternatives by estimating baseline and post-mitigation wildfire risk at both expected (mean) and tail (low probability, high consequence) levels for each feeder segment within the service territory. It also evaluates lifecycle cost and BCRs for each mitigation scenario (CCC, SUG, and operational mitigations) at the feeder-segment level across the HFTD. Together, these analyses support long-term grid-hardening and capital-planning decisions by identifying durable, cost-effective mitigations that reduce wildfire risk, PSPS de-energization impacts, and PEDS-driven outages, while improving overall grid resilience.

The current version of the WiNGS-Planning model suite (version 5.0), used in this GRC filing, incorporates probabilistic risk assessment modeling that is aligned with the Commission's BCR Framework and is designed to meet evolving regulatory requirements. This alignment

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[24] *See* A.25-05-010/013 (cons.), Administrative Law Judge's Ruling Directing the Service of Additional Information and Other Requirements (March 4, 2026) (the March 4, 2026 ALJ Ruling), Section 2.1, Requirement 3 at 10-11.

[25] *See id.*, Section 2.3, Requirement 4 at 14.

[26] *See id.,* Section 2.5, Requirement 3 at 17.

supports compliance with recent and forthcoming filings, including the 2026-2028 Base WMP[27] and the 2025 RAMP filing. [28,29] Risk is first quantified for each power-line span as a range of potential wildfire-related financial outcomes, capturing specific criteria such as weather, customer demographics, equipment characteristics, vegetation, and event-specific assumptions. The results of the risk modeling are then aggregated to the feeder-segment level and used to identify mitigation options that deliver the greatest risk reduction relative to their cost.

The current version of WiNGS-Planning identifies mitigation recommendations for power-line segments planned for implementation beginning in 2028. Grid-hardening priorities are updated regularly using the most recent validated model, allowing mitigation activities to be planned several years in advance.

As shown in Figure JW-6, multiple data sources are used by different Probability of Failure (PoF)[30] submodels – Conductor PoF, Vegetation PoF, Vehicle Contact PoF, and Other Equipment & Foreign Object PoF – which are aggregated into an overall PoF submodel. This overall PoF submodel is then paired with a Conditional PoI|F submodel that feeds into a Monte Carlo Risk Assessment model, which is a set of risk submodels (i.e., Wildfire Likelihood, Wildfire Consequence, PSPS Likelihood, PSPS Consequence, PEDS Likelihood, PEDS Consequence, Wildfire Risk, PSPS Risk, PEDS Risk, and Overall Risk). The Monte Carlo Risk Assessment model produces estimates of Wildfire, PSPS, and PEDS risks, which are summed up to determine the overall risk. The results of WiNGS-Planning are then analyzed, along with lifecycle costs and BCR, to determine the optimal mitigation.

WiNGS-Planning is used to estimate annual asset-level ignition probabilities based on historical annual ignition rates. It then simulates 5 million years across all assets to generate a distribution of possible ignition outcomes. Wildfire risk is calculated at the asset level using hourly outputs from the Probability of Failure and Conditional Probability-of-Ignition

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[27] *See* 2026-2028 Base WMP.

[28] *See 2025 RAMP Report.*

[29] *See supra* note 9.

[30] This filing refers to several PoF models for consistency with previous filings. Models such as the Conductor PoF model actually model the failure rate of conductors in terms of the number of failures per mile per year. Functionally, referring to this as PoF model is a distinction without a different, because the failure rates are very low such that the probability of failure is almost equal to the failure rate when assuming failures have random arrival times (Poisson process).

submodels. These hourly ignition probabilities are aggregated to estimate an annual ignition rate, also referred to as the annual PoI, for each asset. The resulting annual asset-level probabilities of ignition are then used in the Monte Carlo process to produce simulated ignition events. The equation used to calculate the Annual PoI and the variables therein are detailed below.

Equations

The annual Probability of Ignition for an asset *i* is calculated as follows and is expressed in units of ignition events per year:

$$\text{Annual PoI}_i = \frac{1}{N}\sum_{h=1}^{N}(\text{PoF}_{i,h} \times (\text{PoI} \mid F)_{i,h})$$

Variables

- h denotes the hourly time index
- i denotes a particular asset
- N denotes the number of years of hourly Probability of Failure and Conditional Probability of Ignition predictions
- $PoF_{i,h}$ denotes the Probability of Failure results for asset i at hour h and is expressed in units of failure events
- $PoI|F_{i,h}$ denotes the Conditional Probability-of-Ignition results for a given failure of asset i at hour h and is expressed in units of ignitions per failure event

For each asset, a series of two Bernoulli trials within the Monte Carlo Risk Assessment model is used to evaluate the probability that an ignition occurs on a high-fire-risk day in a given year, as illustrated in Figure JW-9. A Bernoulli trial is a simple statistical experiment with two possible outcomes in which the probability of one outcome is specified.[31]

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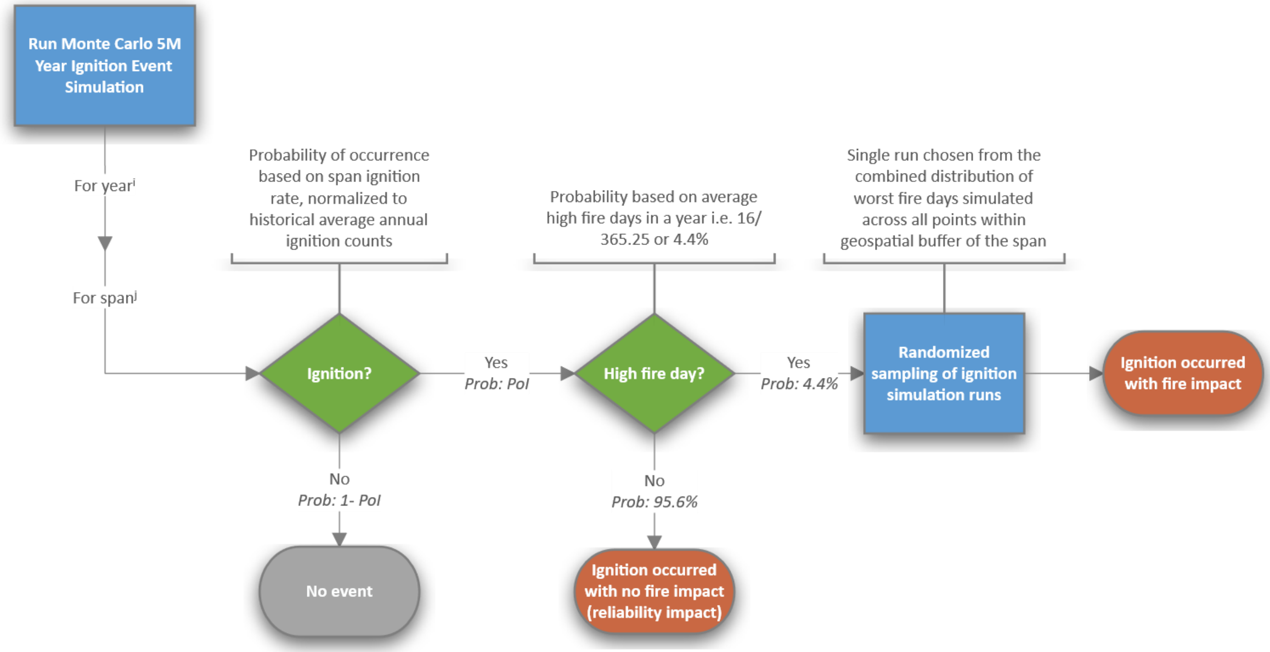
[31] Mathwords. *Bernoulli Trials — Definition, Formula & Examples*, *available at*: https://www.mathwords.com/b/bernoulli_trials.htm.

FIGURE JW-9
Monte Carlo Ignition Risk Event Process Flowchart



For the first Bernoulli trial, the annual ignition rate described above represents the likelihood that an ignition would occur for a given asset in a single year. If the result of the first trial is that the ignition does not occur, the model records no event for that asset in that year. If the result of the first trial is instead that the ignition occurs, then the model proceeds to the second Bernoulli trial. The second Bernoulli trial is used to model whether an ignition that has occurred happened on a high-fire-risk day, which is a day where the chance of a wildfire is high as identified by subject matter experts.

High-fire-risk days are characterized by the issuance of a Red Flag Warning and/or PSPS activation, even if de-energization did not take place. The National Weather Service (NWS) defines a Red Flag Warning as a period of six or more consecutive hours with sustained wind speeds of at least 25 mph and/or wind gusts of at least 35 mph, in combination with relative humidity of 15 percent or lower.[32] Under these conditions, the potential for an ignition to rapidly escalate into a catastrophic wildfire is high. Based on a historical average of 16 high-fire-risk

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[32] NWS, *NWS San Diego All-Hazard Reference Guide*, *available at*: https://www.weather.gov/media/sgx/documents/WWA_Criteria.pdf.

days per year, the probability of an ignition event occurring on high-fire-risk day is estimated at approximately 4.4% (i.e., 16 days divided by 365.25 days per year).

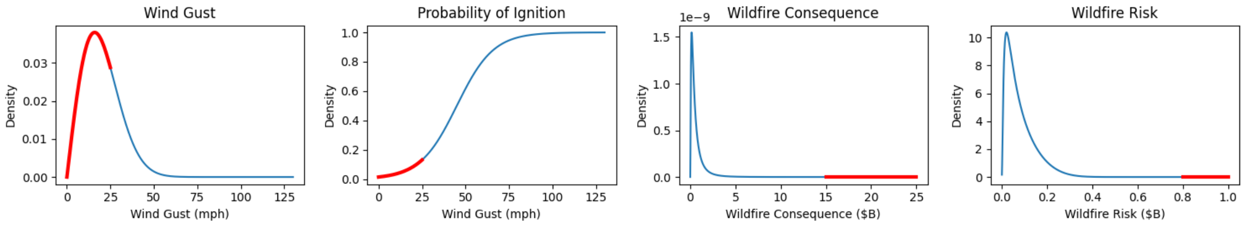
If the result of the second Bernoulli trial is that the ignition did not occur on a high-fire-risk day, then the model records the ignition event as having a reliability impact but not a catastrophic wildfire consequence. If the result of the second trial is that the ignition did occur on a high-fire-risk day, the model assigns a wildfire consequence impact by randomly selecting one simulated fire-spread scenario (supplied by Technosylva modeling) that applies to the area immediately surrounding the asset.

The resulting output is a probabilistic distribution of ignition events and their associated fire-spread scenario metrics from Technosylva's model output (i.e. acres burned, buildings destroyed), which are used to estimate the monetized risk impacts. For more details on the assumptions used to estimate monetized risk impacts associated with ignition events, see Section I.D.1.b.ii.5, which describes the assumptions used within the Wildfire Consequence submodel.

This approach directly addresses concerns raised in multiple stakeholder forums that certain modeling outputs may associate very high wildfire consequences with events characterized by low underlying risk conditions (e.g., low wind speeds and non-critical fuel moisture levels). Under SDG&E’s modeling framework, the Failure and Ignition models are explicitly created and calibrated to the environmental drivers most strongly associated with wildfire risk in the service territory, particularly high wind conditions and dry fuel states. As a result, simulated ignition events occur predominantly under these elevated risk conditions and are therefore inherently aligned with scenarios that have the potential to produce significant consequences.

By design, SDG&E’s modeling approach ensures that high-consequence outcomes are not artificially attributed to low-likelihood, low-risk conditions, but instead arise from realistic combinations of adverse weather, fuel, and system factors. Figure JW-10 presents illustrative probability density distributions for wind gust speed (left), wildfire consequence (second from right), and overall wildfire risk (right), as well as the cumulative distribution of ignition probability as a function of wind gust speed (second from left). The red regions of the wind gust speed and cumulative probability of ignition distributions are associated with low wind speeds unlikely to lead to ignitions with severe consequences. In contrast, the red regions of the risk and consequence distributions are associated with higher wind gust speeds in combination with other adverse fuel and system factors. Because SDG&E's modeling framework constrains results to physically and operationally consistent scenarios, unrealistic pairings of low-ignition-probability conditions and extreme consequences (such as those represented by the red regions of the distributions) are excluded from the Monte Carlo simulations. SDG&E's modeling framework thus ensures that modeled risk outcomes are grounded in credible and internally consistent relationships.

FIGURE JW-10
Example Wildfire Risk-Related Probability Distributions



i. Likelihood

This section describes how WiNGS-Planning calculates the likelihood of a risk event for baseline Wildfire Risk. First, individual PoF submodels are aggregated into an overall PoF submodel, which is paired with a Conditional PoI|F submodel to determine the overall PoI. Outputs from these submodels are then used as inputs to the Monte Carlo Risk Assessment model, which calculates the likelihood and consequence of risk events.

1. Probability of Failure Submodel

This section describes the asset failure rate (i.e., PoF) submodels incorporated within the WiNGS-Planning model suite, with particular emphasis on wind-driven failure mechanisms that are most likely to lead to catastrophic wildfire ignitions. These submodels, including conductor failure, vegetation contact, vehicle contact, and other equipment or foreign-object interactions, are designed to capture, among other factors, localized pole- and span-level conditions, fuel characteristics, and the influence of extreme meteorological conditions on asset failure behavior and ignition likelihood.

In addition, this section presents visualizations of the southern portion of the service territory, highlighting feeder segments in Tier 3 of the HFTD that illustrate the high level of spatial granularity embedded in the risk modeling framework. The figures demonstrate how risk varies at the feeder-segment level, reflecting localized differences in terrain, exposure, and operating conditions. The section also includes illustrative time-series plots for each submodel, demonstrating model behavior across different hours and risk levels, including both low-risk periods and high-risk conditions associated with extreme fire weather.

Even under broadly similar environmental conditions, the risk modeling framework can distinguish relative risk at the feeder-segment level. This capability allows for the identification of localized high-risk areas that may not be evident using coarser, system-level metrics, thereby supporting more targeted and effective mitigation planning.

PoF models are trained using historical span-level data, wind observations from the weather station network (for conductor and vegetation models), and recorded outage events. Statistical and machine learning modeling capabilities approaches are used to estimate relationships between environmental conditions and asset failure likelihood for each failure type. Identified outliers undergo subject matter expert review to assess whether they reflect true anomalous operating conditions, or stem from data errors, or reflect rare extreme events. Based on this evaluation, outliers may be excluded, corrected, or retained, respectively. This structured outlier evaluation process helps ensure that the resulting models are technically robust and operationally representative.

The submodels are integrated with three-day forecasted weather conditions across the service territory to support WiNGS-Ops by enabling forward-looking assessments of outage likelihood under anticipated meteorological and environmental conditions. During periods of elevated wildfire risk, these predictive outputs enhance operational readiness, situational awareness, and resource prioritization by identifying assets and locations where failure risk is expected to increase based on forecasted weather drivers. This capability allows SDG&E to proactively align operational controls and response strategies with anticipated risk levels.

For long-term planning, the submodels are used to predict probabilities in five or more years of historical weather and fuel data to evaluate how the risk of failure changes under different conditions. This analysis enables SDG&E to assess long-term risk patterns associated with specific geographies, asset types, and environmental conditions. As depicted in Figure JW-6 in Section I.C.3, the insights derived from this historical risk patterns are used within WiNGS-Planning to inform strategic mitigation decisions, prioritize capital investments, and identify locations with persistently elevated risk profiles. Collectively, this approach supports evidence-based planning and demonstrates alignment between historical risk exposure and long-term mitigation strategies.

Model updates typically involve retraining using newly available data. However, if ongoing model monitoring indicates methodological drift or a material change in underlying risk drivers, a broader methodological update may be implemented. In cases where model drift is observed to occur more rapidly, updates may be performed more frequently than once per year to ensure predictions remain accurate, stable, and aligned with current operating conditions.

Over successive annual updates, these submodels have demonstrated a high degree of stability in forecasting the expected number of outages, with results consistently exhibiting a strong correlation with prevailing wind patterns and recurrent identification of the same high-risk areas within the service territory. This consistency has provided confidence in the underlying model structure and its representation of the dominant risk drivers.

Submodels are updated annually to incorporate incremental changes including the latest grid configurations, newly available outage and weather observations, and refined data quality inputs. These updates do not fundamentally alter outputs. Versioning serves to maintain technical accuracy, auditability, and transparency while preserving continuity in risk assessment methodologies. These updates also support stability and predictability in long-term investment strategies. Hardening plans are therefore not driven by short-term model fluctuations but instead informed by persistent, multi-year risk signals that have proven robust over time. Annual model updates may result in incremental prioritization adjustments, such as sequencing, scope refinement, or validation of completed work, but they do not materially redirect capital planning unless there are also substantive changes in underlying risk drivers or infrastructure configuration.

The model is run on a rolling basis, which allows it to support both daily operations (WiNGS-Ops) and long-term planning.

Model outputs include the expected number of conductor failures per hour and per mile for each span under varying wind conditions. These span-level results feed into the overall Asset PoF model, which also incorporates failure likelihood from vegetation, vehicle contact, and other causes and is used to inform the overall PoF of a given conductor asset (e.g., span).

a. Conductor PoF Submodel

The Conductor PoF submodel is used to estimate the likelihood that an overhead conductor will fail in a given span based on wind-gust speed and direction. It uses a statistical log-log model trained on historical weather conditions, outage records, equipment failure reports, and detailed conductor characteristics from GIS and asset databases. Observed weather conditions from the weather station network are incorporated as model inputs.

The output of the submodel is conductor failure rates, which are normalized based on weather conditions and again in terms of failures per mile to enable consistent comparisons across spans with varying lengths and weather conditions. Risk event data and asset attributes are refreshed at least annually to reflect the most recent asset outages, infrastructure changes, and system configuration.

Results from the Conductor PoF submodel vary with location and time. Figure JW-11 illustrates this variation for feeder segments in the southern portion of the service territory, which is located in Tier 3 of the HFTD. It shows estimated conductor failure rates under low-wind and high-wind conditions. In this figure, failure rates are represented by contours ranging from dark blue to red, representing relatively low to high conductor failure rates per hour, respectively. The left map depicts estimated conductor failure rates when maximum hourly wind gusts are approximately 20 mph (i.e., low-wind conditions), and the right map shows expected failure rates under high-wind conditions with gusts up to approximately 93 mph. These maps were generated using actual data collected on December 31, 2024 and January 20, 2025, respectively. As wind gust speed increases, the estimated rate of conductor failure per hour can also be seen to increase. Nevertheless, these changes are not uniform across the service territory. This figure shows that highest risk areas are concentrated in relatively small portions of the service territory.

Figure JW-12 shows how expected conductor failure rates change over time under wind-gust conditions in January 2025. In this example, three feeder segments in Tier 3 of the HFTD were selected that represent relatively low, medium, and high failure risk. Under relatively low-wind conditions, all three feeder segments exhibit similarly low expected failure rates. However, as wind gusts increase, their failure rates diverge. The largest wind speeds occur around January 21, 2025. During this period the higher risk segments show a larger expected failure rate. This example demonstrates how conductor failure risk varies across feeder segments depending on weather conditions and timing.

FIGURE JW-11
Conductor Probability of Failure in Tier 3 with Low Risk (left) and High Risk (right) segments

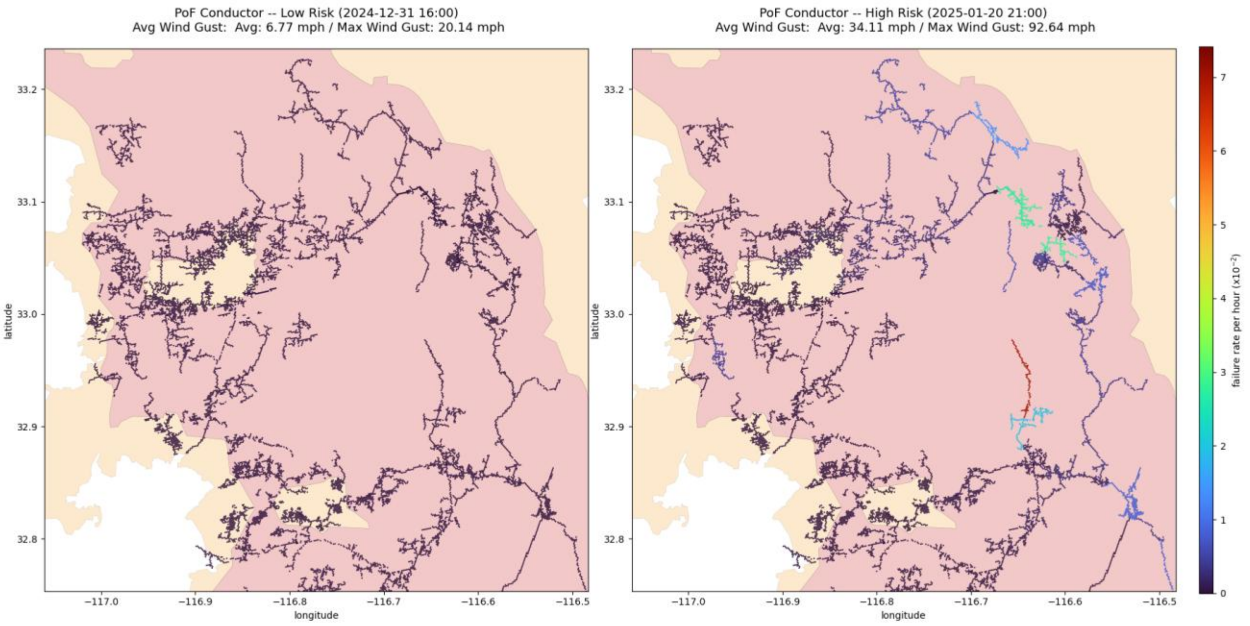
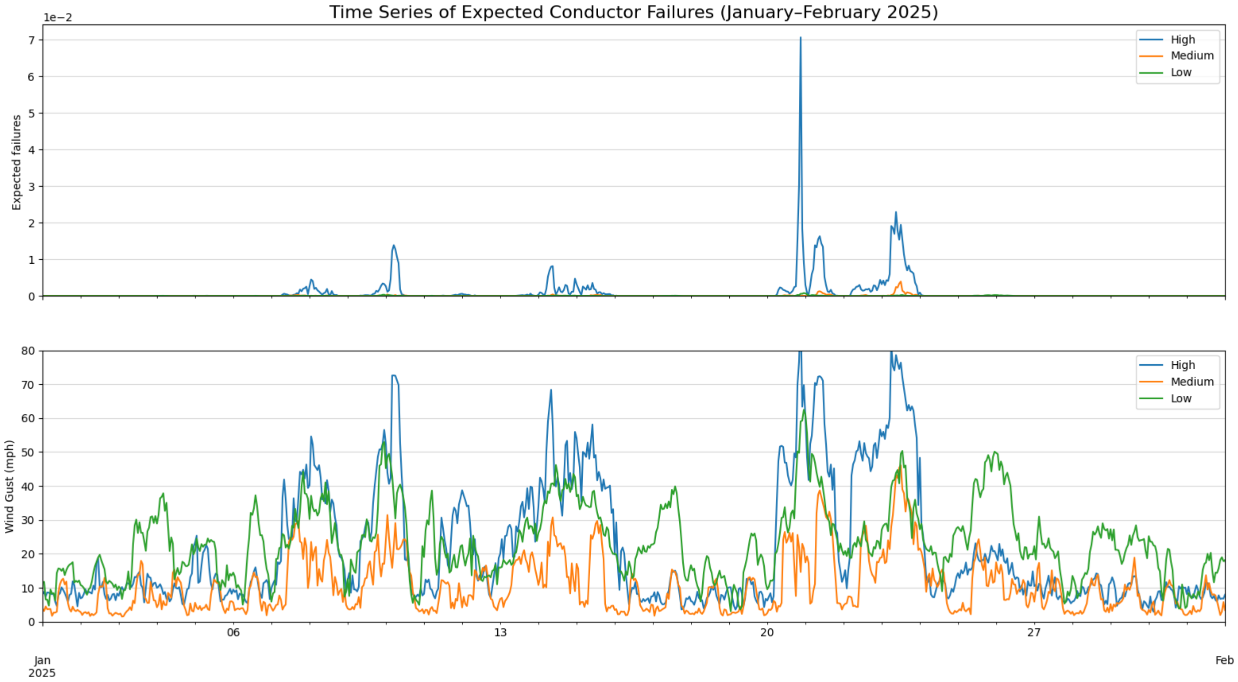


FIGURE JW-12
Illustration of Conductor Probability of Failure over Time



b. Vegetation PoF Submodel

The Vegetation PoF model is used to estimate the likelihood that an outage caused by vegetation will occur at each span in the service territory based on wind gust speed and direction. It uses a statistical log-log regression informed by historical weather data and outage data, asset attributes, and a detailed vegetation inventory that includes tree species, height, location, and pruning history. The submodel produces normalized failure rate estimates, expressed as failures per mile per hour based on exposure. These estimates allow risks to be compared in relative terms across the service territory, even where spans, vegetation conditions, and weather differ. When used for scenario analysis in WiNGS-Planning, this model uses back-casting and mitigation effectiveness multipliers to evaluate past outages and assess how mitigations such as SUG or CCC can reduce vegetation-related risk under various weather conditions. The model is run on a rolling basis and updated as assets, vegetation data, and reporting requirements evolve. Its outputs feed into the broader Asset PoF model alongside conductor, vehicle contact, and other failure modes, which is then paired with ignition probability to assess overall wildfire risk.

The Vegetation PoF submodel shows variation in risk across locations and over time, including annual, seasonal, and hourly differences. Figure JW-13 illustrates this variation by showing Vegetation PoF on low-wind and high-wind days (left and right panels, respectively). In this figure, failure rates are represented by contours ranging from dark blue to red, representing relatively low to high conductor failure rates per hour, respectively. The left map depicts estimated conductor failure rates when maximum hourly wind gusts are approximately 20 mph (i.e., low-wind conditions), and the right map shows expected failure rates under high-wind conditions with gusts up to approximately 76 mph. These maps were generated using actual data collected on December 31, 2024 and January 23, 2025, respectively. The figure shows that the highest-risk segments are concentrated in relatively small portions of the service territory.

Figure JW-14 shows how expected vegetation-related failures vary under different wind-gust conditions with time. In this example, three feeder segments were selected to represent low, medium, and high estimated conductor failure rates. Under low-wind conditions, all three feeder segments exhibit low expected failure rates. As wind gust speed increase, however, the expected failure rates of the feeder segments diverge. This comparison highlights how vegetation-related risk varies by location depending on weather conditions and timing.

FIGURE JW-13
Spatial Illustration of Vegetation Probability of Failure for Tier 3 with Low Risk (left) and High Risk (right) segments

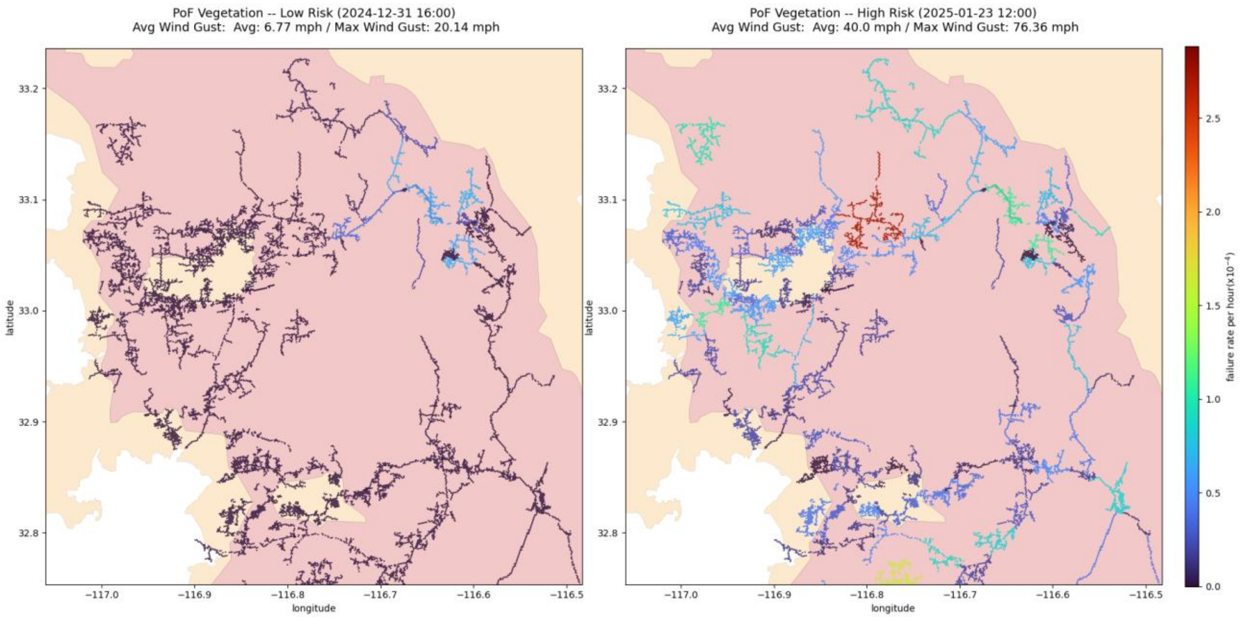
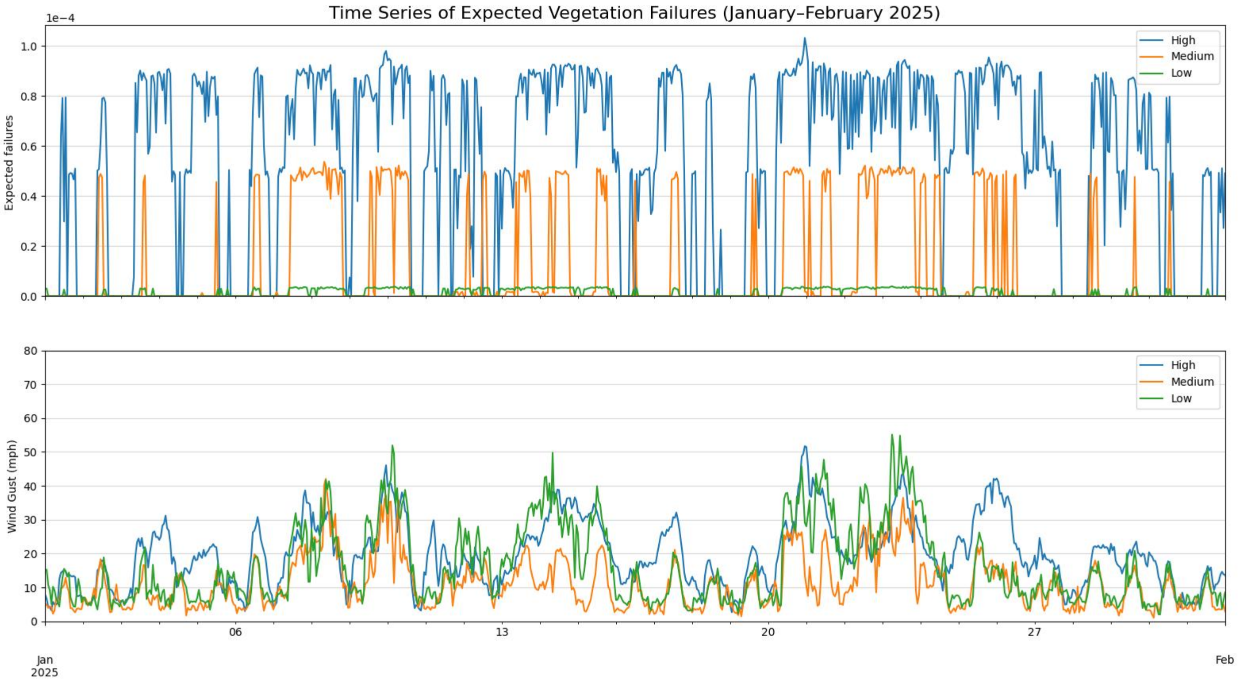


FIGURE JW-14
Temporal Illustration of Vegetation Probability of Failure for Tier 3



c. Vehicle Contact PoF Submodel

The Vehicle Contact PoF model is used to estimate the likelihood of a vehicle strike on each pole in the service territory. Unlike the conductor and vegetation PoF models, this model does not use weather inputs because no meaningful correlation has been observed between wind conditions during elevated or extreme fire weather conditions and vehicle impacts to electrical assets.

The model uses the eXtreme Gradient Boosting (XGBoost) software library, implemented as a classification algorithm. XGBoost classifier is a machine-learning method that builds a sequence of decision trees in which each successive tree improves upon prior prediction errors. This approach is widely adopted due to its strong predictive accuracy, computational efficiency, and effectiveness in modeling complex patterns in structured data.[33] Here, an XGBoost machine learning classifier is trained on outage event data, asset locations, and detailed road attributes sourced from OpenStreetMap via OSMnx.[34] Inputs include historical data on vehicle-caused outages, road speed limits, road curvature, proximity to intersections, populations served, and points of interest (e.g., bars), along with asset-specific GIS data and engineering reports. The training dataset further incorporates the distance between each asset and its nearest road as well as road geometry.

The number of poles struck by vehicles is considerably smaller than the number of poles that are not struck by vehicles. If the dataset is left as is, it would result in the data being used to train the submodel to be imbalanced because the number of poles struck by vehicles is underrepresented throughout the dataset. This imbalance, if used to train the Vehicle Contact submodel, could lead to an underestimation of the probability of a pole being struck by a vehicle. To help prevent such underestimation, the Synthetic Minority Over-sampling Technique (SMOTE)[35] is used, which increases the representation of vehicle-strike events that would otherwise be underrepresented. SMOTE increases the representation of the minority class by generating synthetic examples of vehicle-strike events based on existing data, thereby improving class balance. This approach enables the model to better learn patterns associated with rare but

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[33] XGBoost Documentation, *available at*: https://xgboost.readthedocs.io/en/release_3.2.0/.

[34] OSMnx 2.1.0 Documentation, *available at*: https://osmnx.readthedocs.io/en/stable/.

[35] SMOTE Method, *available at:* https://documentation.sas.com/doc/en/sdgcdc/v_001/sdgug/n034o46i6mitx6n1v8b7jx9km0mq.htm.

critical events, resulting in more reliable and stable predictive performance. Vehicle Contact submodel performance is evaluated using standard classification measures, including confusion matrix analysis in which performance of the model is analyzed. An estimated hourly failure rate is produced for each pole, which is then integrated into an overall Asset PoF submodel. Risk event data and asset attributes are refreshed at least annually to reflect recent asset outages, infrastructure changes, and system configuration. For operations, the Vehicle Contact submodel is used on a rolling basis as new assets come online or as older assets are updated or removed. In this capacity the outputs from this model directly inform the overall Asset PoF model alongside conductor, vegetation, and other failure submodels.

Figure JW-15 shows Vehicle Contact submodel across the service territory on representative low- and high-wind days (left and right panels, respectively). Colors in this figure range from dark blue (lower failure rates per hour) to red (higher failure rates per hour). These maps were generated using actual data collected on December 31, 2024 and January 8, 2025, respectively. Although the two panels reflect significantly different wind speeds of 20 mph and 52 mph, respectively, the patterns are very similar, indicating that vehicle-related risk is largely unaffected by wind conditions.

Figure JW-16 shows how Vehicle Contact failures vary over time. In this example, three feeder segments were selected to represent relatively low, medium, and high potential failure rates. The relatively flat trend of expected failures despite variations in wind speed of up to nearly 60 mph illustrate that the Vehicle Contact PoF model is not strongly sensitive to wind speed. Rather, other factors that are incorporated into this model have a more significant role in the outcomes.

FIGURE JW-15
Illustration of Vehicle Contact PoF for the San Diego service region with Low Risk (left) and High Risk (right) segments

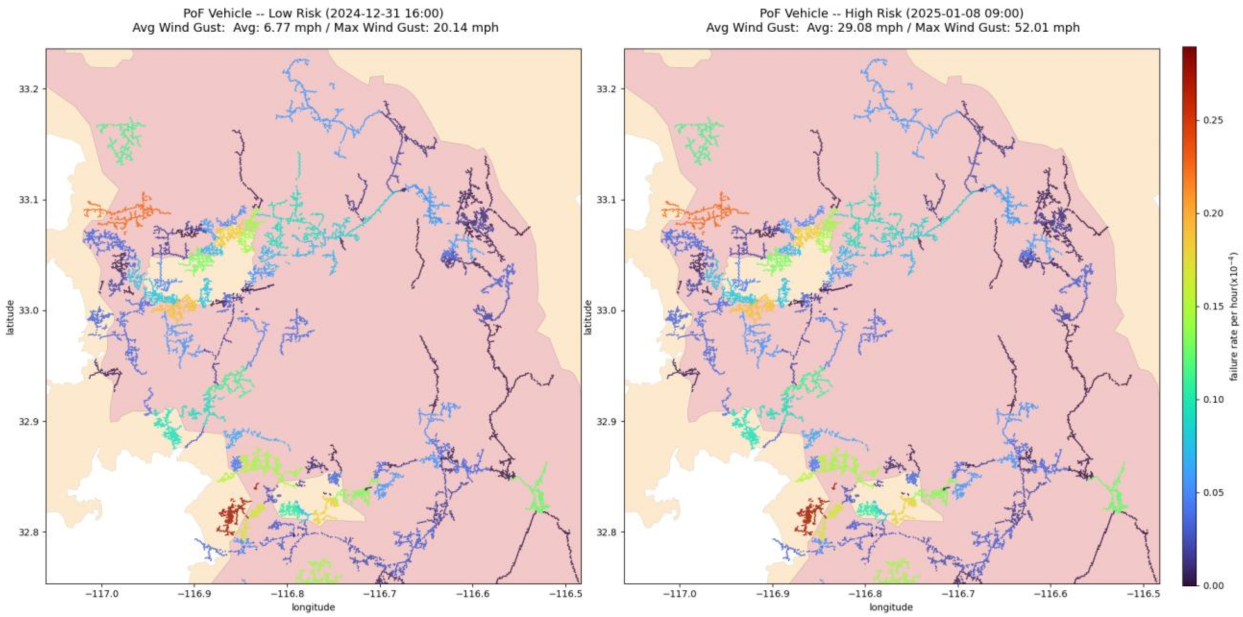
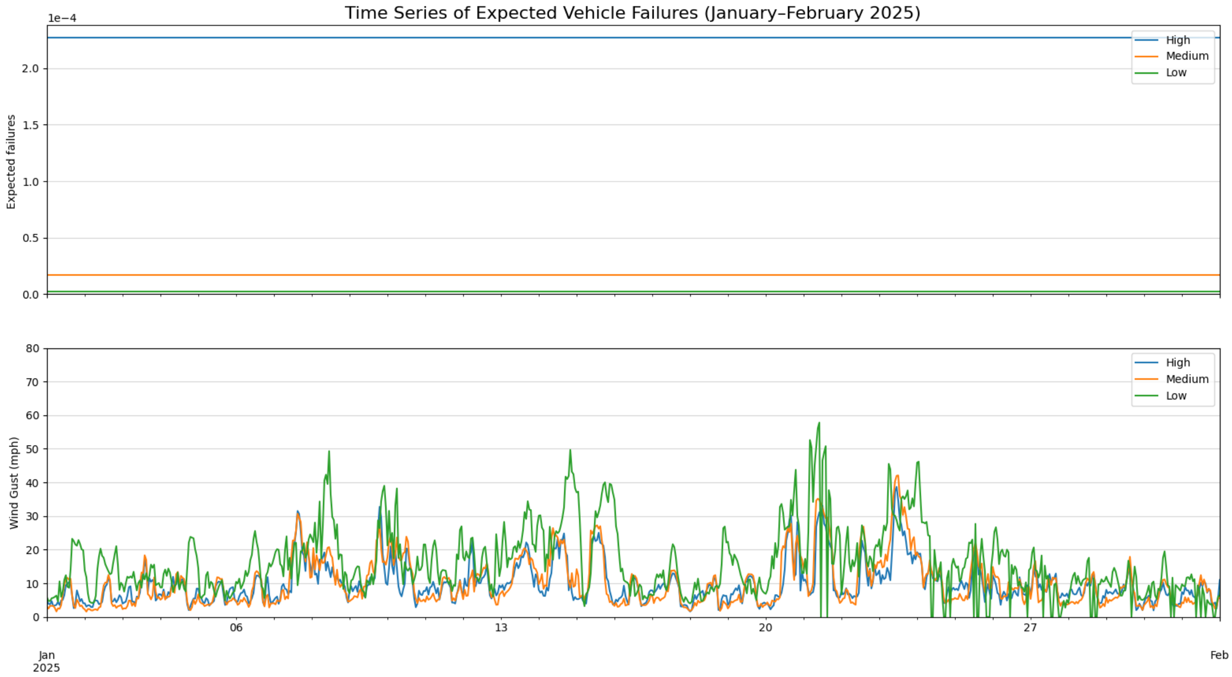


FIGURE JW-16
Temporal Illustration of Vehicle Probability of Failure for Tier 3



d. Other Equipment & Foreign Object PoF Submodel

The Other Equipment & Foreign Object submodel is used to estimate the likelihood of outages that are not correlated to wind conditions or strong seasonal patterns. It encompasses a wide range of failures that could lead to an ignition that has the potential to escalate into a wildfire, including equipment malfunctions such as damaged fuses, recloser or transformer malfunctions, and outages caused by external factors such as animals, balloons, or accidental contact by the public or SDG&E employees performing inspection or corrective activities, excluding vehicle-related contacts. It also includes unpredictable incidents such as vandalism or theft of SDG&E equipment. The submodel is run continuously as assets change and is reviewed annually.

This submodel uses a deterministic approach based on historical outage data rather than a statistical approach. It assigns baseline, non-wind-related failure rates using outage records, equipment failure reports, and GIS asset location data. These baseline rates are adjusted to reflect factors such as conductor type (covered vs. bare), transformer locations, and whether assets are located within the HFTD. The model generates an estimated hourly failure rate for each asset and distinct failure rates for HFTD versus non-HFTD areas. The resulting output is an hourly failure rate for each relevant asset. Ultimately, the outputs from this submodel are used in the overall Asset PoF model alongside Conductor, Vegetation, and Vehicle Contact submodels. Together these models are used to estimate the probability that a given failure will lead to an ignition.

Figure JW-17 shows Other Equipment & Foreign Object failure rates across the service territory for low- and high-risk days (left and right panels, respectively). In the figure, colors range from dark blue (low failure risk) to red (high failure risk). These maps were generated using actual data collected on December 31, 2024 and January 8, 2025, respectively. Although the two panels correspond to significantly different wind speeds of 20 mph and 46 mph, respectively, the patterns are similar, indicating that Other Equipment & Foreign Object submodel is largely unaffected by wind conditions.

Figure JW-18 shows how the Other Equipment & Foreign Object submodel varies over time. Three feeder segments were selected to represent relatively low, medium, and high failure risk. The relatively flat trend over time indicates that expected failures remain stable despite wind speed fluctuations.

FIGURE JW-17
Illustration of Other Equipment & Foreign Object Submodel for the San Diego service region with Low Risk (left) and High Risk (right) segments

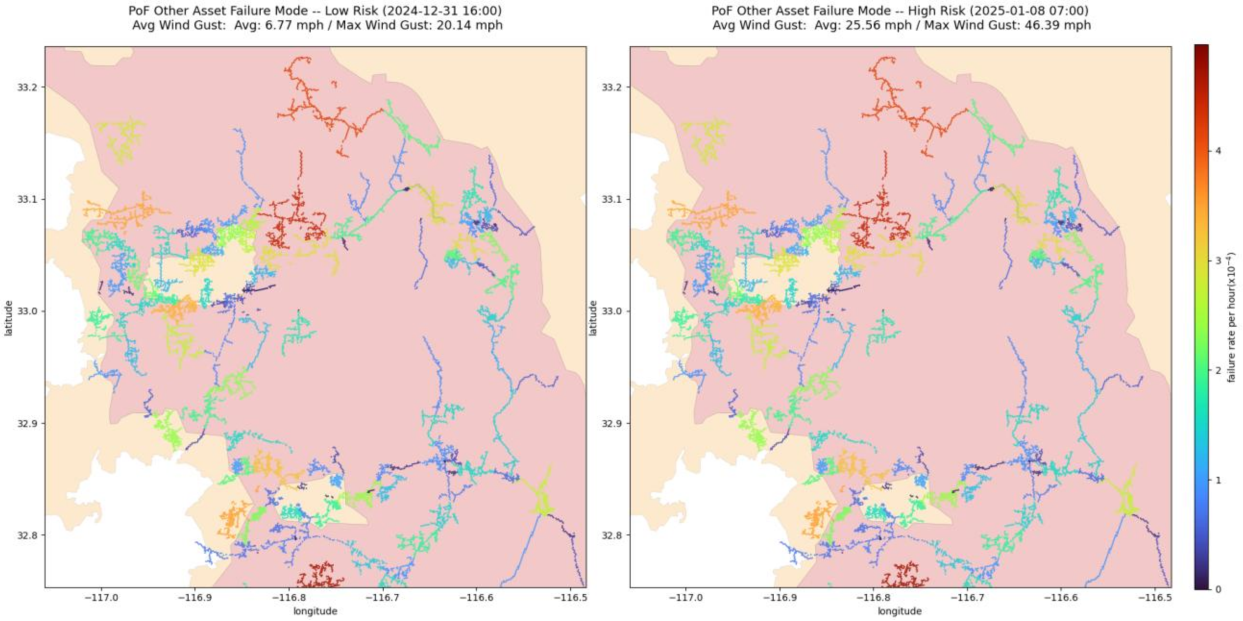
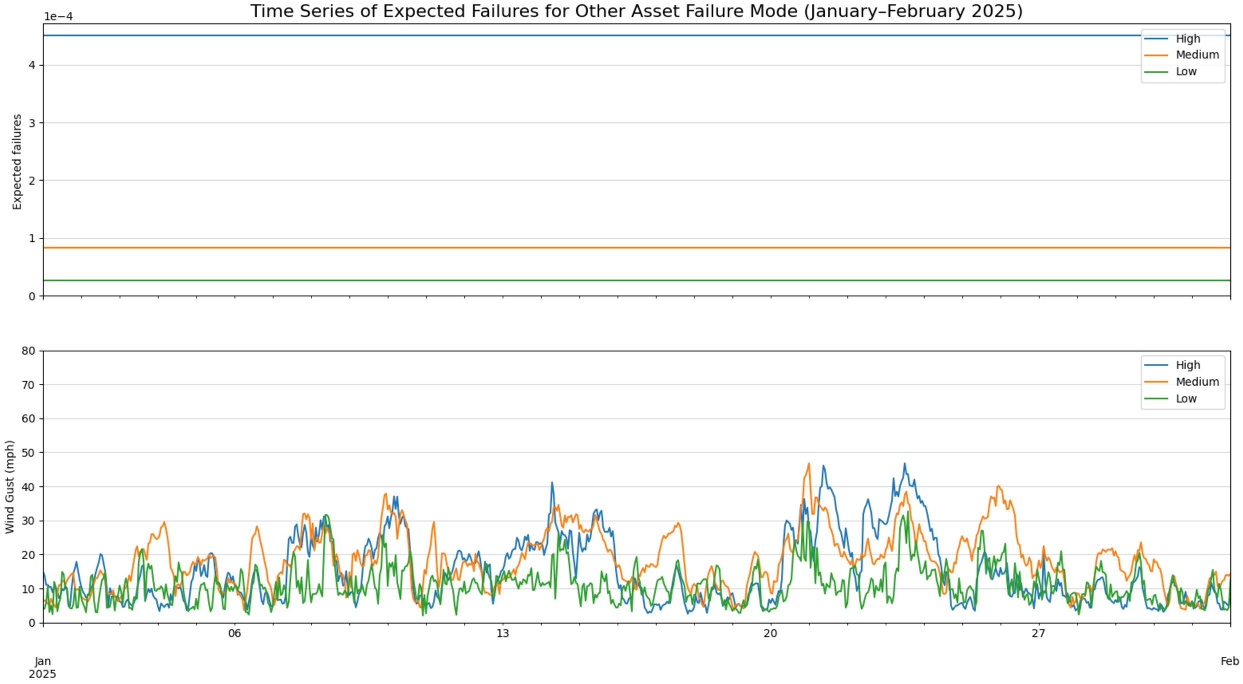


FIGURE JW-18
Temporal Illustration of Other Equipment & Foreign Object submodel for Tier 3



2. Probability of Ignition Submodel

The Probability of Ignition (PoI) is equal to the probability of failure (PoF) multiplied by the conditional probability of ignition (Conditional PoI|F).

The Conditional PoI|F submodel is used to estimate the likelihood that an ignition may occur at an asset (e.g., span or pole), given that a failure is expected to have occurred based on a Conductor, Vegetation, Vehicle Contract or Other Equipment & Foreign Object submodel. Put simply, a spark caused by high wind may or may not lead to an ignition event. If the conditions are favorable (e.g., dry vegetation near the asset) then it may lead to an ignition that could result in outcomes ranging from a small wildfire to a catastrophic wildfire, or, if PSPS protocols are initiated, a proactive de-energization to protect public safety. However, ignition conditions may not be favorable (e.g., due to recent vegetation work, paved or non-combustible terrain, or recent rainfall), in which case an ignition may not occur. These and other potential scenarios are considered in the Conditional PoI|F submodel.

This model combines outputs of the multiple failure submodels and other likelihood factors to produce an overall ignition probability. Weather conditions such as wind gust, wind direction, temperature, humidity, Red Flag Warnings, and vegetation flammability indicators such as the Fire Potential Index (FPI), as well as fuel conditions, are incorporated. These factors help capture environmental conditions that influence whether an asset failure would result in an ignition.

This submodel integrates historical outage-to-ignition relationships through an ignition ratio based on reportable ignition records and evidence of heat records collected by the fire coordination team in collaboration with district engineers. It also accounts for fuel conditions, such as how much fuel is present and how dry it is, along with metrics like the National Fire Danger Rating System's Ignition Component (IC).[36] Together, these inputs capture how environmental conditions influence the likelihood that an asset failure results in an ignition. The outputs of this model are hourly and annual expected ignitions for each pole and span in the service territory.

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[36] Western Fire Chief's Association, *National Fire Danger Rating System (NFDRS) Explained* (edited September 17, 2024), *available at*: https://wfca.com/wildfire-articles/fire-danger-rating-system-explained/

Figure JW-19 shows Expected Ignitions across the service territory on representative days with low and moderate wind speeds (left and right, respectively). Colors range from dark blue (lower failure rate per hour) to red (higher failure rate per hour). This map is best viewed alongside similar maps which show PoF for other conditions. Nevertheless, it clearly illustrates the locality of conditions that lead to the most severe outcomes. These maps were generated using actual data collected on December 31, 2024 and January 20, 2025, respectively. The left map depicts estimated ignition rates when maximum hourly wind gusts are approximately 20 mph (i.e., low-wind conditions), and the right map shows expected ignition rates under high-wind conditions with gusts up to approximately 93 mph.

Figure JW-20 shows how the Expected Ignitions varies with time. In this example, three feeder segments were selected to represent relatively low, medium, and high conductor failure rates. The relatively flat trend over time indicates that the probability of an asset failure resulting in an ignition does not vary significantly with timing, demonstrating the Vehicle submodel's relative insensitivity to temporal factors.

FIGURE JW-19
Illustration of Expected Ignitions for the San Diego Service Region

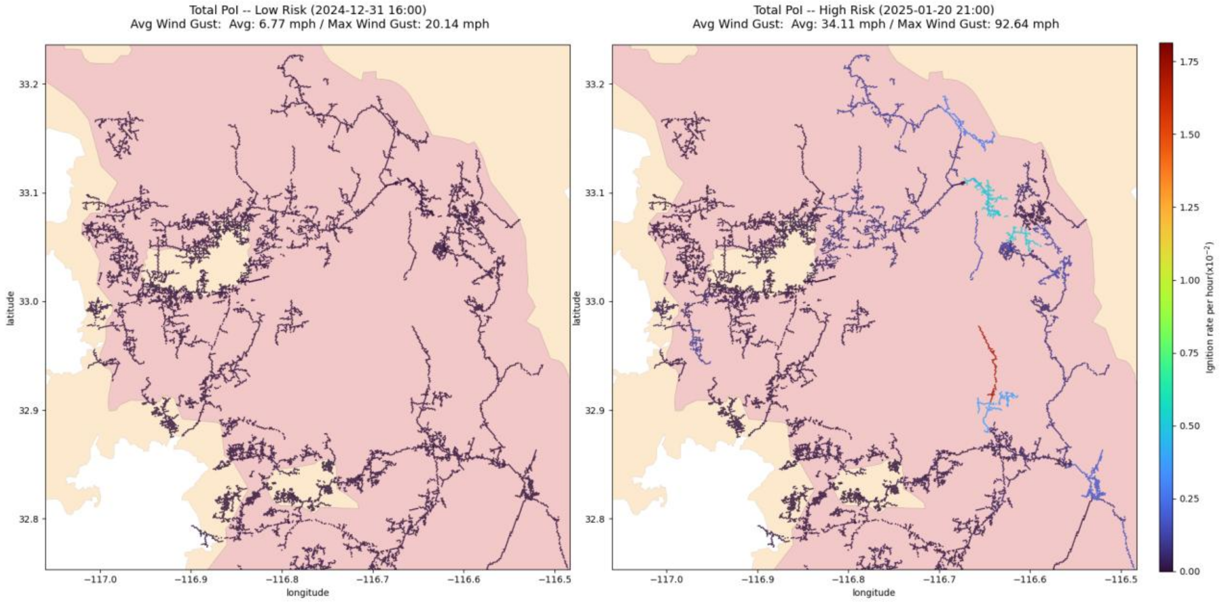
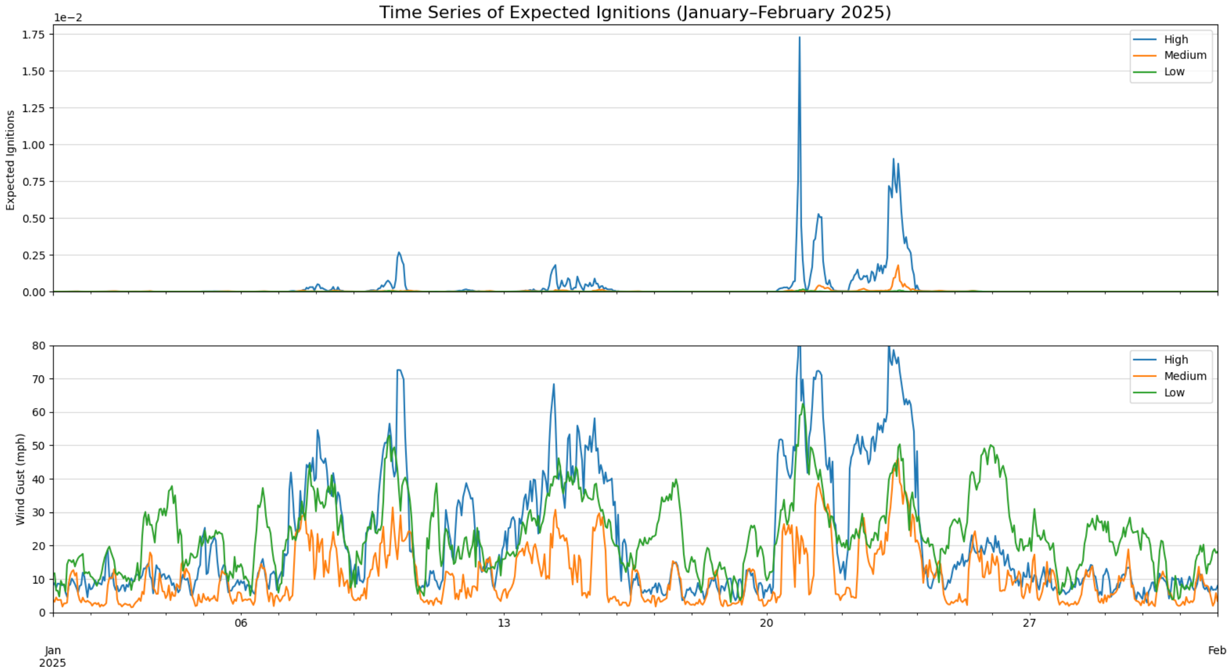


FIGURE JW-20
Expected Ignitions Over Time from January 2025 to February 2025



ii. Consequence

Wildfire consequences are estimated using Technosylva's FireSight™,[37] also known as the Wildfire Analyst Enterprise Wildfire Risk Reduction Model (WFA-E WRRM) and support the WiNGS-Planning and WiNGS-Ops model suites. The model performs fire-spread simulations that assess fire behavior at each asset under historically worst-case fire-weather conditions, supporting the development of site-specific mitigation strategies tailored to each asset's risk profile and surrounding environment.

FireSight™ incorporates historical fire behavior observations and thus implicitly accounts for the effects of land management activities, such as prescribed burns, and vegetation

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[37] *Technosylva Wildfire Planning (FireSight™), available at:* https://technosylva.com/products/wildfire-planning/.

management practices. Together, these inputs influence model land cover, fuel loads, and expected fire spread rates.[38,39]

SDG&E has recently enhanced its consequence modeling to align with its likelihood model, enabling assessment of potential wildfire impacts at the pole span level. This increased granularity supports improved risk characterization, long term mitigation planning, and more informed operational decision-making during periods of elevated fire weather risk.

1. SDG&E Truncated Power Law

A truncated power-law distribution is used to model wildfire-related economic losses within the service territory, as it is well-suited for representing rare, high-consequence events.[40] Power-law distributions[41,42] are well suited for capturing the heavy-tailed nature of wildfire losses, where a small number of extreme events account for a disproportionately large share of total impacts. This method helps estimate the likelihood and scale of catastrophic losses, which is critical for informing long-term investment strategies and guiding operational decisions during periods of extreme fire weather.

To develop the truncated power-law distribution model, statistical analyses of historical wildfire records[43] from Southern California between 2000 to 2025 were conducted to assess the financial consequences of wildfire events. Historical records of acres burned and structures destroyed were converted to monetary values using assumptions presented in Table JW-10, the results of which are shown in Table JW-6. The analysis determined that a Generalized Pareto

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[38] Technosylva, *Models Implemented in WFA*, Appendix D, *available at*: https://helpcenter.technosylva.com/wfa-desktop/models-implemented-in-wfa.

[39] Buckley, D. and Ramirez, J., *New approaches in fire simulations analysis with Wildfire Analyst* (5th International Wildland fire conference) (May 2011), *available at*: https://doi.org/10.13140/2.1.2045.7766

[40] See D.24-05-064 at 54 (“the utility should use a truncated power law distribution to model tail value in wildfire risks, which we consider to be a best practice.”); *see also* FOF 18 and 19 at 953.

[41] University of Michigan, *Power laws, Pareto distributions and Zipf’s law*, *available at*: https://websites.umich.edu/~mejn/courses/2006/cmplxsys899/powerlaws.pdf.

[42] Datacamp, *Power Law: A Pattern Behind Extreme Events* (August 6, 2025), *available at*: https://www.datacamp.com/tutorial/power-law.

[43] Historical wildland fire perimeter data covering both public and private lands throughout California are compiled, maintained, and annually distributed by the California Department of Forestry and Fire Protection’s (CAL FIRE) Fire and Resource Assessment Program (FRAP), *available at*: https://data.ca.gov/dataset/california-fire-perimeters-all.

Distribution (GPD),[44] a type of power law distribution, effectively models the potential wildfire-related economic losses within the service territory, including tail risks. This analysis builds on previous research comparing the GPD to the previously used Gamma distribution.[45]

The current GPD model indicates an annual average wildfire-related loss (or expected loss per year) of $1.213 billion. A maximum economic loss cap of $75 billion is applied to reflect a realistic upper bound on average losses based on historical events and subject matter expertise. This cap has been updated from the previous cap of $25 billion based on the inclusion of the fires that occurred in Los Angeles in January 2025. Table JW-5 presents average annual losses under a range of maximum cap assumptions.

Table JW-5
Impact of the GPD Annual Cap on Average Annual Loss

Annual Cap [$B]	Average Annual Loss [$B]
$ 25.00	$ 1.119
$ 50.00	$ 1.184
$ 75.00	$ 1.213
$ 100.00	$ 1.233
$ 125.00	$ 1.245
$ 150.00	$ 1.255
$ 175.00	$ 1.262

Table JW-6
Average Annual Loss

#	Return Period [Year]	Annual Probability [%]	Probability of Exceedance [%]	Expected Financial Loss [$B]
0	2	50.0%	50.0%	$ 0.60

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[44] The following parameters describe the GPD distribution, in millions of dollars, if SciPy Python package is used: Shape parameter (c): 0.68137, loc: 304.5613, and scale: 337.30484, *available at:* https://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.genpareto.html.

[45] A.22-05-015/016 (cons.), Ex. SCG-03-2R-E/SDG&E-03-2R-E, *Second Revised Prepared Direct Testimony of Gregory S. Flores and R. Scott Pearson* (Chapter 2: RAMP to GRC Integration) (June 2023), at 9, and Appendix B at B-2, B-5, B-10, B-11, and B-16.

#	Return Period [Year]	Annual Probability [%]	Probability of Exceedance [%]	Expected Financial Loss [$B]
1	2.5	60.0%	40.0%	$ 0.73
2	3.3	70.0%	30.0%	$ 0.93
3	5	80.0%	20.0%	$ 1.29
4	10	90.0%	10.0%	$ 2.19
5	20	95.0%	5.0%	$ 3.62
6	50	98.0%	2.0%	$ 6.93
7	100	99.0%	1.0%	$ 11.22
8	200	99.5%	0.5%	$ 18.11
9	250	99.6%	0.4%	$ 21.12
10	500	99.8%	0.2%	$ 33.98
11	1000	99.9%	0.1%	$ 54.61
12	max	100.0%	0.0%	$75.00
13	AAL	---	---	$1.213

2. Limitations of Historical Records and the Need for Advanced Simulations

Current consequence modeling relies solely on historical records to develop mitigation strategies, which inherently assumes that the worst-case scenario has already occurred. This approach can be problematic when developing and justifying a long-term hardening strategy, especially one with an assumed lifetime of approximately five decades. Historical catastrophic events, such as the Witch Fire that occurred in the service territory in 2007, may not adequately represent future risks and evolving conditions and could skew estimates of potential future threats. Therefore, a broader range of data must be incorporated, including predictive modeling and climate projections, to develop a more comprehensive and resilient wildfire mitigation strategy.

Relying solely on historical data from within the service territory to inform long-term mitigation strategies can introduce bias, particularly due to the increased use of proactive de-energizations (i.e., PSPS) since 2013. These actions may suppress observed wildfire impacts, causing consequence estimates to underrepresent the full range of potential outcomes absent such interventions. This limitation is most pronounced in areas experiencing extreme fire weather, where evolving environmental conditions and escalating wildfire severity may produce future scenarios not fully reflected in historical records.

To address this known limitation, unsuppressed fire simulations with a 24-hour duration from Technosylva's FireSight™ [46] were incorporated into the Wildfire Consequence model in 2024. Simulations that assess the potential size and impacts of ignitions are conducted at each asset location using historical worst-case fire-weather conditions. This approach accounts for site-specific factors, including wind speed and direction, fuel conditions, and topography, providing a comprehensive assessment of wildfire risks.

The transition from an 8-hour to a 24-hour fire simulation is supported by the strong alignment between the GPD model and Technosylva's 24-hour monetized consequence estimates, particularly for events with return periods under 100 years. GPD results are generally higher than those estimated by Technosylva for events with longer return periods (200+ years) because the GPD framework explicitly captures the full duration and spatial evolution of wildfire impacts, including compounding effects that extend beyond the initial 24 hours following ignition. While not capturing the full extent of potential events, extending simulations to 24 hours captures the full development of wildfire behavior and impacts, improving the accuracy of consequence estimates. This change aligns with the GPD and increases overall modeling precision, supporting better-informed mitigation planning and resource allocation.

TABLE JW-7
Return Periods and Expected Financial Losses: Comparison of SDG&E's GPD and Technosylva 24-Hour Simulations

Return Period [Year]	Probability [%]	Prob. Exceedance [%]	GPD Expected Financial Loss [$B]	Technosylva 24-hour Expected Financial Loss [$B]
20	95.00%	5.00%	$3.62	$2.38
50	98.00%	2.00%	$6.93	$3.57
100	99.00%	1.00%	$11.22	$4.44
200	99.50%	0.50%	$18.11	$5.20
250	99.60%	0.40%	$21.12	$5.39
500	99.80%	0.20%	$33.98	$5.85

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[46] See *supra* note 39.

Return Period [Year]	Probability [%]	Prob. Exceedance [%]	GPD Expected Financial Loss [$B]	Technosylva 24-hour Expected Financial Loss [$B]
1000	99.90%	0.10%	$54.61	$6.12
max	100.00%	0.00%	$75.00	$8.42
AAL	---	---		$0.60

3. Benchmarking Model Estimates Against Historical Fire Consequences

The monetized values of 8- and 24-hour-duration fire-spread simulations from Technosylva's FireSight under fire-weather conditions were compared with the two largest recorded wildfires: the Cedar Fire (2003) and the Witch Fire (2007). To conduct this analysis, simulated fire ignitions were initiated from utility assets located near the origin points of the historical fires and evaluated under worst-case fire-weather conditions. This comparison provided insight into the limitations of the 8-hour simulation duration and helped assess the potential financial impacts and return intervals of similar catastrophic events at both locations.

Figure JW-21 and Figure JW-22 provide a detailed analysis of the Cedar Fire and Witch Fire. Each figure includes a histogram showing the frequency (y-axis) of simulated financial impacts on a logarithmic scale (x-axis) for 8- and 24-hour simulations from Technosylva's FireSight. These histograms show the distribution of simulated financial impacts across a range of weather scenarios and simulation durations. Accompanying summary tables present financial impact estimates at selected percentiles, with particular emphasis on 1-in-10 to 1-in-100-year values. These tables provide a comprehensive view of the potential financial consequences of catastrophic wildfires in both locations.

Figure JW-21 and Figure JW-22 also reference publicly available sources that provide financial estimates for the Cedar and Witch fires, enabling comparison between simulated outcomes and observed financial impacts. For the Cedar Fire, the 8-hour fire-spread simulations produced impacts centered around $10 million, while 24-hour fire-spread simulations yielded impacts closer to $1 billion, which is more consistent with historical loss estimates. A similar trend can be seen for the Witch Fire, where 8-hour fire-spread simulations also underestimated losses relative to 24-hour fire-spread simulations and reported costs. These comparisons highlight the limitations of 8-hour fire-spread simulations in capturing the full scope of catastrophic wildfire impacts and demonstrate the importance of incorporating longer-duration simulations for more accurate risk assessment and more strategic long-term mitigation planning.

Figure JW-21 further illustrates these differences for the Cedar Fire by distinguishing 8-hour fire spread simulation results (blue outlined columns) from 24-hour fire-spread simulation results (filled columns). Also included are historical cost estimates and averages of the 24-hour fire-spread simulation results, shown as dashed vertical lines. Among the 24-hour simulations, the 6 p.m. to 6 p.m. fire-spread simulation aligns most closely with estimated historical losses. The same trends can be seen in Figure JW-22 for the Witch Fire, indicating that 24-hour fire-spread simulations, and particularly the 6 p.m. to 6 p.m. configuration, provide a more accurate representation of catastrophic wildfire consequences.

These fire-spread configurations were analyzed in collaboration with Technosylva. Earlier modeling relied on a midnight-to-midnight window, which captured early morning wind peaks but often split the late afternoon and evening peak wind period across consecutive simulation days. This fragmentation understated risk during the most severe fire weather conditions. Aligning the simulation period with a 6 p.m. to 6 p.m. window better reflects observed wind-gust timing during extreme events and provides a more complete representation of potential fire spread, improving the reliability of the modeled wildfire consequence estimates across the service territory.

FIGURE JW-21
Cedar Fire vs. Technosylva Simulations: Return Intervals and Financial Impacts

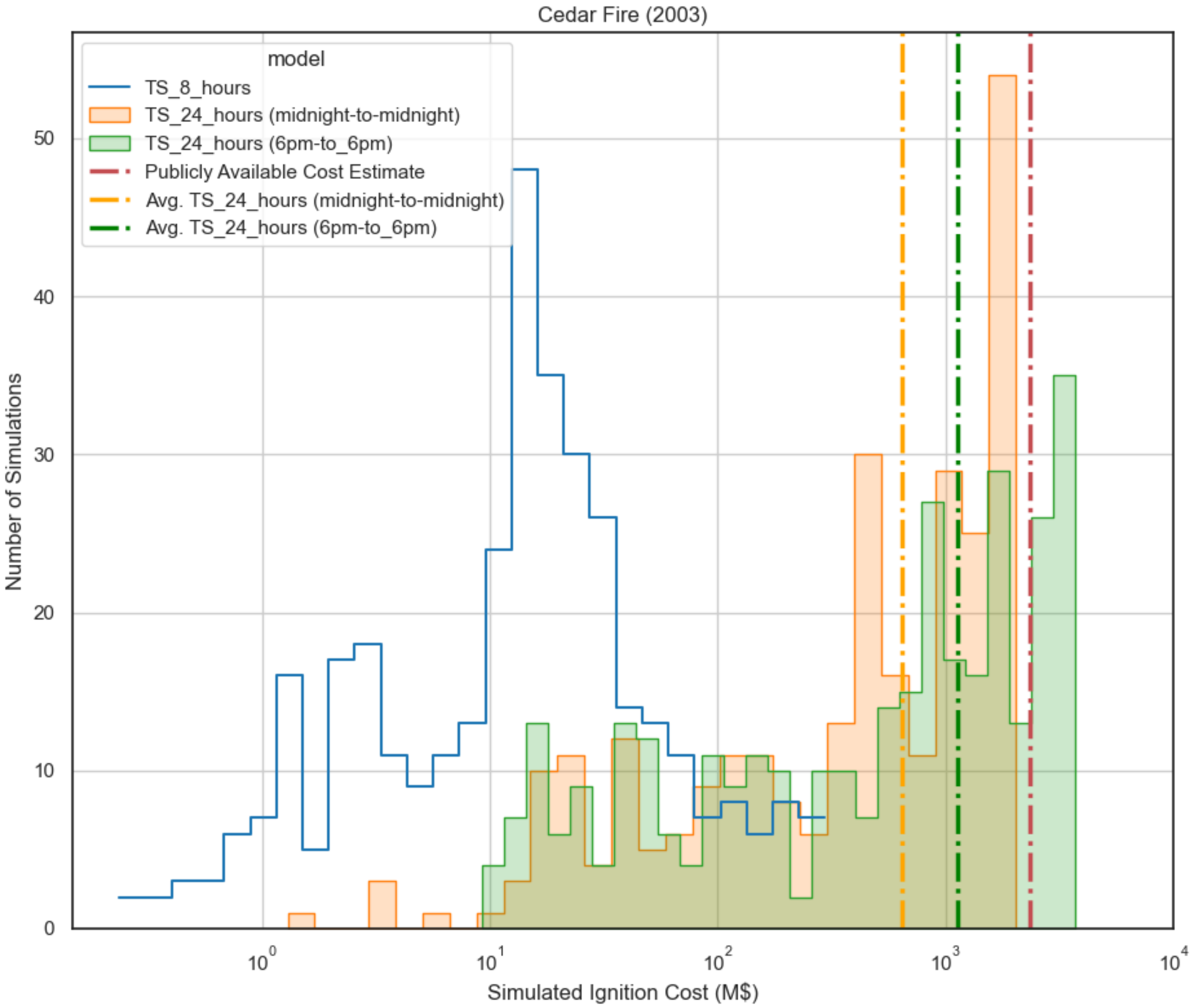

TABLE JW-8
Cedar Fire vs. Technosylva Simulations: Return Intervals and Financial Impacts

				Cedar Fire (2003)			
#	**Return Period (Year)**	**Annual Probability [%]**	**Annual Probability of Exceedance [%]**	**Technosylva 8 hours**	**Technosylva 24 hours (midnight-to-midnight)**	**Technosylva 24 hours (6pm-to-6pm)**	**Publicly Available Cost Estimate [M$]**
0	2	50.0%	50.0%	$15	$504	$727	---
1	10	90.0%	10.0%	$75	$1,716	$3,019	---
2	20	95.0%	5.0%	$140	$1,778	$3,419	---
3	50	98.0%	2.0%	$223	$1,868	$3,576	---
4	100	99.0%	1.0%	$244	$1,982	$3,664	---

				Cedar Fire (2003)			
#	**Return Period (Year)**	**Annual Probability [%]**	**Annual Probability of Exceedance [%]**	**Technosylva 8 hours**	**Technosylva 24 hours (midnight-to-midnight)**	**Technosylva 24 hours (6pm-to-6pm)**	**Publicly Available Cost Estimate [M$]**
5	200	99.5%	0.5%	$273	$2,015	$3,688	---
6	1000	99.9%	0.1%	$293	$2,036	$3,712	---
7	max	100.0%	0.0%	$296	$2,039	$3,716	---
8	AAL	---	---	$32	$723	$1,081	$2,291[47,48]

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[47] Wikipedia, *Cedar Fire, available at*: https://en.wikipedia.org/wiki/Cedar_Fire.

[48] Air Worldwide Corporation (AIR), *California Wildfire: How Large Can the Losses Be?* (2008), *available at*: https://web.archive.org/web/20171212031708/http://air-worldwide.com/_public/NewsData/001563/AIRCurrents_CaliWildfires.pdf.

FIGURE JW-22
Witch Fire vs. Technosylva Simulations: Return Intervals and Financial Impacts

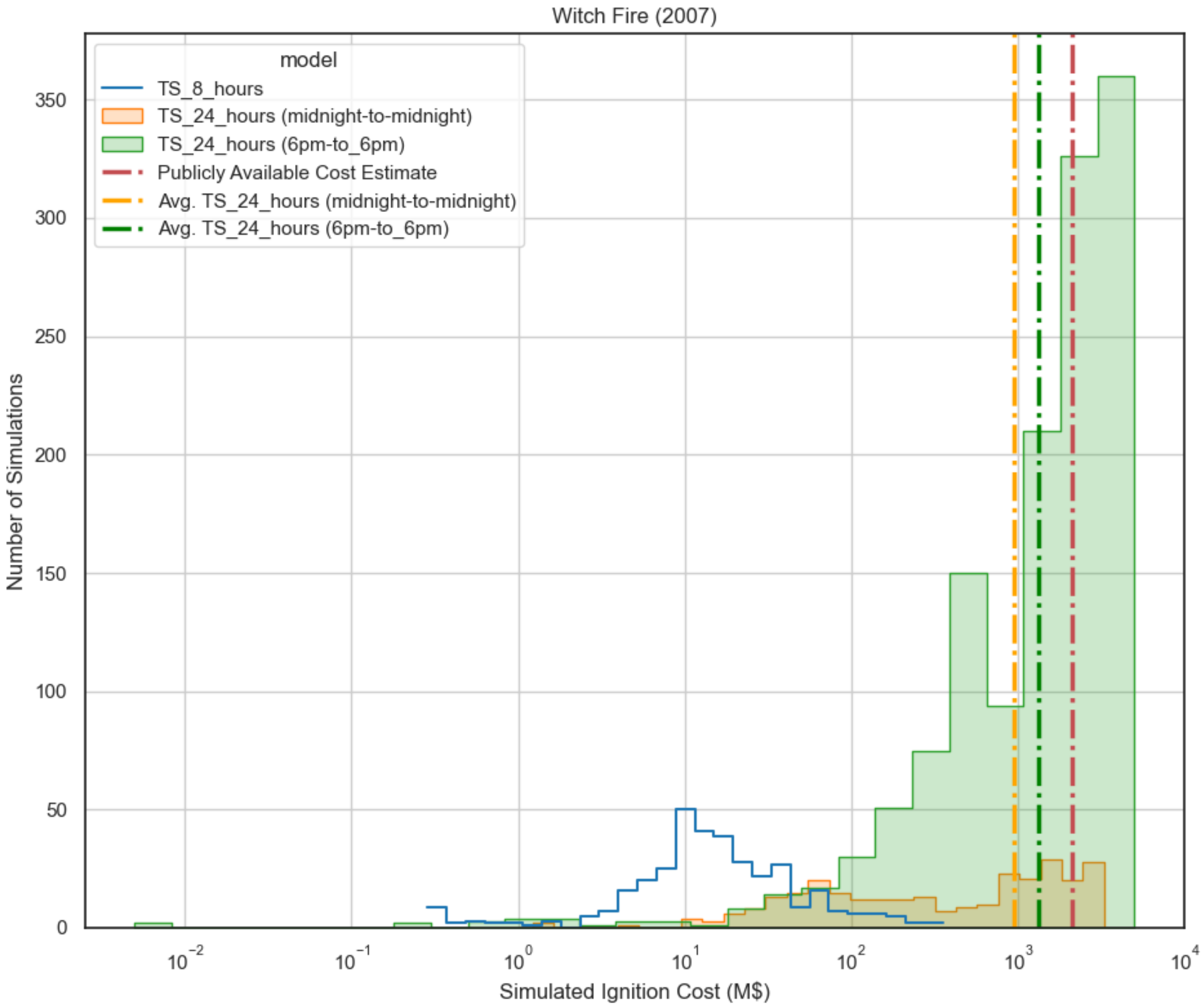

TABLE JW-9
Witch Fire vs. Technosylva Simulations: Return Intervals and Financial Impacts

				Witch Fire (2007)			
#	**Return Period (Year)**	**Annual Probability [%]**	**Annual Probability of Exceedance [%]**	**Technosylva 8 hours**	**Technosylva 24 hours (midnight-to-midnight)**	**Technosylva 24 hours (6pm-to-6pm)**	**Publicly Available Cost Estimate [M$]**
0	2	50.0%	50.0%	$14	$398	$1,817	---
1	10	90.0%	10.0%	$61	$2,452	$3,704	---
2	20	95.0%	5.0%	$105	$2,865	$3,963	---
3	50	98.0%	2.0%	$163	$3,074	$4,669	---

				Witch Fire (2007)			
#	Return Period (Year)	Annual Probability [%]	Annual Probability of Exceedance [%]	Technosylva 8 hours	Technosylva 24 hours (midnight-to-midnight)	Technosylva 24 hours (6pm-to-6pm)	Publicly Available Cost Estimate [M$]
4	100	99.0%	1.0%	$220	$3,149	$4,763	---
5	200	99.5%	0.5%	$278	$3,249	$4,867	---
6	1000	99.9%	0.1%	$335	$3,294	$4,981	---
7	max	100.0%	0.0%	$359	$3,301	$5,020	---
8	AAL	---	---	$28	$854	$1,937	$2,079[49]

4. Selection of Representative Fire-Weather Days to Support Modeling Simulations

Fire weather scenarios used to estimate potential wildfire impacts are evaluated using a selection of 116 days spanning from 2013 to 2025 that represent the most severe fire weather conditions within the service territory. The previous dataset of the 125 worst fire days from 2013-2021 was recently updated to incorporate additional extreme weather that occurred in November 2024 and January 2025. Dates for the updated dataset were selected using a structured process led by internal subject matter experts in collaboration with Technosylva, based on the following criteria:

- **Evolving System Conditions**: Several days were removed from the previous 125-day dataset where proactive PSPS de-energization would likely not be required under today's system conditions. These refinements reflect improvements in system hardening, updated grid configurations, enhanced situational awareness tools, and a deeper operational understanding of the system.
- **Weather Conditions**: Attention was given to days with high wind gusts, wind direction, temperature, and humidity levels that contribute to fire risk.
- **Asset and Site-Specific Conditions**: The conditions of electrical assets and specific site characteristics were considered to understand their vulnerability during extreme weather events.
- **Weather Indices**: Weather indices such as the FPI were used to quantify and compare fire risk levels on different days.

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[49] Wikipedia, *Witch Fire*, *available at*: https://en.wikipedia.org/wiki/Witch_Fire.

5. Monetization of Potential Wildfire Consequences

Technosylva's wildfire modeling framework integrates detailed weather inputs, high resolution fuel layers, and a 24-hour unsuppressed fire-spread model to estimate the potential size and severity of ignition events across the service territory. The modeling evaluates how a fire could spread, measured in acres burned, as well as its potential impacts, including the number of buildings destroyed, both at the ignition point and throughout surrounding areas.

Consequences associated with wildfire, PSPS, and PEDS events are quantified using three distinct attributes: safety, reliability, and financial. Consistent with the RDF framework, each attribute represents a separate dimension of consequence and captures a unique aspect of potential risk. This structure is intended to prevent overlap between attributes and avoid double counting risk. The assumptions outlined in Table JW-10 are applied to the model outputs to derive monetized potential consequence estimates across safety, reliability, and financial attributes. This process produces a comprehensive total cost estimate that reflects the full range of potential wildfire consequences and enables the quantification of risk in monetary terms, identification of areas of elevated risk, and prioritization of mitigation actions based on cost effectiveness.

TABLE JW-10
Risk Attributes for Wildfire Consequence

Risk Attribute	Wildfire Consequence	Assumptions
Safety	Equivalent Safety Serious Injuries and Fatalities (SIFs) are calculated based on Technosylva estimates of structures destroyed.	Assumptions for Serious Injuries and Fatalities (SIF) estimates are based on a review of historical wildfire data and are updated when new data are available. A rate of 0.00523 fatalities per structure is assumed. This value is estimated based on an internal analysis conducted on the CAL FIRE dataset.

Risk Attribute	**Wildfire Consequence**	**Assumptions**
Reliability	Subject matter expert conservative assumption to estimate Customer Minutes Interrupted (CMI) values based on estimates of outage duration and assumed restoration duration.	Assumptions for CMI estimates are derived from a review of historical outage data and are updated as new data becomes available. • A conservative restoration time of 8 hours is assumed; in cases of major destruction, this assumption likely understates the actual restoration duration. • CMI estimates are subsequently monetized using customer class and HFTD tier data to better estimate representative valuation of electric reliability costs, leveraging estimates from the Interruption Cost Estimate (ICE) 2.2 tool developed by Lawrence Berkeley National Laboratory (LBNL) and Resource Innovations, Inc. • The ICE calculator estimates cost per CMI parameters for each of the unique customer class and HFTD groupings[50]: o HFTD Residential o Non-HFTD Residential o HFTD Non-Residential o Non-HFTD Non-Residential • An illustrative example of this calculation is shown in Table JW-11

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[50] SPD Evaluation Report at 146.

Risk Attribute	**Wildfire Consequence**	**Assumptions**
Financial	Calculated at each asset location using simulated acres burned and structures destroyed derived from Technosylva's 24-hour unsuppressed fire spread modeling, which is performed under extreme fire weather conditions. In addition to quantifying acres burned and structures lost, which are directly monetized in the consequence model, SDG&E also evaluates the cost of repairing electric equipment that would be damaged during a wildfire event. Using simulated fire impact footprints, SDG&E estimates the proportion of overhead conductor miles and the number of poles likely to be affected. These values are then combined with expected rebuild costs to generate an estimated electric equipment repair cost. This results in a more comprehensive consequence estimate by capturing not only community-level impacts but also the direct utility infrastructure costs associated with wildfire damage. Due to the difficulty of determining the precise financial losses of wildfire events and the lack of a single source of financial impacts from wildfires, subject matter expert assumptions are made when translating simulated estimates of acres burned, structures destroyed, and overhead electrical equipment into a financial dollar estimate.	• Suppression and restoration cost: $2,350/acres burned[51] • Structures destroyed cost: $1,000,000/structure destroyed[52] • Electric equipment repair cost: $1,000,000/mile[53]

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[51] Subject matter expert assumption based on a review of CALFIRE suppression costs incurred from 2000 to 2023. Data for 2024 and 2025, which would include the recent fires in Los Angeles, is not included as suppression costs for these incidents were not available as of February 2025.

[52] Subject matter expert assumption based on a review of publicly available data on the median listing home price in San Diego County as of February 2025.

[53] Subject matter expert assumption derived from the estimated cost to restore fully destroyed overhead system infrastructure after a catastrophic wildfire.

6. Estimating Reliability Impacts Using the ICE Calculator

SDG&E's risk models are designed to estimate wildfire consequences beyond public safety impacts such as serious injuries or fatalities, and beyond measures of physical devastation such as acres burned or structures destroyed. When an ignition is simulated, the model first evaluates whether it occurs under high-fire weather conditions. If the ignition does not coincide with a high fire-risk day and is therefore unlikely to develop into a large or catastrophic wildfire, the event is classified as a reliability event rather than a wildfire consequence event. In such cases, the resulting impacts, such as customer outages and service interruptions, are estimated using the Interruption Cost Estimate (ICE) 2.2 Calculator. This approach ensures that reliability impacts on customers are consistently quantified and incorporated into the overall risk assessment framework.

Table JW-11 provides an illustrative example of how ICE 2.2 model outputs are used to quantify the reliability consequence of a wildfire, PSPS, or PEDS risk event across three locations with different customer types and classes.

TABLE JW-11
Illustrative Example: Reliability Impact Estimation Using the ICE Calculator

Variable		**Location**			**Formula**
		Feeder-Segment A	**Feeder-Segment B**	**Feeder-Segment C**	
Duration	Hour	24	24	24	[A]
$/CMI	Residential	$0.085	$0.085	$0.085	[B]
	Non-Residential	$37.640	$37.640	$37.640	[C]
Number of customers	Residential	100	30	55	[D]
	Non-Residential	10	80	55	[E]
	Total	110	110	110	[F] = [D] + E]
$/CMI	Weighted Avg.	$3.50	$27.40	$18.86	[G] = ([B]*[D] + [C]*[E])/[F]
Total Reliability Impact ($)	Residential	$12,240	$3,672	$6,732	[H] = 60*[A]*[B]*[D]
	Non-Residential	$542,016	$4,336,128	$2,981,088	[I] = 60*[A]*[C]*[E]
	Total	$554,256	$4,339,800	$2,987,820	[J] = [H] + [I]

Data used to approximate monetized impacts and assumptions will continue to be modified as new information becomes available. In addition, partnerships with industry leader companies and academic institutions will continue to better estimate the safety, reliability, and financial impacts of catastrophic wildfires.

The ICE tool uses survey methods to quantify customer costs associated with lost electric service. The reliability attribute therefore reflects only those outage-related customer costs that ICE is designed to measure. In contrast, the financial attribute in the PSPS and PEDS consequence models capture incremental costs unrelated to reliability that occur during proactive de-energizations.[54,55]

While the ICE 2.0 model and subsequent updates have recently been enhanced, the model does not fully capture the economic impacts associated with longer-duration outages, particularly those that extend beyond the model's standardized survey intervals (momentary, 2-hour, 8-hour, and 24-hour outages). PSPS de-energizations exceeding 24 hours, which typically occur under extreme fire weather conditions, can impose additional burdens on customers, including temporary lodging, meal expenses, and other displacement-related costs. These impacts are outside the scope of the ICE model customer damage functions and therefore must be accounted for separately.

For example, hotel accommodations and meal stipends for customers affected by proactive de-energizations,[56] particularly customers with Access and Functional Needs (AFN), are not captured within ICE's customer damage functions. Yet these needs represent measurable and recurring financial costs borne by both customers and the utility. SDG&E estimates these costs using the U.S. General Services Administration (GSA) per diem rates for lodging and meals in California, which offer an objective and externally validated benchmark.

This methodology clearly separates outage-related reliability impacts from incremental financial impacts, which appropriately captures PSPS consequences and prevents double counting. Collaboration with the ICE development team will continue, and future enhancements that would allow ICE to explicitly incorporate long-duration outage costs and customer support program costs associated with PSPS de-energizations will be supported. Integrating these

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[54] SPD Evaluation Report at 146.

[55] *Id.* (Recommendation #10: SDG&E should provide robust justification for its assumptions in monetizing the PSPS and PEDS financial attributes and explain how the use of $482 and $1446 cost per de-energization for residential customers and C&I customers respectively, reflects best practice in monetizing the financial attribute of CoRE. Also, SDG&E should explain whether these costs are not already included in the electric reliability values determined by ICE.).

[56] Rulemaking (R.) 18-12-005, SDG&E 2025 Plan to Support Access and Functional Needs Populations During PSPS (January 31, 2025), *available at*: https://www.sdge.com/sites/default/files/R.18-12-005%20SDGE%202025%20AFN%20Plan%201%2031%202025.pdf.

elements into future ICE versions would further improve the accuracy, transparency, and consistency of statewide outage impact modeling.[57]

c. PSPS Risk

Public Safety Power Shutoff (PSPS) are a preventive operational measure in which electrical service is proactively de-energized in targeted areas during elevated wildfire risk conditions, such as high winds, low humidity, and dry fuel environments. By de-energizing lines and equipment from service, PSPS events are effective in reducing the likelihood of utility-caused ignitions. However, because power is intentionally shut off to customers to reduce wildfire risk, PSPS events can result in widespread outages. These widespread outages caused by PSPS can lead to economic impacts and potential public safety considerations, even when advance notification is provided.

To model the risk posted by PSPS at the feeder segment level, a probabilistic approach using a Bernoulli trial within the Monte Carlo Risk Assessment model is used to evaluate the likelihood that a PSPS event occurs on a given day in a given year, as illustrated in Figure JW-23. A Bernoulli trial is a statistical experiment with two possible outcomes in which the probability of one outcome is specified.

For each simulated year and day, the model evaluates each segment using a segment-specific probability of event (PoE). This probability reflects the minimum upstream conductor hardening state and the historical frequency of high-fire-risk weather conditions at associated weather stations – specifically, the number of days when wind speeds exceed the hardening-state-specific thresholds that would trigger a PSPS consideration.

If the result of the Bernoulli trial is that a PSPS event does not occur, the model records no event for that day for that segment. If the result is that a PSPS event does occur, the model then evaluates the size of the event. Event size is categorized based on the number of customers affected within a unique PSPS event, with thresholds used to distinguish between smaller and larger PSPS events. If the event is classified as a small PSPS event (fewer than 30,000 customers affected), then the model assigns a duration of 24 hours. If the event is classified as a significant PSPS event (30,000 or more customers affected), then the model assigns a duration of

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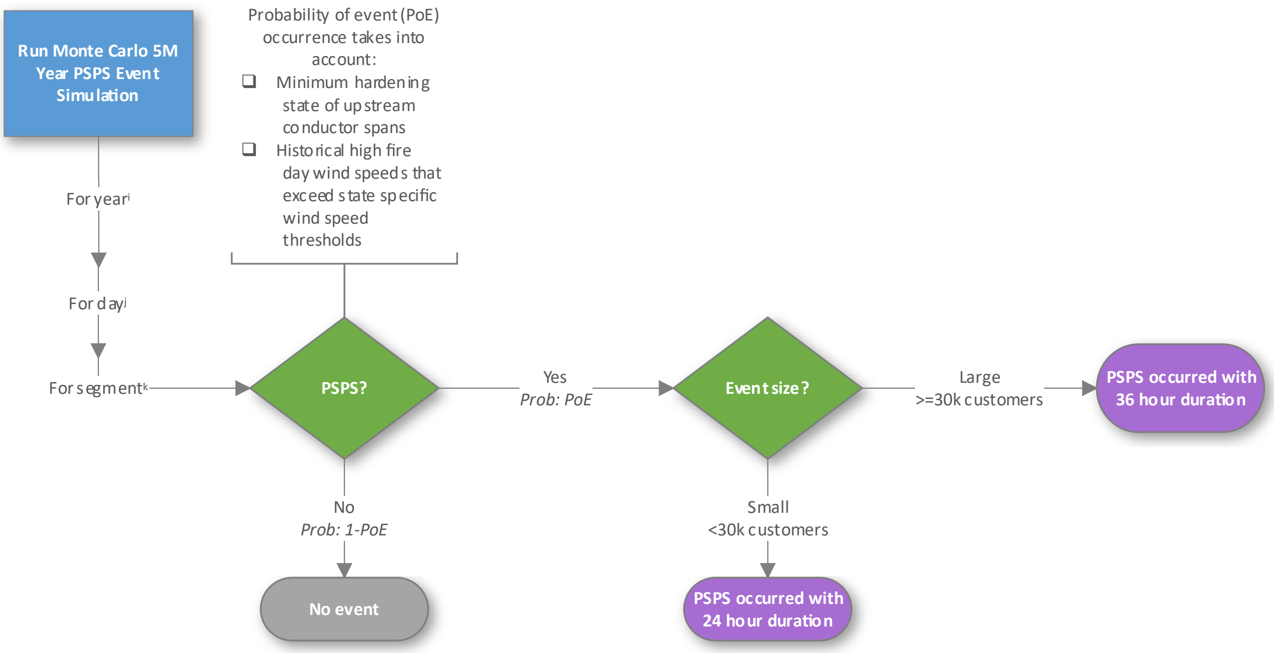
[57] SPD Evaluation Report at 146 (Recommendation #10).

36 hours. These duration assumptions reflect typical operational expectations for outage restoration timelines associated with PSPS events of varying scale.

The resulting output of is a simulated distribution of PSPS events and event durations for a segment, which is then used to estimate reliability and monetized risk impacts. For more details on the assumptions used for estimating monetized risk impacts associated with PSPS events and the PSPS Consequence submodel, see Section I.D.1.c.ii.

Figure JW-23
Monte Carlo PSPS Risk Event Process Flowchart



i. Likelihood

This section describes how WiNGS-Planning calculates the likelihood of a PSPS de-energization. The PSPS likelihood submodel uses 10 years of historical meteorological and weather station data to determine how often wind speeds associated with each asset exceed operational alert thresholds. The 10-year period captures historic wind-gust variability with representative weather-station-to-system associations, ensuring adequate historical variability is captured without relying on outdated conditions that no longer reflect the current system. The PSPS likelihood submodel also incorporates network connectivity conditions: if an upstream asset is unhardened, its baseline de-energization risk propagates to all downstream assets, regardless of their hardening status. See Section I.D.1.c. (PSPS Risk) and Figure JW-23 for a detailed process description of the simulation of PSPS events.

ii. Consequence

To calculate the potential impacts of PSPS de-energizations, the duration of de-energization for a feeder segment is considered, along with the number and type of downstream customers. These values are used to determine standardized impact measures, or “natural units”, for each of the three consequence attributes (safety, reliability, and financial). Refer to Table JW-12.

TABLE JW-12
Risk Attributes for PSPS Consequence

Risk Attribute	PSPS Consequence	Assumptions
Safety	Subject matter expert conservative assumption to estimate the potential number of Serious Injuries and Fatalities (SIF) as a result of a PSPS de-energization.	One fatality per 10 billion customer minutes de-energized is assumed. This value is estimated based on a review of historical PSPS de-energizations in California (2018-2021) to understand the frequency, duration, and magnitude (customers affected) of de-energizations.[58,59,60] As the safety impact of a PSPS de-energization is not the same for all customers, a weighted customer factor used to estimate customer impacts. Based on subject matter expert assumptions, different weighting (or scaling factors) is applied to each customer meter to scale the number of SIFs downstream of each SCADA sectionalizing device. Customer types evaluated include: • Critical: Customers defined in the CPUC's de-energization proceeding definition as critical. • Community Vulnerability: AFN customers based on the CPUC's definition of AFN Customers. • Other: All other customers.

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[58] CPUC, *Utility PSPS Reports: Post-De-energization, Pre-Season and Post-Season*, *available at*: https://www.cpuc.ca.gov/consumer-support/psps/utility-company-psps-reports-post-de-energization-and-post-season.

[59] Southern California Edison Company (SCE), *PSPS Reports to the CPUC*, *available at:* https://www.sce.com/outage-center/outage-information/psps.

[60] Pacific Gas & Electric Company (PG&E), *Public Safety Power Shutoffs*, *available at:* https://www.pge.com/en/outages-and-safety/safety/community-wildfire-safety-program/public-safety-power-shutoffs.html.

Risk Attribute	**PSPS Consequence**	**Assumptions**
Reliability	Subject matter expert conservative assumption to estimate Customer Minutes Interrupted (CMI) values based on estimates of outage duration and assumed restoration duration.	CMI values are derived from a review of historical outage data and are updated as new data becomes available. • An event-conditional 24- or 36-hour restoration time is assumed, informed by SDG&E's historical PSPS re-energization durations • CMI estimates are subsequently monetized using customer class and HFTD tier data to more accurately estimate representative valuation of electric reliability costs, using estimates from the ICE 2.2 tool.[61] • The ICE calculator estimates cost per CMI parameters for each customer class and HFTD groupings:[62] ○ HFTD Residential ○ Non-HFTD Residential ○ HFTD Non-Residential ○ Non-HFTD Non-Residential
Financial[63]	Subject matter expert conservative assumption to estimate the potential financial loss experienced by customers affected by a PSPS de-energization.	• For residential customers a $457 cost per event is calculated using the per diem rates[64] applicable to San Diego, California, as of December 2025, with the assumption of accommodating three family members per customer meter. • For Commercial and Industrial (C&I) customers, a $1,371 cost per event is estimated.

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[61] Lawrence Berkeley National Laboratory, *ICE Calculator Documentation*, *available at*: https://icecalculator.com/documents.

[62] SPD Evaluation Report at 146 (Recommendation #9).

[63] *Id.* (Recommendation #10).

[64] For FY 2025 per diem rates for San Diego, California refer to: U.S. General Services Administration (GSA), *FY 2024 per diem rates for ZIP Code. Financial values as of February 2025. A factor of three is assumed for C*, *available at*: https://www.gsa.gov/travel/plan-book/per-diem-rates/per-diem-rates-results?action=perdiems_report&city=San+Diego&fiscal_year=2024&state=CA&zip=.Financial+values+as+of+February+2025.+A+factor+of+three+is+assumed+for+C&I+customers=.

d. PEDS Risk

Protective Equipment Device Settings (PEDS) are enhanced safety settings, commonly referred to as “fast-trip” settings, that increase the sensitivity of protective devices and equipment so that faults are detected and cleared more quickly through automatic outages. While PEDS are effective in reducing wildfire ignition risk, these heightened sensitivities can also increase unplanned outages, for which advance customer notification is not feasible.[65]

To model PEDS risk for each asset, a probabilistic approach within the Monte Carlo Risk Assessment model is used simulating the occurrence and magnitude of outage events associated with PEDS, as illustrated in Figure JW-24. Constraints in historical data availability and event-level diagnostics limit the ability to assign driver-specific PEDS risk characteristics at the asset level. As a result, PEDS events are treated as uniform and distributed across assets using random sampling of historical event frequency and severity distributions.

For each simulated year and span, the model first determines the number of PEDS events through frequency sampling. Event frequency is modeled using a normal distribution, with parameters derived from historical outage data and informed by subject matter expert judgment. Each draw produces an annual count of PEDS events for the asset.

Event severity is then assigned to each simulated event occurrence using a gamma distribution, which is selected based on its fit to historical outage impacts and ability to capture right-skewed behavior. Severity is measured in Customer Minutes Interrupted (CMI), with distribution parameters calibrated to historical data.

For each event, a severity value is sampled and paired with a single event record, producing a set of simulated events characterized by their severity impact.

The resulting output is a probabilistic distribution of PEDS events and associated CMI, which is used to estimate system reliability and monetized risk impacts. For more details on assumptions used to estimate monetized risk impacts associated with PEDS events, see Section I.D.1.d.ii, which describes the PEDS Consequence submodel.

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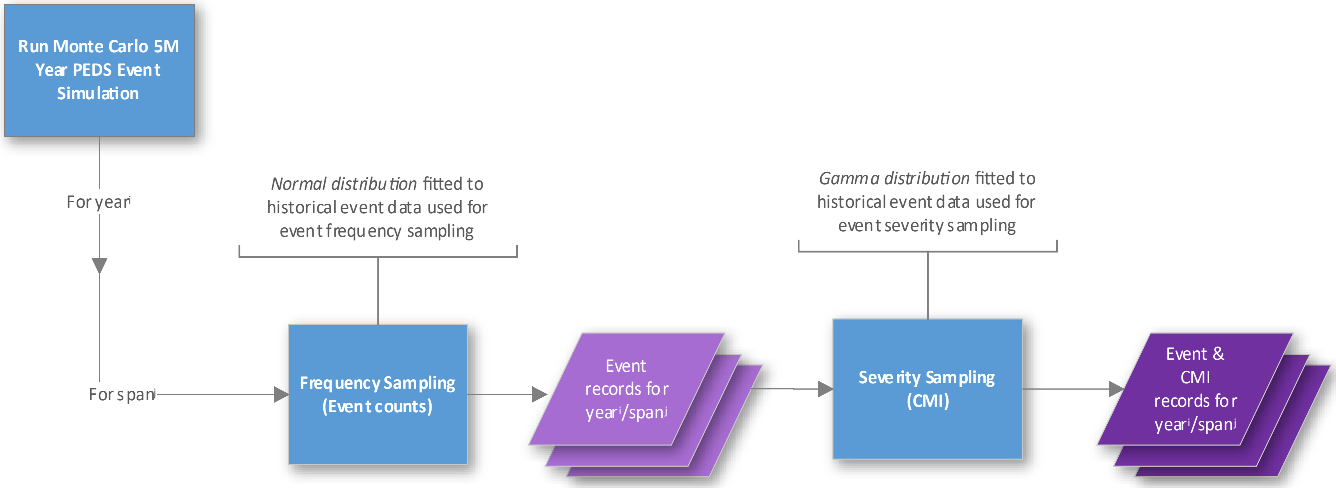
[65] CPUC, *Protective Equipment and Device Settings (PEDS)*, *available at*: https://www.cpuc.ca.gov/industries-and-topics/wildfires/protective-equipment-device-settings.

Figure JW-24
Monte Carlo PEDS Risk Event Process Flowchart



i. Likelihood

The PEDS likelihood model uses historical outage data to estimate annual frequency distributions associated with PEDS events. These events are modeled stochastically, reflecting the inherent variability and uncertainty associated with outage occurrences. See Section I.D.1.d. (PEDS Risk) and Figure JW-24 for a detailed process description of the simulation of PEDS events.

ii. Consequence

The PEDS Consequence submodel uses historical outage data to estimate annual severity distributions of Customer Minutes Interrupted (CMI) experienced by customers during PEDS events. These event severities are modeled as stochastic in nature, reflecting the inherent variability and uncertainty in customer impacts and restoration times observed in historical PEDS outages. See Section I.D.1.d. PEDS Risk and Figure JW-24 for a detailed process description of the simulation of PEDS events and associated sampling of event severities (i.e. CMI values) used within the PEDS Consequence submodel.

The PEDS Consequence submodel employs a methodology similar to that of the PSPS consequence submodel, framing PEDS events as reliability outages that occur during periods of extreme fire weather. The assumptions outlined in Table JW-13 form the basis for quantifying PEDS consequences.

TABLE JW-13
Risk Attributes for PEDS Consequence

Risk Attribute	PEDS Consequence	Assumptions
Safety	Subject matter expert conservative assumption to estimate the potential number of Serious Injuries and Fatalities (SIF) created by a PEDS outage event.	1 fatality per 10 billion customer minutes de-energized is assumed. This value is estimated based on a review of historical PSPS de-energizations in California (2018-2021) to understand the frequency, duration, and magnitude (customers affected) of de-energizations.[66,67,68]
Reliability	Subject matter expert conservative assumption to estimate Customer Minutes Interrupted (CMI) values based on estimates of PEDS outage durations.	CMI values are derived from a sampling of fitted historical distributions of PEDS outage data. ☐ CMI estimates are subsequently monetized using customer class and HFTD tier data to more accurately estimate representative valuation of electric reliability costs, using estimates from the ICE 2.2 tool.[69] ☐ The ICE calculator estimates cost per CMI parameters for each customer class and HFTD groupings[70]: o HFTD Residential o Non-HFTD Residential o HFTD Non-Residential o Non-HFTD Non-Residential
Financial[71]	Subject matter expert conservative assumption to estimate the potential financial loss by a PEDS de-	Whether conducted on foot or by helicopter, a 10% ratio of the expected reliability cost is assumed.

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[66] CPUC, *Utility PSPS Reports: Post-De-energization, Pre-Season and Post-Season*, *available at*: hhttps://www.cpuc.ca.gov/consumer-support/psps/utility-company-psps-reports-post-event-and-post-season.

[67] SCE, *PSPS Reports to the CPUC*, *available at:* https://www.sce.com/outage-center/outage-information/psps.

[68] PG&E, *Public Safety Power Shutoffs*, *available at:* https://www.pge.com/en/outages-and-safety/safety/community-wildfire-safety-program/public-safety-power-shutoffs.html.

[69] Lawrence Berkeley National Laboratory, *ICE Calculator Documentation*, *available at*: https://icecalculator.com/documents.

[70] SPD Evaluation Report at 146 (Recommendation #9).

[71] *Id.* (Recommendation #10).

Risk Attribute	PEDS Consequence	Assumptions
	energization event.	Due to the limited data on the financial impacts of a PEDS outage, conservative estimates from subject matter experts are used. These estimates are based on high-level projections of overhead line patrol costs during periods of elevated or extreme fire weather conditions.

These assumptions are reviewed no less than annually to remain accurate and relevant for long-term decision making. They may also be updated based on new findings and insights, particularly in preparation for future events, which support the refinement of, and enhancements to, the wildfire mitigation strategy.

e. Model Integrity[72] [73] [74]

Model integrity controls are applied within WiNGS-Planning to avoid overstating total wildfire, PSPS, and PEDS risk when common drivers, such as weather conditions, fuel conditions, and system configuration, influence more than one risk category. These controls are intended to keep total risk estimates proportionate to observed system behavior and support equitable comparison of mitigation alternatives.

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[72] *Id.*, at 145 (Recommendation #3: When summing LoRE (or risk) across multiple segments to calculate the total LoRE or the total risk (e.g., for a tranche), SDG&E should clearly demonstrate whether the LoRE events are mutually exclusive. If they are not, SDG&E should apply methods that account for overlap in risk exposure to avoid double-counting and overestimating total LoRE, and total risk.).

[73] *Id.* (Recommendation #7: SDG&E should not assume mutual exclusivity of risk drivers solely from historical data. SDG&E should provide clear documentation showing how its methodology avoids overlap among drivers that are summed up to calculate the total LoRE. To prevent double-counting and overstating risk, SDG&E should either: a. Demonstrate mutual exclusivity by clearly defining driver events such that no overlap can occur, or b. Explicitly model dependencies/overlap using mathematically appropriate methods (e.g., inclusion–exclusion for unions of events, joint/conditional probabilities).

[74] *Id.,* at 145-146 (Recommendation #8: To ensure SDG&E's risk modeling is transparent and does not overstate total risk, the following clarifications are needed: a. SDG&E should clearly demonstrate how overlaps between the drivers of PSPS, PEDS, and wildfire ignition risks are modeled or excluded. b. If risks are treated additively (as SDG&E did in 2025 RAMP), SDG&E should provide evidence that risks, and their drivers are statistically mutually exclusive. c. SDG&E should document the methods used to avoid overstating total risk, including how correlation, dependency, or joint probability structures are addressed in its modeling.).

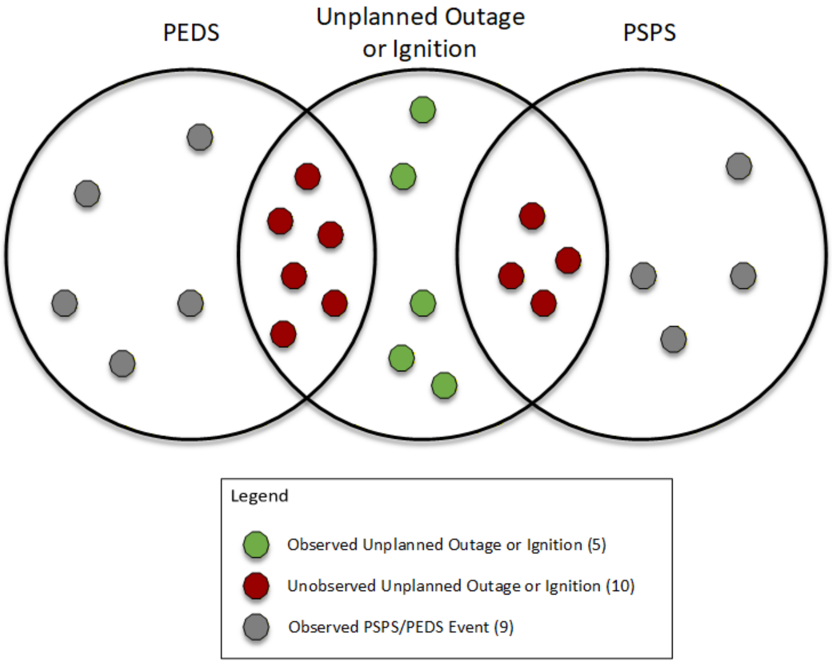
These controls are implemented through two primary mechanisms. First, for wildfire risk modeling, separate historical event data is used to train driver-specific PoF submodels, meaning the same historical event is not included in more than one training dataset. Second, likelihood rates used for wildfire, PSPS, and PEDS are normalized to keep total simulated event counts aligned with expected ranges.

For wildfire likelihood, hourly ignition-related Conditional PoI|F submodel outputs are converted into annual ignition rates at the conductor-span level. Separate likelihood calculation methods are then used for PSPS and PEDS risk. The resulting category-level likelihoods serve as inputs to the Monte Carlo Risk Assessment model. Before the simulation begins, a normalization adjustment is applied to align simulated frequencies of wildfire, PSPS, and PEDS events with historically observed ranges. These measures help reduce overlap among risk categories before total risk is aggregated. Refer to Section I.C.1.b.i.1 and Section I.C.1.b.i.2.

For example, severe fire-weather conditions can simultaneously increase wildfire ignition potential and the likelihood of proactive PSPS de-energization. If these conditions were reflected independently in each risk category without adjustment, the combined result could overstate total risk. To address this issue, historical event data used to develop the wildfire risk models is separated by category, and category-level event rates are normalized prior to simulation.

Figure JW-25 provides a conceptual illustration of this mutual exclusivity approach applied to the training datasets used for risk events. Only observed unplanned outage and ignition events are included in the training dataset used to estimate ignition risk. Potential unplanned outage or ignition events that were not observed because they were prevented by PSPS de-energization or PEDS events are excluded from estimating ignition likelihood and are only counted in the estimations of PSPS and/or PEDS likelihoods.

FIGURE JW-25
Example of Mutual Exclusivity of Risk Event Data



These controls are reviewed before official model runs so that the model reflects the most current validated data, assumptions, and system conditions. A future enhancement is also being evaluated that would configure wildfire, PSPS, and PEDS risk assessment into a single Monte Carlo simulation process, whereby each event location at a given time resolves to a single outcome: no event, ignition, PSPS, or PEDS. This enhancement would make the exclusivity of outcomes more explicit.

In addition to the structural controls described above, WiNGS-Planning incorporates statistical and numerical integrity controls to ensure that simulated risk estimates are stable and representative of low-probability, high-consequence outcomes. In WiNGS-Planning, the wildfire, PSPS, and PEDS likelihood submodels are executed using five million independent one year simulation cycles per asset to adequately represent low-probability, high-consequence events that would otherwise be under sampled. The current simulation scale is a key component to WiNGS-Planning's model integrity, as the large number of simulated years supports statistically stable and representative average annualized risk estimates.

Earlier efforts using 100,000 and 1 million simulated years resulted in fluctuations in risk estimates, especially for assets that contained feeder-segments with very low likelihoods of wildfire risk. Increasing the volume to 5 million simulated years per asset improves representation of infrequent outcomes and supports more stable, representative average annualized risk estimates. The increased scale also supports statistical convergence in the resulting output distributions, meaning additional simulations would not materially affect key performance metrics such as the estimated average wildfire, PSPS, and PEDS rates.

SDG&E is continuing to enhance WiNGS-Planning by increasing the number of simulated years used across the wildfire, PSPS, and PEDS submodels. Although large-scale Monte Carlo simulations present computational and data-management challenges, such as requiring high-performance computing resources and optimized result processing, ongoing improvements in code efficiency, algorithm design, and available compute capacity are expected to support additional sampling without materially increasing runtime or resource demands. Collectively, these characteristics strengthen statistical robustness and model governance, supporting greater confidence in risk-informed planning and investment decisions.

Furthermore, SDG&E's modeling framework does not assume mutual exclusivity of risk drivers based solely on historical data. Instead, the methodology is designed to prevent overlap among drivers that are aggregated to calculate total hourly failure and ignition rates (LoRE), ensuring that risk is not overstated. Specifically, SDG&E models hourly failure and ignition rates for each risk driver independently at the span level and then aggregates these results to feeder segments to estimate expected failures and ignitions per hour. While this methodology could be misconstrued as overstating total failures and ignitions, by implying that multiple independent drivers may produce two or more simultaneous events on the same feeder segment, it does not rely on an assumption of mutual exclusivity. Rather, SDG&E explicitly evaluates the potential for overlap through its Monte Carlo simulation framework.

The Monte Carlo simulation framework constrains the possibility of overlap at the most granular level of modeling. Specifically, within each simulation year, a given conductor span (i.e., pole-to-pole segment) can register at most one ignition event, regardless of the number of underlying risk drivers. As a result, at the span-conductor level, overlapping ignition events from multiple drivers are structurally precluded by design. This modeling feature ensures that any aggregation of ignition risk across drivers does not artificially inflate event counts at the fundamental unit of analysis, reinforcing the conclusion that double-counting is not a material concern.

Although the simulation technically allows for coincident events across the same feeder-segment, consistent with real-world conditions (e.g., adjacent spans experiencing different driver-related failures simultaneously), the probability of multiple ignitions occurring on the same feeder segment within the same hour is extremely low. SDG&E conducted a study to quantify this likelihood and demonstrate that double-counting is not a material concern; results show that even among the top feeder-segments, with the highest modeled ignition potential, the probability of multiple simultaneous ignitions is negligible.

- Probability that two or more ignitions occur on the same feeder segment within the same date and hour: 0.017%
- Probability that two or more ignitions occur on the same feeder segment within the same date: 0.098%
- Probability that two or more ignitions occur within the same date and hour in HFTD: 0.057%
- Probability that two or more ignitions occur within the same date in HFTD: 0.279%

f. Feeder-Segment-Level vs. Tranche-Level Decision-Making[75]

To comply with the Commission's Risk-Based Decision-Making Framework (RDF)[76], feeder segments with similar risk characteristics are grouped into tranches using the Homogeneous Tranching Methodology (HTM) and the quintile-based Phase Three Tranching Approach (PTTA)[77]. Tranching is a component of the RDF Cost-Benefit Approach and is used to provide a more detailed or granular view of how mitigations will reduce risk.[78] The RDF also

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[75] *Id.* at 144 (Recommendation #2: SDG&E should create tranches based on risk scores or LoRE × CoRE pairs across all segments for Wildfire and PSPS risk and avoid redundant steps that could introduce unnecessary complexity or lead to biased or inconsistent outcomes. SDG&E's tranching methodology should be designed to enable data-driven decision-making for hardening prioritization.).

[76] The RDF Framework broadly refers to the recent modifications to the Commission's Rate Case Plan adopted in R.13-11-006, Order Instituting Rulemaking to Develop a RDF to Evaluate Safety and Reliability Improvements and Review the GRC Plan for Energy Utilities (November 14, 2013); A.15-05-002, Application of SDG&E Safety Model Assessment Proceeding (May 1, 1015); and, R.20-07-013, Order Instituting Rulemaking to Further Develop A RDF for Electric and Gas Utilities (July 16, 2020) (the Risk OIR), including D.24-05-064 (Phase 3 Decision), Appendix A.

[77] This is also known as the Phase 3 Decision's Quintile method.

[78] D.18-12-014 at 23.

provides guidance on tranche granularity and identifies tranching as a transparency tool for understanding the riskiest portions of utility infrastructure.[79]

Tranching, however, is not the sole decision-support mechanism used to select wildfire and PSPS mitigations. As described in Section I.C.3, WiNGS-Planning evaluates baseline risk, post-mitigation risk, lifecycle cost, and BCRs at the feeder-segment level to inform the mitigation selection process. Additionally, SDG&E's 2025 RAMP Report[80] notes that BCRs are not the sole determinant of mitigation proposals; mitigation selection may also reflect operational, compliance, labor, planning, and modeling considerations.

This distinction is important because tranching is a portfolio-level reporting construct, whereas wildfire, PSPS and PEDS risk, mitigation feasibility, and implementation cost are highly localized. As explained in the Companies' white paper describing an alternative tranching method,[81] rigid tranche aggregation can result in information loss by grouping dissimilar risk profiles and mitigation strategies within the same tranche. Accordingly, while tranches are appropriate for regulatory reporting, portfolio summaries, and traceability to the RDF, analysis at the feeder-segment level remains the appropriate level of granularity for wildfire, PSPS, and PEDS project scoping, capital allocation, and mitigation comparison.

The following examples are provided to explain why tranche-level averages are not an appropriate basis for project-level mitigation selection. These examples are illustrative only and do not replace feeder-segment-level modeling, engineering review, constructability assessment, and BCR analysis.

The first example is when a feeder segment may be located within a statistically higher-risk tranche but exhibit localized conditions, such as adjacency to a paved transportation corridor, limited or discontinuous fuels, or unusually high underground construction costs due to subsurface conditions, that materially affect both expected risk reduction and project cost. In this scenario, applying a capital-intensive mitigation based solely on tranche-level risk classification could result in a lower project-level BCR once segment-specific risk drivers and costs are evaluated.

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[79] See D.24-05-064 at 26-28; 2025 RAMP Report at Chapter RAMP-3 at 1-3, and 43-48.

[80] *See* 2025 RAMP Report, Chapter RAMP-3.

[81] See Southern California Gas Company (SoCalGas) and SDG&E, *White Paper Describing Alternative Tranching Method of SoCalGas and SDG&E* (November 1, 2024), at 8-14; D.24-05-064 at 26-28.

Conversely, a feeder segment may be located within a statistically lower-risk tranche but traverse localized conditions, such as a narrow wildland-urban interface canyon with concentrated fuels, localized wind alignment, and constrained access, that substantially elevate segment-level wildfire ignition and consequence. In this scenario, reliance on tranche-level averages alone could obscure a segment-specific mitigation opportunity that, when evaluated using feeder-segment-level risk modeling and cost assumptions, would yield a strong project-level BCR.

Accordingly, tranches are used to present homogeneous groupings of feeder segments with similar risk characteristics and to support transparent regulatory reporting, but tranche-level averages are not used to rank, scope, or select individual mitigation projects. Instead, long-term grid hardening mitigation decisions are made using risk, cost, and constructability assessment analyzed at the feeder-segment level, consistent with the WiNGS-Planning model suite, Lifecycle Cost Assessment, and the Cost-Benefit Approach described in this testimony. Table JW-14 identifies the resulting tranche structure that was determined by applying the HTM.[82]

TABLE JW-14
Wildfire and PSPS Tranche Identification

Class	**Number of Feeder-Segments**	**Number of Resulting Tranches HTM**	**Number of Resulting Tranches Quintile (PTTA)**
Non-HFTD	3,959	22	25
HFTD (Tier-2)	940	20	25
HFTD (Tier-3)	408	21	17
Total	5,307	63	67

Table JW-15 summarizes the distinct roles of tranching and feeder-segment analysis within the wildfire risk framework. Tranching supports regulatory reporting and portfolio-level summaries, while feeder-segment analysis supports project-level mitigation evaluation and selection.

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[82] The March 4, 2026 ALJ Ruling, Deficiency Area 2.4, Item 2 at 15.

TABLE JW-15
Tranche-Level vs. Feeder-Segment-Level Analysis

Decision Methodology	**Level of Granularity**	**Primary Use**	**Decision-Making Strengths/Limitations**
- Homogeneous Tranching Methodology (HTM) - Quintile Tranching (PTTA)	Broad risk groupings based on similar LoRE and CoRE characteristics (e.g., Non-HFTD, HFTD Tier 2, HFTD Tier 3)	Regulatory reporting, portfolio-level summaries, and RDF traceability	Supports transparent reporting of homogeneous risk groupings, but may obscure more granular differences in wildfire risk, constructability, and mitigation cost when used alone
Feeder-Segment Analysis	Hyper-local aggregation from conductor span to feeder segment	Engineering review, project scoping, lifecycle cost assessment, and grid-hardening mitigation selection	Supports project-level comparison of risk reduction, constructability, and cost, but requires segment-level data, engineering review, and periodic model updates

For more detailed tranche information, including names, risk quantification by LoRE-CoRE pair, and mitigation associations (i.e., cost mapping and risk reduction) refer to SDG&E's 2025 RAMP Report[83], the 2028 GRC Risk Management Volume (Ex. SCG-02/SDGE-02), and

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[83] *See* 2025 RAMP Report, Chapter RAMP-3, Section VI.G. Tranching at 43-47.

the Risk Aversion and Risk Neutral BCR Workbooks (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF) [84,85,86,87], which include the following information:

- Tranche Mapping Table: A table illustrating how each feeder segment is mapped to a tranche under both tranching methodologies.
- Tranche Mapping Plots: Screenshots from the tranching script showing the mapping of feeder segments to tranches across LoRE and CoRE pairings.
- Tranche Crosswalk: A table providing a crosswalk between HTM tranches and LoRE/CoRE quintile-based reporting (PTTA) tranches, developed to address the ALJ request[88].

g. Extreme Conditions

Extreme weather and environmental conditions are key inputs to the risk evaluations that inform long-term grid-hardening investments and operational decisions. Model inputs, such as wind gust speed and direction, temperature, relative humidity, vapor pressure deficit, and fuel conditions, are derived from historical records of days exhibiting extreme fire weather. These records are evaluated by subject matter experts from the Meteorology, Engineering, and Risk Analytics teams to support the selection of inputs that accurately reflect the types of conditions that have historically contributed to wildfire risk in the service territory. The models incorporate records from 2013 to the present that are obtained from internal sources, weather stations, and third-party fire science platforms such as those provided by Technosylva.

SDG&E's current models incorporate observed extreme weather and environmental conditions into both likelihood and consequence assessments. Likelihood models use a range of environmental and asset specific inputs, including wind gust data, span level vegetation

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[84] SPD Evaluation Report at 144 (Recommendation #2).

[85] *Id.* at 145 (Recommendation #3: When summing LoRE (or risk) across multiple segments to calculate the total LoRE or the total risk (e.g., for a tranche), SDG&E should clearly demonstrate whether the LoRE events are mutually exclusive. If they are not, SDG&E should apply methods that account for overlap in risk exposure to avoid double-counting and overestimating total LoRE, and total risk.).

[86] *Id.* (Recommendation #4: SDG&E should explicitly integrate its tranching methodology into its mitigation planning. Mitigation decisions should be clearly linked to tranches with homogeneous risk or LoRE/CoRE values, ensuring that the highest-risk and most cost-efficient projects (e.g., those with high CBRs) are prioritized. If SDG&E allocates capital to lower-risk segments, it should provide a clear justification.).

[87] The March 4, 2026 ALJ Ruling, Deficiency Area 2.3 at 12-14.

[88] *Id.*

exposure, and conductor characteristics, to estimate the probability of equipment failure under specified conditions. Consequence models, in turn, characterize the potential impacts of an ignition using data associated with the most severe fire weather days identified by subject matter experts. Outputs from the consequence models include estimated flame length, rate of spread, acres burned, buildings threatened, buildings destroyed, and population impacted. These outputs are subsequently reviewed in detail by subject matter experts to ensure their validity and reasonableness.

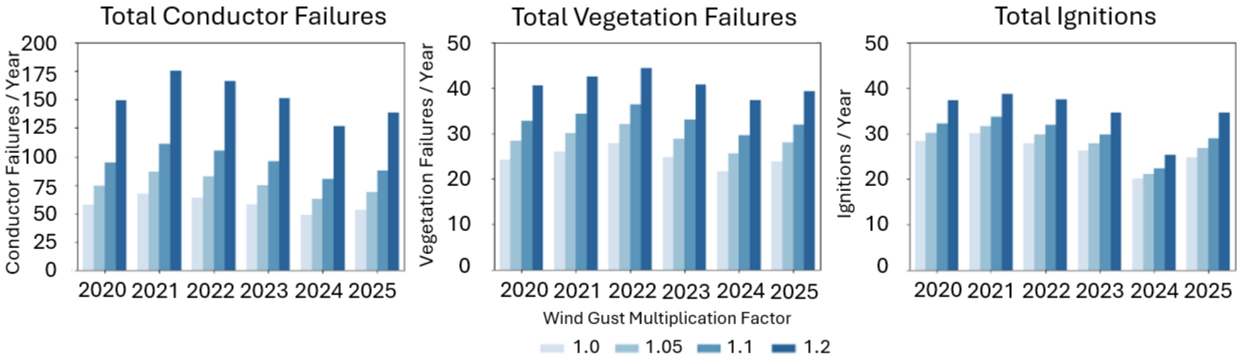
To realistically represent extreme weather events, risk likelihood and consequence modeling relies on historical weather data and observed fire weather conditions rather than fixed historical percentiles for individual environmental variables. Many variables that drive wildfire risk are highly correlated; for example, extreme Santa Ana wind events often coincide with low humidity and high temperatures. Applying a fixed percentile (e.g., the 98th percentile) independently across wind speed, temperature, and fuel load could produce scenarios that are physically implausible and not representative of real-world fire weather scenarios. Such artificial combinations would distort the risk modeling framework and undermine the credibility and validity of the resulting risk assessments and the benefit-cost ratios used to inform decision making.

Instead, historical records of observed fire and fire weather conditions, reviewed by subject matter experts, are used to characterize extreme risk. These records reflect conditions where multiple extreme conditions, such as high wind speeds, low humidity, and low fuel moisture, occurred simultaneously, providing a coherent and realistic basis for modeling wildfire consequences. Even though fixed historical percentile thresholds are not currently applied, SDG&E is exploring statistical approaches to incorporate unobserved extreme weather scenarios in a manner that is both statistically robust and operationally realistic, while preserving model integrity and fidelity to real-world operating conditions.

Validation of extreme conditions starts with subject matter expert review and selection of historical fire weather days to confirm they are realistic and operationally relevant. Likelihood and consequence models are then calibrated based on historical asset performance data under various environmental conditions. Finally, outputs from Technosylva models are compared against known fire events and conditions.

While comprehensive one-by-one sensitivity analyses are not performed for every variable included in the risk models, model behavior indicates that wind gusts are the dominant driver of risk across both likelihood and consequence components. Within the failure rate models, wind speed and wind direction have been identified as the primary drivers of conductor- and vegetation-related outages. Figure JW-26 shows the sensitivity of the Conductor and Vegetation PoF models to wind speed from 2020 to 2025, with lighter shades indicating smaller wind gust speed multipliers from 1.0 to 1.2. In the year 2025 of the leftmost figure, which shows conductor failures per year, a wind gust multiplier increases estimated conductor failure rate from just above 50 to more than 130 per year. Wind gust speed alone is not the only critical factor influencing ignition probability and subsequent fire spread in the consequence modeling framework – wind direction together with prevailing terrain and fuel conditions are also critical factors.

FIGURE JW-26
Example of Sensitivity of Conductor, Vegetation and Ignitions to Wind Speed



PSPS operational decisions are made using an objective review of environmental conditions, including extreme conditions. The following four main inputs are considered as part of the initial decision-making process to identify extreme fire weather conditions in SDG&E's service territory:

- Whether the National Weather Service has communicated that a Red Flag Warning or critical fire weather conditions are possible.
- Whether the Geographic Area Coordination Center in Riverside, CA, has given any indication in their communications of a "High Risk Day" or that a Santa Ana Wildfire Threat Index rating may be issued.
- Whether the FPI is at 14 or above, showing a combination of fuel dryness and Santa Ana winds that could result in a large wildfire.

- Whether internal meteorology models have indicated a reasonable probability of reaching alert speeds at any weather station.

These four criteria are used to decide whether to activate de-energization protocols, depending on event-specific conditions. For example, if wind gust thresholds are exceeded and the FPI and risk scores indicate the potential for significant wildfire growth, the decision-maker retains discretion to de-energize or continue monitoring to determine whether winds are increasing or reflect an isolated anomalous gust. Although the magnitude by which a threshold is exceeded does not solely determine the resulting actions, it is more likely that the decision to de-energize will be made when actuals and forecasted peak wind gusts substantially exceed critical thresholds. These decisions are further informed by asset-specific considerations, including whether the infrastructure is part of the distribution or transmission system, the extent to which affected segments have been hardened, and the current operational and condition status of the assets within the scope of the potential event.

Wildfire risk modeling assumptions and operational thresholds are reviewed regularly and updated to reflect model performance, post-event evaluations, and changing regulatory requirements. SDG&E conducts a comprehensive review of its risk models at least once per year, retraining them with newly collected data including infrastructure performance, weather conditions, and ignition outcomes. This keeps models current and reflective of evolving wildfire risk conditions. For example, while SDG&E does not currently use fixed-percentile thresholds as model inputs, it is actively exploring enhancements to incorporate extreme weather scenarios in a statistically and operationally sound manner, including the potential use of scenario-based simulations and ensemble methods, while maintaining model integrity and operational realism.

h. Climate Change

Changes to climate (e.g., temperature, precipitation, and fire weather events) over the next century will have significant impacts on the service territory. Increasing temperatures can directly impact the frequency and severity of wildfires through increasing atmospheric demand and surface evapotranspiration. This leads to more frequent and longer drought conditions favorable for fuels (e.g., flammable soils and vegetation) to ignite, impacting the magnitude, timing, and frequency of wildfires.

Multiple approaches to capture future risks associated with climate change are being evaluated, with a goal of capturing the projected potential increase in acres burned compared with historical records. By identifying this increased risk, the risk modeling framework can be updated to better estimate future wildfire risk scenarios.

To evaluate the potential influence of climate change on mitigation prioritization and cost-effectiveness, a sensitivity analysis was performed using alternative assumptions for climate-driven wildfire risk over the planning horizon. The analysis confirms that while incorporating climate change increases projected wildfire risk and associated benefits, feeder-level prioritization and relative mitigation performance remain generally consistent, demonstrating that mitigation decisions account for climate considerations without relying on a single climate assumption. Additional information on the methodology, assumptions, and detailed results of this sensitivity analysis is provided in Section I.H – Sensitivity Analysis.

This section summarizes the analysis based on forecast maps of average annual area burned produced on a 3 km grid across California as part of the Westerling Fire Risk Simulation Model (FRSM) developed through the Pyregence Consortium.[89,90] A full discussion of the methodology, including rationales for key modeling choices, is provided in Appendix C. The forecast maps are informed by future climate projections from multiple global climate models (GCMs) and Shared Socioeconomic Pathway (SSP) scenarios. For consistency with prior SDG&E filings and CPUC decisions, this analysis uses maps based on the LOCA2 downscaling methodologies for the SSP3-7.0 scenario. The analysis covers the 2028-2080 time horizon, reflecting the beginning of the GRC timeframe in 2028 and the anticipated service life of assets.

For each year in the time horizon, an ensemble-average map of pixel-wise annual area burned is produced across the available maps for individual GCMs in the FRSM. Pixel-level values are then summed across defined geographic regions to calculate the total annual area burned for each region. The result is a time series of total annual area burned, shown in Figure JW-27. To summarize long-term trends and support downstream financial analysis, an exponential growth curve is fit to this time series that takes the following form:

$$P = P_0(1 + r)^{t-t_0}$$

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[89] Pyregence, *Wildfire Models – FRSM, available at:* https://www.pyregence.org/frsm/.

[90] Pyregence, *Index of /wg4/CEC-Submitted*, *available at:* https://data.pyregence.org/wg4/CEC-Submitted/.

where *P* is the total annual area burned in year *t*, P_0 is the area burned in the baseline year t_0, and *r* is the average annual percentage increase in area burned. This functional form was selected because it represents the increase in area burned over time as a constant annual percentage rate, which can be treated analogously to an inflation factor. This approach enables climate-driven changes in wildfire exposure to be incorporated in a consistent and transparent manner into SDG&E's financial modeling framework used to calculate BCRs for long-term grid-hardening alternatives (refer to Section I.F). The resulting annual percentage increases in area burned for each geographic region is presented in Table JW-16. For subsequent risk and financial analysis, results from SDG&E's Tier 2 and 3 of the HFTD are used, as these areas are the focus of mitigation planning. Based on this analysis, a 0.68% annual increase in area burned is applied as an input to the HFTD evaluation.

FIGURE JW-27
Annual area burned by year in Tier 2 and 3 of the HFTD with best fit curve for the LOCA2 models for the SSP3-7.0 scenario

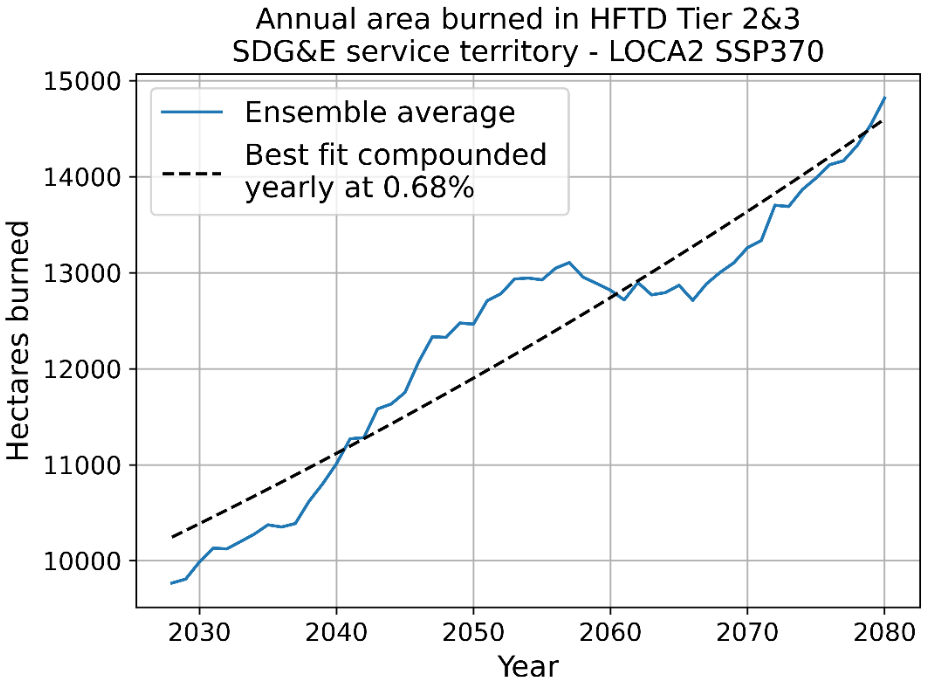

TABLE JW-16
Annual Percentage Increase Burn Area 2028-2080

Scenario	HFTD Tier 2	HFTD Tier 3	HFTD Tier 2 & 3	Service Territory	California
SSP3-7.0	0.66%	0.70%	0.68%	0.67%	0.95%

Currently, the FRSM results are based on static land use inputs. SDG&E plans to analyze fire simulations from the FRSM coupled with the Land Use and Carbon Scenario Simulator (LUCAS) land use and land change projections when they become available, and, based on the results of that review, may incorporate those outputs in future analysis.[91] These fire simulations may yield more refined predictions of annual area burned because the coupled models exchange information about fuel loads, land use, and wildfire activity at each time step.

The current climate integration approach is focused on estimating an annual percentage increase in acres burned and applying this value as a scalar to the consequence calculation, thus resulting in an increased wildfire risk projection.

While this method ensures compatibility with existing risk models and BCR calculations, it does not explicitly account for how shifts in environmental variables may influence the failure rate and ignition rates. Furthermore, while the method does consider spatial distribution of fires by only considering fires within specific geographic areas (e.g., HFTD Tier 2 and 3), it does not explicitly account for how those areas may evolve under a changing climate.

Where these fires may occur can materially affect accuracy of the projected risk based on the characteristics of the changes where the fires occur, including land use changes and asset locations. In addition, the underlying projected fire simulations reflect all wildfire ignitions rather than being limited to utility-caused events co-located with electric infrastructure. This introduces additional uncertainty when translating projected climate impacts on wildfire to utility-specific wildfire risk. SDG&E's current implementation implicitly incorporates changing weather conditions on expected wildfire consequences in the HFTD, but it does not explicitly incorporate projected changes in wind regimes or fire weather extremes into electric equipment

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[91] US Geological Survey, *The LUCAS Model*, *available at*: https://www.usgs.gov/centers/western-geographic-science-center/science/lucas-model.

failure rate or ignition modeling, factors that could influence the likelihood and potential growth of future wildfire events.

Future enhancements to climate integration are expected to improve both the spatial resolution and causal representation of wildfire risk drivers. SDG&E will explore if climate-driven environmental variables, such as temperature, relative humidity, and precipitation, may need to feed directly into asset failure-rate and ignition-probability models, as well as into wildfire event simulations, allowing projected increases in fire size, intensity, and consequence distributions to emerge endogenously through those models. However, explicitly incorporating hourly variations in climate conditions into wildfire spread modeling over a 55-year time horizon would materially increase model complexity and computational burden, potentially by an order of magnitude, raising significant concerns regarding scalability, cost, and overall affordability. Advancing these capabilities remains challenging given that many components of the existing models are statistically derived from historical observations; however, continued development in this area is expected to incrementally improve long-term climate-informed wildfire risk estimates.

i. High-Uncertainty Scenarios

SDG&E electric infrastructure is vulnerable to catastrophic scenarios that not only have low probability and high consequence but also high uncertainty. These events are often influenced by human behaviors, whether accidental, intentional, or adversarial, which are inherently challenging to predict or quantify with confidence. In many cases, risk is shaped by the interaction of multiple factors, including environmental conditions, system vulnerabilities, and external actions, making the frequency and likelihood of such events difficult to estimate using traditional quantitative methods.

For example, a cybersecurity incident could impair or delay SDG&E's ability to execute timely operational safety decisions during periods of extreme fire weather, potentially affecting situational awareness, communications, or control systems that support PSPS and other wildfire-mitigation actions. In a more severe scenario, a cyber intrusion could be coordinated with intentionally set fires to amplify potential impacts to public safety and property. The overall risk associated with such an event depends on a combination of human-initiated and natural factors, including the likelihood of a cyberattack as well as prevailing weather, fuel, and system conditions at the time of the incident. While these scenarios are plausible, their frequency and characteristics are difficult to quantify, and SDG&E is actively evaluating approaches to account for such high-uncertainty, low-probability events within its risk-modeling framework.

These events, sometimes referred to as long-tail events, post particular challenges because they are rare, potentially severe, and not well represented, or entirely absent, in historical data. Evaluating individual events in isolation, especially those unrelated to wildfire risk and outside the HFTD, offers minimal benefit. Instead, approaches that simulate a large number of possible realizations are being explored to better characterize their aggregate. Currently, methods for incorporating these types of scenarios into risk modeling are under consideration.

j. Housing and Population Growth

Currently, SDG&E's risk and financial models assume static population and housing conditions and therefore do not reflect how wildfire consequences may change over time as development and population patterns evolve.[92] However, these factors can materially influence wildfire or PSPS impacts, particularly with respect to structures burned, injuries, and fatalities. Refer to the BCR Workbooks (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF) for additional details on the impacts of housing and population factors.

In San Diego County, the population is projected to peak between 2040 and 2050 before gradually declining.[93] Despite this overall trend, the population in the HFTD is expected to grow more rapidly and decline more slowly than the county average. At the same time, forecasts from the San Diego Association of Governments (SANDAG) indicate continued growth in housing units through 2050.[94] As a result, the number of structures in San Diego County exposed to wildfire risk is expected to increase over the next two decades.

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[92] SPD Evaluation Report at 147 (Recommendation #16: SDG&E should file and serve a technical whitepaper detailing all assumptions, data sources, and formulas used to develop and apply any scaling factors (e.g., associated with population and housing growth or other forecasts) in wildfire consequence modeling, prior to incorporating such factors into its risk modeling. Also, SDG&E should provide version-controlled data to enable SPD and stakeholders to review the effect of these factors on mitigation selection.).

[93] State of California Department of Finance, *Projections, P-2: County Population Projections (2020-2070), available at*: https://dof.ca.gov/forecasting/demographics/projections/.

[94] San Diego Association of Governments (SANDAG), *Series 15 Forecasts Housing Units by Type by 2020 Census Tract*. (last updated April 20, 2026), *available at*: https://opendata.sandag.org/Forecast/Series-15-Forecast-Population-by-Type-by-2020-Cens/pt5p-cv28/about_data.

Because available projections generally do not extend beyond 2050, uncertainty remains regarding longer-term population and housing trends over the full life of wildfire mitigation investments. Nevertheless, although these effects have not yet been incorporated into SDG&E's BCRs, increasing population and housing exposure, especially in high-risk areas, would be expected to increase modeled wildfire consequences. Accordingly, the current analysis may underestimate long-term wildfire risk.

While housing and population growth are not directly reflected in the BCR results presented by SDG&E, these factors can be evaluated within the BCR Excel Workbook by applying an assumed annual growth rate and toggling the corresponding input to assess their effect on BCR outcomes. Housing and population growth are also considered as part of the broader scenario and permutation analysis described in Section I.G, where alternative assumptions are systematically tested within the Grid-Hardening Mitigation Selection Process.

k. Social Vulnerability and DVC

To address SPD's recommendation[95] regarding disproportionate wildfire risk exposure for disadvantaged and vulnerable communities (DVCs), particularly Tribal lands in the HFTD, a feeder-segment–level "DVC indicator" column has been incorporated into the 2028 GRC BCR Workbook (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF). This column enables identification of feeder segments with assets located within DVC boundaries. In addition, Segment Profile Cards have been updated to include this indicator. These site-specific summary cards provide a standardized summary of wildfire, PSPS, and PEDS risk, along with corresponding mitigation options, for the highest-risk distribution segments across the service territory.

This enhancement improves visibility into equity considerations by enabling systematic identification of feeder segments serving DVCs and supports more informed wildfire risk mitigation planning. It facilitates an initial evaluation of DVC risk exposure and enables assessment of mitigation effectiveness at a more granular level.

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[95] SPD Evaluation Report at 202 (ESJ Pilot Summary Recommendations, Regarding Action Item 1: SDG&E estimates a disproportionate exposure to wildfire risk exposure for DVCs (primarily tribal lands) in the HFTD (31 percent risk exposure despite making up less than 10 percent of the square mileage). SPD recommends that SDG&E include in its 2028 GRC filing references to its Wildfire Mitigation Plan's measures to address the mitigations that reduce risk the most in DVCs.).

Furthermore, this capability supports targeted analysis and transparent reporting of mitigation and control measures aimed at reducing risk in DVCs, and enables evaluation of how specific strategies, such as covered conductor installation, targeted vegetation management, and enhanced community engagement, reduce risk in high-priority DVC areas.

Development of data sources tracking and analyzing community vulnerability and engagement with DVCs are primarily occurring in the Climate Adaptation and Vulnerability Assessment (CAVA). SDG&E continues to build upon efforts to incorporate direct consideration of vulnerable communities, as this is an area actively being refined across multiple proceedings. For a more detailed discussion on community vulnerability and engagement with DVCs, refer to section 4 of the CAVA.

l. Risk Aversion[96] [97] [98] [99]

Any probabilistic, decision-making framework consists of three key elements: the probability of an undesirable event, the consequence (or cost) associated with that event, and the

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[96] *Id.* at 146 (Recommendation #12: SDG&E indicated that its selected scaling exponent ($\alpha = 1.47$) was derived by averaging two values (1.34 from the DOE study and 1.6 from the GRI study). a. SDG&E should clearly justify why the use of $\alpha = 1.47$ is appropriate across all segments and attributes. This justification should include demonstrating that the selected exponent aligns with stakeholder risk preferences and is not arbitrarily applied. b. SDG&E should report both unscaled and scaled risk values along with their associated risk attributes (Safety, Reliability, Financial) side-by-side for each segment. SDG&E should also clearly demonstrate how scaling affects each attribute, how it alters segment risk rankings, and how it influences project prioritization in its hardening plans. c. SDG&E should conduct and publish a sensitivity analysis to illustrate how different values of the α impact total Risk Scores, CBR results, and mitigation prioritization.).

[97] *Id.* (Recommendation #13: SDG&E should clearly document and explain both the justification for applying risk scaling and the process used to apply it to any segment when: a. Risk scaling results in the segment being included in or excluded from SDG&E's grid hardening plan. b. Risk scaling causes significant changes to the segment's tranche assignment.).

[98] *Id.* (Recommendation #14: SDG&E should revise its risk assessment and scaling methodology to incorporate full CoRE (and risk) distributions when/if applying risk scaling. This revision should appropriately account for rare segments associated with low-probability, high-impact scenarios. Additionally, SDG&E should demonstrate how its revised model better captures tail risks and guides mitigation decisions for segments where extreme events are plausible.).

[99] *Id.* at 147 (Recommendation #15: SDG&E should explain and justify the linkage (or lack thereof) between the application of risk scaling, and the resulting tranche changes and mitigation selections. If SDG&E's risk scaling application does not lead to changes in mitigation plans and merely increases the CBRs of most highrisk segments, it calls into question the practical utility of the risk scaling function.).

costs of actions taken to reduce likelihood or consequence of said event. Applying such a framework also typically involves evaluating residual risk, that is, risk that remains after mitigations are implemented, and considering the lifecycle activities and costs associated with those mitigations.

Risk is commonly defined as the product of an event's likelihood and its consequence. As a result, a low-consequence, high-probability event may present a similar overall risk to a high-consequence, low-probability event. This relationship can be viewed qualitatively as a risk assessment matrix as illustrated in Table JW-17.

TABLE JW-17
Simplified Risk Assessment Matrix

Likelihood	**Consequence**		
	Low	**Medium**	**High**
High	🟨	🟥	🟥 High Risk
Medium	🟩	🟨 Medium Risk	🟥
Low	🟩 Low Risk	🟩	🟨

This risk assessment matrix can also be demonstrated more quantitatively as in Table JW-18. Here, Likelihood (i.e., annual events) and Consequence are varied proportionately to produce a constant Annual Risk. Events with higher Likelihood carry lower Consequence, while events with lower Likelihood carry higher Consequence. The former group could be considered to correspond to reliability-based events such as PSPS or PEDS. Such events would be expected to occur more frequently than catastrophic wildfires but result in lower cost per event. The latter represents high tail-risk events more consistent with wildfires: events which occur infrequently but result in much higher cost per event. Both types of risk events are included in SDG&E analysis.

TABLE JW-18
Demonstrative Combinations of Risk and Consequence

Likelihood (Annual Events)	**Consequence Per Event**	**Annual Risk**	**Corresponding Case**
100	$1,000	$100,000	Reliability
10	$10,000	$100,000	Reliability
1	$100,000	$100,000	Unclassified
0.1	$1,000,000	$100,000	Unclassified
0.01	$10,000,000	$100,000	Unclassified
0.001	$100,000,000	$100,000	Unclassified

Likelihood (Annual Events)	**Consequence Per Event**	**Annual Risk**	**Corresponding Case**
0.0001	$1,000,000,000	$100,000	Wildfire
0.00001	$10,000,000,000	$100,000	Wildfire
0.000001	$100,000,000,000	$100,000	Wildfire

Risk attitude describes an individual's or organization's approach to uncertain outcomes and informs the strategies used to manage associated risks. Risk with identical expected values may be assessed differently depending on whether decision makers are risk seeking, risk neutral, or risk averse, particularly under conditions of high uncertainty.

Risk-seeking attitudes prefer options with the potential for higher gains, accompanied by the possibility of greater losses, reflecting a higher tolerance for uncertainty. In contrast, risk-averse attitudes prioritize options that limit potential losses, while a risk-neutral attitude reflects no preference among options with the same expected return. The appropriateness of a particular risk attitude depends on the context and nature of the potential gains and losses. Importantly, risk attitudes are not uniform across all types of outcomes. Multiple studies suggest that society does not value all risks equally, particularly when consequences differ substantially in severity.[100,101,102] Aversion to low-consequence, high-probability events, such as frequent short duration outages, is generally considered less pronounced than aversion toward high-consequence, low-probability events, such as catastrophic wildfires that can result in significant loss of life, widespread property damage, long-term environmental impacts, and substantial economic disruption. As a result of their potentially severe and irreversible impacts, such outcomes are typically weighted more heavily in risk-informed decision-making.

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[100] Slovic, P., Lichtenstein, S., and Fischhoff, B., *Modeling the Societal Impact of Fatal Accidents*, Vol. 30, No. 4, The Institute of Management Science (April 1984) at 464-474, *available at:* https://www.jstor.org/stable/2631433.

[101] Griesmeyer, J. M., Simpson, M., and Okrent, D., *The Use of Risk Aversion in Risk Acceptance Criteria?*, UCLA School of Engineering and Applied Science (June 1980), *available* at: https://doi.org/10.2172/5230500.

[102] M. Hammerton, M. W. Jones-Lee, and V. Abbott, *Technical Note—Equity and Public Risk: Some Empirical Results.* Vol. 30, No. 1, Operations Research Journal (February 1982), *available at:* https://doi.org/10.1287/opre.30.1.203.

To incorporate society's risk-averse attitude into the probabilistic decision-making framework, the risk aversion framework described in SDG&E's 2025 RAMP Report[103] is applied throughout SDG&E's mitigation selection process. This framework is incorporated into sensitivity analyses and financial modeling, including the benefit-cost ratio workpapers, to ensure that mitigation decisions appropriately account for low-probability, high-consequence wildfire risks.

To support robust and transparent mitigation planning, a sensitivity analysis was conducted to evaluate how feeder-segment prioritization and mitigation selection respond to alternative assumptions about risk aversion, particularly with respect to low-probability, high-consequence wildfire events. The results indicate that while varying risk aversion affects the weighting of extreme outcomes, it does not significantly change feeder-segment level BCR comparisons across grid-hardening mitigations, demonstrating that results are stable across a reasonable range of risk aversion factors. Additional discussion of the methodology, assumptions, and detailed results of this analysis is provided in Section I.H – Sensitivity Analysis.

A key component of the risk aversion framework is the risk scaling function, which is defined by the CPUC as a "function or formula that specifies an attitude towards different magnitudes of outcomes including capturing aversion to extreme outcomes or indifference over a range of outcomes."[104] The remainder of this section describes the risk scaling function and how it is applied within SDG&E's wildfire risk models to reflect societal preferences for managing rare but severe events and to support the prioritization of wildfire mitigations in the highest-risk areas of the service territory.

Figure JW-28 shows the range of possible annual monetized risk of the Overall Risk across the service territory comparing with and without the incorporation of a risk-averse attitude, shown as an exceedance probability curve. Table JW-19 shows the accompanying median, maximum, and 95th, 98th, and 99th percentile values of overall risk, expressed in millions of dollars, both with and without the incorporation of a risk-averse attitude. Overall risk estimates that incorporate a risk-averse attitude are consistently higher than the corresponding

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[103] 2025 RAMP Report, Chapter RAMP-3 at 23-25.

[104] D.24-05-064, Appendix A at A-5.

estimates that do not incorporate risk aversion. The ratio of the risk-averse to risk-neutral values increases at higher percentiles when a risk-averse attitude is applied. In other words, incorporating risk aversion results in proportionally greater weighting of more extreme wildfire risk outcomes relative to less-extreme events.

FIGURE JW-28
Probability of Exceedance of Monetized Baseline Overall Risk with and without Risk Aversion

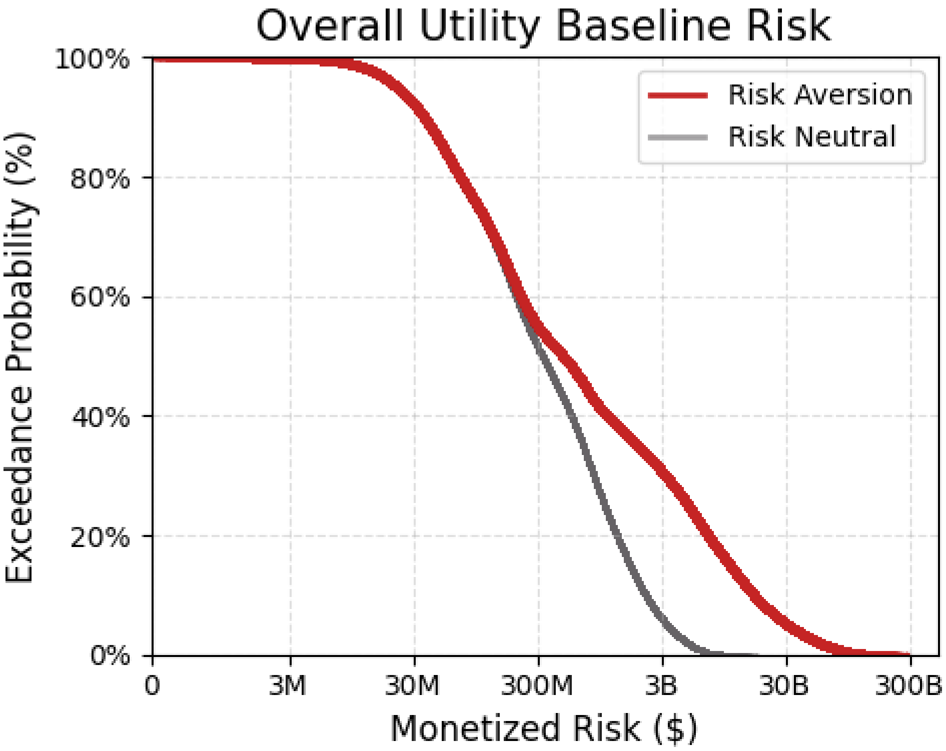

TABLE JW-19
Monetized Baseline Overall Risk Estimates with and without Risk Aversion

Percentile	Annual Return Period (Years)	Overall Utility Risk without Risk Aversion (M$)	Overall Utility Risk with Risk Aversion (M$)
p50	2	$ 326	$ 481
p95	20	$ 3,331	$ 31,210
p98	50	$ 4,828	$ 55,881
p99	100	$ 5,871	$ 75,508
Max	---	$ 17,515	$ 281,403
AAL	1	$ 826	$ 5,930

Risk aversion allows risk-informed decision-making frameworks to align modelled event consequences with society's risk attitude. Risk attitude is typically incorporated through a mapping function that converts a measurable consequence, such as cost, safety, reliability, or other metrics, into an equivalent societal cost. Under a risk-neutral approach, this mapping is linear, reflecting a one-to-one relationship between measured consequences and societal cost. This approach treats high-probability, low-consequence events equivalently to low-probability, high-consequence events.

In contrast, to reflect a risk-averse attitude, consequences are mapped to societal costs using a convex nonlinear function that places disproportionately greater weight on severe outcomes. This approach assigns relatively higher societal cost to low-probability, high-consequence events, such as catastrophic wildfires, than to more frequent, lower consequence events, thus more accurately reflecting societal preferences regarding extreme risks.

SDG&E's risk assessment and scaling methodology incorporates the full distribution of risk event outcomes[105] so that low-probability, high-consequence events are appropriately reflected in the reported risk scores. Circuit segments characterized by this type of profile are referred to as having high tail risk. Tail risk is captured by simulating individual events and their associated consequences, which collectively define the underlying risk distribution. The expected value of the risk distribution, or mean risk, is used as a primary metric. Because rare but severe outcomes materially increase the mean, this approach is inherently sensitive to tail events and account for the contribution of low-probability extreme scenarios at the circuit-segment level.

The risk aversion factor for risk-averse modeling is applied consistently at the individual event level across all modeled outcomes, placing proportionally greater weight on rare, high-consequence events. As a result, the effects of the factor are reflected directly in tail-risk metrics when comparing results with and without risk aversion, since each simulated event retains an associated likelihood value.

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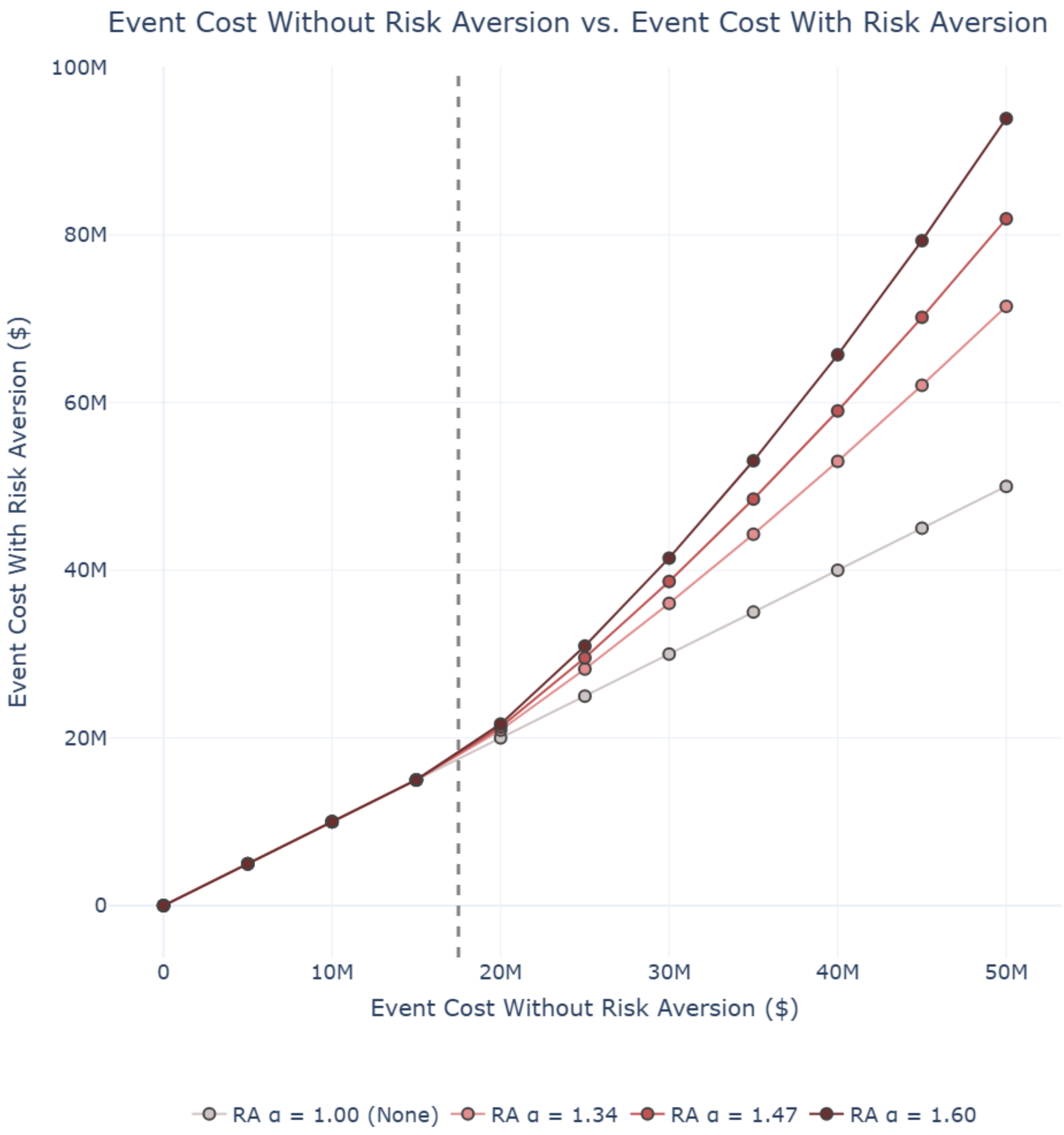
[105] SPD Evaluation Report at 146 (Recommendation #14: SDG&E should revise its risk assessment and scaling methodology to incorporate full CoRE (and risk) distributions when/if applying risk scaling. This revision should appropriately account for rare segments associated with low-probability, high-impact scenarios. Additionally, SDG&E should demonstrate how its revised model better captures tail risks and guides mitigation decisions for segments where extreme events are plausible.).

Circuit segments selected for long-term mitigation are typically identified based on elevated risk under a risk-neutral scenario and are justified by BCRs greater than one and superior to those of alternative mitigation options. In some cases, however, a segment may be prioritized primarily due to the application of risk-averse modeling. When this occurs, it indicates the presence of significant tail risk at the individual-event level. Prioritizing such segments is appropriate, as placing greater emphasis on mitigating low-probability, high-consequence events is consistent with societal expectations for managing catastrophic wildfire risk.

Risk aversion is applied at the individual event level rather than at the feeder-segment level, aligning with its intended purpose of reflecting societal aversion to extreme outcomes from specific events. Figure JW-29 illustrates the application of this approach across variations of risk-averse parameters. Each point represents a simulated risk event and its associated cost, presented under both risk-neutral assumptions and alternative risk-aversion scenarios.

Figure JW-29

Comparison of Risk Averse and Risk Neutral Outcomes at the Risk Event Level



For risk events where the estimated cost exceeds the Value of a Statistical Life (VSL), assumed to be $17.5 million in the current version of WiNGS-Planning, a risk-aversion exponent factor is used. This factor is applied to derive the risk-averse event cost. The risk-averse cost is computed as follows:

$$K = \begin{cases} VSL \times \left(\frac{L}{VSL}\right)^{\alpha}, & L > VSL \\ L & L \leqslant VSL \end{cases}$$

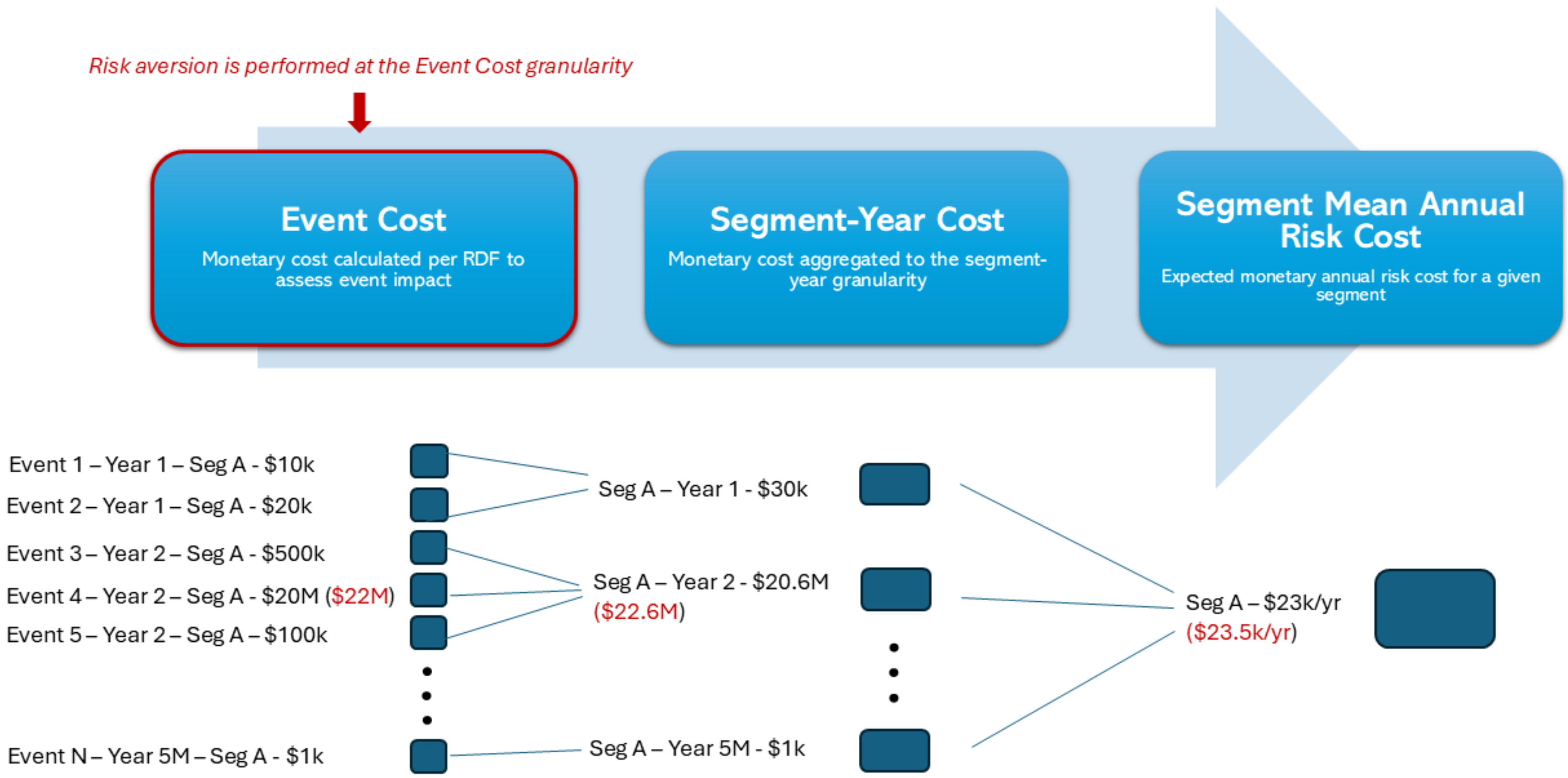
Where α denotes the risk-aversion exponent (1.47 in the current default risk-aversion version of WiNGS-Planning), *L* denotes the risk-neutral event cost, and *K* denotes the risk-averse event cost.

The exponent, α, is applied as a uniform value based on the limited resolution of available data, which does not support the development of location-specific α values. Accordingly, the chosen value for α represents a global risk attitude applied uniformly across all circuit segments rather than being tailored to individual locations. Implementing more granular, location-specific α values could introduce inequities by differentially weighting risk in a manner that may unfairly disadvantage customers associated with lower α values.

Under this risk-aversion framework, circuit segments exposed to a greater frequency of high-consequence events experience a more pronounced effect from the application of risk aversion, while segments primarily affected by lower-consequence events are less influenced. When results are aggregated, the overall impact of risk aversion on a segment depends on the combined frequency and severity of the contributing risk events.

Figure JW-30 illustrates the aggregation steps within the Monte Carlo Risk Assessment model and indicates where the risk aversion factor is applied across wildfire, PEDS, and PSPS risk models. The figure shows how risk data is aggregated from individual simulated events, the highest level of model granularity, to annualized segment-level risk costs, which represent the level of granularity at which SDG&E evaluates long-term mitigation investments.

Figure JW-30
Risk Aggregation Steps by Level of Granularity



Note: Values are for illustrative purposes only. Values in red represent corresponding risk averse values.

SDG&E reports risk baselines, risk reductions, and benefit-cost ratios (BCRs) both with and without risk-aversion in its BCR Workbooks (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF) to enhance transparency regarding the impact of risk aversion on results.

Risk aversion can affect the relative risk ranking of circuit segments because it is applied to individual events rather than to aggregated segment risk. As a result, two segments with similar average risk neutral baseline risk may diverge after risk aversion modeling is applied if one exhibits greater tail risk (i.e., more low-probability high-consequence events). Because the risk-aversion function is a power function, higher-consequence individual events receive disproportionately greater weight, which increases the aggregated risk for segments with more extreme event outcomes and can affect mitigation prioritization.

As an example, segments 237-2R and 442-728R illustrate how risk aversion can change the relative ranking of segments that have similar risk in a risk neutral scenario. Under the risk neutral scenario, these segments exhibit nearly identical monetized mean baseline risk, with baseline monetized risk values of approximately $6,412 (K$/year) for segment 237-2R and $6,181 (K$/year) for segment 442-728R.

However, after applying risk aversion, the relative magnitude of normalized risk for these segments diverges substantially. The monetized baseline risk for segment 237-2R increases to $73,693 (K$/year), while for segment 442-728R the monetized baseline risk increases to $35,407 (K$/year). As a result, segment 237-2R moves up in the relative risk ranking, while segment 442-728R moves to a lower ranking compared to other segments (Table JW-20).

Incorporating risk aversion also influences BCRs. In many cases, BCRs increase, often shifting from less than one to greater than one, particularly for mitigations, such as SUG, that are more effective at reducing tail-risk events. SUG projects tend to experience a larger relative increase in BCRs compared to alternatives such as CCC projects because the risk reduction is higher for scaled tail risk events. SDG&E has focused its proposed 400 miles of SUG on segments with the highest modeled risk and BCRs. Given that the selected segments have some of the highest estimates of risk within SDG&E’s network prior to the application of risk scaling, it is expected that they continue to rank among segments with the highest amounts of risk after the application of the risk scaling function and therefore mostly preserve their place in the list of proposed segments. See Section I.G.1 for details on how risk aversion is leveraged to inform the mitigation selection process.

Table JW-20 presents a side-by-side comparison of the top 50 highest risk feeder segments within the HFTD, showing risk-neutral and risk-averse baseline risk values and their associated cumulative risk percentile groupings. Percentiles are derived from the full population of feeder segments in the HFTD to provide relative ranking context. The table illustrates how application of the risk-aversion factor (α = 1.47) affects segment-level risk values and resulting relative risk rankings. For ease of interpretation, segments for which the application of risk aversion results in a material change in ranking are identified in the "Tail Risk" column. A material change in this case is defined as a shift across at least one cumulative percentile band (e.g., from 80–90% to 90–100%).

Segments flagged in the "Tail Risk" column represent cases where risk aversion meaningfully elevates prioritization, indicating heightened sensitivity to extreme loss scenarios and potential candidates for risk mitigation. While the highest-risk segments remain largely consistent under both assumptions, the application of risk aversion disproportionately amplifies tail risk for segments with a higher likelihood of large, catastrophic events, reflecting both their underlying risk profile and the non-linear nature of the risk-aversion scaling function. These findings reinforce the importance of incorporating risk aversion into prioritization frameworks, as reliance on risk-neutral estimates alone may understate exposure to extreme events and lead to suboptimal allocation of mitigation resources.

Table JW-20[106] [107]

Risk Neutral and Risk Aversion Baseline Risk for Top 50 HFTD Segments

		Baseline Risk (K$/year)		Cumulative Percentile Risk (%)		
Feeder-Segment	**HFTD**	**Risk Neutral (alpha = 1.0)**	**Risk Aversion (alpha = 1.47)**	**Risk Neutral (alpha = 1.0)**	**Risk Aversion (alpha = 1.47)**	**Tail Risk**
237-30R	Tier-3	$ 18,468	$ 206,904	90–100%	90–100%	
222-1986R	Tier-3	$ 15,037	$ 177,857	90–100%	90–100%	
222-1990R	Tier-3	$ 9,728	$ 109,109	90–100%	90–100%	

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[106] *Id.* at 146 (Recommendation #13: SDG&E should clearly document and explain both the justification for applying risk scaling and the process used to apply it to any segment when: a. Risk scaling results in the segment being included in or excluded from SDG&E's grid hardening plan. b. Risk scaling causes significant changes to the segment's tranche assignment.).

[107] The March 4, 2026 ALJ Ruling, Deficiency Area 2.1, Item 1 at 10.

		Baseline Risk (K$/year)		Cumulative Percentile Risk (%)		
Feeder-Segment	**HFTD**	**Risk Neutral (alpha = 1.0)**	**Risk Aversion (alpha = 1.47)**	**Risk Neutral (alpha = 1.0)**	**Risk Aversion (alpha = 1.47)**	**Tail Risk**
909-451	Tier-3	$ 8,862	$ 105,052	90–100%	90–100%	
222-2085	Tier-3	$ 8,412	$ 51,655	90–100%	80–90%	
908-2038R	Tier-2	$ 8,285	$ 100,754	90–100%	90–100%	
524-69R	Tier-3	$ 7,668	$ 66,580	80–90%	80–90%	
CB OK1	Tier-3	$ 7,013	$ 53,335	80–90%	80–90%	
237-2R	Tier-3	$ 6,412	$ 73,693	80–90%	90–100%	x
442-728R	Tier-3	$ 6,181	$ 35,407	80–90%	70–80%	
1458-601R	Tier-3	$ 6,075	$ 64,399	80–90%	80–90%	
157-81R	Tier-3	$ 6,034	$ 41,112	80–90%	70–80%	
79-808R	Tier-3	$ 5,765	$ 53,429	80–90%	80–90%	
971-2050R	Tier-3	$ 5,708	$ 55,405	80–90%	80–90%	
237-1765R	Tier-3	$ 5,669	$ 70,931	80–90%	90–100%	x
79-785	Tier-3	$ 5,665	$ 51,548	80–90%	80–90%	
222-2013R	Tier-3	$ 5,255	$ 30,875	80–90%	60–70%	
909-805R	Tier-2	$ 5,229	$ 57,481	80–90%	80–90%	
1215-32R	Tier-3	$ 5,158	$ 28,590	80–90%	60–70%	
358-682F	Tier-3	$ 5,088	$ 56,067	70–80%	80–90%	x
1021-1748F	Tier-3	$ 5,074	$ 53,153	70–80%	80–90%	x
236-1569R	Tier-3	$ 5,033	$ 53,840	70–80%	80–90%	x
237-17R	Tier-2	$ 4,911	$ 58,960	70–80%	80–90%	x
972-32R	Tier-2	$ 4,888	$ 48,070	70–80%	70–80%	
214-647R	Tier-3	$ 4,867	$ 50,147	70–80%	80–90%	x
599-19R	Tier-2	$ 4,845	$ 42,411	70–80%	70–80%	
448-744R	Tier-3	$ 4,488	$ 20,217	70–80%	50–60%	
445-1311R	Tier-3	$ 4,481	$ 24,003	70–80%	50–60%	
79-1254R	Tier-3	$ 4,461	$ 34,932	70–80%	70–80%	
214-1122R	Tier-3	$ 4,446	$ 39,351	70–80%	70–80%	
445-18R	Tier-2	$ 4,442	$ 18,966	70–80%	40–50%	
CB PE1	Tier-3	$ 4,410	$ 29,734	70–80%	60–70%	
79-679R	Tier-3	$ 4,370	$ 45,811	70–80%	70–80%	
1030-20R	Tier-3	$ 4,101	$ 33,517	70–80%	70–80%	
221-6R	Tier-2	$ 4,028	$ 30,138	70–80%	60–70%	
350-2192R	Tier-2	$ 3,977	$ 26,830	70–80%	60–70%	
971-1973R	Tier-3	$ 3,867	$ 38,211	60–70%	70–80%	x
908-2055F	Tier-3	$ 3,825	$ 40,471	60–70%	70–80%	x
222-1523R	Tier-3	$ 3,816	$ 23,313	60–70%	50–60%	
221-1232F	Tier-3	$ 3,815	$ 14,724	60–70%	40–50%	

Feeder-Segment	HFTD	Baseline Risk (K$/year) Risk Neutral (alpha = 1.0)	Baseline Risk (K$/year) Risk Aversion (alpha = 1.47)	Cumulative Percentile Risk (%) Risk Neutral (alpha = 1.0)	Cumulative Percentile Risk (%) Risk Aversion (alpha = 1.47)	Tail Risk
157-189R	Tier-3	$ 3,776	$ 15,236	60–70%	40–50%	
1030-42R	Tier-3	$ 3,773	$ 32,435	60–70%	60–70%	
357-45R	Tier-3	$ 3,667	$ 32,414	60–70%	60–70%	
215-1534R	Tier-2	$ 3,575	$ 44,831	60–70%	70–80%	x
222-1433R	Tier-3	$ 3,560	$ 40,031	60–70%	70–80%	x
176-197F	Tier-3	$ 3,507	$ 28,343	60–70%	60–70%	
1030-989R	Tier-3	$ 3,485	$ 22,361	60–70%	50–60%	
445-1325F	Tier-2	$ 3,470	$ 18,783	60–70%	40–50%	
445-894R	Tier-2	$ 3,449	$ 12,128	60–70%	30–40%	
73-683R	Tier-3	$ 3,441	$ 25,831	60–70%	60–70%	

2. Mitigation Effectiveness and Risk Reduction

Mitigation Effectiveness (ME) is the evaluation of how mitigation activities reduce the frequency or probability of wildfire ignition and, along with Risk Reduction, is a core component of the Risk Modeling Framework. Mitigation Effectiveness quantifies the extent to which specific sustained, inspection-based, or operational measures reduce ignition risk, while Risk Reduction represents the resulting decrease in overall system risk. Together, these metrics support consistent, transparent prioritization of mitigation investments and help direct resources toward mitigations that most effectively reduce wildfire risk while supporting public safety and system reliability. This section describes the methodology used to calculate Mitigation Effectiveness and Risk Reduction. Different approaches are applied for Grid Hardening programs compared to inspection and operational programs, reflecting differences in activities, how these programs influence wildfire risk reduction, and the duration and consistency of the benefits achieved over time.

a. Grid Hardening (Sustained) Mitigation Effectiveness

For grid hardening programs, namely SUG and CCC, a comprehensive methodology is used that combines historical field data, subject matter expertise, and industry benchmarking to calculate Mitigation Effectiveness for each combination of mitigation activity and wildfire risk driver. This methodology involves the analysis of a system-wide portfolio of historical ignitions and Evidence of Heat events to determine the fraction that would have been prevented by the mitigation activity. The resulting overall Mitigation Effectiveness values, calculated using subject-matter-expert-derived values for ignition probability reduction per risk driver, are grounded in both technical knowledge and real-world operational conditions, enhancing the accuracy of risk reduction calculations and the effectiveness of wildfire mitigation planning.

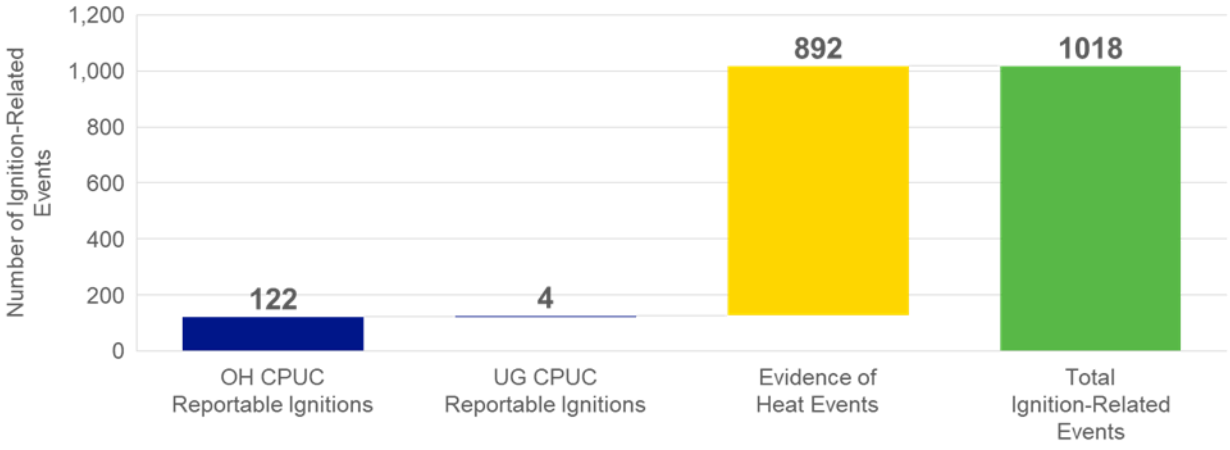
Mitigation Effectiveness values are not specific to each location but are static throughout the service territory. These values are used to calculate Wildfire Risk Reduction, which is location-specific and accounts for both the reduction in ignition probability associated with a given mitigation (i.e., the Mitigation Effectiveness) and the potential consequences of an ignition at that location. These ignition consequences are driven by site-specific factors such as fuel density, topography, and weather conditions. The risk reduction is calculated by the product of an asset's location-specific baseline (pre-mitigation) risk and the Mitigation Effectiveness of the specified mitigation activity (shown in Table JW-21). WiNGS-Planning captures the distinction between Mitigation Effectiveness and Risk Reduction, supporting the selection of mitigation activities that most effectively mitigate the highest-consequence wildfire risks.

The Mitigation Effectiveness of CCC and SUG are calculated using a comprehensive dataset of all known ignition-related events that is continuously updated as new ignition-related events occur in the service territory and is reviewed by a cross-functional team of subject matter experts. Mitigation Effectiveness is estimated using ignition-related data, including both Evidence of Heat events and CPUC-reportable ignitions collected through the Ignition Management Program (IMP).

The IMP gathers input from internal stakeholders to track actual and potential events. It also identifies the causes of equipment failures or incidents. When a definitive cause is established, the corresponding mode of failure is documented and communicated to the appropriate mitigation owner for corrective action. In addition to supporting internal risk management, the IMP helps fulfill regulatory reporting obligations associated with Energy Safety and CPUC ignition reporting requirements. For this GRC filing, ignition-related event data from 2019 through 2024 was used. Data from 2025 was not included because ignition information for that year has not been fully vetted and validated by internal subject-matter experts at the time of preparation. Given the need for additional review and cross-functional coordination to complete the validation process, SDG&E relied on the most recent fully reviewed data available, through 2024, for this analysis.

As shown in Figure JW-31, the dataset used for Mitigation Effectiveness calculations includes ignitions that meet the CPUC's reporting criteria[108] and recorded Evidence of Heat events, regardless of whether they qualify as CPUC-reportable ignitions. Each of these ignition-related events, whether classified as reportable or not, are systematically reviewed by Engineering and Risk Analytics teams. This supports identification and implementation of both immediate and long-term corrective actions. By capturing a broader range of ignition-related data, potential risks can be proactively addressed, improving system safety and reliability.

Figure JW-31
Total Ignition-Related Events from 2019 to 2024



As shown in Table JW-22 incorporating Evidence of Heat events into the Mitigation Effectiveness calculations results in slightly lower Mitigation Effectiveness values for both SUG and CCC compared to values calculated using CPUC-reportable ignitions alone. Nonetheless, SDG&E considers the inclusion of Evidence of Heat events to be more statistically robust and more representative of real-world conditions. Incorporating all available ignition-related data, regardless of reporting thresholds, increases confidence in Mitigation Effectiveness estimates and supports long-term wildfire mitigation decisions grounded in a comprehensive, data-driven assessment of asset performance and ignition behavior under field conditions. Figure JW-32 shows the total ignition-related events by category (overhead, underground, and total) documented by the IMP from 2019 through 2024.

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[108] *See* D.14-02-015.

FIGURE JW-32
Total Ignition-Related Events by Category from 2019 to 2024

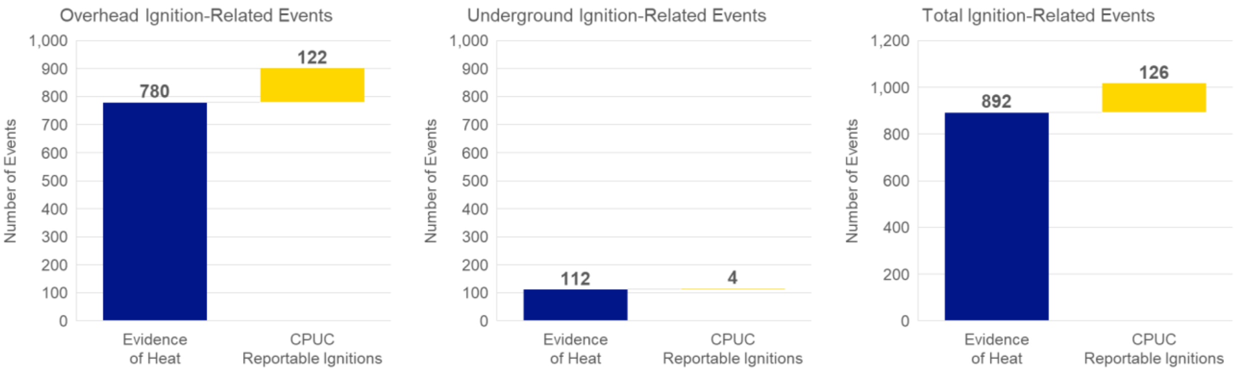

Table JW-21 shows the effectiveness of various mitigation activities on common risk drivers.

TABLE JW-21
Effectiveness Against Risk Drivers by Grid Hardening-Related Mitigation Activity

Operational or Sustained	Mitigation Type	Effectiveness (All Risk Drivers)	Equipment Failure	Fault (Cause Unknown)	Balloon Contact	Animal Contact	Vehicle Contact	Vegetation Contact	High Winds
Sustained	Strategic Undergrounding	98.00%[109]	High	High	High	High	High	High	High
Sustained	Combined Covered Conductor	61.71%	High	High	High	Medium	Medium	Medium	Medium
Operational	Falling Conductor Protection	8%	Medium	Low	Medium	Low	Medium	Medium	Medium
Sustained	Traditional Hardening	39%	High	Medium	Medium	Medium	Medium	Medium	Medium
Operational	Early Fault Detection	16%	High	High	Low	Low	Low	Medium	Low

The following sections describe in detail how the Mitigation Effectiveness values for CCC and SUG are calculated. In addition, Section I.H presents comparisons of benefit-cost ratios for CCC and SUG across a range of alternative ME assumptions. These sensitivity analyses illustrate how variations in mitigation effectiveness influence BCR outcomes and provide transparency into how ME assumptions affect the feeder-segment–level selection and prioritization of system hardening strategies.

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[109] This is the value that is modeled in WiNGS-Planning. Refer to Table JW-24 for additional details on how SDG&E derives this value.

i. Combined Covered Conductor Mitigation Effectiveness

Based on the internal analysis described in this section, the overall Mitigation Effectiveness of CCC is estimated to be 61.71 percent. This value represents the overall effectiveness of a multi-part mitigation program: CCC combines Covered Conductor, Falling Conductor Protection (FCP), and Early Fault Detection (EFD). WiNGS-Planning uses this Mitigation Effectiveness value to calculate the Wildfire Risk Reduction that results from Combined Covered Conductor.

Table JW-22 shows the Mitigation Effectiveness for Covered Conductor based on all ignition-related events (i.e., CPUC-reportable ignitions and Evidence of Heat events), evaluated across various wildfire and PSPS risk drivers.

TABLE JW-22
Mitigation Effectiveness Calculation for Covered Conductor Based on All Ignition-Related Events

Overhead Distribution Ignition-Related Drivers	Total Number of CPUC Reportable Ignitions and Evidence of Heat Events [2019 - 2024]	2024/2025 Subject Matter Expert Ignition-Related Reduction (%)	Estimated Number of Ignition-Related Events Reduced
Animal Contact	20	90%	18
Balloon Contact	27	90%	24.3
Vehicle Contact	20	80%	16
Vegetation Contact	72	90%	64.8
Other Contact*	47	50%	23.5
Conductor	123	90%	110.7
Equipment – Non-Conductor**	412	39%	160.68
Other All***	151	10%	15.1
Undetermined****	10	70%	7
Overhead to Underground Connection	20	75%	15
Total	**902**	**n/a**	**455.08**

** Other contacts include external contacts caused by SDG&E or non-SDG&E personnel, customers, and foreign objects (excluding animals, balloons, vegetation, and vehicles) in overhead electrical equipment.*

*** Equipment – Non-Conductor includes electrical equipment like lightning arrestors, fuses, and transformers.*

**** Other All includes contamination, dig-ins, vandalism, and non-utility fires.*

***** Undetermined includes outages/ignitions with no information in Primary or Secondary Cause.*

To calculate the Mitigation Effectiveness for Covered Conductor, the total number of ignition-related events estimated to be reduced by Covered Conductor is divided by the total number of CPUC-reportable ignitions and Evidence of Heat events over the same time span, as shown in the following equation:

$$ME_{CC}(\text{All Ignition-Related Events}) = \frac{455.08}{902} = 50.45\%$$

To calculate the overall Mitigation Effectiveness of Combined Covered Conductor, the effectiveness of the Covered Conductor mitigation (50.45%) is combined with the effectiveness of the Falling Conductor Protection (FCP) and Early Fault Detection (EFD) mitigations. Using a similar methodology as is used to estimate the Mitigation Effectiveness of Covered Conductor, the Mitigation Effectiveness of FCP on all system outages is estimated to be 8 percent, and the mitigation effectiveness of EFD is estimated to be 16 percent. The Mitigation Effectiveness of Combined Covered Conductor is then calculated as shown in the following equation.

$$\begin{gathered}\text{Combined Effectiveness} = \\ 1 - [(1 - \text{CC Efficacy}) \times (1 - \text{FCP Efficacy}) \times (1 - \text{EFD Efficacy})]\end{gathered}$$

This results in a Mitigation Effectiveness for Combined Covered Conductor of 61.71 percent when all ignition-related events are considered.

$$\begin{gathered}\text{Combined Effectiveness(All Ignition-Related Events)} = \\ 1 - [(1 - 0.5045) \times (1 - 0.08) \times (1 - 0.16)] = 61.71\%\end{gathered}$$

The Mitigation Effectiveness of Combined Covered Conductor was also calculated using the same equation but considering only ignitions that meet the CPUC's reporting criteria, which are detailed in Table JW-23. The resulting Mitigation Effectiveness of Covered Conductor is 61.32 percent and that of Combined Covered Conductor is 70.11 percent, as shown in the following equations.

TABLE JW-23
Mitigation Effectiveness Calculation for Covered Conductor Based on CPUC-Reportable Ignitions Only

Overhead Distribution Ignition Drivers	**Total Number of CPUC Reportable Ignitions [2019 - 2024]**	**2024/2025 Subject Matter Expert Ignition Reduction (%)**	**Estimated Number of Ignitions Reduced**
Animal Contact	19	90%	17.1
Balloon Contact	9	90%	8.1

Overhead Distribution Ignition Drivers	**Total Number of CPUC Reportable Ignitions [2019 - 2024]**	**2024/2025 Subject Matter Expert Ignition Reduction (%)**	**Estimated Number of Ignitions Reduced**
Vehicle Contact	10	80%	8
Vegetation Contact	11	90%	9.9
Other Contact	4	50%	2
Conductor	10	90%	9
Equipment – Non-Conductor	49	39%	19.11
Other All	9	10%	0.9
Undetermined	1	70%	0.7
OH to UG Connection	0	75%	0
Total	122	n/a	74.81

$$\text{Covered Conductor Mitigation Effectiveness(CPUC Reportable Ignitions Only)} = \frac{74.81}{122} = 61.32\%$$

$$\text{Combined Effectiveness(CPUC Reportable Ignitions Only)} = 1 - [(1 - 0.6132) \times (1 - 0.08) \times (1 - 0.16)] = 70.11\%$$

Table JW-24 summarizes the CCC-related Mitigation Effectiveness values discussed in this section.

TABLE JW-24
Summary of Combined Covered Conductor-Related Mitigation Effectiveness Values

Mitigation	**Mitigation Effectiveness Value**	**Calculation Based On All Ignition-Related Events***	**Calculation Based On CPUC Reportable Ignitions Only**	**Comments**
Final Combined Covered Conductor	61.71%	X		Calculated based on All Ignition-Related Events
Combined Covered Conductor	70.11%		X	Calculated based on CPUC Reportable Ignitions only
Covered Conductor	50.45%	X		Calculated based on All Ignition-Related Events

Mitigation	Mitigation Effectiveness Value	Calculation Based On All Ignition-Related Events*	Calculation Based On CPUC Reportable Ignitions Only	Comments
Covered Conductor	61.32%		X	Not used in SDG&E's Risk Analysis. Calculated based on CPUC Reportable Ignitions only
FCP	8.00%			
EFD	16.00%			

** All ignition-related events include both Evidence of Heat events and CPUC reportable ignitions.*

Based on the evaluation of CCC mitigation effectiveness, SDG&E presents risk reductions and benefit-cost ratios (BCRs) in its workpapers using a CCC mitigation effectiveness value of 61.71 percent, calculated with CPUC reportable ignitions and evidence of heat events. In addition, several sensitivity analyses of this assumption, presented in Section I.H, illustrate the impact of alternative CCC mitigation effectiveness values on BCR results. These sensitivities allow reviewers to assess how variations in the assumption of CCC effectiveness influences mitigation outcomes and to understand how this information is incorporated and evaluated at the feeder-segment-level mitigation selection process when comparing CCC and SUG alternatives.

To address uncertainty in assumptions regarding CCC's ability to reduce wildfire risk, a sensitivity analysis was conducted to examine how alternative mitigation effectiveness assumptions affect feeder-segment prioritization and mitigation cost effectiveness. The results show that varying the assumed mitigation effectiveness of CCC has a limited impact on relative benefit-cost outcomes and does not materially change feeder-level mitigation recommendations, with SUG continuing to be the recommended mitigation option for most feeder segments across the mitigation effectiveness range evaluated. Additional detail on the assumptions tested, methodology, and results of this sensitivity analysis is provided in Section I.H.

ii. Strategic Undergrounding Mitigation Effectiveness

The overall Mitigation Effectiveness for Strategic Undergrounding (SUG) is estimated to be 98.52%. Moving overhead infrastructure underground significantly reduces exposure to the primary ignition drivers affecting overhead systems – namely, weather-related events such as high winds leading to equipment failures, downed wires or damage to cross-arms, falling debris, and vegetation contact with energized lines. However, moving infrastructure underground also introduces a small increase in ignition likelihood. This section therefore draws a distinction between the Mitigation Effectiveness of converting overhead assets to underground, which does not account for the small increase in ignition likelihood introduced by undergrounding, and the Mitigation Effectiveness of SUG.

Table JW-25 details the Mitigation Effectiveness of converting overhead assets to underground for specific wildfire and PSPS risk drivers. These weather-related events are common ignition sources during extreme fire weather conditions in the service territory and if not effectively mitigated, can escalate into catastrophic wildfire scenarios. WiNGS-Planning conservatively calculates Wildfire Risk Reduction values using an assumed Mitigation Effectiveness value of 98 percent.

TABLE JW-25
Mitigation Effectiveness Calculation for Relocating Assets from Overhead to Underground Based on All Ignition-Related Events

Overhead Distribution Ignition-Related Drivers	Overhead Distribution Ignition-Related Sub-Drivers	Total Number of CPUC Reportable Ignitions and Evidence of Heat Events [2019 - 2024]	2024/2025 Subject Matter Expert Ignition-Related Reduction (%)	Estimated Number of Ignition-Related Events Reduced	Comments
Equipment	Conductor Failure	123	100%	123	With the removal of overhead assets, it is assumed that there will be zero ignition incidents.
Equipment	Overhead Equipment (Non-Conductor)	412	100%	412	With the removal of overhead assets, it is assumed that there will be zero ignition incidents.

Overhead Distribution Ignition-Related Drivers	Overhead Distribution Ignition-Related Sub-Drivers	Total Number of CPUC Reportable Ignitions and Evidence of Heat Events [2019 - 2024]	2024/2025 Subject Matter Expert Ignition-Related Reduction (%)	Estimated Number of Ignition-Related Events Reduced	Comments
External	Vehicle Contact (Pole)	20	100%	20	With the removal of overhead assets, it is assumed that there will be zero ignition incidents.
Equipment	Overhead Equipment Failure Unknown	10	100%	10	Ignitions with no information in Primary or Secondary Cause (unknown). With the removal of overhead assets, it is assumed that there will be zero ignition incidents.
Equipment	Overhead to Underground Connection	20	100%	20	With the removal of overhead assets, it is assumed that there will be zero ignition incidents.
External	All Other Overhead	151	99%	149.49	This category accounts for potential factors in the overhead system that could impact underground equipment (e.g., contamination and non-utility fires) and assumes that the enclosed nature of underground structures offers better protection and containment of potential ignitions.
External	Other Overhead Contact	47	100%	47	With the removal of overhead assets, it is assumed that there will be zero ignition incidents.

Overhead Distribution Ignition-Related Drivers	Overhead Distribution Ignition-Related Sub-Drivers	Total Number of CPUC Reportable Ignitions and Evidence of Heat Events [2019 - 2024]	2024/2025 Subject Matter Expert Ignition-Related Reduction (%)	Estimated Number of Ignition-Related Events Reduced	Comments
External	Vegetation Contact	72	95%	68.4	The enclosed nature of underground structures is assumed to better contain an ignition. The effectiveness rate accounts for potential vegetation contacts such as roots growing and encroaching on underground structures.
External	Balloon Contact	27	100%	27	With the removal of overhead assets, it is assumed that there will be zero ignition incidents.
External	Animal Contact (Overhead)	20	100%	20	With the removal of overhead assets, it is assumed that there will be zero ignition incidents.
Total		**902**	**n/a**	**896.89**	

The Mitigation Effectiveness of converting overhead distribution assets to underground (i.e., unadjusted mitigation effectiveness or ignition reduction effectiveness) is calculated as the proportion of distribution ignitions avoided by undergrounding overhead distribution assets. Specifically, the calculation divides the estimated number of ignitions reduced through the relocation of assets from overhead to underground by the total number of distribution ignitions. Using this approach, the unadjusted mitigation effectiveness of the is calculated to be 99.43%.

$$\text{OH to UG Mitigation Effectiveness (All Ignition-Related Events)} = \frac{896.89}{902} = 99.43\%$$

This value represents the unadjusted ignition reduction percentage attributable solely to the elimination of overhead ignition drivers. Undergrounding reduces the likelihood of ignition by removing exposure to overhead-related ignition mechanisms; it does not directly mitigate the consequence of an ignition event.

Although overhead-to-underground conversion demonstrates a high Mitigation Effectiveness, it also introduces a minimal increase in ignition likelihood associated with newly installed underground infrastructure (referred to as “Added Ignition-Related Events from Additional UG Infrastructure” in Figure JW-33). Based on historical underground system performance data and internal modeling assumptions, this incremental increase in ignition likelihood is estimated at approximately 0.91%, which is subtracted from the unadjusted mitigation effectiveness. Therefore, the adjusted mitigation effectiveness of SUG projects completed between 2019 and 2024 is calculated to be 98.52%, as shown in Figure JW-33, Table JW-27, and the equation below.

$$\begin{aligned}&\text{SUG Mitigation Effectiveness (All Ignition-Related Events)}\\ &= \text{OH to UG ME} - \text{Added Ignition-Related Risk from UG}\\ &= 99.43\% - 0.91\% = 98.52\%\end{aligned}$$

This value is consistent with unadjusted mitigation effectiveness (i.e., ignition reduction effectiveness) values reported by peer utilities, including approximately 98%[110] and 97%[111] in PG&E’s and SCE’s 2026-2028 Base WMPs, respectively. This alignment indicates that the adjusted mitigation effectiveness of SUG represents an industry-accepted standard for this mitigation.

The unadjusted mitigation effectiveness value of 99.43% represents the theoretical effectiveness of a single action—removal of overhead lines. In contrast, the adjusted mitigation effectiveness value of 98.52% reflects the overall effectiveness of the SUG program after consideration of all relevant factors, including the minimal ignition risk associated with underground infrastructure.

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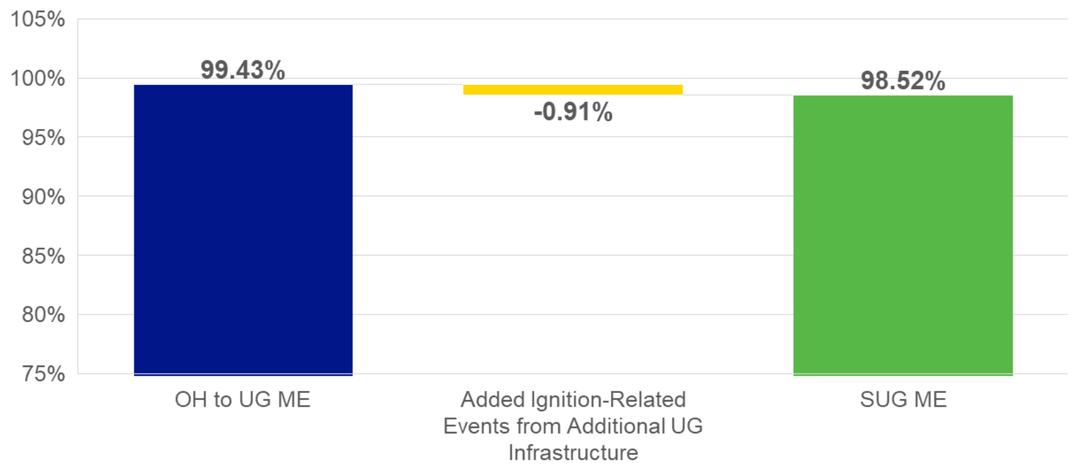
[110] PG&E, *PG&E WMP R0, 2026-2028*, Volume 1 of 2, Table 6-3 at 151, *available at*: https://www.pge.com/assets/pge/docs/outages-and-safety/outage-preparedness-and-support/pge-2026-2028-base-wmp-vol1-r0.pdf.

[111] SCE, *2026-2028 Base WMP Revision 1*, Table 6-3 at 198-199.

FIGURE JW-33
Strategic Undergrounding Mitigation Effectiveness Based on All Ignition-Related Events



When calculated on the basis of CPUC-reportable ignitions only, the Mitigation Effectiveness of converting overhead assets to underground (i.e., the unadjusted mitigation effectiveness) is 99.48% and the adjusted mitigation effectiveness is 98.52% as shown in Table JW-24.

$$\text{OH to UG Mitigation Effectiveness (CPUC Reportable Ignitions Only)} = \frac{121.36}{122} = 99.48\%$$

TABLE JW-26
Mitigation Effectiveness Calculation for Relocating Assets from Overhead to Underground Based on CPUC-Reportable Ignitions Only

Overhead Distribution Ignition Drivers	Total Number of CPUC Reportable Ignitions [2019 - 2024]	2024/2025 Subject Matter Expert Ignition Reduction (%)	Estimated Number of Ignitions Reduced
Animal Contact	19	100%	19
Balloon Contact	9	100%	9
Vehicle Contact	10	100%	10
Vegetation Contact	11	95%	10.45
Other Contact*	4	100%	4
Conductor	10	100%	10
Equipment – Non-Conductor**	49	100%	49
Other All***	9	99%	8.91
Undetermined****	1	100%	1

Overhead Distribution Ignition Drivers	**Total Number of CPUC Reportable Ignitions [2019 - 2024]**	**2024/2025 Subject Matter Expert Ignition Reduction (%)**	**Estimated Number of Ignitions Reduced**
OH to UG Connection	0	100%	0
Total	122	n/a	121.36

** Other contacts include external contacts caused by SDG&E or non-SDG&E personnel, customers, and foreign objects (excluding animals, balloons, vegetation, and vehicles) in overhead electrical equipment.*

*** Equipment – Non-Conductor includes electrical equipment like lightning arrestors, fuses, and transformers.*

**** Other All includes contamination, dig-ins, vandalism, and non-utility fires.*

***** Undetermined includes outages/ignitions with no information in Primary or Secondary Cause.*

TABLE JW-27
Summary of Strategic Undergrounding-Related Mitigation Effectiveness Values

Mitigation	**Mitigation Effectiveness Value**	**Calculation Based on All Ignition-Related Events***	**Calculation Based on CPUC Reportable Ignitions Only**	**Comments**
Strategic Undergrounding**	98.52%	X		Calculated based on all Ignition-Related Events and considers the additional minimal risk introduced by the newly undergrounded system.
Overhead to Underground***	99.43%	X		Calculated based on all Ignition-Related Events
Overhead to Underground***	99.48%		X	Calculated based on CPUC-Reportable Ignitions only
Strategic Undergrounding modeled in WiNGS-Planning	98.00%	X		Value assumed by SDG&E to maintain a conservative modeling approach and calculated based on all Ignition-Related Events

** All ignition-related events include both Evidence of Heat events and CPUC reportable ignitions.*

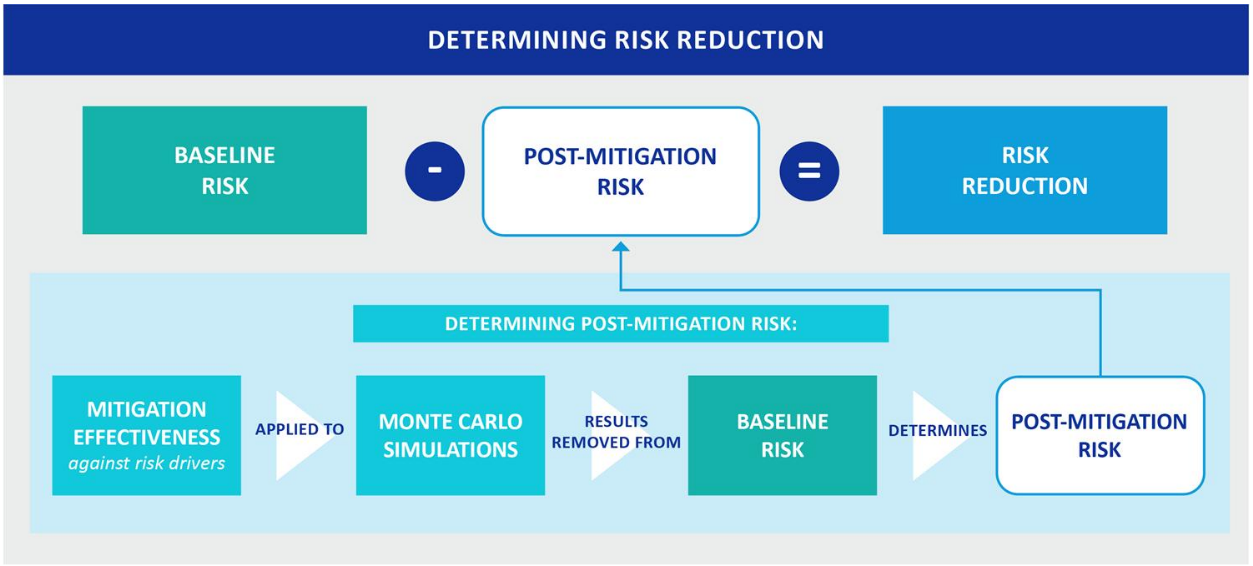
*** Also referred to as Adjusted Strategic Undergrounding mitigation effectiveness.*

**** Also referred to as Unadjusted Strategic Undergrounding mitigation effectiveness, as additional ignition-related events from new undergrounding equipment are not included.*

b. Grid Hardening (Sustained) Risk Reduction

As depicted in Figure JW-34, the Monte Carlo Risk Assessment model estimates Wildfire and PSPS Risk Reduction from grid-hardening mitigation activities by applying Mitigation Effectiveness values to Monte Carlo simulation results. These simulations evaluate millions of possible events for each asset or feeder segment. Mitigation Effectiveness is not currently modeled for PEDS Risk due to insufficient empirical data and because available data does not yet support reliable attribution of PEDS events to specific asset characteristics or operational conditions. Accordingly, Mitigation Effectiveness values cannot be meaningfully applied to PEDS Risk at this time.

Figure JW-34: Determining Risk Reduction



i. CCC and SUG Wildfire Risk Reduction

The impact of a mitigation activity on Wildfire Risk Reduction can vary greatly depending on site-specific factors, even though Mitigation Effectiveness for a mitigation is the same regardless of location.

For example, installing CCC in a paved area with low wind exposure and minimal fire spread potential achieves the same percentage reduction in ignition probability as installing CCC in a remote, fuel-rich, area subject to extreme winds during fire weather conditions because the Mitigation Effectiveness of CCC is the same regardless of location. Despite this, the baseline wildfire risk at the paved site is minimal, while the baseline risk at the remote site is substantially higher due to terrain, vegetation, and exposure to extreme wind conditions. As a result, while

CCC provides the same Mitigation Effectiveness in both areas, the Wildfire Risk Reduction is far greater at the remote site.

Post-Mitigation Monte Carlo Random Sampling for Sustained Mitigations

For each mitigation option, the model is used to determine a given span (Wildfire) or feeder-segment (PSPS) transition state: for example, from Unhardened to CCC. The Mitigation Effectiveness of the specified mitigation activity is then assigned to that span or feeder segment. For the purposes of hardening, mitigations can be summarized mathematically as follows. For a given set of simulated pre-mitigation events, S, let:

- $N = |S|$ = number of pre-mitigation risk events
- $\eta \in [0, 1]$ = Mitigation Effectiveness, i.e., the fraction of events prevented by the mitigation activity
- $K = N \times (1 - \eta)$ = number of post-mitigation events

The model reduces the event count by sampling K events randomly from the original N events as follows, where the post-mitigation event set is represented by s:

$$s = \text{RandomSample}(S, K)$$

For example, a mitigation activity with a mitigation effectiveness of 40% (i.e., $\eta = 0.40$) would be expected to reduce events by as much. However, this does not necessarily result in a 40 percent reduction in overall risk, as the remaining events may differ materially in severity, probability, or consequence.

The remaining 60% [K=N × (1-0.40)] risk forms the post-mitigation event set s. This remaining event set may have larger mitigation effectiveness across fewer spans.

This sampling is done without replacement and with a fixed random seed, which allows results to be reproducible across validation cycles and regulatory reviews.

Monetized Risk Reduction for Sustained Mitigations

After the random sampling process selects the fraction of all simulated events that remain after a given mitigation activity has been applied to a span or feeder segment, the retained events are monetized using the CPUC Risk-Based Decision-Making Framework. The following example illustrates how the risk reduction associated with a particular mitigation activity is calculated for a hypothetical feeder segment, *A*.

Equations

The mean pre- and post-mitigation risk for segment *A* are calculated as follows:

$$\text{Mean Pre-Mitigation Risk}_A = \frac{1}{r}\sum_{i=1}^{N^A} S_i^A$$

$$\text{Mean Post-Mitigation Risk}_A = \frac{1}{r}\sum_{i=1}^{K^A} s_i^A$$

$$\text{Mean Risk Reduction}_A = \text{Mean Pre-Mitigation Risk}_A - \text{Mean Post-Mitigation Risk}_A$$

Variables

- r = number of simulated years
- N^A = number of pre-mitigation events on segment *A*
- K^A = number of post-mitigation events on segment *A*
- S_i^A = monetized risk of pre-mitigation event *i* on segment *A*
- s_i^A = monetized risk of post-mitigation event *i* on segment *A*

Example: Tail Risk Distribution

As shown in Table JW-28, this example illustrates the baseline risk for a long-tailed risk distribution, and demonstrates how random sampling of avoided events, at 98% and 61.7% mitigation effectiveness produces estimates of residual risk across different percentile outcomes.

TABLE JW-28
Tail Risk Distribution Example

		ME = 98%		ME = 61.7%	
Metric	**Baseline Risk ($ values in M$)**	**Residual Risk ($ values in M$)**	**Risk Reduction (%)**	**Residual Risk ($ values in M$)**	**Risk Reduction (%)**
Events	1,000,000	20,000	---	383,000	---
Mean Cost	$ 1,234	$ 25	98.0%	$ 473	61.7%
50%	$ 603	$ -	100%	$ -	100%
60%	$ 733	$ -	100%	$ -	100%
70%	$ 932	$ -	100%	$ 394	57.7%
80%	$ 1,290	$ -	100%	$ 580	55.0%
90%	$ 2,179	$ -	100%	$ 1,044	52.1%
95%	$ 3,608	$ -	100%	$ 1,791	50.4%
98%	$ 6,846	$ 6	99.9%	$ 3,501	48.9%
99%	$ 10,899	$ 602	94.5%	$ 5,700	47.7%

		ME = 98%		ME = 61.7%	
Metric	**Baseline Risk ($ values in M$)**	**Residual Risk ($ values in M$)**	**Risk Reduction (%)**	**Residual Risk ($ values in M$)**	**Risk Reduction (%)**
99.50%	$ 17,206	$ 1,081	93.7%	$ 9,114	47.0%
99.60%	$ 19,906	$ 1,292	93.5%	$ 10,593	46.8%
99.80%	$ 30,214	$ 2,178	92.8%	$ 16,713	44.7%
99.90%	$ 42,545	$ 3,613	91.5%	$ 25,834	39.3%
Max	$ 99,752	$ 91,537	8.2%	$ 99,390	0.4%

For the mean case, the modeled risk reduction aligns well with the assumed mitigation effectiveness (ME), with 98% and 61.7% ME yielding corresponding risk reductions of 98% and 61.7%, respectively. However, as the analysis shifts towards the tail of the distribution (i.e., higher percentiles), the realized risk reduction declines. This divergence is especially pronounced in the extreme tail, where high-severity, low-probability events dominate residual risk, resulting in substantially lower risk reduction compared to the assumed ME. Significant tail risk remains under CCC because many simulated ignition events are only partially mitigated (61.7%), allowing some scenarios to still produce large consequences and drive extreme outcomes.

ii. Combined Covered Conductor PSPS Risk Reduction

For PSPS Risk Reduction assessment, the same Random Sampling framework described in Section I.D.2.a is used but with a Mitigation Effectiveness value that is dependent on wind gust thresholds, as shown in the following equation.

$$\eta_{PSPS}^{CC} = \begin{cases} 0.90, & w \leq 50 \text{ mph} \\ 0.00, & w > 50 \text{ mph} \end{cases}$$

The operational wind speed threshold is 50 mph. At and below this threshold, CCC is modeled as preventing 90% of PSPS events (i.e., the Random Sampling process retains 10% of these events). This Mitigation Effectiveness value of 90 percent reflects that even below the operational wind speed threshold, not all PSPS events are considered preventable. Therefore, to account for de-energizations driven by factors beyond the immediate upstream segment or its localized weather conditions, a conservative 90 percent estimate is used.

Other contributing factors include de-energizations on transmission lines or de-energizations occurring below established CCC wind-speed thresholds due to the presence of assets flagged for temporary construction or compliance conditions, which in turn require lowering the wind-gust alert thresholds applied to the affected feeder segments. When wind speeds exceed 50 mph, CCC does not prevent PSPS de-energizations, as reflected by the Mitigation Effectiveness value of 0 percent. Therefore, Random Sampling retains 100% of these events.

Example

Consider a hypothetical feeder segment for which a set of 100 simulated PSPS events has been generated. CCC is applied to the feeder segment, and Random Sampling is applied to calculate the resulting PSPS Risk Reduction. Of this set of events:

- 60 events have wind gusts ≤ 50 mph → 90% are prevented and the remaining 10% are retained: $60 \times (1 - 0.90) = 6$
- 40 events have wind gusts > 50 mph → none are prevented and all are retained: $40 \times (1 - 0.00) = 40$
- 46 events are retained in total: $K = 6 + 40 = 46$

Using the Random Sampling methodology, CCC results in a 54% reduction in the PSPS event count.

iii. Strategic Undergrounding PSPS Risk Reduction

For PSPS Risk assessment, SUG uses the same Random Sampling framework described for CCC in Section I.D.2.a. The key difference is that the Mitigation Effectiveness of SUG for PSPS is 90 percent, regardless of wind speed, as shown in the following equation.

$$\eta_{PSPS}^{UG} = 0.90 \text{ for all wind speeds}$$

Similar to CCC, the selection of a 90 percent mitigation effectiveness assumption for SUG PSPS impacts is driven by factors that extend beyond the characteristics of an individual feeder segment. These factors include the potential dependence of undergrounded feeder segments on upstream overhead assets that may still be subject to de-energization, which could in turn result in the de-energization of the underground segment. In addition, transmission-level de-energizations can independently drive downstream feeder outages regardless of whether the affected segments are overhead or underground, as occurred during the December 2024 PSPS event following forecasted Santa Ana wind conditions after an abnormally dry year.[112] Considering these system-level dependencies, the use of a 90 percent mitigation effectiveness assumption is intended to represent a conservative modeling approach for both SUG and CCC mitigations.

For SUG PSPS risk reduction, the random sampling process retains 10 percent of simulated PSPS events, regardless of the underlying simulated wind-gust scenario.

$$K = N \times (1 - 0.90) = 0.10N$$

Example

For 100 PSPS events:

$$K = 100 \times (1 - 0.90) = 10$$

Thereby, in this example, SUG would prevent 90 out of a total of 100 simulated PSPS events.

Table JW-29 compares how PSPS Mitigation Effectiveness for SUG and CCC varies by wind speed threshold to calculate PSPS risk reduction

TABLE JW-29
PSPS Mitigation Effectiveness for SUG and CCC by Wind Speed Threshold

Mitigation	**PSPS Mitigation Effectiveness**		**Overall Effect**
	Wind Gust ≤ 50 mph	**Wind Gust > 50 mph**	
Combined Covered Conductor (CCC)	90%	0%	Strong reduction at moderate winds; none at extreme winds
Strategic Undergrounding (SUG)	90%	90%	Maximum PSPS reduction under all conditions

- CCC provides conditional PSPS risk reduction dependent on wind gust thresholds.
- SUG provides uniform, unconditional PSPS risk reduction and represents the highest level of PSPS resilience.

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[112] R.18-12-005, SDG&E Public Safety Power Shutoff Post-Event Group report for December 09 – December 11, 2024 (January 10, 2025), *available at*: A-1 - A-2.

iv. CCC and SUG PEDS Risk Reduction

As stated in Section I.D.2.b.i, Mitigation Effectiveness for PEDS Risk is not currently modeled due to insufficient empirical data and because PEDS occurrences are treated as stochastic events for which initiating factors cannot yet be reliably attributed to specific asset characteristics or operational conditions. The lack of a validated causal mechanism linking mitigation activities to reductions in PEDS event likelihood or severity mean Mitigation Effectiveness values cannot be meaningfully applied to PEDS Risk. As a result, Risk Reduction is not calculated for PEDS Risk.

c. Operational Risk-Based Mitigations

i. Risk-Based Mitigation Effectiveness

Methodology and Definitions

Operational mitigation programs differ fundamentally from grid hardening (sustained) mitigation programs[113] in how Mitigation Effectiveness can be applied. For grid hardening (sustained) programs, mitigation effectiveness can be incorporated directly into risk-reduction calculations because completed hardening work—such as conductor replacement or undergrounding an asset—produces an immediate and measurable reduction in equipment or ignition-related risk.

In contrast, inspection-based operational mitigation programs do not generate immediate risk reduction simply through the act of inspecting assets. Inspections primarily reduce uncertainty by identifying locations with potential defects and locations likely without defects; the actual mitigation of ignition risk occurs only when repairs or replacements are completed. As the risk model already considers historical rates of repairs, defects, and asset failures, inspections are unlikely to change these rates within the risk model over the short term. Because inspection activities themselves do not eliminate risk, the mitigation effectiveness methodology used for capital programs is not an appropriate measure of operational mitigation program performance. In capital programs, the implementation of the program itself directly leads to a reduction in risk. However, in the operational mitigation programs, it is the application of the program followed by subsequent measures to address any defects that are identified through the program that ultimately leads to a reduction in risk. Therefore, mitigation effectiveness for operational

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[113] Grid hardening (sustained) mitigation programs consist of SUG and CCC only.

mitigation programs is only realized when the program is applied in conjunction with asset inspection programs that identify potential defects, leading to application of mitigation programs to segments with the highest risk.

Table JW-30 shows the effectiveness of various operational mitigation activities on common risk drivers.

TABLE JW-30
Effectiveness Against Risk Drivers by Operational Mitigation Activity

Operational	Mitigation Type	Effectiveness (All Risk Drivers)	Equipment Failure(Non Pole)	Pole Failure	Fault (Cause Unknown)	Balloon Contact	Animal Contact	Vehicle Contact	Vegetation Contact	High Winds
Operational	Distribution Overhead Detailed Inspections, Repairs and Replacement	1%	High	High	Medium	Low	Low	Low	Medium	Medium
Operational	Distribution Overhead Patrol Inspections, Repairs and Replacement	0.13%	Medium	High	Medium	Low	Low	Low	Low	Medium
Operational	Distribution Wood Pole Intrusive Inspections, Repairs and Replacement	0.01%	Low	High	Low	Low	Low	Low	Low	Medium
Operational	Risk-Informed Drone Inspection, Repairs and Replacement	9.39%	High	High	Medium	Low	Low	Low	Medium	Medium
Operational	Off-Cycle Patrol in HFTD, Prune and Removal	0.10%	Low	Low	Low	Low	Low	Low	High	Medium
Operational	Pole Clearing	2.28%	Medium	Low	Low	Low	Low	Low	Low	Low
Operational	Fuels Management Distribution - incl. poles and grand*	2.31%	Medium	Low	Low	Low	Low	Low	Low	Low
Operational	Detailed Inspections, Prune and Removal	2.42%	Low	Low	Low	Low	Low	Low	High	Medium

Historically, the effectiveness of operational mitigation programs was evaluated using a system-wide framework similar to that used for capital investments, with an emphasis on inspection detection performance, specifically, how often inspections identified issues, failed to detect issues, or flagged conditions that did not result in outages. This sensitivity- and specificity-based approach primarily measured the effectiveness of inspections as a diagnostic tool. The methodology has since evolved to a risk-based effectiveness framework for inspection programs, which more accurately reflects their role in the risk-management lifecycle by quantifying the amount of wildfire risk reduced through the identification and remediation of asset conditions.

The Risk-Based Mitigation Effectiveness for operational mitigation programs can be calculated using the following equation:

$$\text{RBME} = \text{Inspection Find Rate} \times \text{Targeted Risk Driver} \times \text{Repair Effectiveness}$$

- **Risk-Based Mitigation Effectiveness (RBME):** RBME quantifies the risk reduction that is achieved through a chain of mitigation activities – including inspection and repair – rather than a single mitigation activity in a vacuum. RBME is more focused on the contribution of the entire inspection and repair program to the overall risk reduction rather than the success rate of the inspection alone in finding defects.
- **Inspection Find Rate:** The percentage of inspections resulting in findings that required remediation.
- **Targeted Risk Driver:** This metric represents the proportion of total system risk attributable to the specific failure risk types that a given O&M activity is designed to address. It is derived from the expected risk associated with the targeted failure modes.
    - Consider a simplified example in which total system risk comprises three drivers: A (25%), B (60%), and C (15%). If a mitigation measure is designed to address only risk driver A, then the maximum theoretical share of total system risk that can be mitigated, referred to as the Targeted Risk Driver, is 25%. Even with perfect effectiveness applied to driver A, mitigation cannot reduce the risk associated with drivers B or C. As such, the Targeted Risk Driver metric provides an important boundary on the achievable risk reduction by linking each activity to the portion of system risk it can mitigate.
- **Repair Effectiveness:** The proportion of identified asset conditions or deficiencies for which corrective actions are completed within required timeframes, thereby preventing escalation into failures.

ii. Risk-Based Risk Reduction

Methodology and Definitions:

The annualized risk reduction due to O&M mitigations is driven by several key attributes that determine how effectively a mitigation reduces expected risk over a one-year period. The following Risk Reduction equation evaluates how much risk is reduced when equipment, vegetation, or structures within the inspection scope receive corrective actions. The risk reduction for each inspection varies depending on the Baseline Risk, asset population, scope of work completed (Annual Mitigation Scope), likelihood of finding a defect (Inspection Find Rate), degree of risk prevented by that type of repair (Targeted Risk Driver), and effectiveness of the corrective action (Repair Effectiveness).

$$\text{Risk Reduction} = \text{Baseline Risk} \times \text{Baseline Wildfire Risk } \% \times \text{Annual Mitigation Scope} \times \text{RBME}$$

- **Risk Reduction:** The annual decrease in monetized risk resulting from mitigation.
- **Baseline Risk:** The expected annual monetized risk associated with the assets and failure modes before mitigation is applied.
- **Baseline Wildfire Risk %:** The portion of Overall Baseline Risk associated with Wildfire Risk.
- **Annual Mitigation Scope:** The portion of the asset or tree population receiving inspections or maintenance during the year.
  - For RIDI only, this term is named **Wildfire Risk Addressed** and is defined as the percentage of wildfire risk addressed by the annual scope of RIDI inspections.[114] A different methodology is used for RIDI because this type of inspection is risk-based whereas all other inspection types are time-based.

Table JW-31 summarizes the differences between Mitigation Effectiveness, which is used for quantifying the effectiveness of grid hardening mitigations, and RBME, which is used for quantifying the effectiveness of an operational mitigation.

TABLE JW-31
Mitigation Effectiveness vs. Risk-Based Mitigation Effectiveness

Dimension	Mitigation Effectiveness (ME)	Risk Based Mitigation Effectiveness (RBME)
Primary Purpose	Measures whether a mitigation directly prevents a risk event.	Measures the change in quantified risk achieved through a chain of program activities that starts with the subject inspection measure but requires a set of subsequent actions to achieve the desirable reduction in risk.

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[114] For example, if a segment includes 500 total poles and 200 poles have associated wildfire risk, and RIDI inspections are completed on 40 of those 200 poles, then Wildfire Risk Addressed equals 20 percent (40 ÷ 200).

Dimension	**Mitigation Effectiveness (ME)**	**Risk Based Mitigation Effectiveness (RBME)**
Best Suited For	Capital hardening programs (e.g., CCC, SUG) with immediate and measurable risk removal once the mitigation is deployed and in service.	Inspection-based O&M programs where activities identify conditions, and repairs drive the actual risk reduction.
Outcome Measured	Success/failure of a mitigation action to prevent ignition or equipment failure.	Reduction in risk exposure (e.g., lower probability of failure, lower ignition likelihood) based on defects identified and remediated.
Timing of Risk Reduction	Immediate upon completion of work (e.g., new conductor immediately reduces ignition risk).	Indirect and two-step: inspections identify hazards, then asset remediation reduces risk.
Strengths	Clear cause and effect relationship; directly ties investment to outcomes.	Reflects the true role of inspection programs; quantifies uncertainty reduction and achieved risk reduction.
Limitations	Not appropriate for programs that only detect issues.	This approach relies on modeling risk exposure and remediation impacts and is appropriate primarily in cases where historical and forecasted finding rates and O&M cost activities exhibit year-over-year consistency. Where such consistency does not exist, supplemental analysis and subject matter expertise assumptions may be required.

iii. Example of Risk-Based Mitigation Effectiveness (RBME) and Risk Reduction for Operational Mitigations

This section uses distribution feeder segment 222-1986R to illustrate the evaluation of mitigation effectiveness and risk reduction. The RBME calculation is demonstrated using the Risk Informed Drone Inspections program. The input variables for this program are:

- Inspection Find Rate: 14.08%
- Targeted Risk Driver: 67.38% (equipment failure rate)
- Repair Effectiveness: 99%

The following equation is then used to calculate an RBME of 9.39%:

$$\begin{aligned}\text{RBME} &= \text{Inspection Find Rate} \times \text{Targeted Risk Driver} \times \text{Repair Effectiveness} \\ &= 14.08\% \times 67.38\% \times 99\% = 9.39\%\end{aligned}$$

Of all poles associated with Segment 222-1986R, the scoped 345 poles receiving RIDI inspections collectively cover 100% of the identified wildfire risk. The variables below are used to calculate the risk reduction, resulting in an estimated risk reduction.

- Baseline Risk: $15,037,000
- Baseline Wildfire Risk %: 88.69%
- Wildfire Risk Addressed: 100%
- RBME for RIDI Program: 9.39%

$$\text{Risk Reduction} = \text{Baseline Risk} \times \text{Baseline Wildfire Risk \%} \times \text{Wildfire Risk Addressed} \times \text{RBME}$$
$$= \$15,037,000 \times 88.69\% \times 100\% \times 9.3922\% \approx \$1,253,000$$

Table JW-32 presents an illustrative example for segment 222-1986R, incorporating the variables outlined above and explains how the resulting risk reduction is calculated in the BCR. Comprehensive details for all segments are documented in the BCR Workbook (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF).

TABLE JW-32
Risk-Based Mitigation Effectiveness and Risk Reduction Example for Segment 222-1986R

Feeder Segment	HFTD Tier	Total Risk Addressed	Units in Scope (Poles)	WF + PSPS + PEDS Risk Baseline (K$/year)	Baseline Wildfire (%)	Baseline PSPS (%)	Baseline PEDS (%)	Risk Reduction (K$/year)
222-1986R	Tier-3	100%	345	$ 15,037	88.69%	11.11%	0.20%	$ 1,253

E. Mitigation Lifecycle Cost Assessment

1. Overview

The Mitigation Lifecycle Cost Assessment evaluates the cost-effectiveness of wildfire, PSPS, and PEDS risk mitigation strategies by considering the magnitude of risk reduction achieved, the full lifecycle cost of each mitigation, and the resulting net changes in O&M costs following mitigation implementation. By assessing these factors over the expected lifespan of the assets, long-term investment decisions are supported that prioritize financially sustainable outcomes and durable system benefits rather than focusing solely on minimizing upfront capital expenditures. Without a lifecycle perspective, mitigations that appear cost-effective at installation may result in materially higher long-term costs due to ongoing maintenance requirements, reliability impacts, or declining mitigation effectiveness.

The Mitigation Lifecycle Cost Assessment is conducted using Lifecycle Model Version 3, which is aligned[115] with the 2026-2028 Base WMP, the Risk Assessment and Mitigation Phase (RAMP), and General Rate Case (GRC) financial forecasts. The lifecycle horizon is assumed to be 55 years for both CCC and SUG, consistent with the Electrical Undergrounding Plan (EUP) risk-modeling and reporting requirements established by the CPUC and OEIS.[116]

The Mitigation Lifecycle Cost Assessment incorporates both initial capital expenditures incurred at implementation (Year 0) and ongoing O&M activities. As illustrated in Figure JW-32, total lifecycle costs are comprised of three interrelated components: implementation costs incurred at the time of installation; ongoing long-term operational costs associated with maintaining and operating hardened assets (e.g., inspections, repairs and replacements, vegetation management, outage restoration, situational awareness, and PSPS-related activities); and long-term foundational costs that support systemwide wildfire mitigation capabilities throughout the life of the assets.

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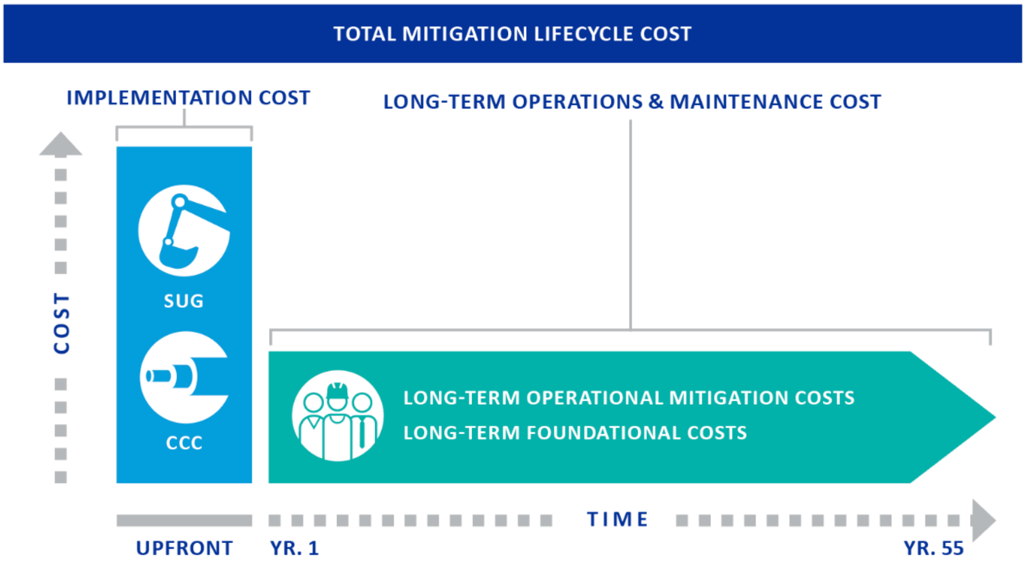
[115] D.24-12-074, OP 45 at 1099 (“San Diego Gas & Electric Company shall coordinate its risk analysis for its Wildfire Mitigation Plans with its Risk Assessment and Mitigation Phase, to the extent possible.”).

[116] Pub. Util. Code § 8388.5(f)(1); *see also* CPUC, *Electric Undergrounding Expediting Program – SB 884*, *available at:* https://www.cpuc.ca.gov/about-cpuc/divisions/safety-policy-division/risk-assessment-and-safety-analytics/electric-undergrounding-sb-884.

FIGURE JW-35
Mitigation Lifecycle Cost Assessment Components



Implementation Costs consist of capital and associated non-capital expenditures necessary to implement a given grid hardening mitigation. Long-term O&M costs consist of Long-term Operational Mitigation Costs and Long-term Foundational Cost and are derived from RAMP controls and mitigations, along with the financial forecasts included in this GRC filing.[117] GRC financial forecasts classify costs into CAPEX and OPEX, which supports consistent aggregation and disaggregation of costs across specific operational activities. Lifecycle Cost Model 3.0 is therefore developed using unit costs derived from GRC annual financial forecasts and units for the 2028-2031 period[118].

Under RAMP Volume 2, SDG&E – Risk-4 Wildfire & PSPS, a total of 38 controls and mitigations are included in this GRC, of these, 13 operational and 19 foundational activities are

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[117] D.24-12-074, OP 45 at 1099 ("San Diego Gas & Electric Company shall coordinate its risk analysis for its Wildfire Mitigation Plans with its Risk Assessment and Mitigation Phase, to the extent possible.").

[118] For purposes of this analysis, the lifecycle horizon is assumed to be 55 years for both CCC and SUG, consistent with the EUP risk-modeling and reporting requirements established by the CPUC and OEIS. *See* Pub. Util. Code § 8388.5(f)(1); *see also* CPUC, *Electric Undergrounding Expediting Program – SB 884*, *available at:* https://www.cpuc.ca.gov/about-cpuc/divisions/safety-policy-division/risk-assessment-and-safety-analytics/electric-undergrounding-sb-884.

incorporated into the Long-Term O&M costs[119] detailed in this section. In addition, activities associated with Risk-5 Electric Infrastructure Integrity were reviewed to capture five incremental post-mitigation O&M cost elements related to undergrounding assets that were not captured under Wildfire & PSPS risk category, shown in Table JW-33. In total, 37 unique programs (13 + 19 + 5) are reflected in the cost framework. Of these, 18 programs are evaluated for long-term operational costs and 20 programs for long-term foundational costs, with one program contributing to both categories.[120]

Table JW-33
Operation and Maintenance GRC Costs Not within RAMP Risk-4 Wildfire Category

RAMP Workpaper	RAMP Workpaper Name / Cost Center	GRC Budget Code	Lifecycle Cost Application
1CR05C267	SDG&E-Risk-5 Electric Infrastructure Integrity Damage Prevention Activities Electric Underground (OPEX)	1GD000.002	SUG Foundational Cost
1CR05C253	SDG&E-Risk-5 Electric Infrastructure Integrity Restoration of Service (CAPEX)	002360.001	SUG and CCC Operational Mitigation - Outage Restoration
1CR05C254	SDG&E-Risk-5 Electric Infrastructure Integrity Underground Cable Replacement Program – Reactive (CAPEX)	002300.001	SUG Operational Mitigation - Outage Restoration
1CR05C212	SDG&E-Risk-5 Electric Infrastructure Integrity GO165 Corrective Maintenance Program Underground (CAPEX)	002290.002	SUG Operational Mitigation – Repair and Replacement

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[119] 38-13-19 = 6, the remaining 6 mitigations are Capital projects such as, Strategic Undergrounding (C518), Combined Covered Conductor (C550) and microgrid (C506), Transmission Overhead Hardening (C522), Distribution Underbuild Repairs on Transmission Structures (C565), Cleveland National Forest Fire Hardening (C569). These are not included in Net O&M calculations.

[120] Costs associated with the C571 Emergency Preparedness and Recovery Plan are split into operational and foundational costs.

RAMP Workpaper	**RAMP Workpaper Name / Cost Center**	**GRC Budget Code**	**Lifecycle Cost Application**
N/A	Electric Regional Operations (OPEX)	1ED005	SUG Operational Mitigation – three inspection activities[121]

Another element of the Mitigation Lifecycle Cost Assessment is Net O&M cost, defined as the change in ongoing O&M costs between baseline (pre-hardening) and post-hardening conditions. Grid hardening strategies, such as CCC and SUG, modify, reduce, or eliminate certain historical O&M activities and introduce new post-mitigation activities. Net O&M captures the incremental increase or decrease in long-term operational costs resulting from these changes and represents the difference between baseline and post hardening O&M expenditures over the asset lifecycle.

This section describes how the components of the Mitigation Lifecycle Cost Assessment are developed and applied. It summarizes the treatment of upfront, one-time implementation costs, the identification and calculation of long-term operational and foundational O&M costs, and the comparison of baseline and post-hardening conditions to derive incremental Net O&M costs. The resulting Net O&M costs are annualized, normalized on a per mile basis, and incorporated into the WiNGS-Planning model suite for use in BCR analysis, where they are evaluated alongside risk-reduction benefits.

Illustrative circuit-segment examples are included to demonstrate the consistent and transparent data lineage[122] from RAMP and GRC inputs through lifecycle calculations and Net

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[121] The inspections include Above-Ground (dead front AGI) inspections, Subsurface Inspection (SS10), Patrol Inspections, which are a subset of total costs under 1ED005.

[122] SPD Evaluation Report at 147 (Recommendation #18: SDG&E should restructure its reporting templates for costs and units across control and mitigation plans in a more consistent and transparent format. SDG&E should provide the units (e.g., miles of UG, inspections) for each year of the GRC cycle without splitting them into O&M and Capital categories. While it may be appropriate to break down forecasted costs into O&M and Capital, such cost information should be presented consistently (e.g., annual reporting or clearly defined multi-year blocks) for all relevant years to allow for clear comparison and alignment with physical work.).

O&M results. Collectively, this section explains how the Mitigation Lifecycle Cost Assessment supports a comprehensive, consistent, and analytically robust evaluation of wildfire mitigation cost effectiveness within SDG&E's risk informed investment planning framework.

2. Implementation Cost Component

The implementation cost component of the Mitigation Lifecycle Cost Assessment represents the total capital and associated non-capital expenditures necessary to implement a given grid hardening mitigation. These costs include expenditures related to installing and deploying applicable sustained mitigations and are incorporated into the BCR to fully capture upfront implementation costs. Additional information on the BCR Framework and SDG&E Workpapers is provided in Section I.F.

For SUG and CCC, assumed to be at $2.32M per mile and $1.31M per mile[123], respectively, implementation costs are developed using historical grid hardening project data and subject matter expert judgment. The unit cost is then used to estimate the forecast in this GRC (2028 to 2031) and is also used to quantify the BCR as a constant value for the implementation cost. This unit cost is detailed in the BCR Workbook (Ex. SCG-02/SDGE-02-WP-S_SDGE-04_WF) for Combined Cover Conductor [C550] and Strategic Undergrounding [C518].[124,125]

To account for uncertainty in mitigation implementation costs, a sensitivity analysis was performed to evaluate how alternative capital cost assumptions for SUG and CCC affect feeder-segment prioritization and benefit-cost results. Additional information on the cost assumptions tested, analytical approach, and detailed results of this sensitivity analysis are provided in Section I.H.

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[123] Ex. SDGE-07, Chapter 1, Section IV.A.4, Strategic Undergrounding (C510), and Section IV.A.10. Combined Covered Conductor (550).

[124] To enable scenario analysis within the BCR Workbooks, the implementation unit cost can be adjusted in cells K5 and K11 on the C518_SUG, C550_CCC, C518_SUG_all_HFTD, and C550_CCC_all_HFTD worksheets.

[125] The March 4, 2026 ALJ Ruling, Deficiency Area 2.5, Item 2 at 17.

3. Long-Term Operations & Maintenance Cost Components[126]

a. Long-term Operational Mitigation Cost Component

The long-term operational mitigation cost component consists of costs associated with ongoing O&M activities on a given circuit segment for existing overhead conductors, covered conductor, and underground assets during the lifetime of the asset. See Table JW-34 for the breakdown of costs for mitigation activities, including asset inspections and repair costs, unplanned outage restoration costs,[127] vegetation management costs, PSPS activation costs, and other mitigation costs.

b. Long-term Foundational Cost Component

The long-term foundational costs component represents ongoing foundational expenditures incurred annually or periodically throughout the lifecycle of an asset, which is assumed to be 55 years. These foundational initiatives provide essential underlying functions that are needed to support operational mitigations and are necessary as utility operational capabilities regardless of overhead or underground assets. These initiatives do not have a direct association with risk reduction, and therefore they are not included in the Risk Reporting Unit[128].

There is a total of 20 ongoing foundational activities. These costs are allocated based on GRC Financial Forecasts and its associated grid system. Table JW-34 indicates foundational costs allocation and post mitigation Net O&M percentage conversion and the estimated post-hardening conversion multiplier used to derive foundational Net O&M costs under each hardening scenario.

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[126] SPD Evaluation Report at 147 (Recommendation #19: SDG&E should provide clear cost allocation rules and reconcile overlapping categories. Each cost element (e.g., capital, O&M, VM, foundational) should be uniquely defined and consistently applied across mitigations. SDG&E should also provide reconciliation tables demonstrating that no cost is double counted across mitigations.).

[127] Unplanned outage restoration cost is documented under the 2025 RAMP Report, Chapter SDG&E-Risk-5 - Electric Infrastructure Integrity, and GRC workpaper 1CR05C253.

[128] D.24-05-064, Appendix A at A-7 ("Risk Reporting Unit (RRU): A CPUC jurisdictional effort within Electric Operations or Gas Operations that simultaneously removes or mitigates a group of assets or systems that exhibit high levels of risk. The RRU must include common elements that must include, but are not limited to Consequence Attributes, Risk level, line-item costs, work units and time. The RRU can be aggregated based on unique identifiers that should include, but are not limited to, hierarchy, risk event, tranche and mitigation type.").

TABLE JW-34
Foundational O&M Cost Allocation and Conversion[129]

		Baseline Cost Allocation		Post Hardening Cost Conversion Multiplier	
Ramp ID	**Work Paper Title**	**OH HFTD**	**UG HFTD**	**If CCC**	**If SUG**
C504	Standby Power Programs (Fixed Backup Power Commercial)	100%	0%	100%	0%
C512	Customized Resiliency Assessment	100%	0%	100%	0%
C516	Generator Assistance Programs	100%	0%	100%	0%
C546	Aviation Program	100%	0%	100%	100%
C548	Wildfire Infrastructure Protection Teams	75%	25%	100%	50%
C552	PSPS Sectionalizing Enhancements	100%	0%	100%	100%
C556	Engagement with AFN Populations	50%	50%	100%	100%
C557	Public Outreach and Education Awareness	50%	50%	100%	100%
C558	Risk Methodology and Assessment	50%	50%	100%	50%
C561	Fire Potential Index	50%	50%	100%	100%
C562	Weather Station Maintenance and Calibration	75%	25%	100%	100%
C563	Wildfire Mitigation Strategy Development	50%	50%	100%	50%
C564	Distribution Communications Reliability Improvements (DCRI)	50%	50%	100%	50%
C566	Enterprise Data Foundation	50%	50%	100%	100%
C567	Public Emergency Communication Strategy	50%	50%	100%	100%
C571	Emergency Preparedness and Recovery Plan (non-activation)	50%	50%	100%	100%
C572	Situational Awareness and Forecasting	50%	50%	100%	100%
C582	Application Support and Risk Analytics	100%	0%	100%	100%
C584	Integrated Work Management & Risk Assessment Platform	100%	0%	100%	100%
C267	SDG&E-Risk-5 Electric Infrastructure Integrity Damage Prevention Activities Electric Underground	0%	25%	0%	100%

The following steps are applied when quantifying Net O&M associated with foundational costs:

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[129] Detailed cost information can be found in Appendix D, (Foundational Programs and Costs).

$$\text{Post-Hardening Long-Term Net Foundational Cost} = \text{Baseline Long-Term Foundational Cost} \times (\text{Post-Hardening Cost Conversion Multiplier} - 1)$$

1. Baseline Long-Term Foundational Cost Allocation: when a foundational program applies exclusively to overhead assets, 100% of the cost is allocated to existing overhead circuit miles within the HFTD. When a program applies to both overhead and underground assets, costs are allocated between the two asset types based on the applicable allocation percentages. The baseline cost allocation percentages are detailed in Table JW-34. For example, 100% of the C546 Aviation Program cost is attributed to overhead assets within the HFTD.

2. Post-Hardening Cost Conversion Multiplier: If an asset remains overhead following implementation of CCC, foundational costs associated with baseline overhead assets remain unchanged, represented by a multiplier of 100%. If a program is discontinued once the upstream circuit is converted to underground, the "If SUG" multiplier is set to 0%. For programs where activity levels scale with overhead circuit miles, costs are reduced proportionally as overhead mileage decreases (e.g., C563 Wildfire Mitigation Strategy Development). Other programs, such as C561 Fire Potential Index, continue at baseline levels to support systemwide operations across the service territory.

3. Long-Term Net Foundational Cost Calculation: The baseline cost attributed to existing overhead assets is normalized by total overhead circuit miles to derive a baseline cost per mile, which is then aggregated to calculate the total baseline cost. The post-mitigation conversion multiplier is applied to determine Net O&M as the incremental change from baseline using the formula below. The resulting differences are aggregated across all applicable programs to calculate total post-mitigation Net O&M.

4. Net Operational O&M Costs and Savings[130] [131] [132]

Net O&M costs capture the change in ongoing operational expenses between baseline (pre-hardening) and post-hardening scenarios. Because grid-hardening strategies, such as CCC and SUG, alter the set of required O&M activities, these mitigations can either increase or reduce long-term operational costs. Table JW-35 summarizes the applicability of each operational mitigation under the Baseline, CCC, and SUG configurations.

O&M Costs are grouped into persistent, removed, and new costs. This allows the comparison of CCC and SUG scenarios by identifying which O&M activities persist, which are

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[130] SPD Evaluation Report at 146 (Recommendation #11: SDG&E should reconsider Alt 2, the covered conductor approach, after correcting the CBR calculation to include only incremental O&M costs as part of the net benefits.).

[131] *Id.,* CBR Calculations, Observations & Findings #1 at 52.

[132] The March 4, 2026 ALJ Ruling, Deficiency Area 2.5, Item 1 at 17.

avoided, and which are newly introduced because of hardening investments. It also establishes the basis for calculating Net O&M costs or Net O&M savings.

- Persistent Costs – Costs associated with operational activities that continue after hardening. In Table JW-35, 'Persistent' indicates that an activity continues with no change in cost assumptions (e.g., C526 Distribution Overhead Detailed Inspections under CCC), while 'Persistent*' indicates that the activity continues but with modified costs due to changes in asset conditions or configuration (e.g., C507 Repair and Replacement). These activities generate cost differences relative to baseline and therefore contribute to Net O&M savings.

  For example, baseline costs for C507 Repair and Replacement are forecasted based on current average asset age and condition. Under the CCC scenario, costs are instead forecasted using finding rates associated with asset age over a 1- to 55-year horizon. This frequency-based methodology is detailed in Section D.4.a.iii, Methodology – Frequency.

  For C571 (Emergency Preparedness and Recovery Plan), costs are segmented to avoid double counting: activation costs are included in operational Net O&M calculations while the remaining costs are classified as foundational costs.

- Removed Costs – Costs associated with activities that are eliminated because the underlying hazard, exposure, or asset condition is no longer present under the hardened configuration.

- New Costs – Costs related to additional activities required by the hardened asset type, technology, or design that did not exist under the baseline condition.

TABLE JW-35
Operational Mitigation Costs by Baseline Mitigation, CCC and SUG[133]

Mitigation Category	RAMP ID	Workpaper/Program Title	Baseline	If CCC	If SUG
Inspections & Maintenance (Overhead Asset)	C526	Distribution Overhead Detailed Inspections	Yes	Persistent	Removed
	C536	Distribution Overhead Patrol Inspections	Yes	Persistent	Removed
	C530	Distribution Wood Pole Intrusive Inspections	Yes	Removed	Removed
	C534	Risk-Informed Drone Inspections	Yes	Persistent	Removed
	C507	CMP Repairs and Replacements	Yes	Persistent*	Removed
Inspections & Maintenance	NA	Above-Ground (dead front AGI) Inspections	No	NA	New

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[133] *Id.*, Deficiency Area 2.5, Item 2 at 17.

Mitigation Category	RAMP ID	Workpaper/Program Title	Baseline	If CCC	If SUG
(Underground Asset)	NA	Subsurface Inspections (SS10)	No	NA	New
	NA	Patrol Inspections	No	NA	New
	C212	Repair Replacement	No	NA	New
Unplanned Outage Restoration	C253	Overhead Asset Restoration	Yes	Persistent*	Removed
	C253, C254	Underground Asset Restoration	No	NA	New
Veg Management	C554	Detailed Inspections	Yes	Persistent	Removed
	C551	Prune and Removal (Clearance)	Yes	Persistent	Removed
	C578	QA/QC of Vegetation Management	Yes	Persistent	Removed
	C544	Pole Clearing	Yes	Persistent	Removed
	C537	Off-Cycle Patrol	Yes	Persistent	Removed
	C540	Fuels Management Distribution - poles	Yes	Persistent	Removed
	C540	Fuels Management – Other	Yes	Persistent	Removed
PSPS	C571	Emergency Preparedness and Recovery Plan (activation related costs only)	Yes	Persistent*	Persistent*
Grid Operation (EFD&FCP)	C573	Early Fault Detection	No	New	NA
	C508	Advanced Protection (FCP Only)	No	New	NA
Foundational		Total O&M Cost	Yes	Persistent	Persistent*
		Total Capital Cost	Yes	Persistent	Persistent*

Note:
- Persistent* indicates the activity continues but the cost is modeled differently due to hardened grid.
- Repairs and Replacements include CAPEX and OPEX dollars.
- Asset inspection costs include QA/QC activities.
- Microgrid O&M cost is not included.
- Foundational costs and the RAMP ID are detailed in Appendix D (Foundational Programs and Costs); additional data regarding operational costs are detailed in Appendix E (Operational Mitigation Costs by Baseline Mitigation, CCC and SUG).

This categorization provides a consistent framework for comparing CCC and SUG scenarios by identifying which O&M activities persist, which are avoided, and which are newly introduced because of hardening investments. It also establishes the basis for calculating Net O&M costs or savings.

a. Net Operation & Maintenance Methodology[134]

Net O&M costs are calculated by subtracting Baseline O&M Costs from Post-Hardening O&M Costs, which are derived from their respective O&M cost categorizations as detailed in Table JW-35 under Baseline Mitigation, CCC and SUG. This application of lifecycle costs in deriving Net O&M costs (or savings), illustrated in Figure JW-37, aligns with the comments from SPD RAMP Evaluation Report #17[135] to incorporate the incremental difference between the proposed mitigation and the no-built baseline.

FIGURE JW-36
Determining Net Ongoing O&M Costs

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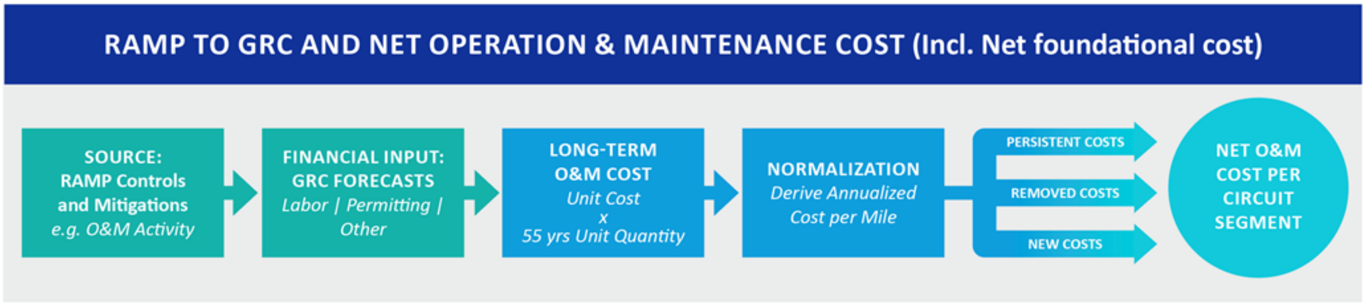
[134] The term O&M used in this section refers to Operations and Maintenance and associated activities, such as asset inspections and vegetation inspections, asset repairs, and related costs. This term is different from the cost type OPEX that is used to differentiate from CAPEX.

[135] SPD Evaluation Report at 147 (Recommendation #17: The CBR calculation should be based solely on the incremental difference between the proposed mitigation and the no-build baseline (i.e., a well-defined baseline scenario representing no mitigation). Net O&M benefits (or costs) should be calculated from the no-build baseline. This approach prevents double-counting and ensures analytical consistency.).

i. Data Source and Data Lineage Across RAMP and GRC Filings[136]

Two primary data sources, RAMP controls and mitigations and GRC financial forecasts, represented as green icons in Figure JW-37, are used to estimate mitigation lifecycle costs. Each RAMP control and mitigation is reviewed to identify applicable O&M costs. These activities are incorporated once by allocating the associated costs to pre- and post-hardening operational costs. This allows all relevant costs to be fully captured while avoiding double counting[137].

FIGURE JW-37
RAMP to GRC and Net O&M Costs Data Lineage



Using these data sources, a series of lifecycle O&M calculations are performed, illustrated by the blue icons in Figure JW-37:

Long-term O&M costs are calculated using the following equation:

$$units \times unit\ cost \times 55\ years\ activity\ frequency$$

Long-Term O&M costs are normalized to an annual cost per mile to enable consistent comparison across mitigations, asset configurations, and circuit segments. The cost per mile is calculated using the following equation:

$$Long\ term\ operational\ cost \div 55\ years \div circuit\ segment\ miles$$

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[136] *Id.* (Recommendation #20: SDG&E should reconcile conflicting cost figures and ensure consistency across all filings (RAMP, GRC, and data requests). If differences arise due to methodological assumptions or updated estimates, SDG&E should explicitly disclose the rationale and provide a crosswalk table showing how each figure was derived.).

[137] *Id.* (Recommendation #19: SDG&E should provide clear cost allocation rules and reconcile overlapping categories. Each cost element (e.g., capital, O&M, VM, foundational) should be uniquely defined and consistently applied across mitigations. SDG&E should also provide reconciliation tables demonstrating that no cost is double counted across mitigations.).

Normalized costs are then assigned to one of three cost categories: persistent, removed, or new, based on the applicability of each operational activity under baseline, CCC, and SUG configurations detailed in Table JW-35 and Appendix E (Operational Mitigation Costs by Baseline Mitigation, CCC and SUG).

Net O&M Costs per circuit segment, expressed as nominal costs, are then derived by aggregating the calculated cost across all applicable operational and foundational activities.

Figure JW-36 illustrates the approach to derive Net O&M Cost per mile for a given segment, which is used to determine BCR values at the segment level. Under this approach, each applicable operational and foundational activity is accounted for once, establishing a clear lineage between RAMP controls, GRC forecasts, and the BCR framework. This method captures costs while preventing the double counting of activities, consistent with SPD's recommendations, thereby providing a transparent method between RAMP, GRC, and the BCR framework.[138,139]

ii. Units and Unit Cost

To quantify and aggregate all O&M costs[140] for a given circuit segment, an annualized unit cost is calculated using the present value of the applicable GRC financial forecast and its associated unit quantities.[141] The annualized unit cost is then multiplied by the relevant number of units for each circuit segment to estimate the O&M cost of a specific operational mitigation or foundational activity.

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[138] *Id.* (Recommendation #18: SDG&E should restructure its reporting templates for costs and units across control and mitigation plans in a more consistent and transparent format. SDG&E should provide the units (e.g., miles of UG, inspections) for each year of the GRC cycle without splitting them into O&M and Capital categories. While it may be appropriate to break down forecasted costs into O&M and Capital, such cost information should be presented consistently (e.g., annual reporting or clearly defined multi-year blocks) for all relevant years to allow for clear comparison and alignment with physical work.).

[139] *Id.* (Recommendation #20: SDG&E should reconcile conflicting cost figures and ensure consistency across all filings (RAMP, GRC, and data requests). If differences arise due to methodological assumptions or updated estimates, SDG&E should explicitly disclose the rationale and provide a crosswalk table showing how each figure was derived.).

[140] O&M costs are presented as present value without applying inflation or other parameters that influence cost during the data processing in the lifecycle cost model.

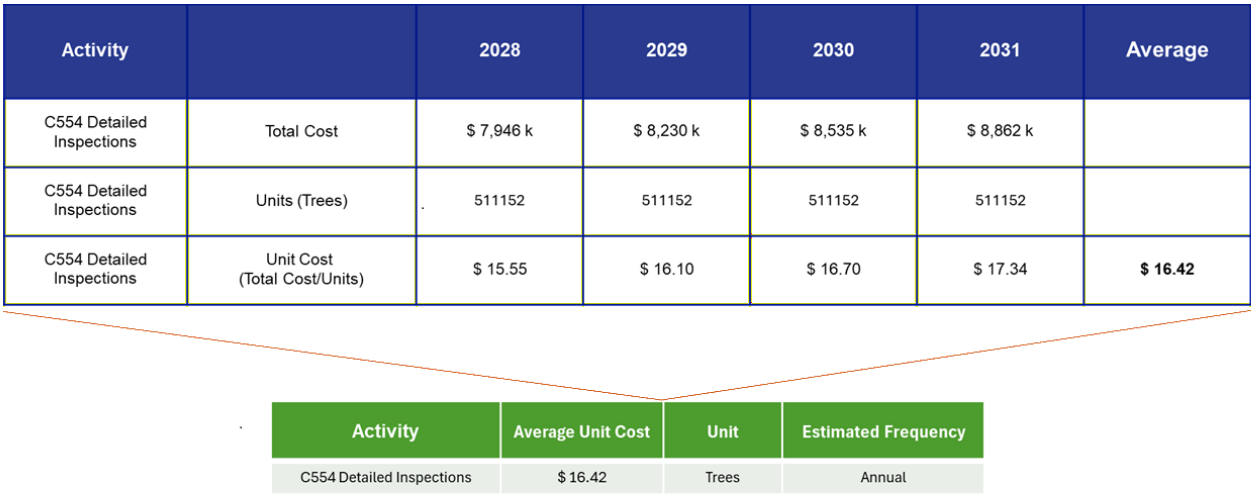
[141] When the unit is countable, the same unit value in GRC filing is used; otherwise, the applicable circuit miles are used to quantify the unit cost as cost per mile.

Units represent measurable quantities, such as poles, trees, circuit miles, devices, or nodes located within the HFTD and associated with an operational mitigation. For foundational activities, units are determined based on the circuit miles of the impacted areas. For example, Distribution Communications Reliability Improvements benefit all areas of the HFTD service territory; approximately 50% of circuit miles located in HFTD are overhead. Accordingly, 50% of the total activity cost is allocated to assets that are currently overhead, and the unit of measure is defined as the overhead circuit miles within the HFTD for the purpose of the lifecycle cost assessment.

Unit Cost is defined as the annualized cost, in dollars, required to perform a given activity, divided by the total number of applicable units. For example, the inspection unit cost within the HFTD is calculated by dividing total annual inspection costs by the total number of structures.

Figure JW-38 illustrates the calculation of the average annual unit cost of $16.42 for C554 (Vegetation Detailed Inspection). Unit costs are calculated for each individual GRC year (2028-2031) using the corresponding GRC financial forecasts and the forecasted number of trees inspected in each year. The annual unit costs are then averaged across the GRC forecast period to produce a representative unit cost that is used in lifecycle cost calculations.

FIGURE JW-38
Units and Nominal Unit Cost Example – C554 Vegetation Detailed Inspection



Activity		2028	2029	2030	2031	Average
C554 Detailed Inspections	Total Cost	$ 7,946 k	$ 8,230 k	$ 8,535 k	$ 8,862 k	
C554 Detailed Inspections	Units (Trees)	511152	511152	511152	511152	
C554 Detailed Inspections	Unit Cost (Total Cost/Units)	$ 15.55	$ 16.10	$ 16.70	$ 17.34	**$ 16.42**

Activity	Average Unit Cost	Unit	Estimated Frequency
C554 Detailed Inspections	$ 16.42	Trees	Annual

iii. Frequency

The frequency of operational activities and corrective repair or replacement actions is quantified to estimate lifecycle costs over a 55-year horizon.

Some activities, such as vegetation management detailed inspections, are conducted on an annual basis while others, such as asset detailed inspections, follow multi-year cycles. For modeling purposes, the frequencies of inspections, repair and replacement, and outage restoration repair activities are translated into equivalent annual rates so they can be applied consistently when projecting costs over the 55-year horizon. For example, Distribution Overhead Asset Detailed Inspections (C526) are performed every 5 years. Therefore, the annualized frequency is 1/5 and the total lifecycle frequency is 1/5 × 55 years = 11.

iv. Repair and Replacement Unit Cost Methodology

The costs associated with repairs and replacements resulting from overhead asset inspection activities are separated from inspection costs and are included in CMP Repairs and Replacements (C507). These costs are for corrective actions identified through inspections performed under Distribution Overhead Detailed Inspection (C526), Distribution Wood Pole Intrusive Inspection (C530), Risk-Informed Drone Inspection (C534), and Distribution Overhead Patrol Inspection (C536) and include both capital expenditures (CAPEX), recorded under budget code 002390, and O&M expenditures (OPEX), recorded under Workpaper 1WM001 as shown in Table JW-36.[142] In the lifecycle cost model, each repair and replacement cost is attributed to the specific inspection program that identified the finding, ensuring transparency, traceability, and consistency across programs.

TABLE JW-36
Repair and Replacement Cost and Inspection Linkage (Baseline)
GRC Workpaper Title: CMP Repairs and Replacements

If Segment X = Baseline				
i Value	CMP by Inspection Type	GRC Workpaper		RAMP Workpaper
		CMP (CAPEX)	CMP (OPEX)	CMP
1	Distribution Overhead Detailed Inspections (Repairs)	002390.001	1WM001.507	1OR04C507, 1CR04C507

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[142] D.26-01-021, OP 8 at 189 ("In its next General Rate Case application, San Diego Gas & Electric Company (SDG&E) shall specify the Operations & Maintenance costs for all Asset Management and Inspection programs separately from the capital costs for repair or replacement of poles and other equipment and the number of poles being replaced. SDG&E shall also coordinate and optimize pole inspection and replacement programs and demonstrate the lack of redundancy between such programs.").

If Segment X = Baseline				
i Value	CMP by Inspection Type	GRC Workpaper		RAMP Workpaper
		CMP (CAPEX)	CMP (OPEX)	CMP
2	Distribution Patrol Inspection (Repairs)	002390.001	1WM001.507	1OR04C507, 1CR04C507
3	Risk-Informed Drone Repairs	002390.002	1WM001.507	1OR04C507, 1CR04C507
4	Distribution Wood Pole Intrusive Inspections (Repairs)	002390.001	1WM001.507	1CR04C507

Because the scope, type, and volume of repair and replacement activities can vary from year to year and do not occur at fixed intervals, historical data is used as the primary basis for estimating both the expected cost and frequency of these activities.

For **pre-hardening (baseline) conditions**, repair and replacement costs are estimated using historical inspection finding rates for each inspection program within the HFTD, combined with the average cost of repair, to develop a 55-year lifecycle cost profile. Historical data includes repair and replacement activity dating back to 2015, or the earliest year in which each inspection program was implemented. Additional assumptions used in the Baseline scenario include:

- Because exact locations of future pole replacements cannot be predicted with certainty, the model uses the oldest poles each year to estimate expected replacement costs and its locations. Each pole is selected once in the 55-year timeframe.
- Pole replacement, crossarm, and transformer replacement costs are used to inform unit cost of capital expenditures (CAPEX), whereas other types of asset repairs are used to inform estimated unit cost of operational expenditure (OPEX). Both CAPEX- and OPEX-related expenditures are included in ongoing O&M costs and are incorporated into the Net O&M cost calculation.

For **post-hardening conditions**, Table JW-37 details the inspection programs that are included to derive the costs. Ongoing repair and replacement costs for assets hardened through CCC and SUG mitigations are modeled using average repair costs and age-based repair frequency. These estimates exclude pole and structure replacement, consistent with the assumption that those assets are newly installed and therefore would not require repairs or replacement during the modeled period.

Unit costs are calculated using historical average replacement costs by equipment type, excluding pole replacement costs. Repair and replacement frequency within the HFTD is estimated based on inspection finding rates grouped by asset age. Due to recent grid hardening activities, the HFTD contains a limited number of older assets. Therefore, age-based finding rates are adjusted using rate-of-increase factors derived from non-HFTD asset populations, which provide a larger and more statistically robust sample size. The resulting finding rates are first calculated on a per-structure basis and then converted to findings per mile using the average number of structures per mile. Age groups are presented in Table JW-39.

TABLE JW-37
Repair and Replacement Cost and Inspection Linkage (Post-Hardening)
GRC Workpaper Title: CMP Repairs and Replacements

If Segment X = CCC

		GRC Workpaper		RAMP Workpaper
i Value	**CMP by Inspection Type**	**CMP (CAPEX)**	**CMP (OPEX)**	**CMP**
1	Distribution Overhead Detailed Inspections (Repairs)	002390.001	1WM001.507	1OR04C507, 1CR04C507
2	Distribution Patrol Inspections (Repairs)	002390.001	1WM001.507	1OR04C507, 1CR04C507
3	Risk-Informed Drone Repairs	002390.002	1WM001.507	1OR04C507, 1CR04C507

If Segment X = SUG
GRC Workpaper Title (CAPEX): CORRECTIVE MAINTENANCE PROGRAM (CMP) – UNDERGROUND
GRC Workpaper Title (OPEX): Electric Regional Operations (Non-RAMP)

i Value	**CMP by Inspection Type**	**GRC Workpaper**		**RAMP Workpaper**
		CMP (CAPEX)	**CMP (OPEX)**	**CMP**
1	Above-Ground (dead front AGI) Inspections (Repairs)	002290.002	1ED005	1CR05C212
2	Subsurface Inspections (SS10) (Repairs)	002290.002	1ED005	1CR05C212
3	Distribution Underground Patrol Inspections (Repairs)	002290.002	1ED005	1CR05C212

Key modeling assumptions used include:

- Pole-related corrective repairs are excluded when calculating the finding rates based on the assumption that steel poles installed under the CCC initiative will remain structurally sound over their expected lifecycle. An exception is made for pole replacements resulting from vehicle contact; these replacement events are estimated using annual average of pole-vehicle contact and are randomly distributed across modeled segments within the mitigation locations to reflect their non-systematic occurrence.
- Because the number of underground structures associated with SUG configurations has not yet been finalized for each modeled circuit segment, repair and replacement costs are normalized on a per-circuit-mile basis. This approach uses existing structure-per-mile densities observed in the HFTD as a reasonable proxy. Normalizing costs on a per-mile basis ensures consistent treatment across asset types and allows CCC and SUG repair and replacement costs to be estimated even in the absence of finalized, segment-specific underground structure counts.

Net costs or savings are calculated as the difference between post-hardening and pre-hardening repair and replacement costs. Specifically, net impacts are determined by subtracting baseline (pre-hardening) repair and replacement costs from the corresponding post-hardening costs.

v. Baseline and Post-Hardening Net O&M Costs Calculation

1. Inspection Activity Costs

Inspection-related O&M costs are listed in Table JW-38. For a given circuit segment X, total inspection O&M costs are calculated as the sum of all applicable new and persistent inspection mitigations (i=1…N), including activities associated with overhead or underground asset inspections and vegetation management inspections. The following equation is used to derive the Inspection O&M Costs for a given segment X.

$$\text{Inspection O\&M Cost}_X = \sum_{i=1}^{N} \left(\text{Annualized Unit Cost}_{i,X} \times \text{Units}_{i,X} \times \text{Frequency}_{i,55\,\text{years}}\right)$$

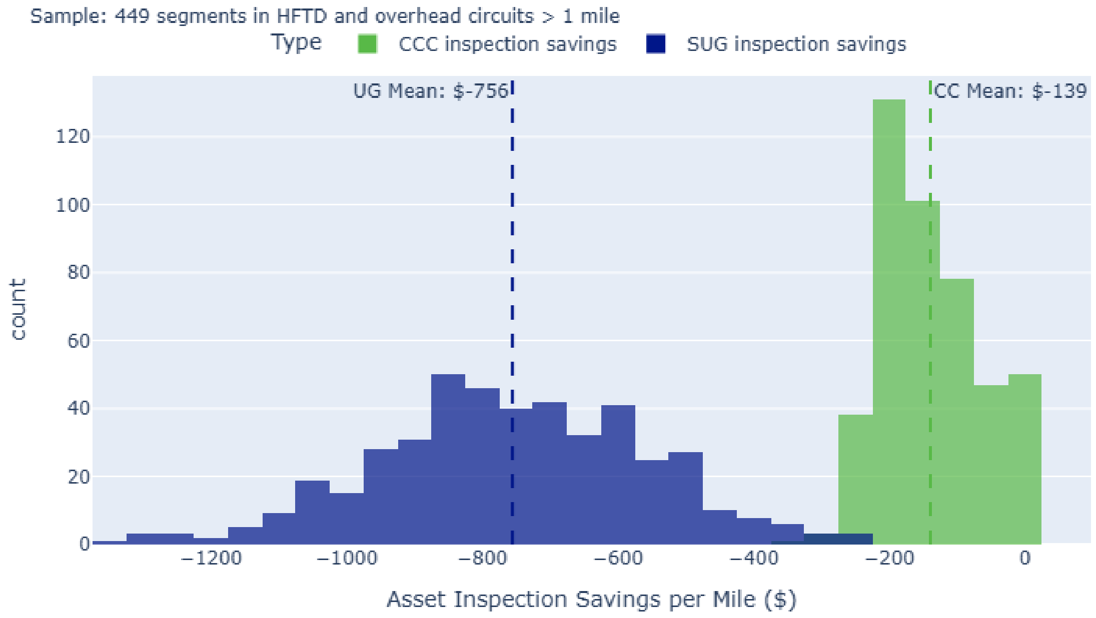
TABLE JW-38
Inspections (i) by Mitigation Scenarios

Inspection Type	Baseline	CCC Mitigation Scenario	SUG Mitigation Scenario
Asset Inspections	Distribution Overhead Detailed Inspections (C526)	Distribution Overhead Detailed Inspections (C526)	Above-Ground (Dead Front AGI) Inspections
	Distribution Overhead Patrol Inspections (C536)	Distribution Overhead Patrol Inspections (C536)	Subsurface Inspections (SS10)

Inspection Type	Baseline	CCC Mitigation Scenario	SUG Mitigation Scenario
	Risk-Informed Drone Inspections (C534) Distribution Wood Pole Intrusive Inspections (C530)	Risk-Informed Drone Inspections (C534)	Distribution Overhead Patrol Inspections (C536)
Vegetation Management Inspections	Detailed Inspections (C554) Prune and Removal (Clearance) (C551) QA/QC of Vegetation Management (C578) Pole Clearing (C544) Off-Cycle Patrol (C537) Fuels Management Program (C540)	Detailed Inspections (C554) Prune and Removal (Clearance) (C551) QA/QC of Vegetation Management (C578) Pole Clearing (C544) Off-Cycle Patrol (C537) Fuels Management Program (C540)	

To evaluate the contribution of inspection costs to overall Net O&M, total inspection costs for each mitigation scenario are normalized to a cost-per-mile-year basis and compared against baseline costs to derive the net inspection O&M cost per mile-year for each segment. Examples are provided in Section I.E.4.b.i. A total of 449 segments within the HFTD are included in the analysis and presented in Figure JW-39.

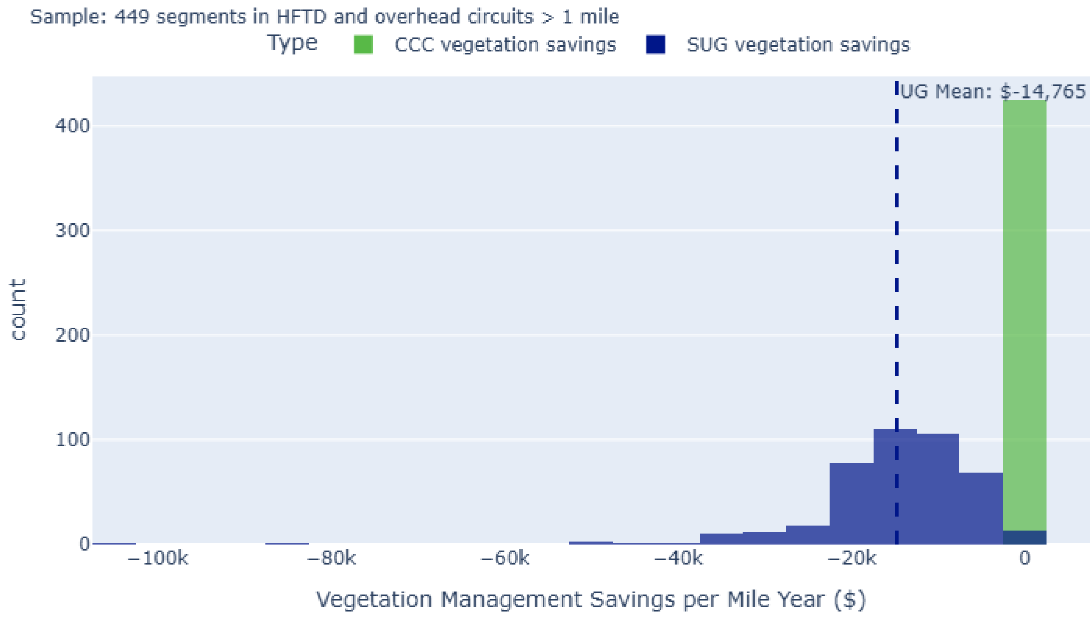
FIGURE JW-39
Distribution of Asset Inspection Nominal Cost Savings



As shown in Figure JW-39, the net change in inspection costs, defined as post-hardening inspection costs less baseline costs, is negative for most segments within the HFTD, indicating cost savings. Estimated savings range from near zero to more than $300 per mile-year under the CCC scenario, and from approximately $200 per mile-year to over $1,300 per mile-year under the SUG scenario. These results reflect substantial post-hardening reductions in inspection costs, driven by reduced inspection requirements under the CCC scenario and changes in inspection practices under the SUG scenario. Overall, system hardening through SUG results in materially greater inspection cost savings relative to CCC.

In addition to inspection-related savings, the SUG mitigation eliminates vegetation management costs. These avoided costs represent a significant component of total net savings, averaging 46.9% and ranging from 4 percent to 88 percent across applicable segments. Figure JW-40 presents vegetation management cost savings on a per mile-year basis for segments located within the HFTD. As the CCC scenario does not result in vegetation management cost savings, its value is shown as zero.

FIGURE JW-40
Distribution of Vegetation Management Nominal Cost Savings



2. Repair and Replacement Costs

SDG&E calculates total **baseline repair and replacement costs** at the segment level using a deterministic cost model. The model multiplies the finding rate, unit cost, and repair frequency for each repair type and then aggregates the results across all baseline repair categories.

The calculation is expressed as follows:

Equation 1

$$\text{Total Baseline Repair Replacement Cost}_X = \sum_{i=1}^{4} (\text{Finding Rate}_{X,i} \times \text{Unit Cost}_i \times \text{Frequency}_i)$$

Variables

- i denotes the inspection activity that the repair jobs are associated with. In the baseline scenario, the model includes repair or replacement jobs resulting from four inspection types: Distribution Overhead Detailed Inspections (C526), Distribution Overhead Patrol Inspections (C536), Risk-Informed Drone Inspections (C534), and Distribution Wood Pole Intrusive Inspections (C530) (refer to Table JW-38). Therefore, i ranges from 1 to 4.
- X denotes the individual feeder segment.
- Finding Rate_i denotes the current finding rate for segment X and inspection type i. The finding rate is fixed for each segment-inspection type combination and varies based on segment location and condition characteristics.
- Unit Cost denotes the average cost to complete a single repair or replacement job estimated for CAPEX and OPEX cost. The unit cost is fixed by cost type, detailed in E.4.a.iv.
- Frequency_i denotes the total number of inspections associated with repair or replacement job expected to occur for inspection type i over a span of 55 years.

Repair and Replacement Costs for **post grid-hardening assets** (CCC and SUG) are estimated using the asset age-based finding rate where the age group T is shown in Table JW-38.

TABLE JW-39
Asset Age Group

If i =

- **Distribution Overhead Detailed Inspections (C526)**
- **Distribution Patrol Inspections (C536)**
- **Risk-Informed Drone Inspection (C534)**

t Value	Asset Age Group
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-55

If i =

- **Subsurface Inspections (SS10)**
- **Above-Ground (AGI)**

t Value	Asset Age Group
1	1-10
2	11-20
3	21-30
4	31-40
5	41-55

Under this approach, SDG&E calculates the total post-hardening repair and replacement cost for a given segment by multiplying the finding rate, unit cost, and repair frequency for each repair cost type (OPEX vs CAPEX) and asset age group and then summing the results across all applicable categories.

The calculation is expressed as follows:

Equation 2

$$\text{Total Post-Hardening Repair Replacement Cost}_X = \sum_{i=1}^{m}\sum_{t=1}^{n}(\text{Finding Rate}_{X,i,t} \times \text{Unit Cost}_i \times \text{Frequency}_i)$$

Variables

- X denotes the individual feeder segment.

- *i* denotes the inspection type. For both CCC-mitigated and SUG-mitigated segments, the model includes repair and replacement costs associated with different inspection types (refer to Table JW-39);
- *t* denotes the asset age group associated with each inspection type (refer to Table JW-39).
- *n* denotes the total number of asset age groups. For CCC-mitigated segments, $n = 6$. For SUG-mitigated segments, $n = 5$. (Refer to Table JW-39.)
- $\text{Finding Rate}_{i,t}$ denotes the finding rate for inspection type *i*, and asset age group *t*.
- Unit Cost denotes the fixed value of unit cost for repair cost type (CAPEX and OPEX).
- Frequency_i denotes the number of repairs for inspection type *i* over the 55-year planning horizon.

SDG&E applies this age-based methodology to reflect the expected evolution of repair needs as post-hardening assets mature over time.

Figure JW-41
Distribution of Repair & Replacement Nominal Cost Savings

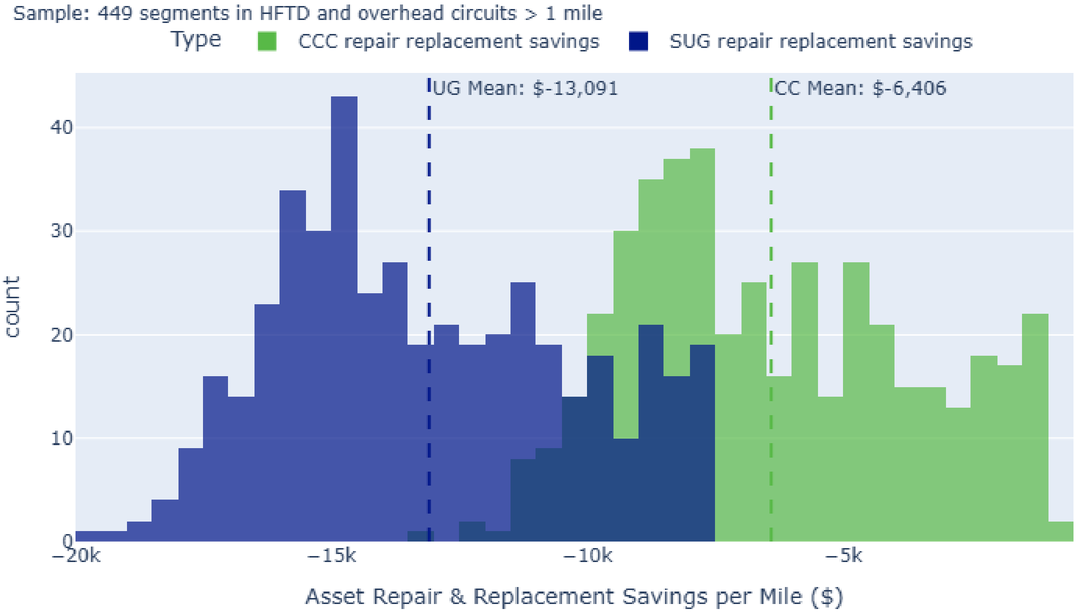


Figure JW-41 illustrates the cost savings attributable to asset repair and replacement activities. As indicated by the equation above, total costs are driven by multiple factors. Within HFTD areas, underground assets exhibit lower failure finding rates and reduced inspection frequencies relative to overhead assets in the same region. Repair and replacement activities contribute a larger share of total cost savings for both SUG and CCC compared with inspection. For CCC, however, these savings are partially offset by the incremental maintenance costs associated with Falling Conductor Protection and Early Fault Detection technologies. As a result, the average savings from SUG ($13,091/mile) are approximately twice those achieved by CCC ($6,406/mile).

3. PSPS Activation Costs

PSPS-related O&M costs are estimated using a combination of historical costs and probabilistic activation rate per year using Monte Carlo simulations. Given the nature of emergency preparedness, ongoing activities are required to anticipate, prepare for, and operate under a range of weather conditions, including the years in which weather conditions did not require PSPS activation.

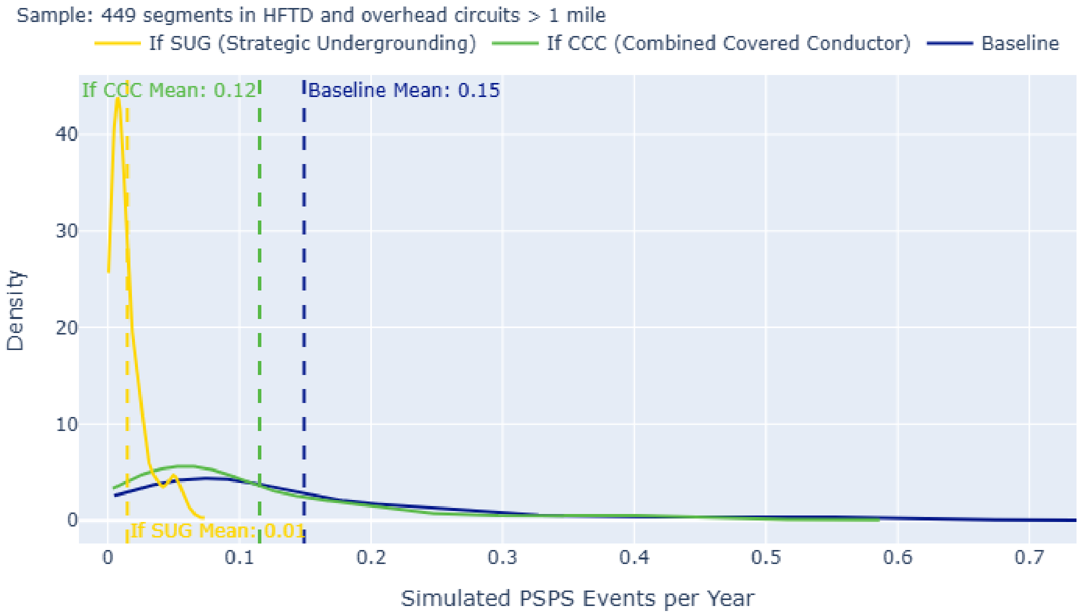
Operational costs attributable to PSPS activation are derived from historical activation-year expenditures and are allocated to individual segments based on their modeled likelihood of experiencing a PSPS de-energization. Using Monte Carlo probabilistic simulations, each segment is assigned an annual PSPS activation rate reflecting expected future operating conditions.

The Monte Carlo Risk Assessment (detailed in Section C.2) quantifies the simulated annual PSPS activation rate under three scenarios:

- Baseline scenario – mean simulated events per year
- CCC scenario – mean simulated events per year
- SUG scenario – mean simulated events per year

Figure JW-42 illustrates the distribution of simulated mean PSPS events per year for 449 segments under the three scenarios.

Figure JW-42
Distribution of Simulated PSPS Frequency per Year (Mean)



PSPS Activation Costs are allocated to circuit segments with a simulated annual PSPS activation rate greater than zero. The total forecasted annual PSPS Activation Cost is distributed across these segments using an activation-rate-weighted circuit mile methodology. Under this approach, each segment's allocation is proportional to the product of its simulated annual PSPS activation rate and circuit segment miles. Segments with higher modeled activation rates, greater circuit segment miles, or both, receive a larger share of the total forecasted annual PSPS Activation Cost. Segments with a simulated annual PSPS activation rate of zero are assigned zero PSPS Activation Cost.

For each eligible segment, the annual PSPS Activation Cost is calculated by dividing the segment's activation-rate-weighted circuit miles by the total activation-rate-weighted circuit miles for all eligible segments, then multiplying that ratio by the total forecasted annual PSPS Activation Cost. The lifecycle PSPS Activation Cost is calculated by multiplying the segment's annual PSPS Activation Cost by 55-year analysis horizon.

Set S includes all circuit segments in the territory with a simulated annual PSPS activation rate greater than zero. Segments excluded from S are not included in the denominator and are assigned zero PSPS Activation Cost.

Equations

The annual PSPS Activation Cost allocated to segment X is calculated as follows:

$$C_X^{\text{PSPS Act}} = \left(\frac{A_X \times L_X}{\sum_{i \in S} A_i \times L_i} \right) \times C_{\text{Total}}^{\text{PSPS Act}}$$

where:

$$S = \{ i \in T \mid A_i > 0 \}$$

The lifecycle PSPS Activation Cost allocated to segment *X* is calculated as follows:

$$LC_X^{\text{PSPS Act}} = C_X^{\text{PSPS Act}} \times H$$

where:

$$H = 55$$

Variables

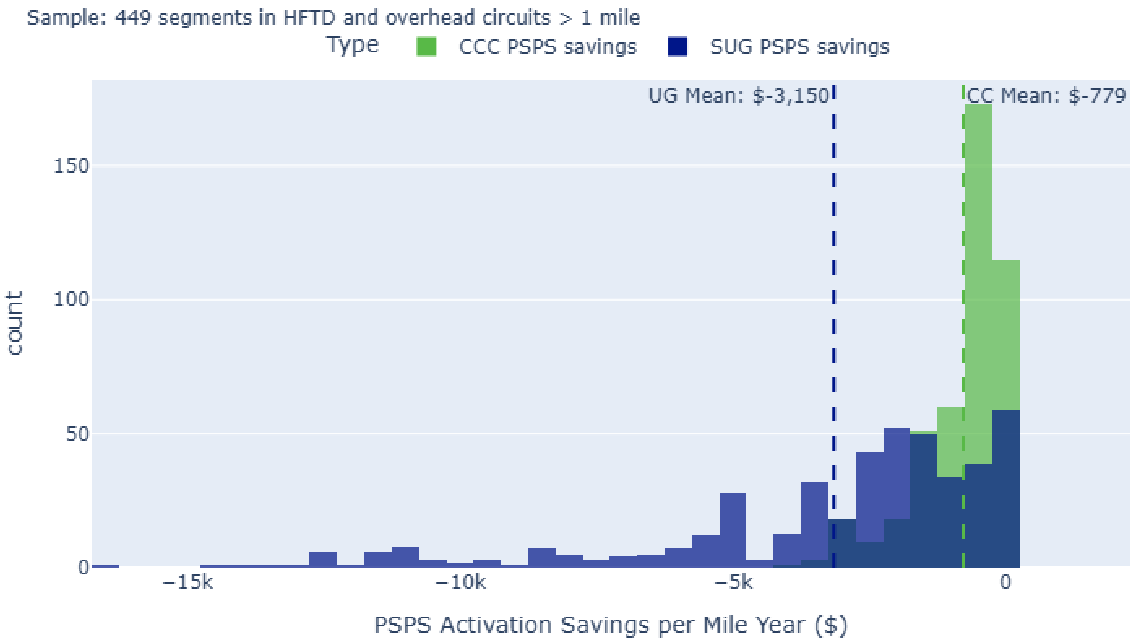
Variable	Definition	Units
$C_X^{\text{PSPS Act}}$	Annual PSPS Activation Cost allocated to segment *X*	Dollars per year
$LC_X^{\text{PSPS Act}}$	Lifecycle PSPS Activation Cost allocated to segment *X*	Dollars
$C_{\text{Total}}^{\text{PSPS Act}}$	Total forecasted annual PSPS Activation Cost to be allocated across eligible segments	Dollars per year
A_X	Simulated annual PSPS activation rate for segment *X* per scenario (Baseline, CCC, SUG)	Activations per year
A_i	Simulated annual PSPS activation rate for segment i per scenario (Baseline, CCC, SUG)	Activations per year
L_X	Length of segment *X*	Circuit miles
L_i	Length of segment *i*	Circuit miles
$A_X \times L_X$	Activation-rate-weighted circuit miles for segment *X*	Activation-miles per year
$\sum\limits_{i \in S} A_i \times L_i$	Total activation-rate-weighted circuit miles for all eligible segments in set *S*	Activation-miles per year
T	Set of all circuit segments in the territory evaluated for PSPS Activation Cost allocation	Not applicable
S	Set of all circuit segments in *T* with a simulated annual PSPS activation rate greater than zero	Not applicable
i	Index representing each segment included in set *S*	Not applicable

Variable	**Definition**	**Units**
X	Segment for which PSPS Activation Cost is being calculated	Not applicable
H	Fixed 55-year analysis horizon used to calculate lifecycle PSPS Activation Cost	Years

Net O&M savings are expected under both CCC and SUG scenarios, as the hardened assets are projected to mitigate a broader range of adverse weather conditions compared to the baseline (no-built) configuration. The lifecycle cost savings associated with a segment are then normalized to cost per mile-year.

Figure JW-43 demonstrates the attributable cost savings from PSPS activation under CCC and SUG scenarios.

Figure JW-43
Distribution of PSPS Activation Nominal Cost Savings



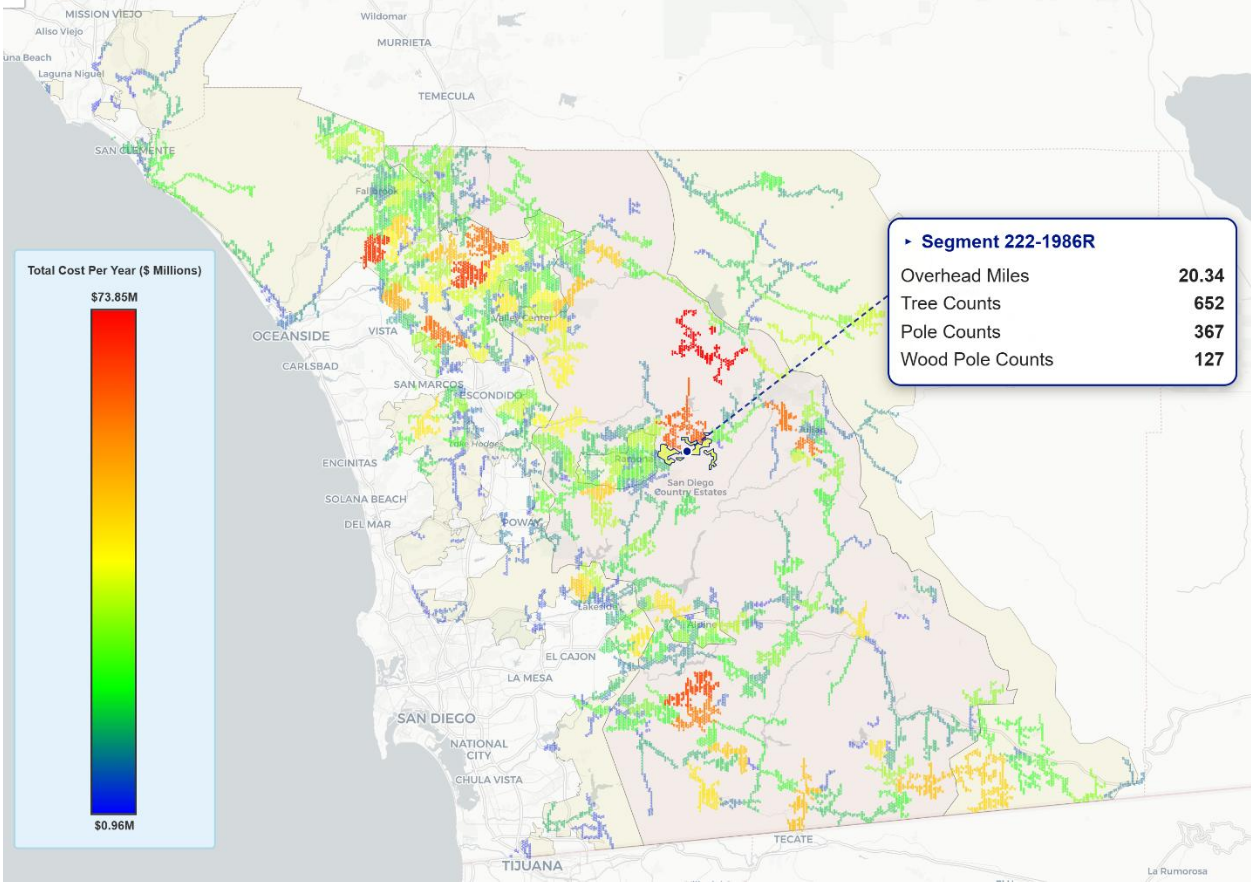
Segments with higher PSPS activation frequency are associated with significantly greater activation cost savings under the SUG scenario compared with the CCC scenario. On average, annual PSPS activation savings under SUG are approximately $3,150 per mile-year. In contrast, PSPS risk reduction under CCC scenario is primarily wind-dependent, resulting in limited activation cost savings relative to SUG.

b. Examples of Long-Term Operational O&M Lifecycle Costs

This section uses representative distribution feeder segments 222-1986R, to illustrate the evaluation of associated lifecycle costs. The segment is among the top 1 percent of segments based on overall risk and has been scoped for grid hardening consideration in this GRC. It is introduced here to demonstrate the calculation of Longer-Term O&M cost associated with mitigation measures. The same segment is subsequently referenced in later sections to illustrate how corresponding BCR result is derived, aggregated and used within the Grid-Hardening Mitigation Selection Process in Section G.1.d.

Figure JW-44 illustrates the existing overhead circuit-segment assets and their corresponding total operational lifecycle costs per year, which range from $0.96M to $73.85M. Circuit segments shown in warmer colors represent areas with higher operational mitigation costs, driven by greater vegetation density and segment length. For example, segment 222-1986R falls within the top 1 percent of segments based on overall risk and one of these higher-cost areas for baseline cost due to the additional inspection activities associated with the number of trees and wood poles. Using this segment as example, the following subsection demonstrates the calculation used to derive Net Operational O&M and Net Foundational cost under CCC and SUG scenarios, and cross-reference between RAMP and GRC.

FIGURE JW-44
Segment Map of Long-Term Operational O&M Lifecycle Costs



i. Lifecycle Operation & Maintenance Cost Associated with Post-hardening Scenarios

Table JW-40 also provides a crosswalk[143] demonstrating the data linage from RAMP risk attributes and GRC forecast inputs to the resulting Net O&M Cost output. This process includes the following steps, and step numbers are indicated in the headers of Table JW-43:

1. The average unit cost is derived from the GRC financial forecast (see Section I.E.4.ii and Figure JW-38).

2. The total lifecycle cost of a mitigation is calculated as the product of the average unit cost, number of units, and frequency within 55 years, yielding the "Cost in 55 years".

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[143] SPD Evaluation Report at 147 (Recommendation #20: SDG&E should reconcile conflicting cost figures and ensure consistency across all filings (RAMP, GRC, and data requests). If differences arise due to methodological assumptions or updated estimates, SDG&E should explicitly disclose the rationale and provide a crosswalk table showing how each figure was derived.).

3. The cost is categorized using “Persistent, Removed, New”. As shown in Figure JW-42, costs for C554, are “Persistent”, while costs for C530 are “Removed” because implementing the CCC mitigation would not reduce Distribution Overhead Detailed Inspections but would replace Distribution Wood Pole Intrusive Inspection.

4. The cost is divided by 55 years so that the “Baseline (cost per year)” is normalized.

5. Mitigation costs determined to be “Persistent” or “New” are aggregated and costs determined “Removed” are dropped to derive the total post-hardening operational cost per mile per year, whereas all baseline O&M costs are summed to derive the total baseline costs (per mile).

6. Net O&M Cost or Savings (per year) are calculated by subtracting the baseline costs from the total post-hardening operational costs.

Under the baseline scenario, this segment requires ongoing operational activities, including annual vegetation management, overhead asset inspections, repair and replacement of aging infrastructure, additional fuel removal mitigations, and the use of PSPS and other preventative operational measures, such as situational awareness, during periods of extreme wildfire weather.

When the segment is mitigated through CCC, only one inspection activity is removed, repair and replacement and PSPS activation costs are estimated to be reduced. In addition, two new operational mitigations, Early Fault Detection and Falling Conduct Protection (FCP), are introduced as new operational activities. Because CCC infrastructure remains overhead, the majority of baseline O&M activities,[144] remain unchanged.

The non-zero values shown under “(6) Net O&M (cost/yr)” reflect the incremental cost impacts attributable to changes in operational activities under the mitigation scenario. These costs are summarized based on the “Cost Category for CCC” and grouped into Post Hardening and Pre Hardening (Baseline). Based on this framework, the overall operational Net O&M savings for segment 222-1986R under the CCC scenario are estimated to be $113,044 per year.

Similarly, Table JW-44 presents the cost calculations for the same segment 222-1986R under SUG scenario. Greater cost reductions are observed relative to CCC due to the elimination of overhead-related operational activities, including vegetation management and certain

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[144] SDG&E’s CCC mitigation includes wood to steel conversion. Refer to Ex. SDGE-07, Chapter 1, Section IV.A.10 for additional details.

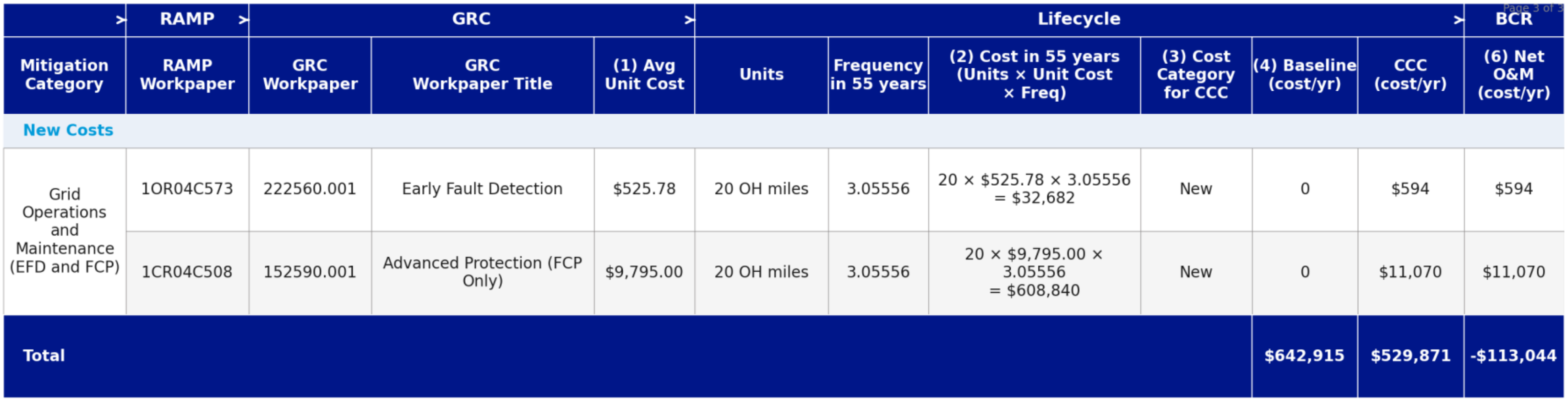
inspection requirements. While new inspection activities associated with underground infrastructure are introduced, costs related to recurring activities—such as outage restoration and PSPS events—are reduced. Total net operational O&M savings under the SUG scenario are estimated at $585,264 annually.

Figure JW-44 provides a comparative illustration of lifecycle operational net O&M savings for Segment 222-1986R under both CCC and SUG scenarios.

TABLE JW-40
Net O&M Nominal Cost Associated with CCC Scenario – Segment 222-1986R

>	RAMP >	GRC		>	Lifecycle					>	BCR
Mitigation Category	**RAMP Workpaper**	**GRC Workpaper**	**GRC Workpaper Title**	**(1) Avg Unit Cost**	**Units**	**Frequency in 55 years**	**(2) Cost in 55 years (Units × Unit Cost × Freq)**	**(3) Cost Category for CCC**	**(4) Baseline (cost/yr)**	**CCC (cost/yr)**	**(6) Net O&M (cost/yr)**
Persistent Costs											
Inspections & Maintenance (Overhead Asset)	1OR04C526	1WM001.526	Distribution Overhead Detailed Inspections	$29.89	367 poles	11	367 × $29.89 × 11 = $120,666	Persistent	$2,194	$2,194	0
	1OR04C536	1WM001.536	Distribution Overhead Patrol Inspections	$4.22	367 poles	55	367 × $4.22 × 55 = $85,181	Persistent	$1,549	$1,549	0
	1OR04C534, 1CR04C534	1WM001.534, 222590.001	Risk-Informed Drone Inspections	OpEx: $147.89 CapEx: $77.78	367 HFTD poles	7.85714	367 × $147.89 × 7.85714 (OpEx) + 367 × $77.78 × 7.85714 (CapEx) = $650,736	Persistent	$11,832	$11,832	0
	1OR04C507, 1OR04C526, 1OR04C534, 1CR04C507	1WM001.507, 002390.001, 002390.002	CMP Repairs (Equipment Repair and Replacement)	CapEx: $8,601.50 OpEx: $3,672.99	20 OH miles	Baseline: 40.4989 CCC: 34.6938	Bsln: 20 × ($8,601.50 + $3,672.99) × 40.4989 = $10,112,437 CCC: 20 × ($8,601.50 + $3,672.99) × 34.6938 = $8,662,931	Persistent*	$183,862	$157,508	-$26,355
	1OR04C507, 1OR04C526, 1OR04C534, 1CR04C507	1WM001.507, 002390.001, 002390.002	CMP Repairs (Pole Replacement)	$27,224.00	Baseline: 127 wood poles CCC: 9 steel poles (Vehicle Contact)	1	Bsln: 127 × $27,224.00 × 1 = $3,457,448 CCC: 9 × $27,224.00 × 1 = $245,016	Persistent*	$62,863	$4,455	-$58,408
Restoration of Service	1CR05C253	002360.001	Restoration of Service - OH	$236.53	20 OH miles	55	20 × $236.53 × 55 = $264,641	Persistent	$4,812	$4,812	0
Veg Management	1OR04C554, 1OR05C554	1WM002.554	Detailed Inspections	$16.42	652 trees	55	652 × $16.42 × 55 = $588,821	Persistent	$10,706	$10,706	0
	1OR04C551, 1OR05C551, 1OR04C540	1WM002.551	Prune and Removal (Clearance)	$317.43	40% of 652 = 260.8 trees	55	260.8 × $317.43 × 55 = $4,553,216	Persistent	$82,786	$82,786	0

>	RAMP >	GRC		>	Lifecycle					>	BCR
Mitigation Category	**RAMP Workpaper**	**GRC Workpaper**	**GRC Workpaper Title**	**(1) Avg Unit Cost**	**Units**	**Frequency in 55 years**	**(2) Cost in 55 years (Units × Unit Cost × Freq)**	**(3) Cost Category for CCC**	**(4) Baseline (cost/yr)**	**CCC (cost/yr)**	**(6) Net O&M (cost/yr)**
Veg Management	1OR04C578, 1OR05C578, 1CR04C578	1WM002.578, 26886A.001	QA/QC of Vegetation Management - Detailed Inspections	$38.40	25% of 652 = 163.0 trees	55	163.0 × $38.40 × 55 = $344,256	Persistent	$6,259	$6,259	0
	1OR04C578, 1OR05C578, 1CR04C578	1WM002.578, 26886A.001	QA/QC of Vegetation Management - Prune and Removal	$38.40	7% of 652 = 46.6 trees	55	46.6 × $38.40 × 55 = $98,359	Persistent	$1,788	$1,788	0
	1OR04C578, 1OR05C578, 1CR04C578	1WM002.578, 26886A.001	QA/QC of Vegetation Management - Pole Clearing	$38.40	25% of 158 = 39.5 clearance poles	55	39.5 × $38.40 × 55 = $83,424	Persistent	$1,517	$1,517	0
	1OR04C544	1WM002.544	Pole Clearing	$244.82	158 clearance poles	55	158 × $244.82 × 55 = $2,127,486	Persistent	$38,682	$38,682	0
	1OR04C537, 1CR04C537	1WM002.537, 26886B.001	Off-Cycle Patrol	OpEx: $6.08 CapEx: $1.63	652 trees	55	652 × $6.08 × 55 (OpEx) + 652 × $1.63 × 55 (CapEx) = $276,481	Persistent	$5,027	$5,027	0
	1OR04C540	1WM002.540	Fuels Management Program	$3,512.31	158 clearance poles	5.5	158 × $3,512.31 × 5.5 = $3,052,197	Persistent	$55,494	$55,494	0
	1OR04C540	1WM002.540	Fuels Management - Other	$374.59	19 HFTD OH miles	55	19 × $374.59 × 55 = $394,666	Persistent	$7,176	$7,176	0
PSPS	1OR04C571	1WM004.571	Emergency Preparedness and Recovery Plan (Activation)	$24,412.06	20 OH miles	Baseline: 18.2498 CCC: 14.0016	Bsln: 20 × $24,412.06 × 18.2498 = $9,062,974 CCC: 20 × $24,412.06 × 14.0016 = $6,953,286	Persistent*	$164,781	$126,423	-$38,358
Removed Costs											
Inspections & Maintenance (Overhead Asset)	1OR04C530	1WM001.530	Distribution Wood Pole Intrusive Inspections	$125.03	127 wood poles	5.5	127 × $125.03 × 5.5 = $87,333	Removed	$1,588	0	-$1,588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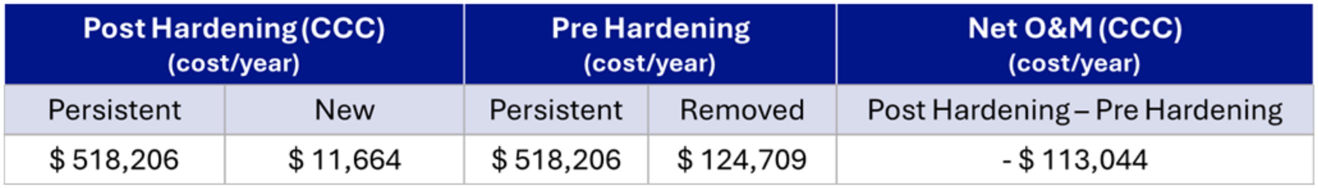
	RAMP	GRC			Lifecycle						BCR
Mitigation Category	**RAMP Workpaper**	**GRC Workpaper**	**GRC Workpaper Title**	**(1) Avg Unit Cost**	**Units**	**Frequency in 55 years**	**(2) Cost in 55 years (Units × Unit Cost × Freq)**	**(3) Cost Category for CCC**	**(4) Baseline (cost/yr)**	**CCC (cost/yr)**	**(6) Net O&M (cost/yr)**
New Costs											
Grid Operations and Maintenance (EFD and FCP)	1OR04C573	222560.001	Early Fault Detection	$525.78	20 OH miles	3.05556	20 × $525.78 × 3.05556 = $32,682	New	0	$594	$594
	1CR04C508	152590.001	Advanced Protection (FCP Only)	$9,795.00	20 OH miles	3.05556	20 × $9,795.00 × 3.05556 = $608,840	New	0	$11,070	$11,070
Total									**$642,915**	**$529,871**	**-$113,044**

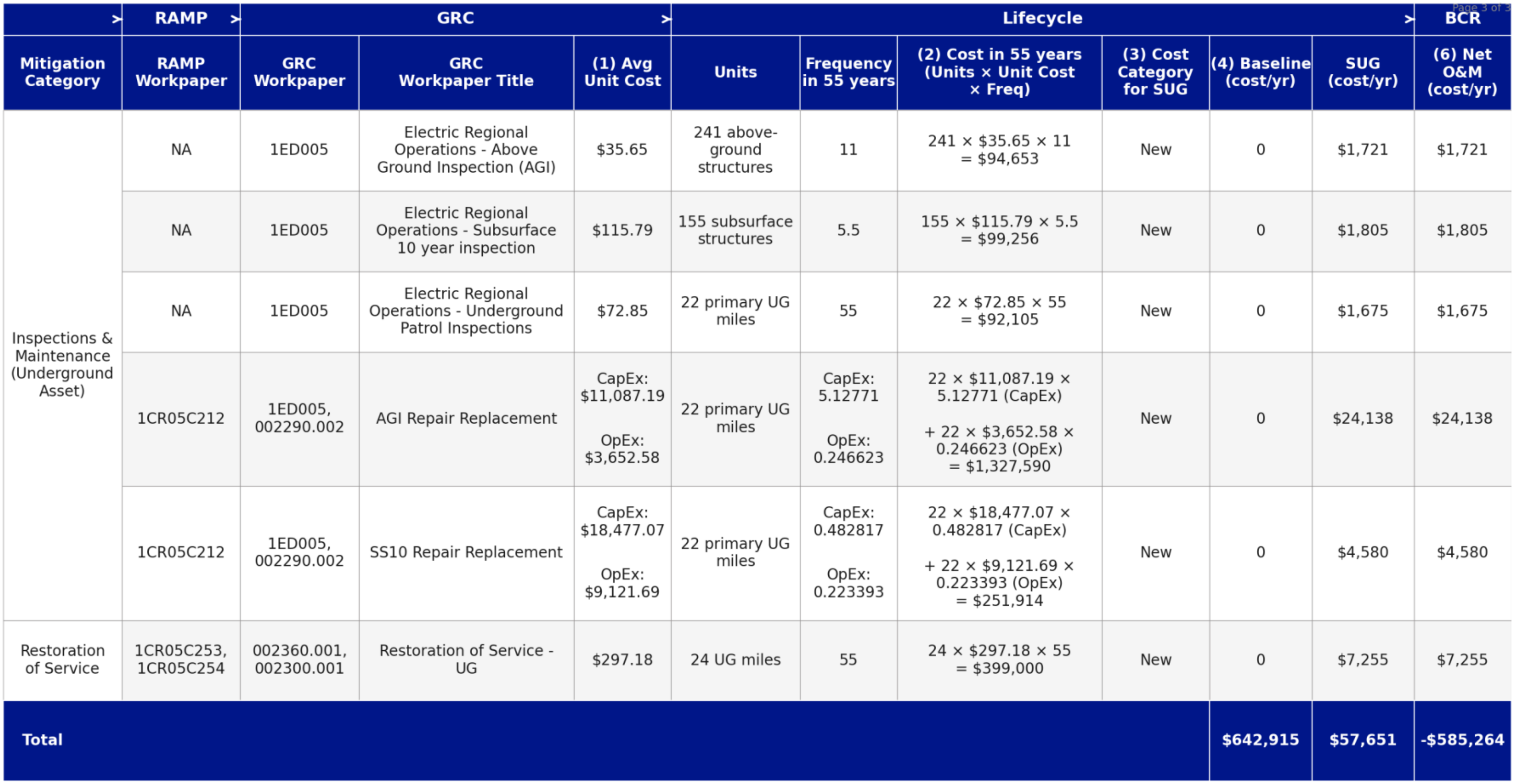


Post Hardening (CCC) (cost/year)		Pre Hardening (cost/year)		Net O&M (CCC) (cost/year)
Persistent	New	Persistent	Removed	Post Hardening – Pre Hardening
$ 518,206	$ 11,664	$ 518,206	$ 124,709	- $ 113,044

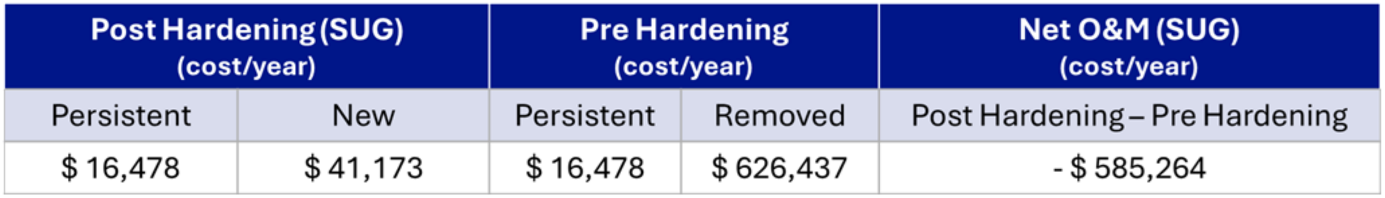
TABLE JW-41
Net O&M Nominal Cost Associated with SUG Scenario – Segment 222-1986R

>	RAMP >	GRC		>	Lifecycle					>	BCR
Mitigation Category	**RAMP Workpaper**	**GRC Workpaper**	**GRC Workpaper Title**	**(1) Avg Unit Cost**	**Units**	**Frequency in 55 years**	**(2) Cost in 55 years (Units × Unit Cost × Freq)**	**(3) Cost Category for SUG**	**(4) Baseline (cost/yr)**	**SUG (cost/yr)**	**(6) Net O&M (cost/yr)**
Persistent Costs											
PSPS	1OR04C571	1WM004.571	Emergency Preparedness and Recovery Plan (Activation)	$24,412.06	20 OH miles	Baseline: 18.2498 SUG: 1.82496	Bsln: 20 × $24,412.06 × 18.2498 = $9,062,974 SUG: 20 × $24,412.06 × 1.82496 = $906,286	Persistent*	$164,781	$16,478	-$148,303
Removed Costs											
Inspections & Maintenance (Overhead Asset)	1OR04C526	1WM001.526	Distribution Overhead Detailed Inspections	$29.89	367 poles	11	367 × $29.89 × 11 = $120,666	Removed	$2,194	0	-$2,194
	1OR04C536	1WM001.536	Distribution Overhead Patrol Inspections	$4.22	367 poles	55	367 × $4.22 × 55 = $85,181	Removed	$1,549	0	-$1,549
	1OR04C530	1WM001.530	Distribution Wood Pole Intrusive Inspections	$125.03	127 wood poles	5.5	127 × $125.03 × 5.5 = $87,333	Removed	$1,588	0	-$1,588
	1OR04C534, 1CR04C534	1WM001.534, 222590.001	Risk-Informed Drone Inspections	OpEx: $147.89 CapEx: $77.78	367 HFTD poles	7.85714	367 × $147.89 × 7.85714 (OpEx) + 367 × $77.78 × 7.85714 (CapEx) = $650,736	Removed	$11,832	0	-$11,832
	1OR04C507, 1OR04C526, 1OR04C534, 1CR04C507	1WM001.507, 002390.001, 002390.002	CMP Repairs (Equipment Repair and Replacement)	CapEx: $8,601.50 OpEx: $3,672.99	20 OH miles	40.4989	20 × $8,601.50 × 40.4989 (CapEx) + 20 × $3,672.99 × 40.4989 (OpEx) = $10,112,437	Removed	$183,862	0	-$183,862
	1OR04C507, 1OR04C526, 1OR04C534, 1CR04C507	1WM001.507, 002390.001, 002390.002	CMP Repairs (Pole Replacement)	$27,224.00	127 wood poles	1	127 × $27,224.00 × 1 = $3,457,448	Removed	$62,863	0	-$62,863
Restoration of Service	1CR05C253	002360.001	Restoration of Service - OH	$236.53	20 OH miles	55	20 × $236.53 × 55 = $264,641	Removed	$4,812	0	-$4,812

>	RAMP >	GRC		>	Lifecycle					>	BCR
Mitigation Category	**RAMP Workpaper**	**GRC Workpaper**	**GRC Workpaper Title**	**(1) Avg Unit Cost**	**Units**	**Frequency in 55 years**	**(2) Cost in 55 years (Units × Unit Cost × Freq)**	**(3) Cost Category for SUG**	**(4) Baseline (cost/yr)**	**SUG (cost/yr)**	**(6) Net O&M (cost/yr)**
Veg Management	1OR04C554, 1OR05C554	1WM002.554	Detailed Inspections	$16.42	652 trees	55	652 × $16.42 × 55 = $588,821	Removed	$10,706	0	-$10,706
	1OR04C551, 1OR05C551, 1OR04C540	1WM002.551	Prune and Removal (Clearance)	$317.43	40% of 652 = 260.8 trees	55	260.8 × $317.43 × 55 = $4,553,216	Removed	$82,786	0	-$82,786
	1OR04C578, 1OR05C578, 1CR04C578	1WM002.578, 26886A.001	QA/QC of Vegetation Management - Detailed Inspections	$38.40	25% of 652 = 163.0 trees	55	163.0 × $38.40 × 55 = $344,256	Removed	$6,259	0	-$6,259
	1OR04C578, 1OR05C578, 1CR04C578	1WM002.578, 26886A.001	QA/QC of Vegetation Management - Prune and Removal	$38.40	7% of 652 = 46.6 trees	55	46.6 × $38.40 × 55 = $98,359	Removed	$1,788	0	-$1,788
	1OR04C578, 1OR05C578, 1CR04C578	1WM002.578, 26886A.001	QA/QC of Vegetation Management - Pole Clearing	$38.40	25% of 158 = 39.5 clearance poles	55	39.5 × $38.40 × 55 = $83,424	Removed	$1,517	0	-$1,517
	1OR04C544	1WM002.544	Pole Clearing	$244.82	158 clearance poles	55	158 × $244.82 × 55 = $2,127,486	Removed	$38,682	0	-$38,682
	1OR04C537, 1CR04C537	1WM002.537, 26886B.001	Off-Cycle Patrol	OpEx: $6.08 CapEx: $1.63	652 trees	55	652 × $6.08 × 55 (OpEx) + 652 × $1.63 × 55 (CapEx) = $276,481	Removed	$5,027	0	-$5,027
	1OR04C540	1WM002.540	Fuels Management Program	$3,512.31	158 clearance poles	5.5	158 × $3,512.31 × 5.5 = $3,052,197	Removed	$55,494	0	-$55,494
	1OR04C540	1WM002.540	Fuels Management - Other	$374.59	19 HFTD OH miles	55	19 × $374.59 × 55 = $394,666	Removed	$7,176	0	-$7,176
New Costs											



>	RAMP >	GRC		>	Lifecycle					>	BCR
Mitigation Category	**RAMP Workpaper**	**GRC Workpaper**	**GRC Workpaper Title**	**(1) Avg Unit Cost**	**Units**	**Frequency in 55 years**	**(2) Cost in 55 years (Units × Unit Cost × Freq)**	**(3) Cost Category for SUG**	**(4) Baseline (cost/yr)**	**SUG (cost/yr)**	**(6) Net O&M (cost/yr)**
Inspections & Maintenance (Underground Asset)	NA	1ED005	Electric Regional Operations - Above Ground Inspection (AGI)	$35.65	241 above-ground structures	11	241 × $35.65 × 11 = $94,653	New	0	$1,721	$1,721
	NA	1ED005	Electric Regional Operations - Subsurface 10 year inspection	$115.79	155 subsurface structures	5.5	155 × $115.79 × 5.5 = $99,256	New	0	$1,805	$1,805
	NA	1ED005	Electric Regional Operations - Underground Patrol Inspections	$72.85	22 primary UG miles	55	22 × $72.85 × 55 = $92,105	New	0	$1,675	$1,675
	1CR05C212	1ED005, 002290.002	AGI Repair Replacement	CapEx: $11,087.19 OpEx: $3,652.58	22 primary UG miles	CapEx: 5.12771 OpEx: 0.246623	22 × $11,087.19 × 5.12771 (CapEx) + 22 × $3,652.58 × 0.246623 (OpEx) = $1,327,590	New	0	$24,138	$24,138
	1CR05C212	1ED005, 002290.002	SS10 Repair Replacement	CapEx: $18,477.07 OpEx: $9,121.69	22 primary UG miles	CapEx: 0.482817 OpEx: 0.223393	22 × $18,477.07 × 0.482817 (CapEx) + 22 × $9,121.69 × 0.223393 (OpEx) = $251,914	New	0	$4,580	$4,580
Restoration of Service	1CR05C253, 1CR05C254	002360.001, 002300.001	Restoration of Service - UG	$297.18	24 UG miles	55	24 × $297.18 × 55 = $399,000	New	0	$7,255	$7,255
Total									**$642,915**	**$57,651**	**-$585,264**



Post Hardening (SUG) (cost/year)		Pre Hardening (cost/year)		Net O&M (SUG) (cost/year)
Persistent	New	Persistent	Removed	Post Hardening – Pre Hardening
$ 16,478	$ 41,173	$ 16,478	$ 626,437	- $ 585,264

FIGURE JW-45
Lifecycle Operational Mitigation Net Nominal O&M Breakdown[145]

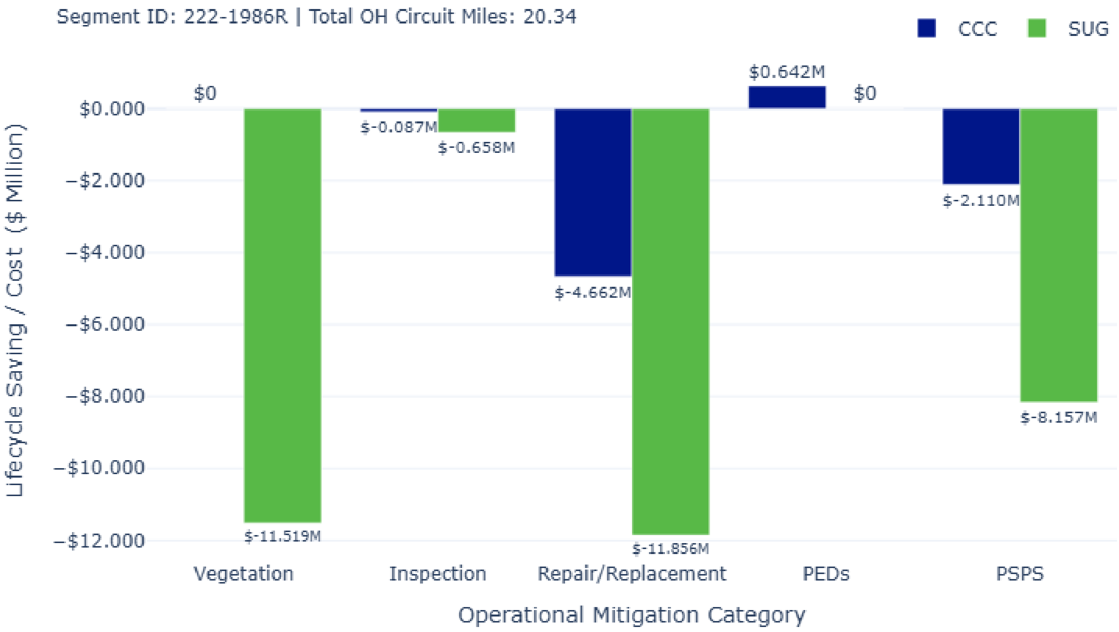


Figure JW-45 summarizes the savings listed in the tables above over 55 years and groups cost savings into five categories undergrounding Segment 222-1986R yields operational cost savings shown as green bars that are significantly greater than those shown in blue bars achieved under the Covered Conductor (CCC) scenario. This differential is primarily driven by the elimination of vegetation management costs and further reductions in repair and replacement, and PSPS activation expenditures under the SUG configuration.

While both mitigation scenarios provide meaningful savings associated with repair and replacement—reflecting decreased corrective maintenance needs due to the installation of new and hardened assets, the CCC scenario continues to incur certain incremental operational costs. Specifically, CCC introduces additional ongoing maintenance requirements associated with PEDS and retains exposure to vegetation-related risks due to its overhead configuration.

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[145] These savings can be aggregated by multiplying 55 years and the sum of the annual savings in Table JW-43 and JW-44. "Vegetation" in this Figure is defined as activities listed within "Veg Management." "Inspection" category is defined as inspection activities listed within "Inspection & Maintenance (Overhead Asset)," and it does not include CMP repair costs. Repair/Replacement includes "CMP Repairs" resulted from asset inspections and "(Outage) Restoration of Service." PSPS is defined as cost associated with activation related activities, does not include foundational activity related costs.

In contrast, SUG substantially reduces or eliminates these cost drivers by relocating infrastructure underground. As a result, the total operational cost savings under the SUG scenario are approximately 5 times greater than those realized under the CCC scenario over the evaluated lifecycle.

ii. Lifecycle Cost of Foundational Activities

To illustrate the cost calculation associated with foundational costs, segment 222-1986R is used again as an example in Table JW-42. All foundational activities follow the same following steps and methods.

1. Foundational programs are identified under RAMP and GRC filing, including the unique ID associated with both filings. The unique ID listed under GRC "workpaper" in TABLE JW-46 contains the ID from CAPEX and OPEX dollars. Due to the foundational nature of this program, the average annual cost forecasted for 2028-2031 GRC is allocated between HFTD overhead and HFTD underground circuit miles.

2. The "Avg Unit Cost" is then calculated by using the dollar values allocated in HFTD overhead from step 1 and dividing it by the total overhead miles in HFTD. This unit cost is a constant value for all circuit segments. "Baseline (cost/yr)" for segment 222-1986R circuit segment is then calculated by multiplying the "Avg Unit Cost" and "Unit (OH Miles)".

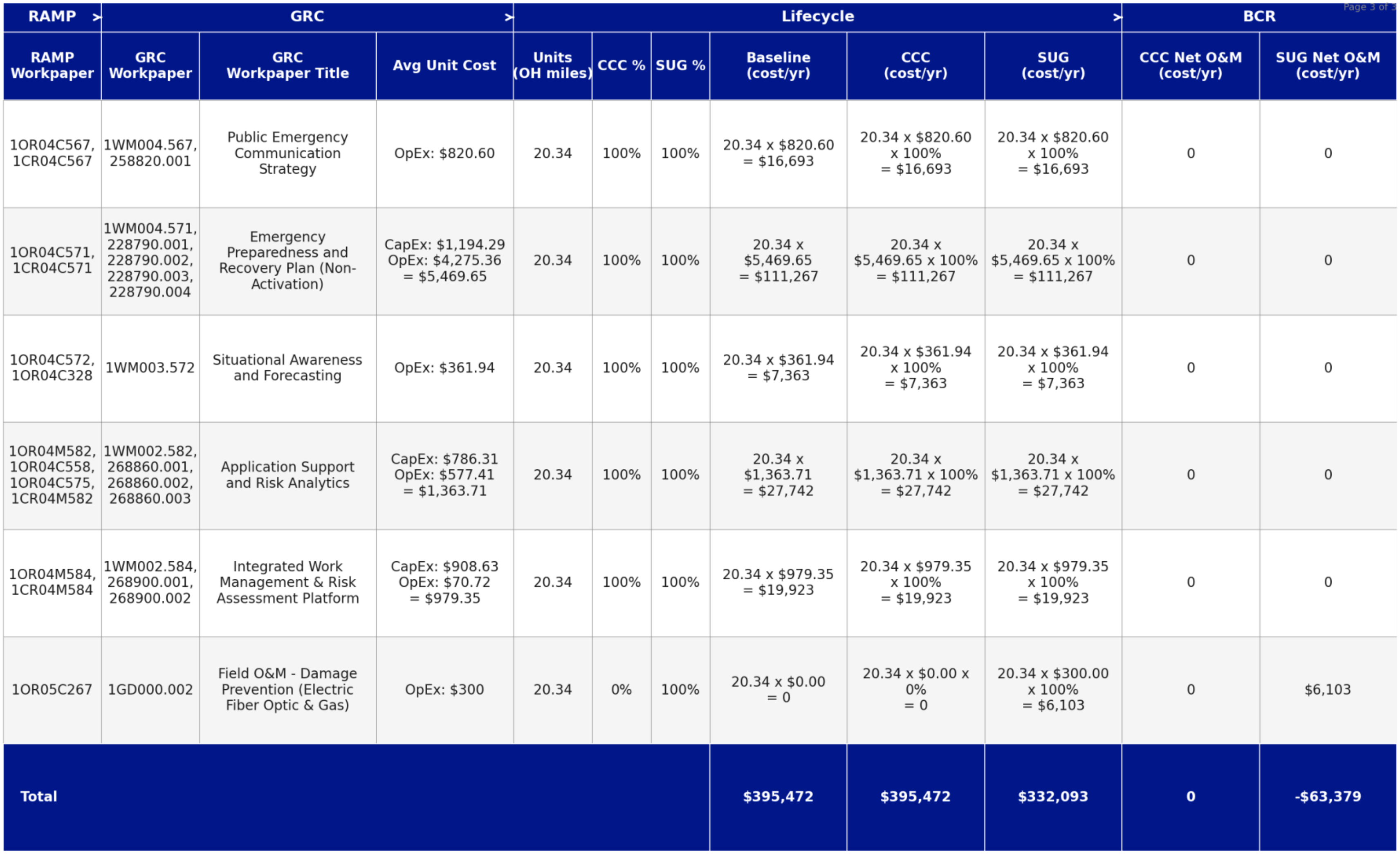
3. The lifecycle cost percentages applicable under the CCC and SUG scenarios ("CCC%" and "SUG%") are estimated based on the functional characteristics of each program. The detailed cost allocation by category for both mitigation strategies is provided in Table JW-34. These percentage assumptions are then applied to calculate the corresponding annualized costs, presented as "CCC (Cost/Year)" and "SUG (Cost/Year)."

4. CCC and SUG "Net O&M (cost/yr)" (savings) are calculated by subtracting the baseline costs from the total post-hardening operational costs. SDG&E estimated the net foundational cost to be zero under CCC scenario, $3,116/mile-year under SUG scenario. In the BCR workbook, this net foundational cost under CCC and SUG is applied to all circuit segments.

TABLE JW-42
Net Foundational Nominal Cost Associated with CCC and SUG Scenario – Segment 222-1986R

RAMP >	GRC >			Lifecycle >						BCR	
RAMP Workpaper	**GRC Workpaper**	**GRC Workpaper Title**	**Avg Unit Cost**	**Units (OH miles)**	**CCC %**	**SUG %**	**Baseline (cost/yr)**	**CCC (cost/yr)**	**SUG (cost/yr)**	**CCC Net O&M (cost/yr)**	**SUG Net O&M (cost/yr)**
1OR04C504	1WM001.504	Standby Power Programs (Fixed Backup Power Commercial)	OpEx: $275.97	20.34	100%	0%	20.34 x $275.97 = $5,614	20.34 x $275.97 x 100% = $5,614	20.34 x $0.00 x 0% = 0	0	-$5,614
1OR04C512	1WM001.512	Customized Resiliency Assessments	OpEx: $1,086.62	20.34	100%	0%	20.34 x $1,086.62 = $22,105	20.34 x $1,086.62 x 100% = $22,105	20.34 x $0.00 x 0% = 0	0	-$22,105
1OR04C516	1WM001.516	Generator Assistance Programs	OpEx: $185.22	20.34	100%	0%	20.34 x $185.22 = $3,768	20.34 x $185.22 x 100% = $3,768	20.34 x $0.00 x 0% = 0	0	-$3,768
1OR04C546, 1CR04C546	1WM001.546, 202770.001	Aviation Program	CapEx: $115.43 OpEx: $1,399.87 = $1,515.30	20.34	100%	100%	20.34 x $1,515.30 = $30,825	20.34 x $1,515.30 x 100% = $30,825	20.34 x $1,515.30 x 100% = $30,825	0	0
1OR04C548	1WM001.548	Wildfire Infrastructure Protection Teams	OpEx: $928.40	20.34	100%	50%	20.34 x $928.40 = $18,886	20.34 x $928.40 x 100% = $18,886	20.34 x $464.20 x 50% = $9,443	0	-$9,443
1OR04C552, 1CR04C552	1WM001.552, 192450.001	PSPS Sectionalizing Enhancements	CapEx: $566.20 OpEx: $5.57 = $571.77	20.34	100%	100%	20.34 x $571.77 = $11,631	20.34 x $571.77 x 100% = $11,631	20.34 x $571.77 x 100% = $11,631	0	0
1OR04C556	1WM004.556	Engagement with AFN Populations	OpEx: $242.80	20.34	100%	100%	20.34 x $242.80 = $4,939	20.34 x $242.80 x 100% = $4,939	20.34 x $242.80 x 100% = $4,939	0	0

RAMP >	GRC		>	Lifecycle					>	BCR	
RAMP Workpaper	**GRC Workpaper**	**GRC Workpaper Title**	**Avg Unit Cost**	**Units (OH miles)**	**CCC %**	**SUG %**	**Baseline (cost/yr)**	**CCC (cost/yr)**	**SUG (cost/yr)**	**CCC Net O&M (cost/yr)**	**SUG Net O&M (cost/yr)**
1OR04C557, 1OR04C571	1WM004.557	Public Outreach and Education Awareness	OpEx: $461.28	20.34	100%	100%	20.34 x $461.28 = $9,384	20.34 x $461.28 x 100% = $9,384	20.34 x $461.28 x 100% = $9,384	0	0
1OR04C558, 1CR04C558	1WM007.558, 238750.001	Risk Methodology and Assessment	CapEx: $936.86 OpEx: $982.04 = $1,918.90	20.34	100%	50%	20.34 x $1,918.90 = $39,036	20.34 x $1,918.90 x 100% = $39,036	20.34 x $959.45 x 50% = $19,518	0	-$19,518
1OR04C561, 1OR04C572	1WM003.561	Fire Potential Index	OpEx: $143.29	20.34	100%	100%	20.34 x $143.29 = $2,915	20.34 x $143.29 x 100% = $2,915	20.34 x $143.29 x 100% = $2,915	0	0
1OR04C562, 1OR04C572, 1CR04C562	1WM003.562, 192470.001	Weather Network & Technology Programs	CapEx: $348.28 OpEx: $75.23 = $423.50	20.34	100%	100%	20.34 x $423.50 = $8,615	20.34 x $423.50 x 100% = $8,615	20.34 x $423.50 x 100% = $8,615	0	0
1OR04C563, 1OR04C558	1WM006.563	Wildfire Mitigation Strategy Development	OpEx: $506.96	20.34	100%	50%	20.34 x $506.96 = $10,313	20.34 x $506.96 x 100% = $10,313	20.34 x $253.48 x 50% = $5,156	0	-$5,156
1OR04C564, 1CR04C564	1WM001.564, 198720.001	Distribution Communications Reliability Improvements	OpEx: $381.31	20.34	100%	50%	20.34 x $381.31 = $7,757	20.34 x $381.31 x 100% = $7,757	20.34 x $190.66 x 50% = $3,878	0	-$3,878
1OR04C566, 1CR04C566	1WM005.566, 248770.001, 248770.002, 248770.003	Enterprise Data Foundation	CapEx: $1,463.75 OpEx: $340.18 = $1,803.93	20.34	100%	100%	20.34 x $1,803.93 = $36,697	20.34 x $1,803.93 x 100% = $36,697	20.34 x $1,803.93 x 100% = $36,697	0	0



RAMP >	GRC >			Lifecycle >						BCR	
RAMP Workpaper	**GRC Workpaper**	**GRC Workpaper Title**	**Avg Unit Cost**	**Units (OH miles)**	**CCC %**	**SUG %**	**Baseline (cost/yr)**	**CCC (cost/yr)**	**SUG (cost/yr)**	**CCC Net O&M (cost/yr)**	**SUG Net O&M (cost/yr)**
1OR04C567, 1CR04C567	1WM004.567, 258820.001	Public Emergency Communication Strategy	OpEx: $820.60	20.34	100%	100%	20.34 x $820.60 = $16,693	20.34 x $820.60 x 100% = $16,693	20.34 x $820.60 x 100% = $16,693	0	0
1OR04C571, 1CR04C571	1WM004.571, 228790.001, 228790.002, 228790.003, 228790.004	Emergency Preparedness and Recovery Plan (Non-Activation)	CapEx: $1,194.29 OpEx: $4,275.36 = $5,469.65	20.34	100%	100%	20.34 x $5,469.65 = $111,267	20.34 x $5,469.65 x 100% = $111,267	20.34 x $5,469.65 x 100% = $111,267	0	0
1OR04C572, 1OR04C328	1WM003.572	Situational Awareness and Forecasting	OpEx: $361.94	20.34	100%	100%	20.34 x $361.94 = $7,363	20.34 x $361.94 x 100% = $7,363	20.34 x $361.94 x 100% = $7,363	0	0
1OR04M582, 1OR04C558, 1OR04C575, 1CR04M582	1WM002.582, 268860.001, 268860.002, 268860.003	Application Support and Risk Analytics	CapEx: $786.31 OpEx: $577.41 = $1,363.71	20.34	100%	100%	20.34 x $1,363.71 = $27,742	20.34 x $1,363.71 x 100% = $27,742	20.34 x $1,363.71 x 100% = $27,742	0	0
1OR04M584, 1CR04M584	1WM002.584, 268900.001, 268900.002	Integrated Work Management & Risk Assessment Platform	CapEx: $908.63 OpEx: $70.72 = $979.35	20.34	100%	100%	20.34 x $979.35 = $19,923	20.34 x $979.35 x 100% = $19,923	20.34 x $979.35 x 100% = $19,923	0	0
1OR05C267	1GD000.002	Field O&M - Damage Prevention (Electric Fiber Optic & Gas)	OpEx: $300	20.34	0%	100%	20.34 x $0.00 = 0	20.34 x $0.00 x 0% = 0	20.34 x $300.00 x 100% = $6,103	0	$6,103
Total							**$395,472**	**$395,472**	**$332,093**	**0**	**-$63,379**

iii. Lifecycle Operation & Maintenance Cost Associated with Wood Poles and Steel Poles (repair replacement)[146]

Because attached equipment also is subject for replacement when converting from wood poles to steel poles, whereas these equipment might not be replaced by other utilities, failure and repair rates observed in those utilities are not considered representative for cost saving analysis. Since the initial deployment of covered conductors in 2020, no structure failures have been observed within the service territory, aside from those attributable to extreme external impacts, such as vehicle contact.

Pole material affects lifecycle O&M costs because wood poles and steel poles have different inspection, repair, and replacement drivers. Wood poles remain subject to wood-pole-specific condition assessment and corrective work associated with weathering, decay, insect activity, and structural deterioration. When Combined Covered Conductor is installed and wood poles are replaced with steel poles, routine overhead asset inspections and vegetation management continue because the electrical equipment remains overhead. However, steel poles reduce the number of wood-pole-specific inspection activities and corrective repair and replacement events modeled over the asset life. This reduction reflects steel poles' consistent manufacturing quality, non-combustible material, and resilience during wildfire and high-wind conditions. As a result, pole material is directly associated with Net O&M cost because inspection frequency, repair rates, and replacement assumptions differ between wood-pole and steel-pole configurations.

To account for differences[147] in operational mitigation between wood and steel poles, the Lifecycle Cost Model only includes Wood Pole Intrusive Inspection and its repair and replacement costs in the baseline scenario. In the baseline scenario, these repair and replacement rates are based on historical rates to calculate wood pole related costs. Wood poles require ongoing inspection activities, with an average cost $125.03 per pole; whereas steel poles do not, resulting in additional cost savings under the CCC scenario compared to the baseline scenario. In the SUG scenario, they are excluded because poles are assumed to be removed.

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[146] D.26-01-021, OP 4 at 188.

[147] Refer to Ex. SDGE-07, Chapter 1, Section IV.A.10 for additional details about replacing wood poles with steel poles.

Accordingly, projected steel pole replacement costs are based exclusively on the historical annual average of vehicle-contact incidents observed in the HFTD, with no additional replacements assumed over the 55-year service life.

This section concludes the costs related narratives and once Net O&M cost are generated,

F. Benefit-Cost Ratio Framework

This section outlines the BCR framework used to evaluate wildfire risk mitigation investments in accordance with the Risk-Based Decision-Making Framework (RDF).[148] The BCR framework provides a structured and transparent approach for comparing mitigation alternatives by systematically weighing the incremental risk-reduction benefits against full lifecycle costs of implementation. Consistent with the RDF, this approach is intended to support risk-informed decision-making by explicitly linking investment decisions to quantifiable reductions in wildfire risk and associated impacts. This framework is used to determine whether a mitigation is warranted for a given feeder segment and, if so, which modeled mitigation alternative provides the most cost-effective long-term risk reduction under the applicable assumptions. In addition to cost efficiency, the segment selection process considers the sensitivity of the estimates of risk and cost in each segment to the assumptions made in their calculations as well as engineering and practical constraints associated with the implementation of each mitigation strategy at a segment.

Within the RDF, cost-effectiveness is evaluated based on total lifecycle value rather than solely on upfront capital costs. Accordingly, the BCR framework assesses expected benefits over the useful life of an asset. These include reductions in wildfire, PSPS, and PEDS risk, in both likelihood and consequence, along with relevant costs such as capital expenditures, O&M, and corrective repair or replacement. This approach provides a consistent basis for comparing mitigation options and supports decisions that reflect long-term value and risk mitigation rather than short-term cost considerations.

Consistent application of the BCR framework demonstrates how proposed investments advance the RDF's objectives of optimizing safety outcomes, improving system resilience, and maintaining affordability through prudent investment selection. The BCR Framework and the BCR Workbooks (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF) also support regulatory

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[148] *See supra* at note 76.

review by providing a clear, repeatable methodology for assessing whether selected mitigations deliver risk reduction commensurate with their costs, thereby reinforcing accountability and transparency in wildfire mitigation planning.

The BCR provides a consistent, transparent, and replicable framework for comparing the cost-effectiveness of mitigation alternatives across utilities and projects. The primary purpose of the BCR is to inform investment selection and prioritization as one of the factors, while supporting effective regulatory oversight and decision making. To achieve these objectives, the BCR must be applied consistently and based on clearly defined and well-documented components. Accordingly, the BCR calculation framework incorporates all relevant capital and non-capital expenditures required to implement mitigation alternatives, the associated reductions in wildfire and reliability risk, and the post mitigation O&M costs and savings relative to the pre-mitigation condition.

Key inputs to the BCR calculations include monetized risk calculated by the WiNGS-Planning model suite, circuit segment characteristics, financial present value adjustment factors, and the climate change factor. In particular, the following inputs are processed using the BCR workbook:

- Feeder-segment characteristics are used to calculate baseline and mitigation risk and cost impacts at the segment level. These include the number of residential, non-residential, and AFN customers; estimated mitigation implementation costs; existing overhead O&M costs, including any potential net savings or increases resulting from a mitigation; and segment overhead length, including any expected changes associated with route modifications (e.g., conversion from overhead to underground).

- WiNGS Planning outputs are used to estimate baseline risk and the incremental risk reduction associated with each mitigation strategy. These outputs include expected annual event rates and monetized wildfire and outage risk at the individual circuit segment level. Risk estimates are disaggregated into financial, reliability, and safety components to illustrate the contribution of each attribute to overall feeder segment baseline risk and to support consistent comparison across mitigation alternatives.

- Climate change factors are incorporated to account for the projected impact of changing climate conditions on wildfire and outage risk over time. Using CMIP6 data on acres burned, the annual percentage increase in acres burned in Tiers 2 and 3 of the HFTD within the service territory is determined. This annual percentage increase is applied to the BCR Workbook to estimate the increased risk due to climate change. (See Section I.C.1.h for a more detailed discussion on efforts to incorporate climate change into wildfire and outage risk estimates).

- Risk Aversion Attitude is incorporated to reflect society's tolerance for low-probability, high-consequence events. WiNGS-Planning produces two sets of outputs: one that reflects expected risk without considering the risk aversion attitude, and another that applies a risk aversion function to amplify the monetized risk associated with more severe wildfire and outage events, consistent with societal perceptions of catastrophic outcomes. BCR results corresponding to each scenario are presented in the BCR Workbooks due to the large volume of data and to facilitate transparent and consistent review of the results. A more detailed description of Risk Aversion Attitude is provided in Section I.C.1.l.

- Inflation and Discount Rates are used to evaluate present values of monetized risk and Net O&M cost over time considering different scenarios.

    - An Annual Inflation Rate of 3.2% is applied to evaluate nominal monetized risk values for future years.

    - Discount Rates are employed in the calculation of present values for three discount rate scenarios: Weighted Average Cost of Capital (WACC); Societal; and Hybrid.[149] A more detailed discussion of discount rates and their assumed values is provided in Section I.F.1.

- Present Value of Monetized Risk is calculated in the model using the following geometric series equation:

    - Where α_i and α_d are inflation and discount rates, respectively, and the summation is over the assumed lifetime of the mitigation as reflected in parameter t (e.g., 55 years for SUG and CCC).

$$\text{Present Value of Monetized Risk} = \sum_{t=0}^{\text{Service Life}-1} \text{Annual Risk} \times \frac{(1+\alpha_i)^t}{(1+\alpha_d)^t}$$

- Housing and Population Growth captures how the number of individuals and structures affected by wildfires or outages within the HFTD or service territory is expected to change over the service life of the mitigation. Currently, impacts due to shifts in population and housing within San Diego County are not considered given their uncertainty in future years. However, a placeholder for Housing and Population Growth factors is included in the BCR Workbooks to demonstrate their influence on the overall feeder-segment risk and support manual sensitivity analysis. See Section I.C.1.j for details.

The annual baseline risk values, as well as the implementation and ongoing Net O&M costs calculated for the 2025 baseline year, are first projected to the year in which the mitigation

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[149] R.20-07-013, Order Instituting Rulemaking to Further Develop A RDF for Electric and Gas Utilities (July 16, 2020) (the Risk OIR).

is assumed to be placed in service and are then extended over the expected lifetime of the feeder segment to capture risk and cost impacts over the analysis horizon.

The present values of costs and monetized risks are then used to calculate BCRs for each circuit segment and mitigation strategy, as discussed in Section I.F.1.

For each mitigation program, summary tables and detailed feeder-segment-level calculations are provided within the supporting BCR workbooks, which trace the underlying inputs and assumptions used to calculate and compare BCR results across mitigation strategies under three discount rate scenarios. Outputs include the present value of annual monetized risk reduction accumulated over the assumed lifetime of the mitigation for both the baseline case and each mitigation strategy, as well as the present value of implementation costs and Net O&M costs accumulated over the same period. Collectively, these outputs support a transparent evaluation and comparison of the long-term cost-effectiveness of proposed mitigation measures and inform decision-making where multiple mitigation alternatives are under consideration at the circuit-segment level.

1. BCR Calculations[150]

The BCR equation presented in this section illustrates how overall cost effectiveness is assessed. The BCR is applied to mitigation measures that result in a quantifiable reduction in risk to determine their relative cost effectiveness, which is used to compare mitigations. The details of BCR calculations are provided in two BCR Workbooks (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-04_WF), one with risk aversion and one without.

$$\text{BCR} = \frac{\text{Total Mitigation Benefit}}{\text{Implementation Cost} + \text{Net Ongoing O\&M Costs}}$$

Total Mitigation Benefit represents the aggregated risk reduction achieved through implementation of a mitigation program or portfolio of mitigations. This value is monetized by applying monetized risk attributes that reflect safety, reliability, and financial impacts and includes reductions in wildfire risk, PSPS risk, and PEDS. These benefits are quantified as the change in risk relative to the pre-mitigation baseline condition.

Implementation Cost represents the total cost of implementing a sustained mitigation project that requires upfront capital investment and other non-capital expenses.

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[150] The March 4, 2026 ALJ Ruling, Deficiency Area 2.5, Item 2 at 17.

Net Ongoing O&M Costs represent the savings (as a net value) or additional lifecycle O&M costs resulting from the differences between baseline (pre-mitigation) and post-mitigation operational activities when applied to mitigations that alter existing operational activities, such as CCC or SUG.[151] [152]

Discount rates used in BCR costs are employed in the calculation of present values of benefits and costs in the BCR formula. Present values are evaluated for three discount rate scenarios per the requirements of the Risk-Based Decision-Making Framework (RDF) Decision, D.24-05-064:[153]

- WACC Discount Rate: 7.45% nominal
  The WACC Discount rate is the authorized cost of capital[154] last modified in the 2023 CoC Phase 2 Decision,[155] which adopts the new Return on Equity of 10.23% for SDG&E, resulting in a Rate of Return of 7.45%.

- Societal Discount Rate: 2% nominal
  The Societal Discount Rate originates from the latest available near-term social rate of time preference provided by the U.S. Office of Management and Budget (OMB) in Circular A-4.

- Hybrid Discount Rate: 6.09% nominal (safety, reliability), 7.45% financial
  The Hybrid Discount Rate scenario uses the WACC Discount Rate for financial risk metric values and a hybrid discount rate for safety and reliability risk metric values. The hybrid discount rate is derived from the effective compounded rate of the 10-year effective average inflation rate as measured by the California statewide consumer price index, the 10-year effective average per-capita real growth rate of wages as measured by California statewide mean hourly and total wages for all occupations, and the Societal Discount Rate.

Figure JW-46 depicts the major components of the BCR equation shown above.

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[151] SPD Evaluation Report at 146 (Recommendation #11: SDG&E should reconsider Alt 2, the covered conductor approach, after correcting the CBR calculation to include only incremental O&M costs as part of the net benefits.).

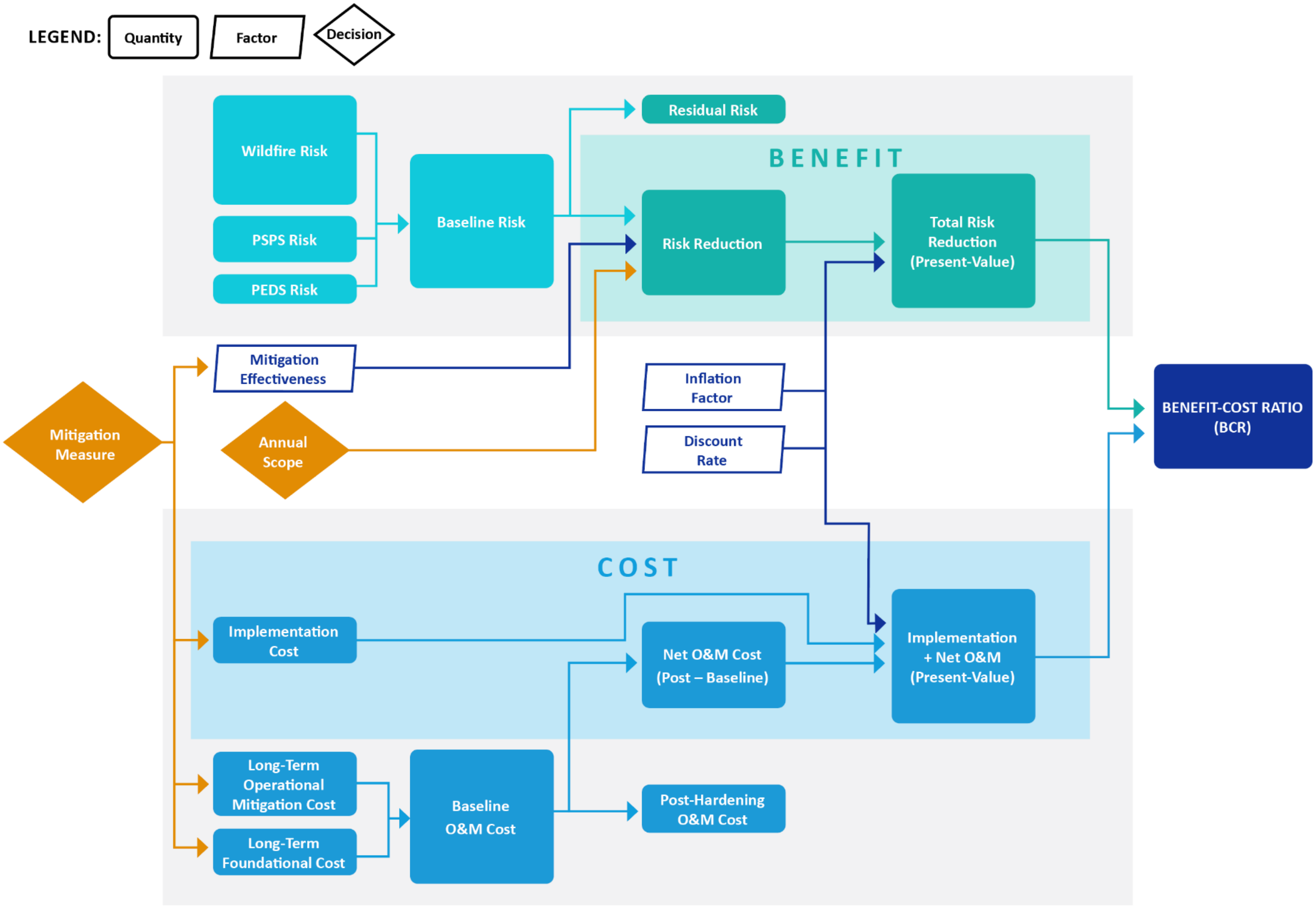
[152] *Id.*, CBR Calculations, Observations & Findings #1 at 52.

[153] D.24-05-064 at 102-105.

[154] Sempra, *2024 Annual Report: Powering Potential* (March 2025), *available at*: https://investor.sempra.com/static-files/42894eb7-9d54-409c-982d-c8fd4465538d.

[155] *See* D.24-10-008.

FIGURE JW-46
Benefit-Cost Ratio Equation Flowchart



a. BCR (SUG/CCC or Mitigations with Net O&M)156 157

The BCR framework aggregates the long-term benefits and costs associated with CCC or SUG grid hardening mitigations into a singular parameter. Benefits include reduction in wildfire and reliability risk over the expected service life of the mitigation. Costs include the capital and other expenditures required for the upfront implementation of the mitigation and the net cumulative ongoing costs (e.g., O&M costs associated with maintaining the hardened grid for an assumed 55-year service life period). Ongoing (Net) O&M costs are only applicable to grid hardening strategies that alter the existing operational activities, as in CCC or SUG. For other grid hardening programs, such as distribution underbuilds or strategic pole replacements, that do not result in substantial changes in O&M activities, Net O&M costs are not considered in the BCR calculations.

If the selected grid hardening strategy has lower O&M costs than the baseline state (i.e., if the hardening strategy results in O&M cost savings), then the Net O&M Cost parameter in the BCR equation will have a negative value. If the negative Net O&M Cost is larger than the Implementation Cost, then the denominator of the BCR equation will have a negative value. Therefore, if a hardening strategy with a positive Total Mitigation Benefit results in Net O&M cost savings that ultimately exceed its Implementation Cost, the resulting BCR is negative. In such cases, a negative BCR indicates that the proposed mitigation would result in overall cost savings.

b. BCR (Other Mitigations or Mitigations without Net O&M)

BCR calculations for mitigations without Net O&M costs follow the same general approach as BCR calculations for SUG and CCC, with one key distinction: pre- and post-mitigation O&M cost are equal, resulting in a Net O&M of zero. As such, Implementation Costs and Net O&M Costs for mitigations are consolidated into a single parameter, Total Cost of Mitigation, which represents the annual cost of a given mitigation program.

$$\text{BCR} = \frac{\text{Total Mitigation Benefit}}{\text{Total Cost of Mitigation}}$$

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[156] SPD Evaluation Report at 146 (Recommendation #11: SDG&E should reconsider Alt 2, the covered conductor approach, after correcting the CBR calculation to include only incremental O&M costs as part of the net benefits.).

[157] *Id.*, CBR Calculations, Observations & Findings #1 at 52.

The *Total Mitigation Benefit* is the reduction in risk due to mitigation and is calculated per the framework discussed in Section I.E.3.

The *Total Mitigation Cost* represents the cost of the activities required to implement a mitigation. For example, the cost of implementation, establishing and maintaining infrastructure, such as systems for monitoring lines and collecting, storing and processing data, as well as the cost of procuring hardware required to conduct mitigations. It also includes the costs of ongoing activities required to execute a mitigation, such as inspections and vegetation management. The duration of mitigation benefits varies by program and reflects the expected period over which risk reduction is realized. For example, the benefits associated with an Early Fault Detection program are assumed to persist for approximately 18 years. In contrast, Vegetation Overhead Detail inspection programs typically provide a shorter benefit duration, averaging at least three years. This reflects the fact that, although inspections may occur annually, vegetation management activities such as trimming are not required for the same assets every year.

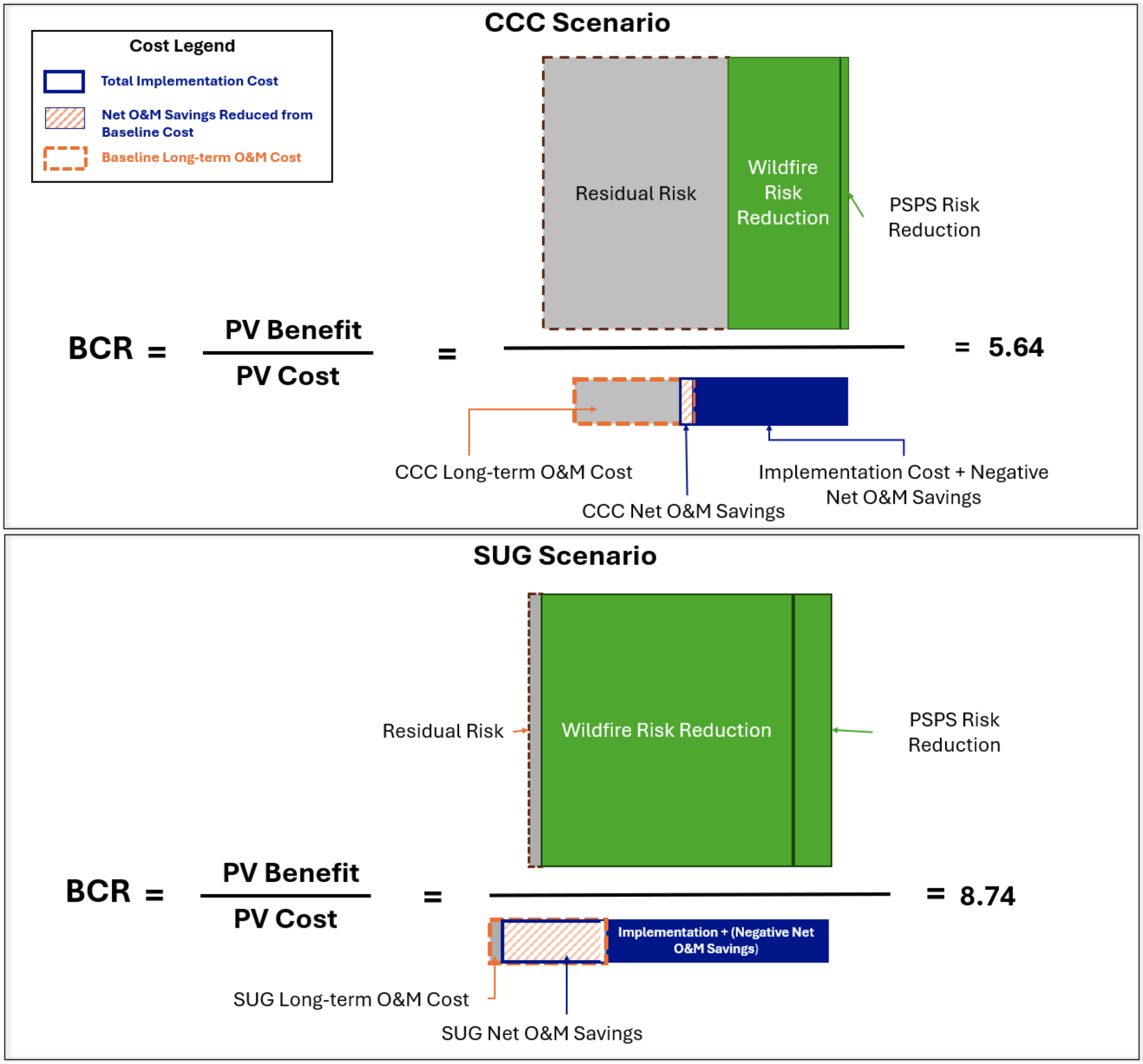
The Total Cost of Mitigation is calculated on an annual basis while accounting for inflation and discount rates that would affect the present value of the costs incurred.

2. Segment Example: Grid Hardening

To illustrate how the BCR is calculated and interpreted, this section continues the use of the segment example 222-1986R introduced in prior sections on net O&M cost. This approach allows the reader to clearly trace how changes in risk reduction and operational cost impacts are translated into a single cost-effectiveness metric, and to better understand the drivers behind the resulting BCR values.

For segment 222-1986R shown in Figure JW-47 as one of the 1008 evaluated permutations (detailed in Table JW-34), the green and blue solid boxes represent the numerator (benefits) and denominator (costs) of BCR equation, respectively. The relative size of each box is scaled to reflect the proportional magnitude of these values. The orange dashed box represents the current baseline O&M costs that are the same for both scenarios. Within this, the hatched box denotes the portion of baseline O&M cost that is avoided under each mitigation scenario (i.e., the net O&M saving), which is used in the BCR equation to offset the upfront total implementation costs shown within the blue box. Based on this framework, the resulting BCRs are 5.64 for CCC scenario and 8.74 for SUG scenario. Both CCC and SUG are viable mitigation options; however, the magnitude of benefits and cost offsets differs materially between the two options.

Figure JW-47
CCC and SUG BCR Result Comparison for Segment 222-1986R



CCC reduces the likelihood of ignition by insulating overhead lines and minimizing overhead faults. This leads to a moderate reduction in wildfire risk and PSPS de-energizations, estimated at a total of present value over $126 million in year 55 and indicated as the green solid box in the Figure above. Additionally, CCC avoids one operational mitigation, wood pole intrusive inspections, resulting in savings of inspections and the overall corrective work over the asset lifecycle period of 55 years. These savings are partially offset by new incremental costs associated with maintaining PEDS equipment, which results in more limited Net O&M savings overall. When compared to the relatively moderate implementation cost estimation of $25 million and cost savings of $ 2.5 million (present value)[158], these combined benefits result in a BCR of 5.64, indicating that for every dollar spent, CCC delivers approximately $5.64 in risk reduction.

SUG, by contrast, provides a more comprehensive risk mitigation solution. By relocating infrastructure below ground, SUG significantly reduces overhead ignition sources, substantially reducing wildfire risk and the need for PSPS de-energizations on this segment, its total present value of the risk reduction is estimated to be over $319 million in year 55. These improvements translate into a higher overall risk reduction compared to CCC, shown as the larger green solid box under SUG in Figure JW-47. While SUG requires significantly higher upfront capital investment shown as the blue box and estimated at present value of over $50 million, it also results in greater operational savings over time, including saving through the elimination of vegetation management and through reduced inspection and repair costs as detailed in Figure JW-44. The present value of the total Net O&M savings is estimated at over $14 million. The combined benefit, implementation and cost savings result in a BCR of 8.74, meaning that for every dollar spent, SUG delivers approximately $8.74 in risk reduction.

This comparison between CCC and SUG shows that although both options are cost effective (e.g., a BCR greater than 1.0), SUG provides a higher return in terms of risk reduction per dollar spent. This outcome is driven by segment 222-1986R high baseline risk, where the substantial reduction in wildfire risk and PSPS exposure outweighs the higher capital cost of undergrounding.

The BCR values depend on key modeling assumptions and inputs, such as mitigation effectiveness and how risk is monetized (e.g., with or without risk aversion). Sensitivity analyses, detailed in Section I.H, test how changes in these assumptions affect BCR values and assess the option that would be more cost-effective over the other option among all 1008 permutations[159]. While the BCR provides a consistent measure of cost effectiveness, it is only

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[158] This total implementation estimation includes CAPEX and OPEX dollars.

[159] Permutations refer to the 1008 different testing configurations listed in Table JW-33.

one input into the overall mitigation selection decision-making process. As described in Figure JW-48, other factors, such as constructability, also play an important role in determining the most appropriate mitigation approach.

3. Benefit-Cost Ratio Workbooks

The BCR Workbook (Ex. SCG-02B/SDGE-02B-WP-S_SDGE-4_WF) tables act as both a source of information for the GRC and a methodological guide to benefit-cost calculations. Calculation methodologies for BCRs are contained within the tabs in the Excel workbook. To maximize transparency, the tables contain summary tabs, a tab dedicated to each of the scoped mitigation programs in grid hardening, vegetation management, asset inspections, advanced protection, and PSPS categories, and tabs that contain input data. Each mitigation program tab contains measurements, separated by feeder segment and year, of lifecycle cost, baseline risk, mitigation risk reduction, and cost-benefit calculations for three separate discount rates. There is also a Likelihood of Risk Event (LoRE) and Consequence of Risk Event (CoRE) measurement along with percentage estimations of risk reduction within each feeder segment and total service territory risk reduction. These measurements are summarized for each mitigation program in the BCR Summary by Risk tab. The tabs in the Master Input section contain the raw data used to calculate the measurements and estimations found in the mitigation tabs. This raw data includes output from the WiNGS-Planning model suite, subject matter expert estimations of long-term mitigation costs, historical mitigation costs, and feeder segment mile tracking.

The BCR Workbook tables are intended to be interactive and user-friendly so that reviewers can independently test different assumptions and perform their own sensitivity analyses. Reviewers can carry out sensitivity analyses by systematically modifying cells in spreadsheets that contain inputs to the BCR calculation, then assessing the impacts of the specified changes to the BCRs or other calculation outputs of interest. The BCR Workbook tables are also aligned with WMP and RAMP files.

To demonstrate the impact of risk aversion on BCR calculations while avoiding excessive consolidation of information, two separate files (Risk Aversion and Risk Neutral) are provided.

4. Responses to BCR-Related Regulatory Requirements and Recommendations

a. SPD Recommendation #11[160]

Lifecycle O&M costs in the adopted approach for BCR calculations account for the post-mitigation incremental lifecycle O&M costs, i.e., O&M costs include any additional costs that are specific to the proposed mitigation strategy as well as any reductions in O&M costs compared to the status quo. This approach accounts for all relevant baseline and post-mitigation lifecycle O&M costs in the BCR calculations and avoids double counting costs that are shared between the pre- and post-mitigated states.

b. SPD Recommendation #17[161]

At each circuit segment where the cost-efficiency of various mitigation alternatives is compared, the three components of the BCR formula are measured with respect to the current pre-mitigated or baseline state of the segment. The Total Mitigation Benefit is the amount of reduction in wildfire and reliability risks as a result of the implementation of a mitigation and is measured as the difference between the pre- and post-mitigated amount of risk experienced at the circuit segment. Implementation Cost is the additional mitigation cost. The Net Ongoing O&M Costs represents new O&M costs associated with the proposed mitigation strategy as well as reduction in the O&M costs as a result of O&M activities that would no longer be required once the segment is mitigated.

c. Risk-Based Decision-Making Framework Phase 3 Decision (D.24-05-064), Ordering Paragraphs 3(a)

The current climate integration approach is focused on estimating an annual percentage increase in acres burned and applying this value to the wildfire consequence calculation, which results in an increased wildfire risk projection. Refer to Section I.D.1.h and Appendix C for details about the climate integration approach.

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[160] SPD Evaluation Report at 146 (Recommendation #11: SDG&E should reconsider Alt 2, the covered conductor approach, after correcting the CBR calculation to include only incremental O&M costs as part of the net benefits.).

[161] *Id.* at 147 (Recommendation #17: The CBR calculation should be based solely on the incremental difference between the proposed mitigation and the no-build baseline (i.e., a well-defined baseline scenario representing no mitigation). Net O&M benefits (or costs) should be calculated from the no-build baseline. This approach prevents double-counting and ensures analytical consistency.).

G. Risk-Informed Strategy and Prioritization

This section describes how risk model outputs inform grid-hardening mitigation selection at the feeder-segment level, where baseline risk, post-mitigation risk, lifecycle cost, and BCRs for available mitigation alternatives can be evaluated with the greatest precision. Using these metrics, eligible segments are comparatively assessed to identify the mitigation recommendation supported by the modeled results.

Mitigations are not preselected based on type or prioritized using tranche-level averages. Instead, each eligible feeder segment is evaluated using applicable risk metrics, risk-per-mile screening criteria, and modeled performance of SUG, CCC, or no grid-hardening mitigation. Prioritization is based on segment-level estimates of risk reduction, lifecycle costs, and BCRs, in conjunction with scenario-based review of the modeled recommendation.

1. Grid-Hardening Mitigation Selection Process[162]

Wildfire Risk Drivers include downed conductors, foreign object/vegetation contacts, and equipment failures. Of these, risk drivers tied to overhead line risk exposure represent the greatest risk. Therefore, strategic undergrounding of electric lines and installing covered conductor combined with advanced protection settings are the mitigations evaluated in WiNGS-Planning because these initiatives are the most effective at reducing risk events on utility equipment.

The Grid-Hardening Mitigation Selection Process provides a transparent basis for determining which mitigation, CCC, SUG, or no mitigation, best addresses risk on a circuit segment. It also tests the consistency of recommendations across scenarios before a segment is included in the proposed mitigation portfolio. Detailed in Figure JW-48, the process supports consistency with the CPUC's RDF and provides a transparent audit trail from baseline risk

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[162] D.24-12-074, FOF 173 at 990 ("In its next rate case, San Diego Gas & Electric Company must provide cost and mileage data separately for these two components of system hardening and explain and justify its selection of circuit segments for undergrounding based on risk analyses or other factors.").

assessment to project scoping to final mitigation selection.[163,164] The process consists of three phases: High-Risk Screen, Modeling Recommendation, and Mitigation Scoping.

1. High-Risk Screen: Feeder segments are screened using multiple WiNGS-Planning scenario runs with varying input parameters. Segments in the HFTD that meet the applicable high-risk criteria, namely the risk-per-mile threshold, are advanced for further mitigation evaluation. Segments that do not pass are advanced directly to the Modeling Recommendation Phase.

2. Modeling Recommendation: For each feeder segment that passes the High-Risk Screen, the modeled mitigation scenarios are evaluated, a mitigation recommendation (CCC, SUG, or no mitigation) is developed for each scenario, and the cost-effectiveness is evaluated to identify the modeled recommendation.

3. Mitigation Scoping: The modeled mitigation recommendation is scoped, and engineering feasibility, constructability, and other segment-specific considerations are reviewed. Before making the final mitigation selection decision, additional engineering or risk assessments are performed where warranted that may override the modeled recommendation.

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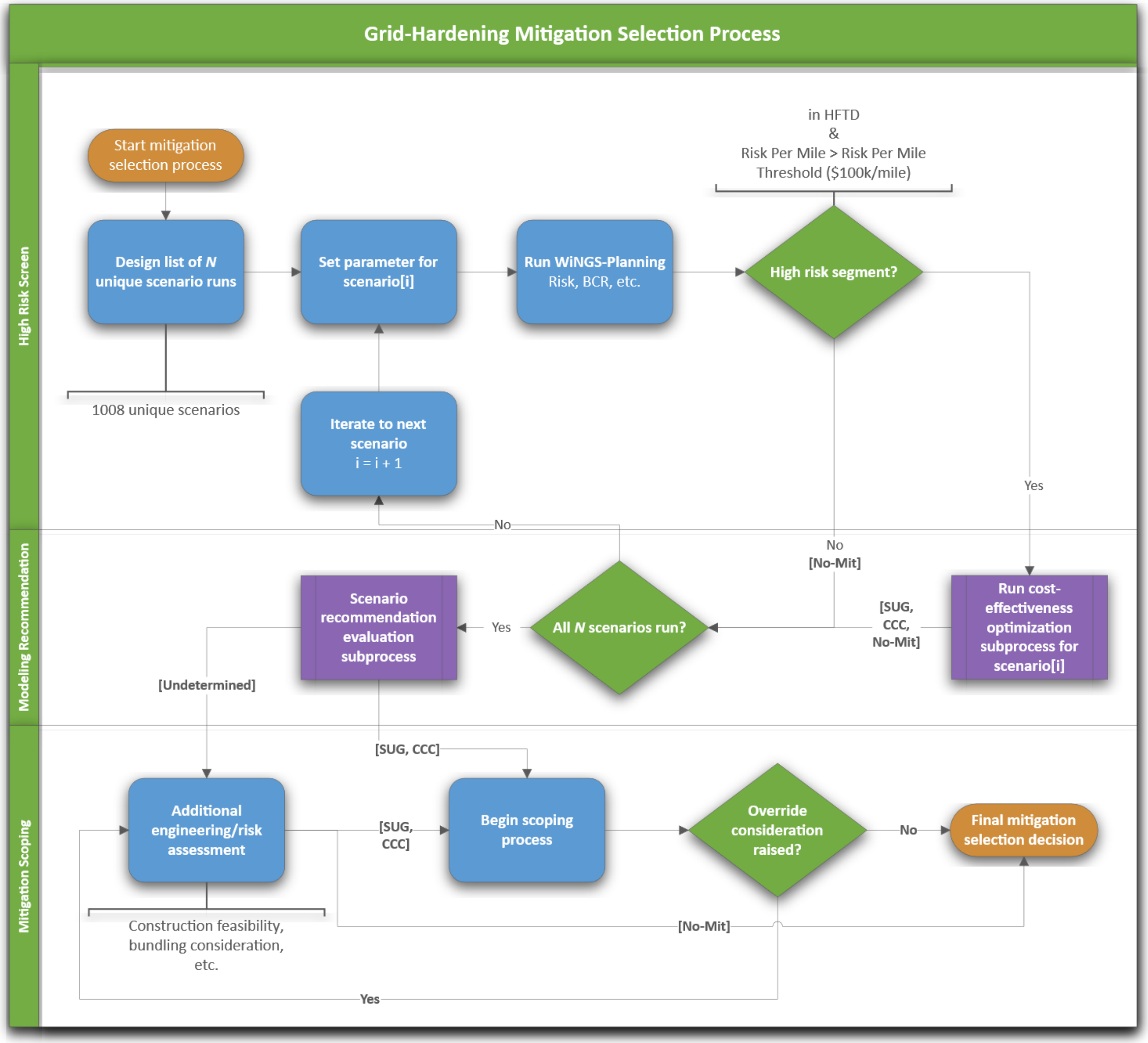
[163] SPD Evaluation Report at 145 (Recommendation #5: SDG&E should provide detailed documentation of its mitigation selection process, including a clear step-by-step description and an accompanying decision tree or flowchart. In addition, SDG&E should: (a.) Disclose weighting or prioritization criteria used when/if multiple factors (e.g., risk reduction, CBR, residual risk, feasibility) conflict. (b.) Provide case examples demonstrating how specific projects were selected or rejected using this framework. (c.) Clarify the role of modeling vs. expert judgment in the final decision, including thresholds or conditions under which expert overrides are applied. (d.) Ensure consistency with the CPUC's risk-based decision-making standards like RDF, so that mitigation selection is transparent, repeatable, and auditable.).

[164] *Id.* (Recommendation #6: To ensure accountability, SDG&E should maintain a transparent version-controlled record of its risk calculations and mitigation selection (criteria), so that stakeholders can verify whether mitigation priorities are consistently risk-based and not subject to arbitrary shifts.).

FIGURE JW-48
Grid-Hardening Mitigation Selection Process



The Grid Hardening Mitigation Selection Process chooses mitigations for individual feeder segments rather than at the Tranche level allowing SDG&E to more precisely target risk drivers at a localized level, ensuring that selected mitigations are aligned with the specific conditions and vulnerabilities of each segment, such as weather patterns, asset characteristics, and customer demographics. The scope of the feeder segments analyzed for grid-hardening selection include distribution feeder segments within the service territory, specifically, segments in the HFTD, segments with historical PSPS de-energizations, and segments in higher-risk urban areas such as coastal canyons or wildland open spaces.[165,166,167]

A benefit-cost analysis is used to quantify baseline wildfire, PSPS, and PEDS risks, assess mitigation-specific risk reduction and lifecycle cost, and prioritize mitigations at the circuit-segment level. This analysis helps prioritize grid hardening efforts by identifying the most effective and cost-efficient solutions for each feeder segment within Tier 2 and Tier 3 of the HFTD.

a. Phase 1: High-Risk Screen[168]

In Phase 1, a list of unique analytical scenarios is determined that reflects varying assumptions regarding risk-attitude scaling, CCC mitigation effectiveness, and other modeling inputs ("Design list of N unique scenario runs" process node). For each scenario, the applicable model parameters are set ("Set parameter for scenario[i]" process node), after which the WiNGS-Planning model is executed to quantify baseline wildfire, PSPS, and PEDS risks for that particular scenario run (scenario [i]). This execution also produces associated BCRs and other relevant analytical outputs ("Run WiNGS-Planning" process node).

The Grid-Hardening Mitigation Selection Process can be executed under multiple scenario configurations, each defined by its own set of parameter assumptions. These assumptions may include variations in risk aversion, the type of discount rate applied for present-value (PV) metric calculations, mitigation effectiveness estimates, pre-mitigation and post-mitigation risk-per-mile thresholds, and other key analytical inputs.

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[165] *Id.* at 144 (Recommendation #2: SDG&E should create tranches based on risk scores or LoRE × CoRE pairs across all segments for Wildfire and PSPS risk and avoid redundant steps that could introduce unnecessary complexity or lead to biased or inconsistent outcomes. SDG&E's tranching methodology should be designed to enable data-driven decision-making for hardening prioritization.).

[166] *Id.* at 145 (Recommendation #4: SDG&E should explicitly integrate its tranching methodology into its mitigation planning. Mitigation decisions should be clearly linked to tranches with homogeneous risk or LoRE/CoRE values, ensuring that the highest-risk and most cost-efficient projects (e.g., those with high CBRs) are prioritized. If SDG&E allocates capital to lower-risk segments, it should provide a clear justification.).

[167] The March 4, 2026 ALJ Ruling, Deficiency Area 2.4, Item 2 at 15.

[168] SPD Evaluation Report at 146 (Recommendation #14: SDG&E should revise its risk assessment and scaling methodology to incorporate full CoRE (and risk) distributions when/if applying risk scaling. This revision should appropriately account for rare segments associated with low-probability, high-impact scenarios. Additionally, SDG&E should demonstrate how its revised model better captures tail risks and guides mitigation decisions for segments where extreme events are plausible.).

For the mitigation recommendations presented in this GRC, a total of 1,008 unique scenario runs were conducted, summarized in Table JW-42. These scenarios were designed to test the sensitivity of results across key ranges of analytics inputs and assumptions, reflecting a range of possible scenarios most relevant for decision-making.

Table JW-43
Mitigation Selection Scenario Permutations

Factor	Unique Values	Count	Justifications/Notes
Risk aversion factor	1, 1.34, 1.47, 1.6	4	Risk aversion factors include 1 (None) and 1.47, as default risk neutral and risk averse conditions, respectively. Additionally, a selection of other relevant risk aversion factors was also evaluated (i.e. 1.34, 1.6), referenced in studies by the Department of Energy (DOE) and Gas Research Institute (GRI) referenced in the 2025 RAMP Chapter RAMP-3 Risk Quantification Framework at 24-25.
CCC mitigation effectiveness	56.7%, 61.7%, 67.7%, 72.7%, 77.7%, 82.7%, 87.7%	7	CCC mitigation effectiveness estimated default value (61.7%), as well as values within roughly a -5% and +25% confidence interval.
Climate factor	0%, 0.68%	2	Factor ranging from None (0%) to internal estimate of +0.68%. 0.68% is assumed as the default condition. This factor is applied to the acres burned estimate.
Housing/Population factor	0%, 1%	2	Factor ranging from None (0%) to internal estimate of +1%. 0% is assumed as the default condition. This factor is applied to the Wildfire Risk estimate.
CCC cost-per-mile	$1.31M; 1.81M; $810k	3	CCC cost-per-mile estimated default value ($1.31M), as well as accounting for a +/ $500k confidence interval ($1.81M, $810k)
SUG cost-per-mile	$2.32M; $2.82M; $1.82M	3	SUG cost-per-mile estimated default value ($2.32M), as well as accounting for a +/ $500k confidence interval ($2.82M, $1.82M)
Total risk neutral scenario count calculations	1 x 7 x 2 x 2 x 3 x 3	**252**	Count of scenarios where risk aversion factor = 1 (None)
Total risk averse scenario count calculations	3 x 7 x 2 x 2 x 3 x 3	**756**	Count of scenarios where risk aversion factor ≠ 1 (i.e. 1.34, 1.47, 1.6)

Factor	**Unique Values**	**Count**	**Justifications/Notes**
Total scenario count calculation	4 x 7 x 2 x 2 x 3 x 3	**1008**	All scenarios run

The WiNGS-Planning model suite estimates the baseline risk and quantifies the expected risk reduction for CCC and SUG for each feeder segment. These individual risk reductions are evaluated within the Cost-Benefit Approach outlined by the Risk OIR Phase II and Phase III Decisions[169] ("Run WiNGS-Planning" process node). This framework models risk reduction, installation, and O&M costs, considering inflation and various discount rate scenarios over the expected 55-year lifetime of the assets. While SDG&E does not consider Tranches in its mitigation decisions, this framework enables prioritization of the highest-risk and most cost-efficient feeder-segments.

Once risk metrics are calculated for a given scenario, each feeder segment for that scenario is evaluated to determine whether it meets the criteria of a high-risk segment, as defined by its location within the HFTD and by exceedance of the established risk-per-mile threshold ("High risk segment?" decision node).

The risk-per-mile threshold directly determines which feeder segments within the HFTD warrant evaluation for grid-hardening mitigation. For all scenarios detailed in Table JW-43, a conservative risk-per-mile threshold of $100,000 per mile-year was used to target the highest risk feeder-segments within the HFTD for the scope of the mitigation selection recommendations. The proposed value for the risk-per-mile threshold is selected on the basis that circuit segments that meet or exceed this value have the greatest contribution to overall risk. Circuit segments with normalized annual risk exceeding $100,000 per mile-year contribute to approximately 80% of the overall risk.

Additional default parameters, which are held constant across all scenarios listed in Table JW-43, are detailed in Table JW-44 for increased transparency on the risk modeling inputs used for the scenario mitigation selection process.

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[169] *See* D.22-12-027 and D.24-05-064.

Table JW-44
Mitigation Selection Default Parameters[170]

Factor	Value	Justifications/Notes
SUG Mitigation Effectiveness	98%	Calculated and described in the 2023-2025 Base WMP Filing, Section 6.1.3.3.5, Measuring Effectiveness of Mitigation Initiatives
Discount Factor Category	WACC	Calculated at 7.45%. Represents a conservative assumption compared to the alternative Hybrid (6.10%) and Societal (2.00%)
Monte Carlo Simulation Runs	5M Years	Enables improved output stability at higher simulation run counts
Minute Duration Per Wildfire Interruption	480 minutes	Estimated pole restoration time
Cost Per Building Destroyed	$1M	Subject matter expert assumption based on a review of publicly available data on the median listing home price in San Diego County
Cost Per Acres Destroyed	$2,350	Subject matter expert assumption based on a review of CALFIRE suppression costs incurred during historical fires
Value of Statistical Life (VSL)	$17.5M	CA adjusted 2024 VSL (2025 RAMP Chapter RISK-3, Risk Quantification Framework at 7) from Department of Transportation, projected to 2025 dollars.
Customer Minute Interrupted (CMI) Cost for Non-Residential Customers	$37.64/min	Calculated using ICE 2.2 calculator.
Customer Minute Interrupted (CMI) Cost for Residential Customers	$0.08/min	Calculated using ICE 2.2 calculator.
Overall Risk Per Mile Threshold	$100k/mile	Conservative risk per mile threshold to help target the riskiest feeder segments in the HFTD

Segment-scenario combinations that meet the criteria for high-risk proceed to the cost-effectiveness optimization subprocess (see Figure JW-49), where SUG and CCC are evaluated as potential strategies (“Run cost-effectiveness optimization subprocess for scenario[i]” process node).

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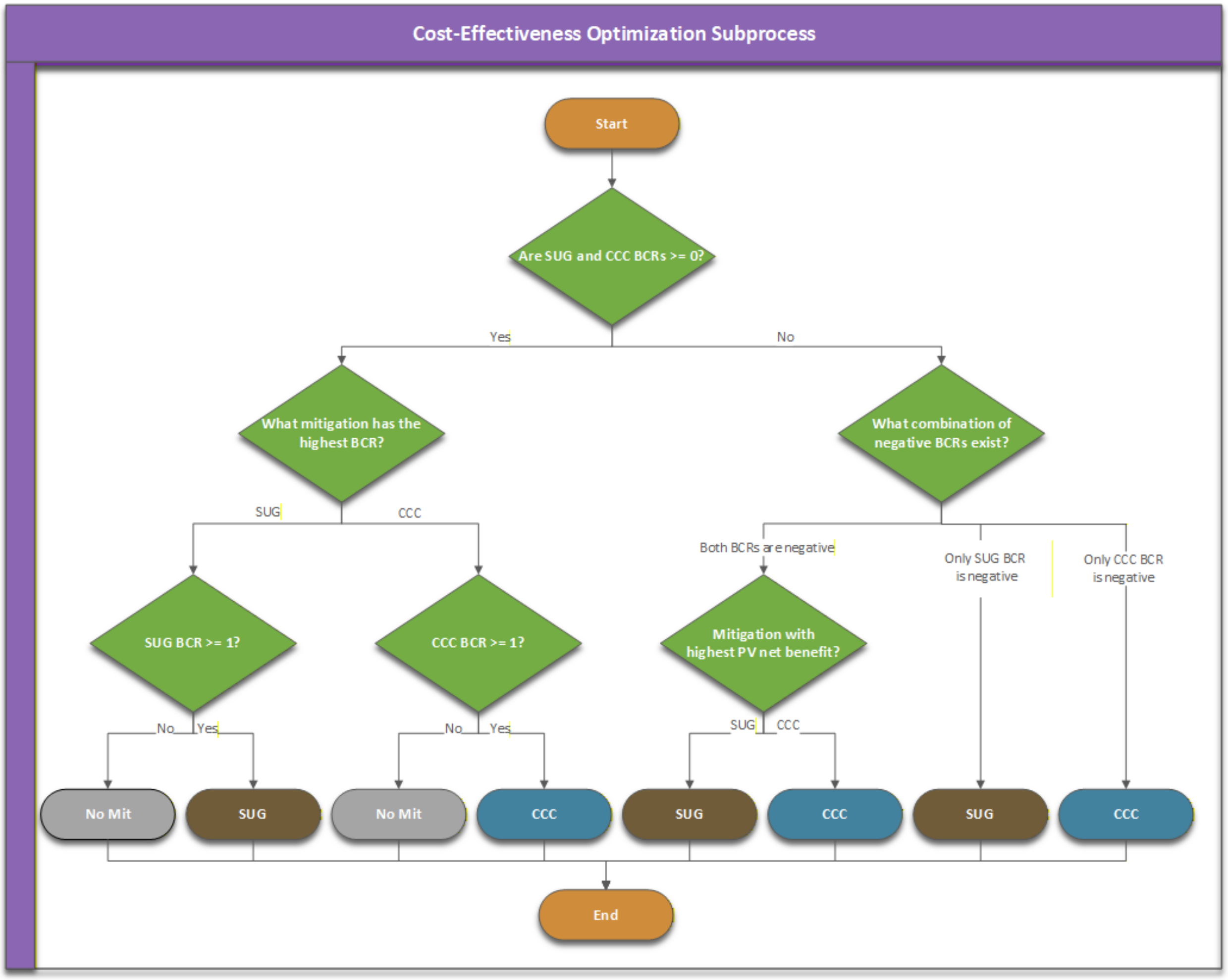
[170] These parameters do not represent an exhaustive list of all parameters used across the WiNGS-Planning model suite; rather, they reflect a selected set of key parameters relevant to mitigation selection.

b. Phase 2: Modeling Recommendation

Figure JW-49 demonstrates the first step of Phase 2, the “Run cost-effectiveness optimization subprocess for scenario[i]” process, showing the BCR and Net Benefit factors that are incorporated as decision points to drive decision-making for a given scenario condition of a segment.

FIGURE JW-49
Cost-Effectiveness Optimization Subprocess



The cost-effectiveness optimization subprocess is designed to select mitigation project recommendations for a given scenario based on the Target and Constraint conditions shown in Table JW-45 and Table JW-46.

TABLE JW-45
Cost-Effectiveness Optimization Subprocess Targets for Unique BCR Scenarios

Scenario	Scenario Conditions	Target	Target Justification
Both BCRs are positive	SUG BCR ≥ 0 and CCC BCR ≥ 0	Max BCR Mitigation Option	Select the option with the highest BCR to maximize risk reduction return per net dollar spend.
Both BCRs are negative	SUG BCR < 0 and CCC BCR < 0	Max PV Net Benefit Mitigation Option	When both BCRs are negative, the metric no longer provides meaningful differentiation. A negative denominator reflects that lifecycle net O&M savings exceed implementation costs, such that both alternatives yield net cost savings. Under these conditions, investment selection is based on maximizing present value net benefits, with preference given to the alternative that delivers the greatest net benefit.
Mixed-sign BCRs	One positive and one negative BCR	Negative BCR Mitigation Option	Negative BCR is chosen over any positive BCR because it reflects cases where net O&M savings exceed implementation costs, resulting in net cost savings in addition to risk-reduction benefits.

TABLE JW-46
Cost-Effectiveness Optimization Subprocess Constraints

Constraint	Meaning
BCR > 1 OR BCR < 0	The selected mitigation must: 1. Produce more risk reduction benefits for the net dollar spend expected (BCR > 1) OR 2. Result in net cost savings in addition to risk-reduction benefits (BCR < 0)

Together, these Target and Constraint conditions support the optimization of mitigation recommendations for both risk-reduction value and economic efficiency. The structure prevents the selection of projects with positive BCRs that are less than 1, prioritizes mitigations that deliver the greatest risk-reduction benefit per dollar spent, and compares scenarios where one or both mitigations have negative BCRs. (For more details on negative BCRs, refer to Section I.F.1.a.) This design produces a transparent, repeatable, and defensible decision logic that aligns with regulatory expectations and ensures responsible stewardship of mitigation investments. The model iterates through each scenario until all N scenarios have been completed (“Iterate to next scenario" process node). Each scenario results in a unique feeder segment recommendation per the cost-effectiveness optimization subprocess.

After completing all scenario runs, the consistency of mitigation recommendations generated across all scenarios for a given feeder-segment is evaluated (see "Scenario recommendation evaluation process" process node). Table JW-47 and Figure JW-50 detail the Scenario Recommendation Evaluation Subprocess.

Mitigation scenarios are grouped into those without risk aversion ("Risk Neutral") and those with risk aversion ("Risk Averse"), and threshold-based mitigation selection percentage criteria are applied to determine a single recommended mitigation outcome for each feeder-segment.

The first step determines whether grid hardening should be applied to a given feeder segment by evaluating whether grid-hardening mitigations (CCC or SUG) are supported across both non-risk-averse and risk-averse scenario groupings. Segments satisfy this step if grid hardening is independently supported by a majority of the modeled outcomes within each scenario grouping (i.e. 50% or more of non-risk-averse scenarios and 50% or more of risk-averse scenarios indicate grid hardening).

If the level of support within one or both groupings is below the threshold, the segment is considered to have an "Undetermined" mitigation recommendation and is referred to the "Additional engineering/risk assessment" process, which evaluates whether grid hardening may nevertheless be appropriate. One example of a case where grid hardening may be considerate appropriate after performing the subsequent "Additional engineering/risk assessment" process is when the segment could be incorporated as an upstream or downstream adjacent segment of a neighboring grid-hardening project (bundling).

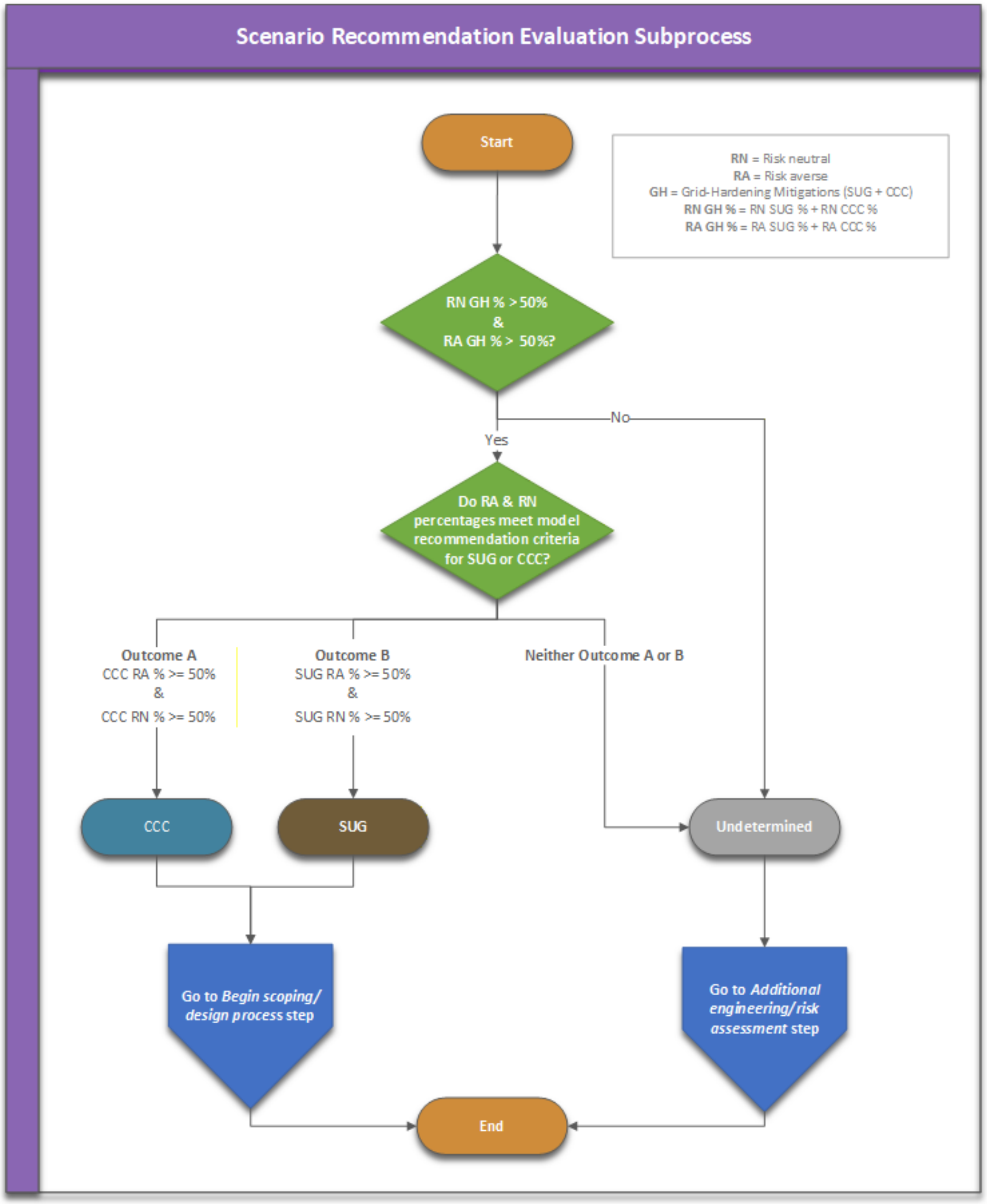
Segments that meet the threshold move to the next step in the subprocess, which evaluates the selection percentages for CCC and SUG across both risk-averse and risk neutral scenario groupings. Outcome A (see Figure JW-48) is achieved if CCC selection exceeds 50% in both the risk-averse and risk neutral scenario groupings. If Outcome A is met, CCC is selected as the recommended mitigation. Outcome B is achieved if SUG selection exceeds 50% in both the risk-averse and risk neutral scenario groupings. If Outcome B is met, SUG is selected as the recommended mitigation. If neither conditions are met, the mitigation selection is deemed "Undetermined" and the process proceeds to the "Additional engineering/risk assessment" step.

TABLE JW-47
Scenario Recommendation Evaluation Subprocess Summary

Step	Condition Evaluated	Condition Passed Resulting Action	Condition Failed Resulting Action
1	- Of the Risk Neutral scenarios, SUG or CCC was selected > 50% of the time, AND - Of the Risk Averse scenarios, SUG or CCC was selected > 50% of the time	Proceed to the next step of the Scenario Recommendation Evaluation Subprocess.	Model recommended mitigation is undetermined. Proceed to the “Additional engineering/risk assessment” process.
2	- Of the Risk Neutral scenarios, CCC was selected > 50% of the time, AND - Of the Risk Averse scenarios, CCC was selected > 50% of the time	Model recommended mitigation is CCC. Proceed to the “Begin scoping/design” process.	Model recommended mitigation is undetermined. Proceed to the “Additional engineering/risk assessment” process.
	- Of the Risk Neutral scenarios, SUG was selected > 50% of the time, AND - Of the Risk Averse scenarios, SUG was selected > 50% of the time	Model recommended mitigation is SUG. Proceed to the “Begin scoping/design” process.	

FIGURE JW-50

Scenario Recommendation Evaluation Subprocess



c. Phase 3: Mitigation Scoping

After completion of the Scenario Recommendation Evaluation Process, a segment may follow one of two paths within Phase 3, Mitigation Scoping, depending on whether the prior analysis produced a quantitatively determined mitigation recommendation (SUG or CCC) or whether the mitigation outcome remained undetermined.

If a segment has a quantitatively determined mitigation recommendation, it moves to the "Begin scoping process" step for the respective mitigation recommendation. Subject matter experts (including electric system hardening engineers, meteorologists, and wildfire risk analysts) then review the modeled mitigation options, benefit-cost results, and scenario-level outcomes. This review includes preliminary engineering feasibility assessments, evaluation of segment characteristics (such as length, terrain, accessibility, and surrounding infrastructure), and identification of opportunities to bundle adjacent segments to optimize PSPS risk reduction and achieve economies of scale.

If significant override considerations are identified that were not fully captured in the model, such as constructability constraints, cost anomalies, permitting challenges, or localized risk conditions, the segment transitions to the "Override consideration raised?" step. If an override is triggered, the segment is sent back to the first step in the phase ("Additional engineering/risk assessment" step). Any revised mitigation strategy is then reevaluated to ensure continued alignment with risk-reduction objectives and benefit-cost requirements, after which the segment re-enters the scoping process ("Begin scoping process" step).

Once all technical, operational, and risk considerations have been addressed, the Mitigation Scoping phase issues a final, documented mitigation recommendation ("Final mitigation selection decision" step).

If the segment is considered to have an "Undetermined" mitigation recommendation at the end of Phase 2, it moves to the "Additional engineering/risk assessment" step. The segment then undergoes an evaluation to determine whether mitigation is warranted, including consideration of alternative approaches such as project bundling.

After the evaluation, the segment proceeds through the same technical, engineering, and expert review steps as segments with quantitatively defined mitigation recommendations, resulting in a mitigation decision of SUG, CCC, or no mitigation. If the "Additional engineering/risk assessment" step results in a decision to not mitigate, then the segment moves directly to the "Final mitigation selection decision" node (as "No-Mit").

d. Segment Example[171]

To illustrate how the Grid Hardening Mitigation Selection Process is applied in practice, this subsection describes the progression of a single feeder segment through the three phases, High-Risk Screen, Modeling Recommendation, and Mitigation Scoping, of the mitigation selection process. This example demonstrates how probabilistic risk modeling, lifecycle cost analysis, and engineering judgment are integrated at the segment level to determine a final mitigation outcome.

i. Baseline Segment Profile

The segment evaluated in this example is segment 222-1986R, located in Tier 3 of the HFTD on Circuit 222 in Ramona within San Diego County (see Figure JW-51). Segment 222-1986R is approximately 42 miles in length (consisting of approximately 23 miles of underground infrastructure and 19 miles of overhead facilities) and serves 305 customers downstream of its switch location. These customers consist of 220 residential customers, including 14 that are designated Access Functional and Needs (AFNs), and 85 commercial customers, including 2 critical communication facilities.

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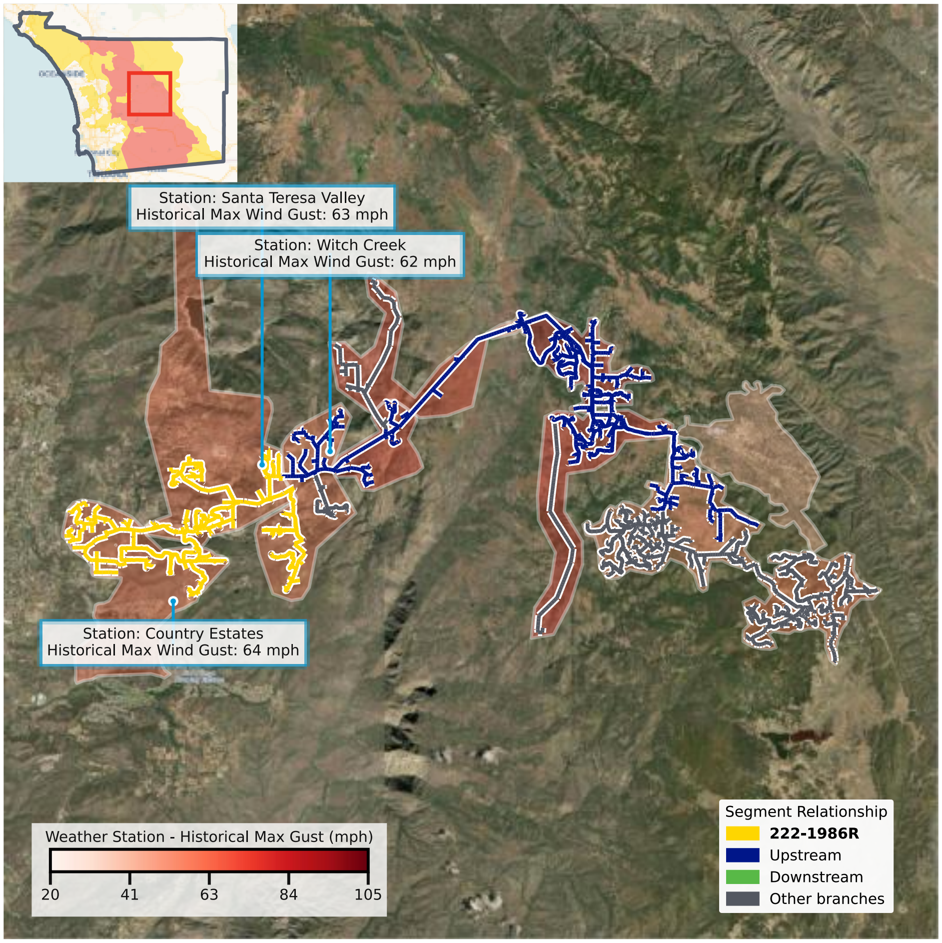
[171] The March 4, 2026 ALJ Ruling, Deficiency Area 2.1, Item 2 at 10.

Figure JW-51
Geospatial Map of Segment 222-1986R



Under baseline conditions (risk-neutral), segment 222-1986R is the second highest ranked segment in the HFTD and exhibits a total monetized risk of $15.04 million per year, which corresponds to approximately $739,000 per year per overhead mile. (See Figure JW-52). The bulk of this risk, $13.34 million per year, is attributed to the risk of a wildfire event occurring as opposed to the risk of PSPS or PEDS events. The primary risk drivers for this segment include high wind speeds, including max wind gusts of 64 mph, observed on fire-weather condition days, as well as the prevalence and proximity of vegetation surrounding the overhead lines. As a result of this high-wildfire risk, customers served by segment 222-1986R have exhibited the highest duration of PSPS de-energizations in the service territory, with a total of 1,936 hours of de-energization since 2017 (see Figure JW-53).

Figure JW-52
Baseline Risk Assessment of Segment 222-1986R

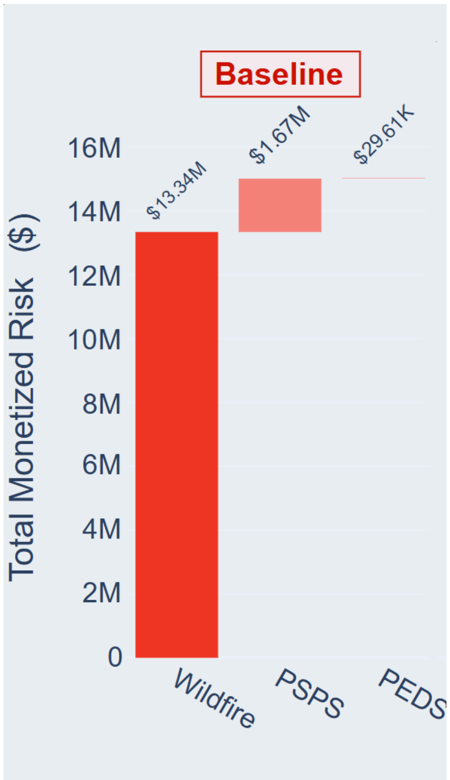
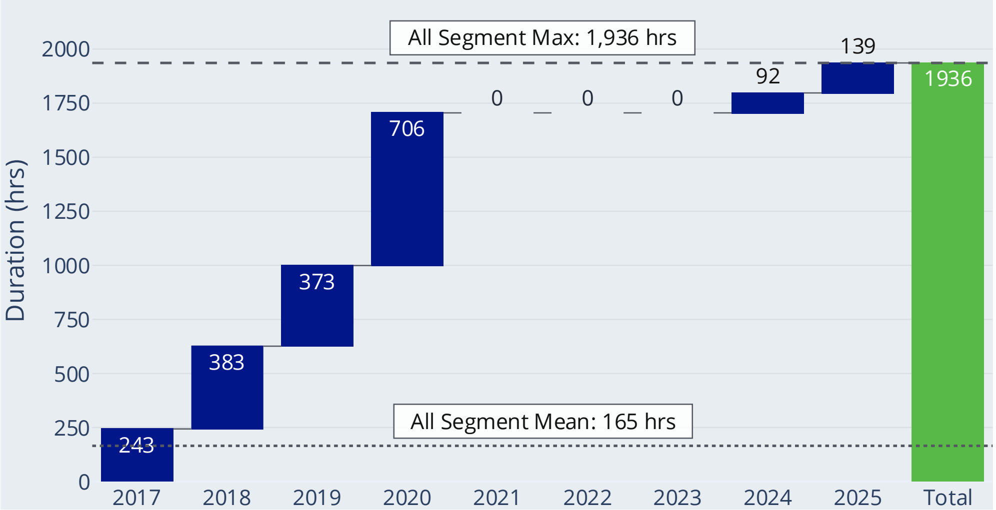


Figure JW-53
Historical PSPS Duration on Segment 222-1986R



ii. Phase 1: High-Risk Screen

During the High-Risk Screen, the monetized risk per mile of segment 222-1986R is compared to the established screening threshold, and the geographic location of the segment is confirmed to be in the HFTD.

Table JW-48 provides estimates of the monetized risk per mile in Segment 222-1986R for four distinct risk aversion factors (see Table JW-43 for details on the risk aversion factors used).

TABLE JW-48
Risk per Mile Estimates for Segment 222-1986R Using Four Individual Risk Aversion Factors

Risk Aversion Factor	Risk per Mile ($)
1.00	739,182
1.34	4,304,032
1.47	8,743,030
1.60	17,904,322

The segment passes the screening threshold of $100,000 per mile for all risk aversion factors. Because it is also confirmed to be located within Tier 3 of the HFTD, it passes this phase and qualifies for further analysis. Consequently, all 1,008 scenario permutations (252 risk neutral and 756 risk averse) for segment 222-1986R advance to the Modeling Recommendations phase.

iii. Phase 2: Modeling Recommendation

<u>Risk Neutral Scenarios</u>

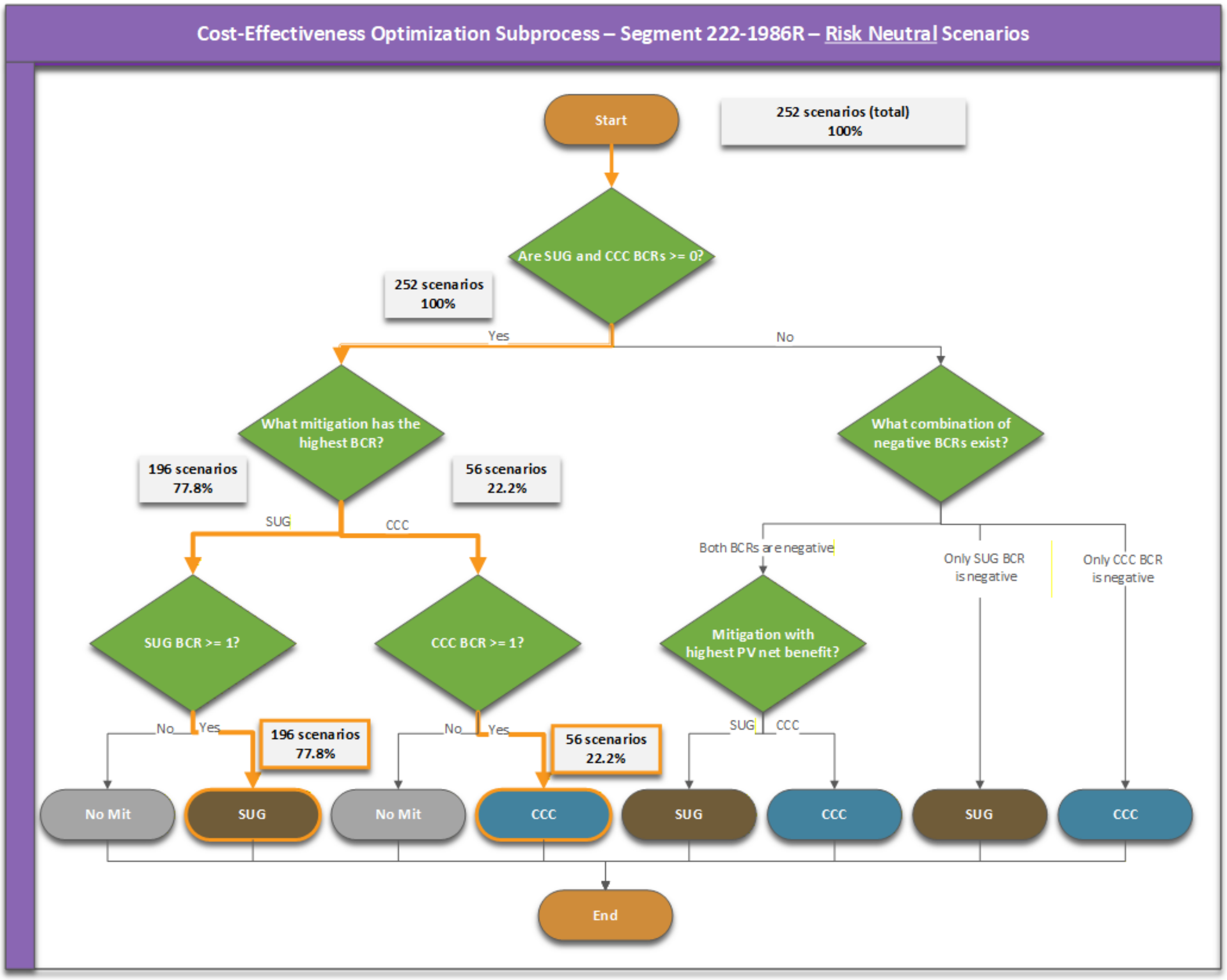
In this phase, BCR outputs for 252 risk-neutral scenarios are calculated for segment 222-1986R.

- CCC BCR: 3.56 (min) to 14.31 (max), with an average of 7.41
- SUG BCR: 5.94 (min) to 17.39 (max), with an average of 10.17

The BCRs are greater than 1 for all scenarios for both SUG and CCC.

Next, the scenarios were evaluated using the Cost-Effectiveness Optimization Subprocess (see Figure JW-54). Out of the 252 non-risk-averse scenarios, the subprocess recommended SUG for 196 scenarios (77.8%) and recommended CCC for 56 scenarios (22.2%). This demonstrates that under risk neutral assumptions, Phase 2 recommends SUG in the majority of scenarios tested.

Figure JW-54
Cost-Effectiveness Optimization Subprocess for Risk Neutral Scenarios for Segment 222-1986R



Risk-Averse Scenarios

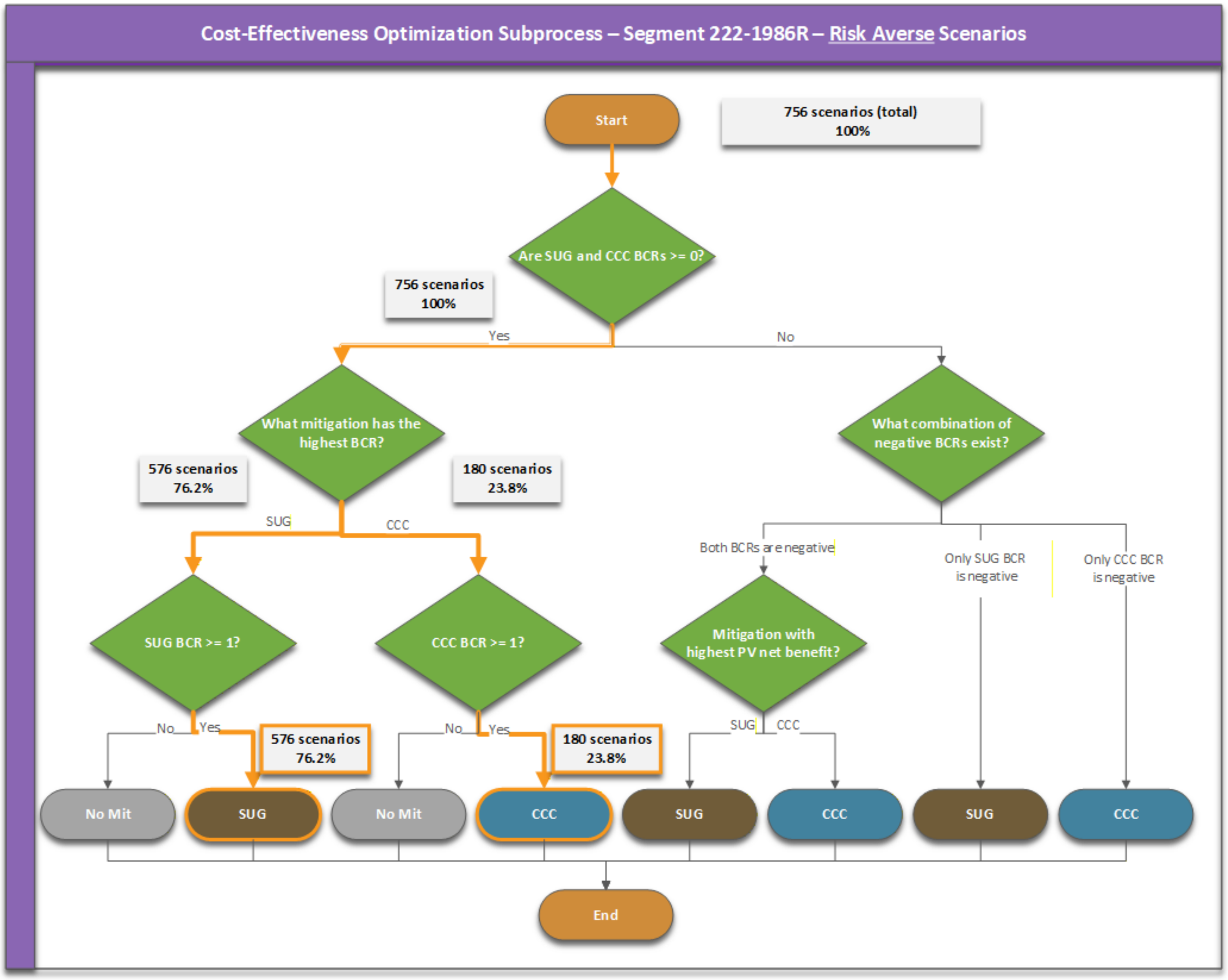
This phase also calculates BCR outputs using risk-averse assumptions, in which low-probability, high-consequence wildfire outcomes are given greater weight. For segment 222-1986R, a total of 756 scenarios are considered.

- CCC BCR: 21.54 (min) to 375.54 (max), with an average of 109.73
- SUG BCR: 34.86 (min) to 442.36 (max), with an average of 145.74

The BCRs are greater than 1 for all scenarios for both SUG and CCC.

Next, the scenarios were evaluated using the Cost-Effectiveness Optimization Subprocess (see Figure JW-55), and this resulted in the following: out of the total 756 non-risk-averse scenarios run, SUG was selected as the optimal mitigation choice in 576 scenarios (76.2%), and CCC was selected in 180 scenarios (23.8%). This means that under the various risk-averse assumptions, SUG is shown as the more ideal of the two mitigation options in the majority of the scenarios tested.

Figure JW-55
Cost-Effectiveness Optimization Subprocess for Risk Averse Scenarios for Segment 222-1986R



Evaluating all risk-averse and risk neutral (non-risk-averse) scenarios together, the scenario results yield the following selection percentages for each mitigation type:

Non-risk-averse recommendation: SUG (78%), CCC (22%)

Risk-averse recommendation: SUG (76%), CCC (24%)

Figure JW-56 shows the scatterplot of BCR outputs for risk neutral and risk-averse scenarios for segment 222-1986R.

Figure JW-56
SUG/CCC BCRs for Risk Neutral and Risk Averse Scenarios for Segment 222-1986R

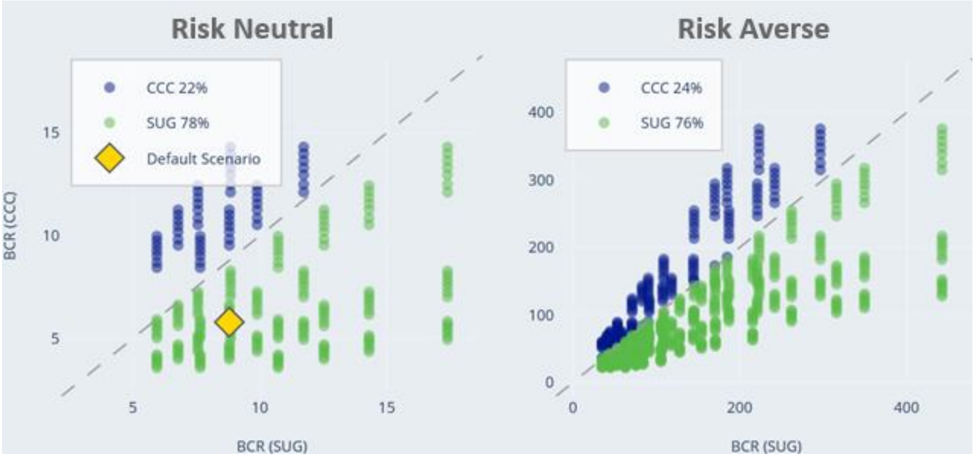
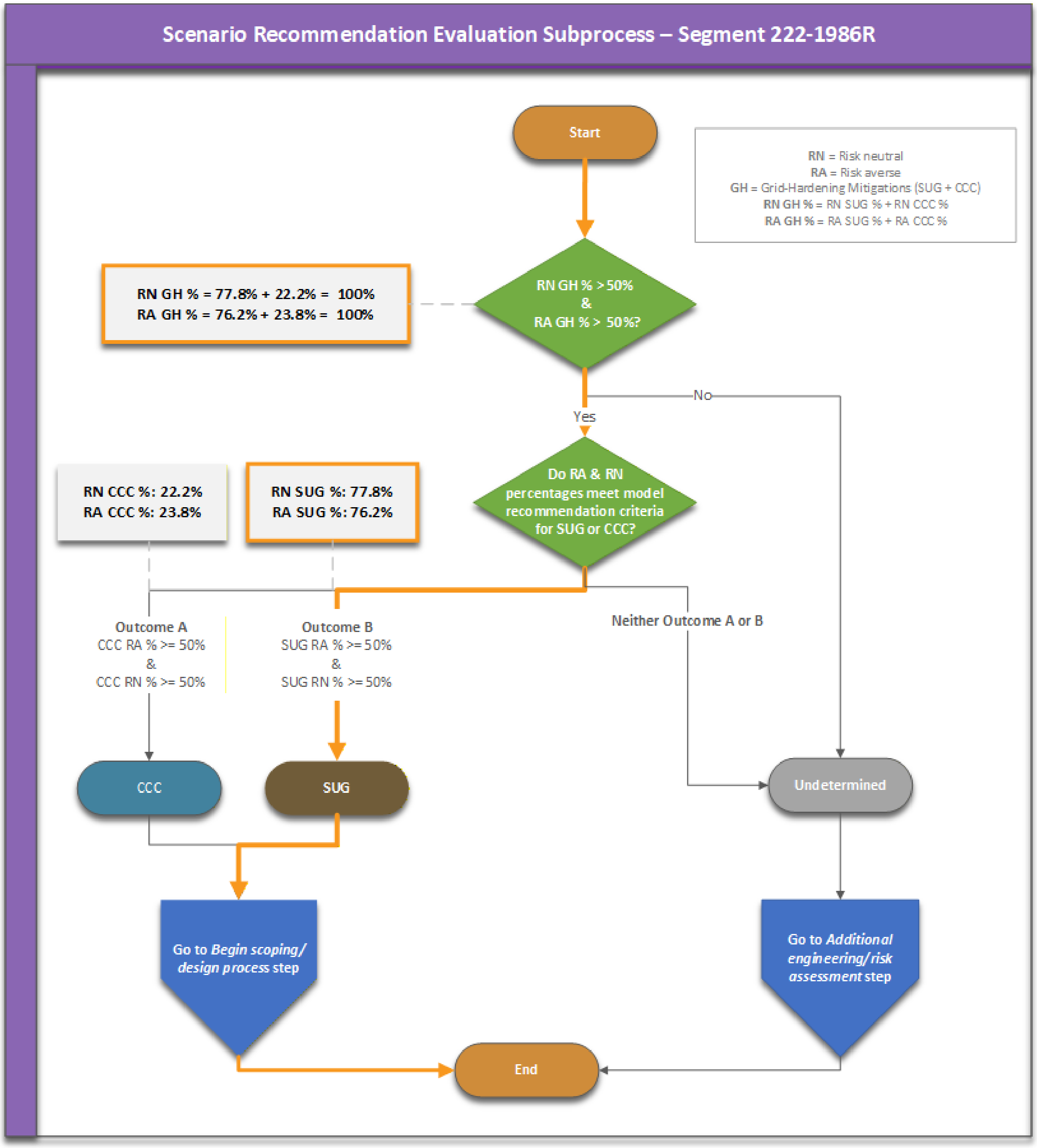


Figure JW-57 shows segment 222-1986R going through the Scenario Recommendation Evaluation Subprocess, whereby both risk averse and risk neutral scenario results are evaluated to see which mitigation better meets modeling recommendation criteria. Applying the scenario-based decision logic, segment 222-1986R receives a modeling recommendation of SUG, based on a high likelihood of meeting the cost-effectiveness criteria with SUG, with consideration of the consistency of that likelihood across both risk neutral and risk averse assumptions.

Figure JW-57
Scenario Recommendation Evaluation Subprocess for Segment 222-1986R



Once segment 222-1986R goes through the Modeling Recommendation phase (phase 2) and is recommended for SUG, it then goes on to the Scoping Mitigation phase (phase 3) for further evaluation.

iv. Phase 3: Mitigation Scoping

Following the modeling recommendation, segment 222-1986R undergoes mitigation scoping, where engineering and constructability considerations are evaluated. This includes assessment of terrain, permitting requirements, construction feasibility, and potential opportunities to bundle the segment with adjacent projects.

For this step, key considerations include constructability and permitting/environmental factors for segment 222-1986R. These considerations are performed by the Engineering teams to ensure that work scope is feasible of being executed as recommended and within the planned timeline.

Based on Engineering's initial review of the scoping feasibility for undergrounding on segment 222-1986R, the modeling recommendation is confirmed as applicable, and thus segment 222-1986R will proceed forward for undergrounding work scope as planned.

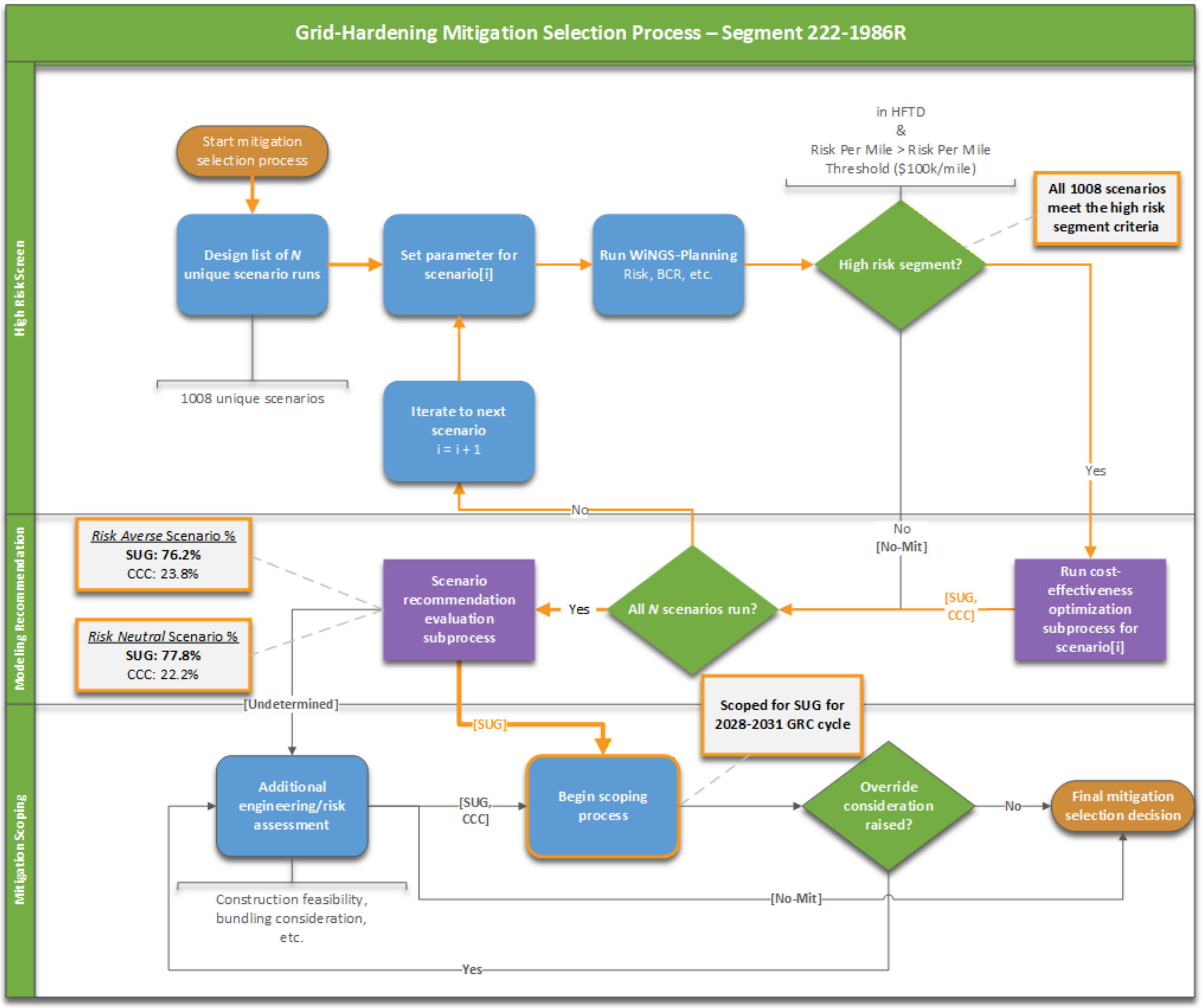
v. Summary of Outcome

This example demonstrates how a single feeder segment, in this instance segment 222-1986R, progresses through the 3 phases of the Grid-Hardening Mitigation Selection Process (see Figure JW-58).

- Phase 1 - High Risk Screen:
    - Segment 222-1986R passes the High-Risk Screen for all 1,008 scenarios run
- Phase 2 - Model Recommendation:
    - Cost-effectiveness analysis under both risk-averse and risk neutral conditions is performed for segment 222-1986R, with an optimal modeling recommendation of SUG being assessed based on BCRs across the 1,008 scenario outcomes.
- Phase 3 - Mitigation Scoping:
    - An initial scope feasibility assessment by engineering confirms SUG as a feasible recommendation for segment 222-1986R, allowing the mitigation to begin the scoping process.

At the end of the selection process, segment 222-1986R is assigned a mitigation selection of SUG, reflecting a balance between modeled baseline risk assessment, mitigation cost-effectiveness, and practical implementation considerations. Scoping and planning for the segment undergrounding work will begin to take place, managed by grid-hardening engineering teams, to proceed forward with the recommended grid-hardening execution for segment 222-1986R.

Figure JW-58
Grid-Hardening Mitigation Selection Process for Segment 222-1986R



2. Recommended Grid Hardening Mitigation Portfolio

Building on the Grid-Hardening Mitigation Selection Process described in Section I.G.1, SDG&E proposes a recommended grid-hardening portfolio consisting of approximately 400 miles of SUG and 200 miles of CCC during the GRC cycle. These recommendations are based on feeder-segment-level evaluation of wildfire, PSPS, and PEDS risk, mitigation lifecycle cost, and BCR results, with selection informed by both expected outcomes and tail-risk considerations. The supporting analysis applies planning-level implementation cost assumptions of $2.32 million per mile for SUG and $1.31 million per mile for CCC, as described in Ex. SDGE-07, Chapter 1[172], and is intended to identify the combination of mitigations that provides the most durable and cost-effective reduction in catastrophic wildfire risk over the planning horizon.

Within this portfolio, the 400-mile SUG target is focused on the highest-risk locations, including areas subject to frequent de-energizations and circuits serving schools, fire and law enforcement stations, and other critical facilities, while the 200-mile CCC target is focused on locations with elevated wildfire, PSPS, and PEDS risk where CCC is identified as effective and appropriate based on model results and site-specific evaluation of system configuration, environmental conditions, and operational considerations, including locations where typical maximum wind gusts are not expected to exceed approximately 50 mph. The proposed pace and composition of both portfolios reflect practical implementation and affordability considerations, including bundling opportunities, construction capacity, material availability, and coordination with communities and permitting agencies. While most segment recommendations directly follow the model and decision-tree outputs, engineering and implementation judgment has also been used in a limited number of cases to override the model-recommended mitigation where practical considerations—such as construction bundling opportunities, coordination with adjacent projects, constructability constraints, or other portfolio-level efficiencies—improve overall execution and affordability without materially reducing risk-reduction benefits. Together, the SUG and CCC portfolios are designed to complement one another by directing SUG to the highest-risk segments requiring the most durable form of hardening, while applying CCC where it can provide efficient and appropriate risk reduction in a more targeted manner. Accordingly, the proposed portfolio represents a reasonable and prudent application of a risk-informed analytical framework and reflects a balanced approach to maximizing wildfire risk reduction while responsibly managing ratepayer impacts. Table JW-49[173] summarizes each in-scope feeder

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[172] Ex. SDGE-07, Chapter 1, Section IV.A.4 Strategic Undergrounding (C510) and Section IV.A.10 Combined Covered Conductor (550).

[173] D.24-12-074 at 483 ("In the next GRC, the Commission expects SDG&E to provide more information, as required by its WMP, including the number of miles of electrical lines it has undergrounded and installed with covered conductor in HFTDs, along with the number of miles of electrical lines it proposes to underground and install with covered conductor in HFTDs, and where.")

segment, its proposed mitigation, associated mileage, BCR results, and any noted deviation from the model-recommended mitigation. For more information about how scenario recommendations are evaluated and specifically the determination of the model recommendation of SUG, CCC or Undetermined, see Section 1.G.1.b

Also noted in Table JW-49, a decision on the proposed mitigation for certain feeder segments has been deferred. The following are potential reasons to postpone feeder-segment projects in this GRC until additional engineering analysis is completed:

- Preliminary engineering did not provide sufficient confidence that the existing route is suitable for undergrounding; therefore, assumptions regarding the overhead (OH) to underground (UG) conversion ratio remain uncertain.
- In areas where wind gusts exceed 50 mph, segments recommended for combined covered conductor installations require additional evaluation, as CCC mitigations offer limited risk reduction during PSPS de-energization events.
- The proposed SUG portfolio has already reached approximately 400 miles based on identified bundling opportunities, limiting capacity for additional feeder-segments.
- Additional field validation, constructability reviews, and cost refinement are needed to ensure project feasibility and alignment with risk-reduction objectives. Potential permitting, environmental, or right-of-way constraints have not yet been fully assessed and could materially impact project timelines and costs.

Deferring these projects allows for more robust engineering validation to ensure that selected mitigation strategies are feasible, cost-effective, and aligned with overall wildfire risk reduction goals.

Table JW-49
Proposed Feeder Segments in Scope for Grid Hardening

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
237-30R Rank: **1** Mit Miles: **40.6**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **34%**, SUG: **66%**, No Mit: **0%** RA: CCC: **37%**, SUG: **63%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (237-2R) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **63 mph**. The segment serves approximately **323** downstream customers including **identified critical facilities, DVCs, and Tribal areas**.
222-1986R Rank: **2** Mit Miles: **24.4**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **22%**, SUG: **78%**, No Mit: **0%** RA: CCC: **24%**, SUG: **76%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1990R) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **64 mph**. The segment serves approximately **305** downstream customers including **identified critical facilities**.
222-1990R Rank: **3** Mit Miles: **17.3**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **22%**, SUG: **78%**, No Mit: **0%** RA: CCC: **22%**,	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1986R) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **75 mph**. The segment serves

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
		SUG: **78%**, No Mit: **0%**	approximately **416** downstream customers including **identified critical facilities, DVCs, and Tribal areas**.
909-451 Rank: **4** Mit Miles: **25.1**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **SUG**	RN: CCC: **47%**, SUG: **53%**, No Mit: **0%** RA: CCC: **51%**, SUG: **49%**, No Mit: **0%**	Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **SUG** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (909-805R) supported the selection of **SUG**. Moreover, the presence of **existing Undergrounding (UG)** influenced the choice to select **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **68 mph**. The segment serves approximately **432** downstream customers including **identified critical facilities, DVCs, and Tribal areas**.
222-2085 Rank: **5** Mit Miles: **29.7**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **8%**, SUG: **92%**, No Mit: **0%** RA: CCC: **9%**, SUG: **91%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1523R, CB PE1) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **88 mph**. The segment serves approximately **1472** downstream customers including **identified critical facilities**.
908-2038R Rank: **6** Mit Miles: **21.7**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **28%**, SUG: **72%**, No Mit: **0%** RA: CCC: **29%**, SUG: **71%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-2** feeder segment is **68 mph**. The segment serves approximately **448** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
524-69R Rank: **7** Mit Miles: **34.6**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **58%,** SUG: **42%,** No Mit: **0%** RA: CCC: **59%,** SUG: **41%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-46R, 524-27R, 524-1782F, CB 524) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **51 mph**. The segment serves approximately **416** downstream customers including **identified critical facilities**.
CB OK1 Rank: **8** Mit Miles: **--**	Model Recommendation: **CCC** Selected Mitigation: **DEFER**	RN: CCC: **54%,** SUG: **46%,** No Mit: **0%** RA: CCC: **54%,** SUG: **46%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
237-2R Rank: **9** Mit Miles: **20.3**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **25%,** SUG: **75%,** No Mit: **0%** RA: CCC: **27%,** SUG: **73%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, **Tail Risk** was a consideration in the decision to select **SUG**. Furthermore, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Moreover, **Bundling** with other segments (237-30R) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **54 mph**. The segment serves approximately **694** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
442-728R Rank: **10** Mit Miles: **27.0**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **11%**, SUG: **89%**, No Mit: **0%** RA: CCC: **11%**, SUG: **89%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **67 mph**. The segment serves approximately **867** downstream customers including **identified critical facilities**.
1458-601R Rank: **11** Mit Miles: **18.8**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **SUG**	RN: CCC: **49%**, SUG: **51%**, No Mit: **0%** RA: CCC: **50%**, SUG: **50%**, No Mit: **0%**	Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **SUG** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **59 mph**. The segment serves approximately **450** downstream customers including **identified critical facilities, DVCs, and Tribal areas**.
157-81R Rank: **12** Mit Miles: **--**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **DEFER**	RN: CCC: **46%**, SUG: **54%**, No Mit: **0%** RA: CCC: **51%**, SUG: **49%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
79-808R Rank: **13** Mit Miles: **--**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **DEFER**	RN: CCC: **48%,** SUG: **52%,** No Mit: **0%** RA: CCC: **50%,** SUG: **50%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
971-2050R Rank: **14** Mit Miles: **25.2**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **22%,** SUG: **78%,** No Mit: **0%** RA: CCC: **23%,** SUG: **77%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. The maximum recorded wind gust for this **Tier-3** feeder segment is **50 mph**. The segment serves approximately **898** downstream customers including **identified critical facilities**.
237-1765R Rank: **15** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **27%,** SUG: **73%,** No Mit: **0%** RA: CCC: **28%,** SUG: **72%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
79-785 Rank: **16** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **19%**, SUG: **81%**, No Mit: **0%** RA: CCC: **21%**, SUG: **79%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
222-2013R Rank: **17** Mit Miles: **15.0**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **12%**, SUG: **88%**, No Mit: **0%** RA: CCC: **12%**, SUG: **88%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **62 mph**. The segment serves approximately **246** downstream customers including **identified critical facilities**.
909-805R Rank: **18** Mit Miles: **16.3**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **SUG**	RN: CCC: **49%**, SUG: **51%**, No Mit: **0%** RA: CCC: **54%**, SUG: **46%**, No Mit: **0%**	Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **SUG** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (909-451) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-2** feeder segment is **68 mph**. The segment serves approximately **149** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
1215-32R Rank: **19** Mit Miles: **--**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **DEFER**	RN: CCC: **48%,** SUG: **52%,** No Mit: **0%** RA: CCC: **53%,** SUG: **47%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
358-682F Rank: **20** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **45%,** SUG: **55%,** No Mit: **0%** RA: CCC: **46%,** SUG: **54%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
1021-1748F Rank: **21** Mit Miles: **18.0**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **46%,** SUG: **54%,** No Mit: **0%** RA: CCC: **48%,** SUG: **52%,** No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-25R, 1021-1760R, 1021-855, 1021-883R, 1021-92) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **48 mph**. The segment serves approximately **864** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
236-1569R Rank: **22** Mit Miles: **--**	Model Recommendation: **CCC** Selected Mitigation: **DEFER**	RN: CCC: **54%**, SUG: **46%**, No Mit: **0%** RA: CCC: **56%**, SUG: **44%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
237-17R Rank: **23** Mit Miles: **--**	Model Recommendation: **CCC** Selected Mitigation: **DEFER**	RN: CCC: **56%**, SUG: **44%**, No Mit: **0%** RA: CCC: **58%**, SUG: **42%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
972-32R Rank: **24** Mit Miles: **--**	Model Recommendation: **CCC** Selected Mitigation: **DEFER**	RN: CCC: **53%**, SUG: **47%**, No Mit: **0%** RA: CCC: **58%**, SUG: **42%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
214-647R Rank: **25** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **22%,** SUG: **78%,** No Mit: **0%** RA: CCC: **22%,** SUG: **78%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
599-19R Rank: **26** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **42%,** SUG: **58%,** No Mit: **0%** RA: CCC: **47%,** SUG: **53%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
448-744R Rank: **27** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **34%,** SUG: **66%,** No Mit: **0%** RA: CCC: **31%,** SUG: **69%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
445-1311R Rank: **28** Mit Miles: **12.2**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **32%,** SUG: **68%,** No Mit: **0%** RA: CCC: **36%,** SUG: **64%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **77 mph**. The segment serves approximately **130** downstream customers including **identified critical facilities, DVCs, and Tribal areas**.
79-1254R Rank: **29** Mit Miles: **11.6**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **22%,** SUG: **78%,** No Mit: **0%** RA: CCC: **22%,** SUG: **78%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **73 mph**. The segment serves approximately **252** downstream customers including **identified critical facilities**.
214-1122R Rank: **30** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **28%,** SUG: **72%,** No Mit: **0%** RA: CCC: **31%,** SUG: **69%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
445-18R Rank: **31** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **42%**, SUG: **58%**, No Mit: **0%** RA: CCC: **49%**, SUG: **51%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
CB PE1 Rank: **32** Mit Miles: **8.2**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **0%**, SUG: **100%**, No Mit: **0%** RA: CCC: **0%**, SUG: **100%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1523R, 222-2085) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **55 mph**. The segment serves approximately **116** downstream customers including **identified critical facilities**.
79-679R Rank: **33** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **20%**, SUG: **80%**, No Mit: **0%** RA: CCC: **21%**, SUG: **79%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
1030-20R Rank: **34** Mit Miles: **19.1**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **12%,** SUG: **88%,** No Mit: **0%** RA: CCC: **13%,** SUG: **87%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (1030-42R, 1030-989R) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **52 mph**. The segment serves approximately **303** downstream customers including **identified critical facilities, DVCs, and Tribal areas**.
221-6R Rank: **35** Mit Miles: **--**	Model Recommendation: **CCC** Selected Mitigation: **DEFER**	RN: CCC: **74%,** SUG: **26%,** No Mit: **0%** RA: CCC: **74%,** SUG: **26%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
350-2192R Rank: **36** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **44%,** SUG: **56%,** No Mit: **0%** RA: CCC: **48%,** SUG: **52%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
971-1973R Rank: **37** Mit Miles: **11.1**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **23%**, SUG: **77%**, No Mit: **0%** RA: CCC: **25%**, SUG: **75%**, No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (CB MOR1) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **48 mph**. The segment serves approximately **305** downstream customers including **identified critical facilities**.
908-2055F Rank: **38** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **39%**, SUG: **61%**, No Mit: **0%** RA: CCC: **43%**, SUG: **57%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
222-1523R Rank: **39** Mit Miles: **10.6**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **0%**, SUG: **100%**, No Mit: **0%** RA: CCC: **0%**, SUG: **100%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (CB PE1, 222-2085) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **55 mph**. The segment serves approximately **492** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
221-1232F Rank: **40** Mit Miles: **9.4**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **17%,** SUG: **83%,** No Mit: **0%** RA: CCC: **22%,** SUG: **78%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **88 mph**. The segment serves approximately **1666** downstream customers including **identified critical facilities**.
157-189R Rank: **41** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **14%,** SUG: **86%,** No Mit: **0%** RA: CCC: **11%,** SUG: **89%,** No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
1030-42R Rank: **42** Mit Miles: **20.4**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **19%,** SUG: **81%,** No Mit: **0%** RA: CCC: **21%,** SUG: **79%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (1030-20R, 1030-989R) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **55 mph**. The segment serves approximately **732** downstream customers including **identified critical facilities, DVCs, and Tribal areas**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
357-45R Rank: **43** Mit Miles: **--**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **DEFER**	RN: CCC: **50%**, SUG: **50%**, No Mit: **0%** RA: CCC: **52%**, SUG: **48%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.
215-1534R Rank: **44** Mit Miles: **9.5**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **47%**, SUG: **53%**, No Mit: **0%** RA: CCC: **47%**, SUG: **53%**, No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. The maximum recorded wind gust for this **Tier-2** feeder segment is **58 mph**. The segment serves approximately **190** downstream customers including **identified critical facilities**.
222-1433R Rank: **45** Mit Miles: **--**	Model Recommendation: **SUG** Selected Mitigation: **DEFER**	RN: CCC: **35%**, SUG: **65%**, No Mit: **0%** RA: CCC: **35%**, SUG: **65%**, No Mit: **0%**	Deferred due to additional engineering requirements; ongoing asset inspections, PSPS, and situational awareness will continue as interim operational measures.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
176-197F Rank: **46** Mit Miles: **13.5**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **23%,** SUG: **77%,** No Mit: **0%** RA: CCC: **26%,** SUG: **74%,** No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (176-161R, 176-1834R) supported the selection of **CCC**. Furthermore, the presence of **existing Covered Conductor (CC)** and **existing steel poles** were factors in the decision to select **CCC**. Having both can further reduce installation costs and complexity, as the infrastructure is already partially upgraded. The maximum recorded wind gust for this **Tier-3** feeder segment is **50 mph**. The segment serves approximately **524** downstream customers including **identified critical facilities**.
1030-989R Rank: **47** Mit Miles: **23.8**	Model Recommendation: **SUG** Selected Mitigation: **SUG**	RN: CCC: **23%,** SUG: **77%,** No Mit: **0%** RA: CCC: **27%,** SUG: **73%,** No Mit: **0%**	**Scenario analysis** indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (1030-20R, 1030-42R) supported the selection of **SUG**. The maximum recorded wind gust for this **Tier-3** feeder segment is **66 mph**. The segment serves approximately **154** downstream customers including **identified critical facilities**.
176-161R Rank: **61** Mit Miles: **10.7**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **39%,** SUG: **61%,** No Mit: **0%** RA: CCC: **44%,** SUG: **56%,** No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (176-197F, 176-1834R) supported the selection of **CCC**. Furthermore, the presence of **existing Covered Conductor (CC)** and **existing steel poles** were factors in the decision to select **CCC**. Having both can further reduce installation costs and complexity, as the infrastructure is already partially upgraded. The maximum recorded wind gust for this **Tier-3** feeder segment is **53 mph**. The segment serves approximately **809** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
67-34R Rank: **75** Mit Miles: **20.6**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **54%,** SUG: **46%,** No Mit: **0%** RA: CCC: **55%,** SUG: **45%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (67-1728R, 67-1726R, 67-1724R) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **52 mph**. The segment serves approximately **593** downstream customers including **identified critical facilities**.
524-46R Rank: **87** Mit Miles: **12.6**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **54%,** SUG: **46%,** No Mit: **0%** RA: CCC: **56%,** SUG: **44%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-69R, 524-27R, 524-1782F, CB 524) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **51 mph**. The segment serves approximately **736** downstream customers including **identified critical facilities**.
1021-25R Rank: **113** Mit Miles: **7.1**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **42%,** SUG: **58%,** No Mit: **0%** RA: CCC: **42%,** SUG: **58%,** No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-1760R, 1021-855, 1021-883R, 1021-92) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **42 mph**. The segment serves approximately **80** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
176-1834R Rank: **114** Mit Miles: **9.1**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **28%,** SUG: **72%,** No Mit: **0%** RA: CCC: **30%,** SUG: **70%,** No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (176-197F, 176-161R) supported the selection of **CCC**. Furthermore, the presence of **existing Covered Conductor (CC)** and **existing steel poles** were factors in the decision to select **CCC**. Having both can further reduce installation costs and complexity, as the infrastructure is already partially upgraded. The maximum recorded wind gust for this **Tier-3** feeder segment is **53 mph**. The segment serves approximately **1179** downstream customers including **identified critical facilities**.
524-27R Rank: **135** Mit Miles: **14.8**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **57%,** SUG: **43%,** No Mit: **0%** RA: CCC: **57%,** SUG: **43%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-69R, 524-46R, 524-1782F, CB 524) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **33 mph**. The segment serves approximately **1103** downstream customers including **identified critical facilities**.
CB MOR1 Rank: **157** Mit Miles: **3.6**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **51%,** SUG: **49%,** No Mit: **0%** RA: CCC: **53%,** SUG: **47%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (971-1973R) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-2** feeder segment is **48 mph**. The segment serves approximately **102** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
67-1728R Rank: **162** Mit Miles: **13.8**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **58%,** SUG: **40%,** No Mit: **2%** RA: CCC: **62%,** SUG: **38%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (67-34R, 67-1726R, 67-1724R) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **48 mph**. The segment serves approximately **156** downstream customers including **identified critical facilities**.
67-1726R Rank: **213** Mit Miles: **10.4**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **56%,** SUG: **40%,** No Mit: **4%** RA: CCC: **62%,** SUG: **38%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (67-34R, 67-1728R, 67-1724R) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **52 mph**. The segment serves approximately **107** downstream customers including **identified critical facilities**.
524-1782F Rank: **226** Mit Miles: **8.7**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **63%,** SUG: **37%,** No Mit: **0%** RA: CCC: **63%,** SUG: **37%,** No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-69R, 524-46R, 524-27R, CB 524) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **33 mph**. The segment serves approximately 1243 downstream customers.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
1021-1760R Rank: **232** Mit Miles: **3.0**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **CCC**	RN: CCC: **48%,** SUG: **52%,** No Mit: **0%** RA: CCC: **52%,** SUG: **48%,** No Mit: **0%**	Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-855, 1021-883R, 1021-92) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **53 mph**. The segment serves approximately **212** downstream customers including **identified critical facilities**.
1021-855 Rank: **281** Mit Miles: **3.0**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **42%,** SUG: **58%,** No Mit: **0%** RA: CCC: **43%,** SUG: **57%,** No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-1760R, 1021-883R, 1021-92) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **47 mph**. The segment serves approximately 42 downstream customers.
67-1724R Rank: **322** Mit Miles: **8.4**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **CCC**	RN: CCC: **0%,** SUG: **0%,** No Mit: **100%** RA: CCC: **61%,** SUG: **39%,** No Mit: **0%**	Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (67-34R, 67-1728R, 67-1726R) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **48 mph**. The segment serves approximately **82** downstream customers including **identified critical facilities**.

Segment Attributes	Mitigation	CCC vs SUG frequency for Risk Neutral vs Risk Averse	Justification Paragraph
1021-883R Rank: **439** Mit Miles: **0.7**	Model Recommendation: **CCC** Selected Mitigation: **CCC**	RN: CCC: **53%**, SUG: **47%**, No Mit: **0%** RA: CCC: **51%**, SUG: **49%**, No Mit: **0%**	**Scenario analysis** indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-1760R, 1021-855, 1021-92) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **47 mph**. The segment serves approximately 8 downstream customers.
CB 524 Rank: **490** Mit Miles: **3.5**	Model Recommendation: **UNDETERMINED** Selected Mitigation: **CCC**	RN: CCC: **0%**, SUG: **0%**, No Mit: **100%** RA: CCC: **40%**, SUG: **26%**, No Mit: **33%**	Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (524-69R, 524-46R, 524-27R, 524-1782F) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **38 mph**. The segment serves approximately **1779** downstream customers including **identified critical facilities**.
1021-92 Rank: **532** Mit Miles: **0.5**	Model Recommendation: **SUG** Selected Mitigation: **CCC**	RN: CCC: **24%**, SUG: **76%**, No Mit: **0%** RA: CCC: **35%**, SUG: **65%**, No Mit: **0%**	Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-1760R, 1021-855, 1021-883R) supported the selection of **CCC**. The maximum recorded wind gust for this **Tier-3** feeder segment is **47 mph**. The segment serves approximately 4 downstream customers.

H. Sensitivity Analysis[174]

SDG&E utilized results from WiNGS-Planning to perform sensitivity analyses evaluating the key variables that influence the cost-effectiveness metric used in decision-making, the Benefit-Cost Ratio (BCR). The approach involves varying a single input parameter while holding all other input parameters constant to evaluate BCR outcome sensitivities.

For each scenario, feeder-segment-level scatter plots were produced comparing SUG BCR values on the x-axis and CCC BCR values on the y-axis. Each point represents an individual feeder segment and reflects the modeled response to the parameter variation.

The following sections present the sensitivity analysis results for four parameters with the greatest impact on the BCR; Risk Aversion Factor, Climate Change Factor, CCC Mitigation Effectiveness, and CCC & SUG Implementation Cost.

For visualization purposes, SDG&E presents plots showing the top 100 feeder segments with the highest baseline risk values. The statistical results reported in the accompanying tables are calculated using the same set of 100 feeder segments to maintain analytical consistency.

In addition, a display window filter is applied to the scatter plots to limit the visible plotting range to a predefined window. The display window filter affects visualization only and does not exclude any data points from the underlying analysis or statistical calculations.

By constraining the visible plotting range, the display window filter improves visual clarity and supports interpretation of overall trends within the primary concentration of data points, while the complete dataset is retained for analytical purposes

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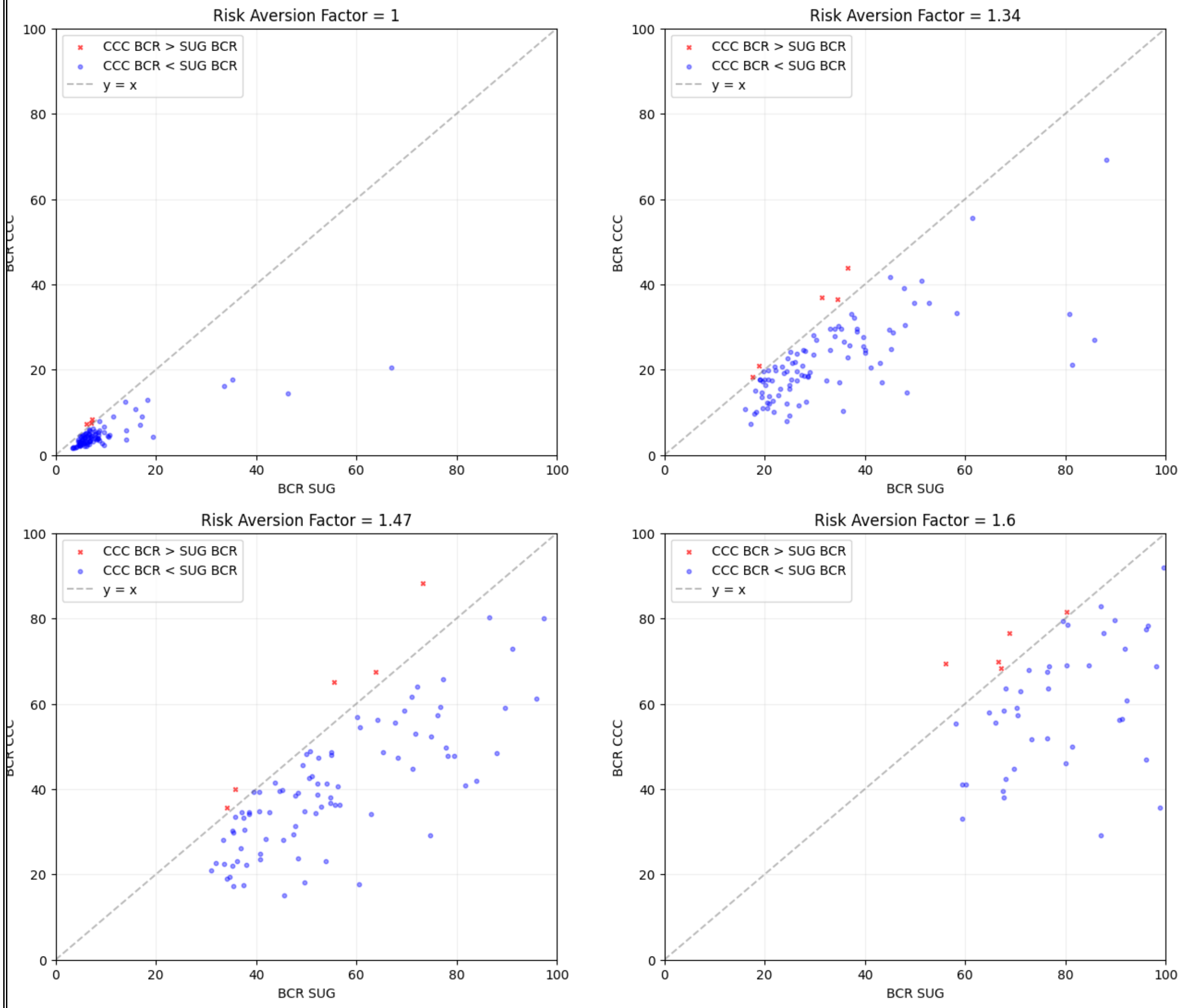
[174] *See supra* notes 130, 96, and 97.

1. Risk Aversion Factor Sensitivity Analysis[175]

FIGURE JW-59
Sensitivity Analysis Scatter Plot Across Different Risk Aversion Assumptions



SDG&E conducted an analysis to evaluate the impact of varying the Risk Aversion Factor within the risk calculation framework, assessing the sensitivity of BCRs to different levels of risk aversion. The purpose is to evaluate how mitigation prioritization and cost-effectiveness results respond to alternative assumptions regarding risk aversion, particularly for

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[175] SPD Evaluation Report at 146 (Recommendation #13: SDG&E should clearly document and explain both the justification for applying risk scaling and the process used to apply it to any segment when: a. Risk scaling results in the segment being included in or excluded from SDG&E's grid hardening plan. b. Risk scaling causes significant changes to the segment's tranche assignment.).

low-probability, high-consequence wildfire events. The results indicate that increasing or decreasing the Risk Aversion Factor does not change the preferred mitigation outcome. Across all evaluated scenarios, SUG is identified as the preferred mitigation option, with an Average SUG BCR/CCC BCR ratio ranging from 1.4 to 2.3. The analysis supports regulatory transparency by demonstrating that mitigation recommendations remain robust under a reasonable range of risk aversion assumptions.

The evaluated Risk Aversion Factor values included no adjustment, or risk neutral (1.00), the default risk aversion scaling (1.47), and additional representative values cited in Department of Energy (DOE) and Gas Research Institute (GRI) studies referenced in the 2025 RAMP, Volume 1, Chapter 3 (Risk Quantification Framework, pages 24–25), specifically 1.34 and 1.60.

BCRs were then calculated for two grid hardening mitigation alternatives, SUG and CCC, at the feeder segment level for each risk aversion factor assumption. Summary statistics supporting these scatter plots are provided in Table JW-50.

TABLE JW-50
Benefit-Cost Ratio Statistics Under Alternative Risk Aversion Assumptions

Risk Aversion Factor	Total segments	Number of segments shown in chart*	Percentage of feeder segments above y = x (CCC > SUG)	Percentage of feeder segments below y = x (CCC < SUG)	Average of CCC BCR	Average of SUG BCR	Average SUG BCR/CCC BCR ratio
1	100	99	3%	97%	4.8	11.2	2.3
1.34	100	100	5%	95%	22.4	32.4	1.4
1.47	100	92	5%	95%	43.3	60.6	1.4
1.6	100	46	8%	92%	85.6	116.8	1.4

***To improve visibility, the chart displays only points within the axis limits.**

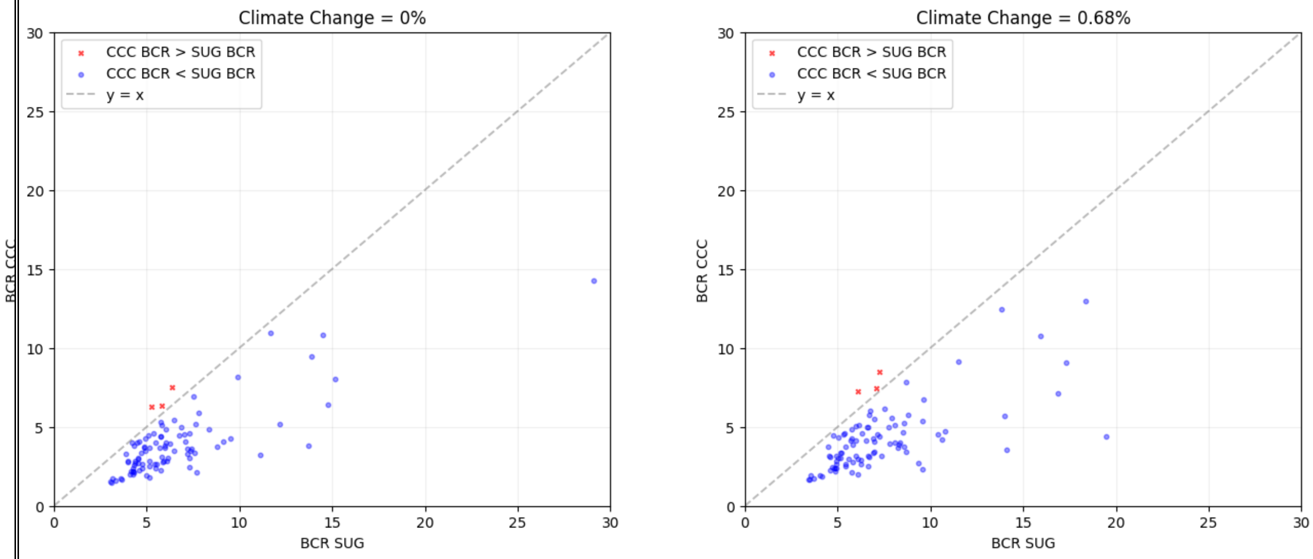
The results indicate that increasing the Risk Aversion Factor increases the average BCR for both mitigation alternatives across the evaluated feeder segments. Across all evaluated Risk Aversion Factor values, the average SUG BCR remains higher than the average CCC BCR.

This relationship is also reflected in the scatter plot distributions relative to the y = x reference line, where points below the line indicate feeder segments for which the SUG BCR exceeds the CCC BCR.

For each evaluated Risk Aversion Factor value, the percentage of feeder segments plotted below the y = x line is greater than the percentage plotted above the line. This pattern indicates that, under the evaluated assumptions, SUG is more frequently associated with higher BCRs than CCC at the feeder-segment level. The results show that increasing or decreasing assumptions about risk aversion changes the emphasis placed on rare, high-consequence events but does not materially alter feeder-level mitigation prioritization. SUG continues to perform favorably across the range of risk aversion assumptions evaluated, indicating that mitigation results are not dependent on a single view of risk aversion.

2. Climate Change Factor Scenario Sensitivity Analysis

FIGURE JW-60
Sensitivity Analysis Scatter Plot Across Different Climate Change Factors



SDG&E conducted a sensitivity analysis to evaluate how mitigation prioritization and benefit-cost results change under alternative assumptions about future wildfire risk associated with climate change. Under all assumptions, the average SUG/CCC BCR ratio is greater than one, ranging from 1.8 to 2.3, which demonstrate that mitigation recommendations remain prudent and cost-effective across a reasonable range of climate projections. The analysis varied the climate change factor between two values, zero and 0.68 percent, while holding all other input parameters constant. The zero value represents a no–climate change baseline, while the 0.68 percent value reflects the internal estimate of the climate change factor used in the model.

Table JW-51 presents summary statistics for the resulting BCRs under the CCC and SUG plans.

TABLE JW-51
Benefit Cost Ratio Statistics Under Alternative Climate Change Factor Scenarios

Climate Change Factor	Total segments	Number of segments shown in chart*	Percentage of feeder segments above y = x (CCC > SUG)	Percentage of feeder segments below y = x (CCC < SUG)	Average of CCC BCR	Average of SUG BCR	Average SUG BCR/CCC BCR ratio
0%	100	96	3%	97%	4.3	7.9	1.8
0. 68%	100	95	3%	97%	4.8	11.2	2.3

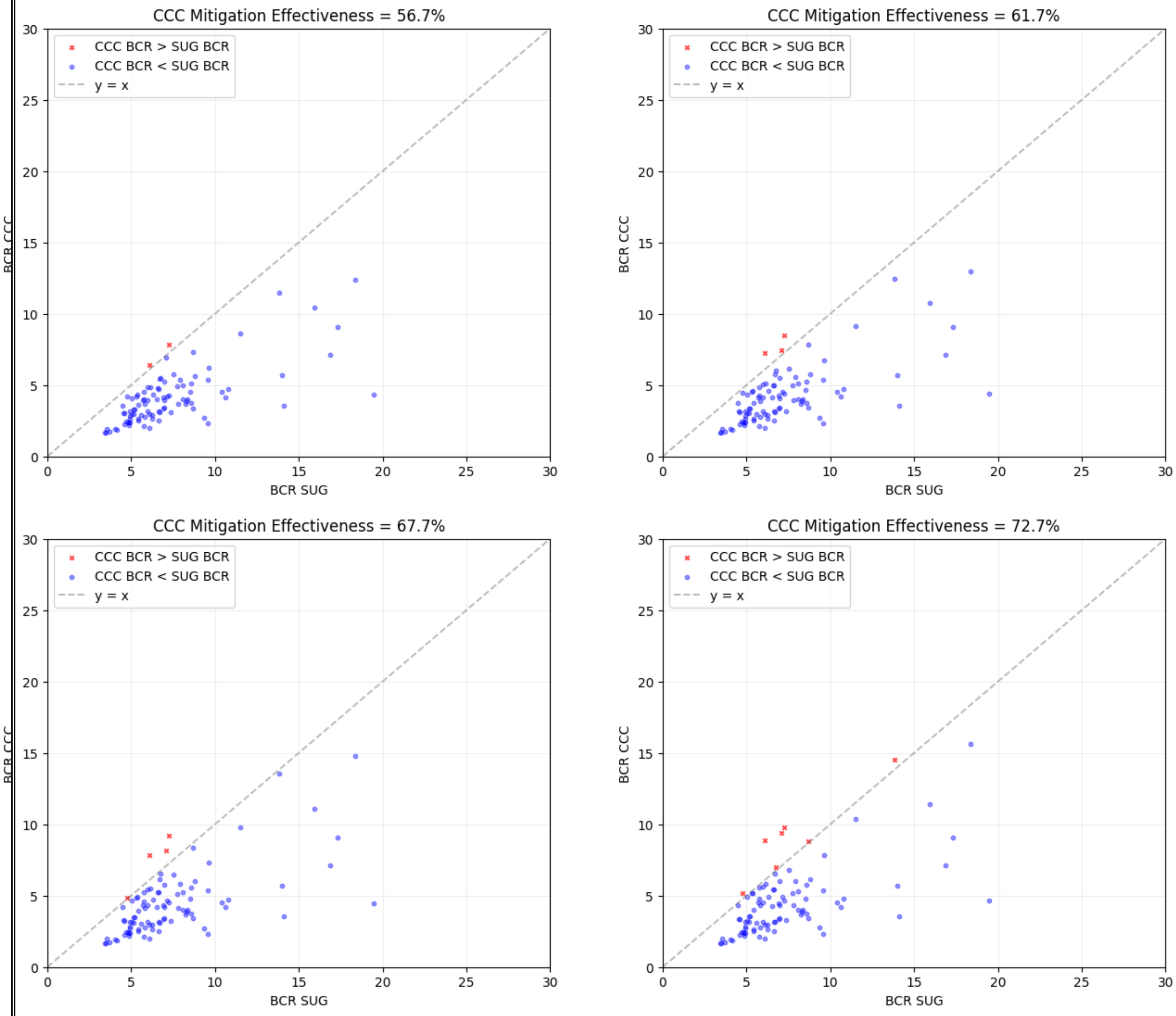
*** To improve visibility, the chart displays only points within the axis limits.**

The statistics in Table JW-51 show that the number of feeder segments with SUG BCR values exceeding CCC BCR values is materially greater than the number of segments where the opposite relationship occurs. In the scatter plots, this relationship is reflected by a higher concentration of points below the diagonal reference line. This distribution indicates that, for the majority of the analyzed segments, SUG yields higher BCRs than CCC. As the climate change factor increases from 0% to 0.68%, the average BCRs for both CCC and SUG increases. In both cases, the SUG BCR exceeds the CCC BCR.

Overall, the results show that SUG delivers higher benefit cost performance than CCC at the feeder segment level under all climate change factors evaluated. While incorporating climate change increases projected wildfire risk and associated benefits, SUG remains more cost effective on average even without climate adjustments, demonstrating that its relative performance is robust across climate assumptions.

3. CCC Mitigation Effectiveness Sensitivity Analysis

FIGURE JW-61
Sensitivity Analysis Scatter Plots Across CCC Mitigation Effectiveness Assumptions

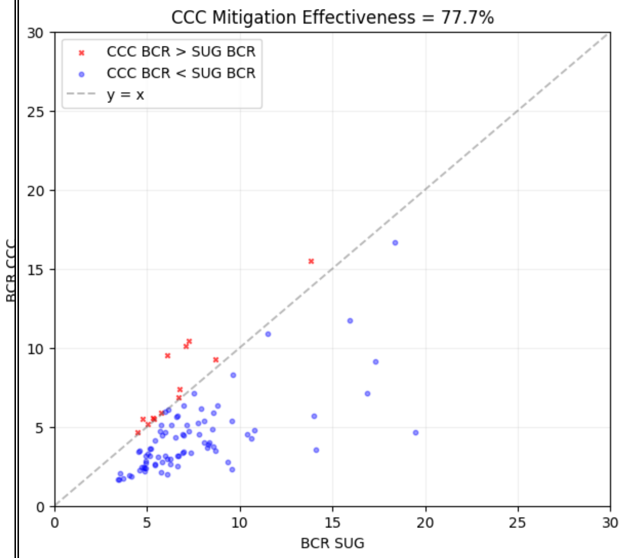


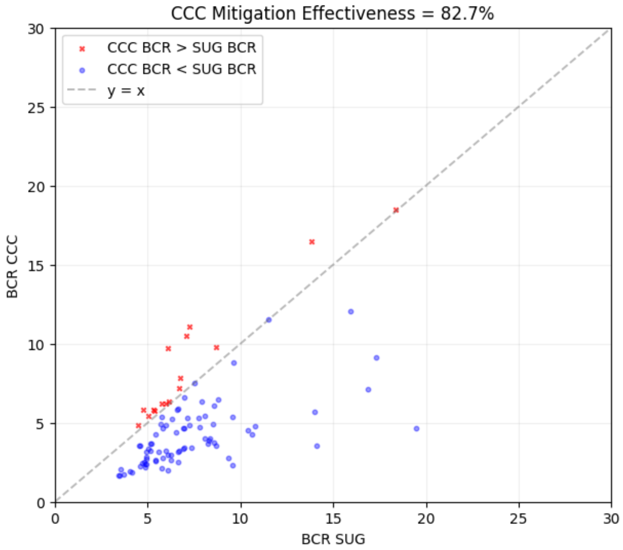
CCC Mitigation Effectiveness = 56.7%

CCC Mitigation Effectiveness = 61.7%

CCC Mitigation Effectiveness = 67.7%

CCC Mitigation Effectiveness = 72.7%





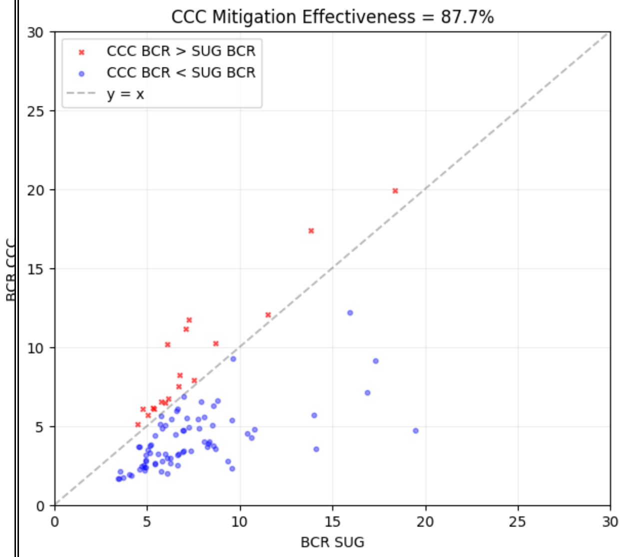


TABLE JW-52

Benefit Cost Ratio Statistics Under Alternative CCC Mitigation Effectiveness Assumptions

CCC Mitigation Effectiveness	Total segments	Number of segments shown in chart*	Percentage of feeder segments above y = x (CCC > SUG)	Percentage of feeder segments below y = x (CCC < SUG)	Average of CCC BCR	Average of SUG BCR	Average SUG BCR/CCC BCR ratio
56.7%	100	95	2%	98%	4.7	11.2	2.4
61.7%	100	95	3%	97%	4.8	11.2	2.3
67.7%	100	95	4%	96%	5.0	11.2	2.3

CCC Mitigation Effectiveness	Total segments	Number of segments shown in chart*	Percentage of feeder segments above y = x (CCC > SUG)	Percentage of feeder segments below y = x (CCC < SUG)	Average of CCC BCR	Average of SUG BCR	Average SUG BCR/CCC BCR ratio
72.7%	100	95	7%	93%	5.1	11.2	2.2
77.7%	100	95	13%	87%	5.3	11.2	2.1
82.7%	100	95	16%	84%	5.4	11.2	2.1
87.7%	100	95	18%	82%	5.5	11.2	2.0

*** To improve visibility, the chart displays only points within the axis limits.**

SDG&E conducted a sensitivity analysis to evaluate how mitigation prioritization and benefit-cost results are affected by uncertainty in the assumed mitigation effectiveness of CCC at reducing wildfire risk.

Across all evaluated scenarios, SUG is identified as the preferred mitigation option, with an average SUG BCR/CCC BCR ratio ranging from 2 to 2.4, which confirms that mitigation recommendations remain stable across a reasonable range of performance assumptions and remain consistent under alternative mitigation effectiveness estimates.

The analysis varied CCC mitigation effectiveness while holding all other model input parameters constant, including SUG mitigation effectiveness, which was fixed at 98% for all scenarios. The sensitivity analysis evaluated seven CCC mitigation effectiveness scenarios relative to the current baseline value of 61.7% as well as values within roughly a -5% to +25% confidence interval.

For each CCC mitigation effectiveness scenario, SDG&E calculated the resulting SUG and CCC BCRs while holding all other input parameters constant and applied the same benefit and cost methodologies used in the base-case analysis.

Table JW-52 and Figure JW-61 present the results of the sensitivity analysis. The results show that CCC BCRs increase as CCC mitigation effectiveness increases, while SUG BCRs remain unchanged under those varied model assumptions. As CCC mitigation effectiveness increases, the percentage of segments recommended for CCC increases from 2% to 18%. This pattern reflects the relative sensitivity of CCC benefits to assumed mitigation effectiveness.

Across all evaluated scenarios, the average BCR for SUG remains higher than that for CCC. Additionally, across all scenarios, more than approximately 80 percent of feeder segments fall below the y = x reference line and only a limited number of segments fall above this line, indicating that SUG generally demonstrates stronger benefit-cost performance than CCC under the modeled assumptions.

4. CCC/SUG Implementation Cost Per Mile Sensitivity Analysis

FIGURE JW-62
Implementation Cost Sensitivity Analysis Scatter Plots

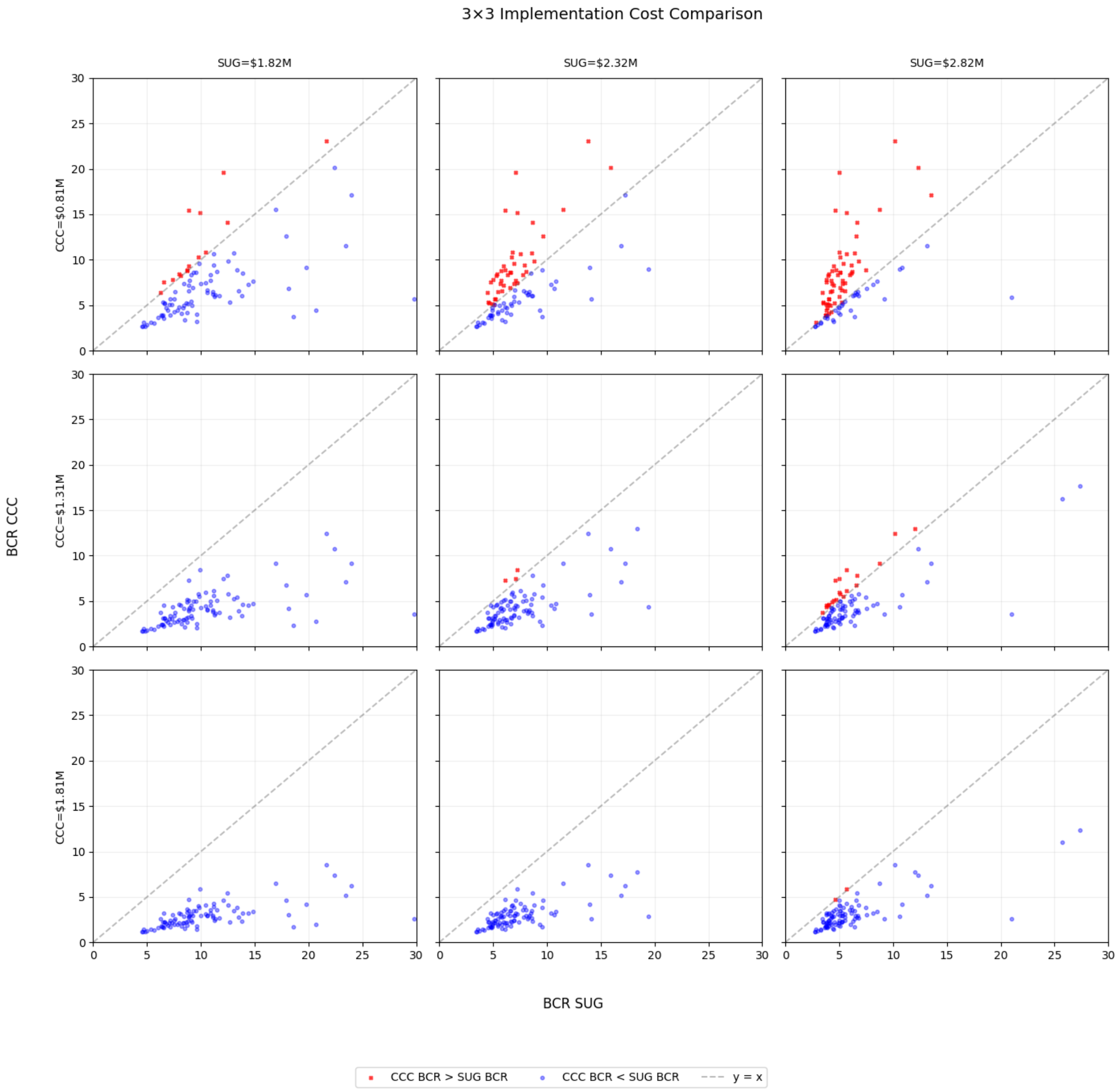


TABLE JW-53
Benefit Cost Ratio Statistics Across Different CCC & SUG Implementation Cost Values

CCC Implementation Cost Per Mile ($M)	SUG Implementation Cost Per Mile ($M)	Total segments	Number of segments shown in chart*	Percentage of feeder segments above y = x (CCC > SUG)	Percentage of feeder segments below y = x (CCC < SUG)	Average of CCC BCR	Average of SUG BCR	Average SUG BCR/CCC BCR ratio
0.81	1.82	100	94	16	84	8.6	14.4	1.7
0.81	2.32	100	94	44	56	8.6	11.2	1.3
0.81	2.82	100	95	65	35	8.6	6.8	0.8
1.31	1.82	100	94	0	100	4.8	14.4	3.0
1.31	2.32	100	95	3	97	4.8	11.2	2.3
1.31	2.82	100	98	20	80	4.8	6.8	1.4
1.81	1.82	100	94	0	100	3.4	14.4	4.3
1.81	2.32	100	95	0	100	3.4	11.2	3.3
1.81	2.82	100	98	2	98	3.4	6.8	2.0

*** To improve visibility, the chart displays only points within the axis limits.**

One of the input parameters in SDG&E's BCRs calculations is CCC and SUG mitigation implementation cost per mile. SDG&E conducted a sensitivity analysis to examine how mitigation selection and benefit-cost outcomes respond to alternative implementation cost assumptions for CCC and SUG. The intent is to understand the extent to which relative cost assumptions influence mitigation preferences and to confirm that recommended mitigation portfolio remains appropriate across plausible cost ranges.

For CCC, three implementation cost assumptions are considered, a default value of $1.31 million/mile and a confidence interval of ±$500,000, resulting in low and high cases of $0.81 million/mile and $1.81 million/mile. For SUG, similarly three implementation cost assumptions are estimated, a default value of $2.32 million/mile and a confidence interval of ±$500,000, resulting in low and high cases of $1.82 million/mile and $2.82 million/mile, respectively.

To assess sensitivity to implementation cost assumptions, all nine combinations of CCC and SUG implementation costs are evaluated. Each combination was assessed at the feeder-segment level using consistent benefit assumptions and identical analytical structure. The results demonstrate a systematic cost-driven tradeoff between the two mitigation options. As SUG implementation cost increases, a greater number of feeder segments plot above the y=x line, indicating that CCC provides a higher BCR for those segments. Conversely, as CCC implementation cost increases, a greater number of segments plot below the diagonal, indicating that SUG provides a higher BCR.

As captured in Figure JW-62, across most cost combinations, the distribution of feeder segments is concentrated below the diagonal. This pattern indicates that SUG generally provides higher BCR than CCC at the feeder-segment level under a wide range of implementation cost values.

As detailed in Table JW-53, CCC becomes materially competitive only under scenarios that combine lower CCC implementation cost assumptions with higher SUG implementation cost assumptions. When CCC cost is assumed to be $0.81 million/mile, the share of feeder segments for which CCC BCR outperforms SUG BCR increases substantially as SUG cost increases, rising from approximately 16 percent to 44 percent and then to 65 percent.

When CCC capital cost increases to $1.31 million or $1.81 million, CCC's relative advantage largely dissipates. Under these assumptions, only 0 to 20 percent of feeder segments plot above the y=x line, with most scenarios near zero. SUG remains the preferred mitigation for approximately 80 to 100 percent of segments.

Overall, the sensitivity analysis indicates that SUG is the more cost-effective mitigation option for the majority of feeder segments across a broad range of implementation cost assumptions. Across the scenarios evaluated, SUG generally exhibits higher average benefit-cost ratios than CCC, with feeder-segment comparisons showing that most segments fall below the y = x reference line. CCC becomes competitive in only one of the nine cost combinations evaluated, specifically when lower CCC cost assumptions are paired with higher SUG cost assumptions, suggesting that relative mitigation performance remains stable across appropriate implementation cost ranges.

5. CCC with Solar plus Battery Storage[176]

As part of an additional BCR sensitivity analysis, SDG&E evaluates an illustrative extreme case in which CCC is deployed in combination with solar plus battery storage (SBS). This mitigation alternative is assumed to achieve approximately 98% wildfire risk reduction, consistent with the assumed effectiveness of SUG, while incorporating the combined costs of CCC installation and SBS deployment. This scenario is intentionally designed as an

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[176] A.22-05-015/016 Track 3, Ex. PCF-47 at 40-42 and Ex. PCF-59 at 22-24.

upper-bound sensitivity case, representing an unrealistic best-case outcome for CCC + SBS, rather than a practical base-case assumption for decision-making.

Under this unrealistic best-case configuration, CCC + SBS produces consistently lower BCRs relative to standalone SUG or CCC alternatives. Despite these lower BCRs, SDG&E notes that CCC + SBS may remain a viable mitigation option in specific circumstances, such as locations where undergrounding is infeasible due to terrain, environmental, or permitting constraints, or where resiliency and customer reliability benefits associated with distributed energy resources provide incremental value not fully captured in the wildfire risk reduction framework.

For modeling simplicity and to reflect a standardized, cost-efficient implementation approach, the SBS system is assumed to be uniform in size across all residential customers and separately uniform across all non-residential customers. In addition, SBS is modeled as a one-time installation applied consistently across customers, independent of individual load profiles, system-sizing requirements, or site-specific feasibility considerations (e.g., available space or interconnection constraints). Accordingly, this representation is not intended to capture the full range of potential design variability, but rather to provide a simplified and consistent basis for comparing relative costs and risk reduction outcomes across mitigation strategies.

SDG&E recognizes that assuming a single SBS installation over a 55-year evaluation period is not realistic; this assumption is used solely for modeling simplicity and to establish a best-case BCR benchmark for Solar and SBS relative to SUG and CCC. In practice, system components have differing useful lives, with solar panels typically lasting 25 to 30+ years, while inverters and battery storage systems generally require replacement every 10 to 15 years. While not modeled in this sensitivity analysis, incorporating these additional replacement cycles over the 55-year horizon would materially decrease the BCR of the CCC + SBS mitigation.

The installation and annual O&M costs for the SBS mitigation are summarized in Table JW-54.

TABLE JW-54
CapEx and OpEx Costs for SBS

Item	**Residential Solar (7.9kW) + Battery System (5kW-12.5kWh)**	**Non-Residential Solar (200kW) + Battery System (200 - 1,600kWh)**
CAPEX Solar System	$0.0219M /customer	$0.3834M /customer

Item	Residential Solar (7.9kW) + Battery System (5kW-12.5kWh)	Non-Residential Solar (200kW) + Battery System (200 - 1,600kWh)
Solar OPEX	$0.0002M /customer/year	$0.0039M /customer/year
CAPEX Battery System	$0.0187M /customer	$0.6343M /customer
Battery OPEX	$0.0005M /customer/year	$0.0153M /customer/year
OPEX Solar + Battery System	$0.0007M /customer/year	$0.0191M /customer/year

In the BCR workpapers, SDG&E enables key SBS assumptions to be varied, allowing for sensitivity analyses and comparison of resulting BCRs against SUG and CCC alternatives at the feeder-segment level.

I. Segment Profile Cards

The Segment Profile Cards in Appendix F provide a standardized summary of wildfire, PSPS and PEDS risk and mitigations evaluated for high-risk distribution segments across the service territory. Each card presents the relative risk ranking of a segment compared to other high-risk segments, characterizes the underlying drivers of risk, and evaluates available hardening strategies. The cards summarize the lifecycle costs of each hardening method, the level of risk reduction achieved, and the resulting cost-effectiveness. Together, these profiles support consistent comparison across segments and provide a transparent basis for selecting mitigation strategies that balance wildfire risk reduction and cost.

Each Segment Profile Card consists of the following visuals and charts:

- Title: Displays the selected feeder segment ID, the segment's risk rank (using SDG&E's default model assumptions for key input parameters), the proposed mitigation (SUG, CCC, or No Mitigation), downstream customer information, the applicable HFTD tier, and any relevant segment attributes, including critical facilities and community designations.
- Description: Describes the selected feeder segment and key considerations in the mitigation selection decision-making process.
- Circuit Map: Displays the geographic location of the selected feeder segment within the service territory, including upstream and downstream segments, and weather station information.
- Risk Rank Comparison Chart: Compares the Risk Rank and the Total Monetized Risk of the selected feeder segment against other segments in the HFTD.

- PSPS Event Duration Chart: Displays the total historical annual PSPS outage duration (hours) for the selected feeder segment, illustrating potential PSPS impact reduction achieved through SUG.
- Lifecycle Cost Over 55 Years Chart: Compares the Implementation and Long-Term Operational Mitigation Costs of SUG and CCC for the selected feeder segment, estimating when the cost of ownership for CCC will exceed SUG.
- Upstream Hardened Miles Chart: Summarizes the current, as-built hardening condition of the selected feeder segment and related segments on the same circuit.
- Risk Breakdown Chart: Estimates the risk buydown of SUG and CCC for the selected feeder segment as well as the residual risk to be managed by asset inspections, PSPS + Situational Awareness.
- Cost-Effectiveness – Mitigation Selection Scenarios Chart: Compares the BCR performance of SUG and CCC across hundreds of simulated mitigation selection scenarios, incorporating multiple parameter permutations with and without risk aversion.

1. Title

The Title identifies the selected feeder segment and summarizes key segment attributes. This includes the feeder segment ID, the segment's risk rank, the selected mitigation, downstream customer information, the applicable HFTD tier, and any relevant segment attributes, including critical facilities and community designations. These fields provide geographic and customer-context information and support interpretation of the segment's potential community and customer impacts.

The Rank field identifies the risk rank of the selected segment. The risk rank is determined using SDG&E's default model assumptions for key input parameters. These default assumptions correspond to the Default Scenario shown in the Cost-Effectiveness – Mitigation Selection Scenarios Chart. The risk rank provides a relative comparison of the selected segment's modeled risk against other segments in the service territory and should be read together with the Risk Rank Comparison Chart.

The Mitigation field identifies the mitigation option proposed for the segment, which may be SUG, CCC, or No Mitigation. This field summarizes the selected outcome from the Grid-Hardening Mitigation Selection Process (see Section I.G for details).

The downstream customer information provides customer exposure context for the selected feeder segment.

- Downstream Customers: Number of all customer meters (Residential and C&I) downstream of the selected segment.
- Residential: Number of all residential customer meters downstream of the selected segment.
- Commercial: Number of all commercial customer meters downstream of the selected device.
- Access and Functional Needs (AFN) Customers: Number of all customers within the AFN[177] community, including those who rely on uninterrupted power for their health and safety.

The Community field identifies applicable community information for the selected segment. Community information may include DVCs, Tribal communities, and critical facilities.

2. Description

The Description describes the selected feeder segment and key considerations in the mitigation selection decision-making process. For additional information on selection justification, see Table JW-49.

3. Circuit Map

The Circuit Map shows the selected feeder segment's geographic location within the service territory. The map identifies the selected segment in relation to nearby upstream and downstream segments and other segments at the same level as the selected segment. This grid-topology context supports interpretation of the segment's risk profile, customer exposure, PSPS exposure, and mitigation options (CCC or SUG).

The map legend distinguishes the selected segment from related circuit segments.

- Segments in purple ("Upstream") are segments electrically upstream of the selected segment.
- Segments in blue ("Downstream") are segments electrically downstream of the selected segment.
- Segments in gray ("Other branches") are other segments on the same circuit that are at the same level as the selected segment. These other branches are neither upstream nor downstream of the selected segment.

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[177] CPUC, *Evolution of PSPS Guidelines, available at:* http://cpuc.ca.gov/consumer-support/psps/evolution-of-psps-guidelines.

The map also displays weather station information, which identifies the weather station name and the historical maximum wind gust observed at that station.

These map features provide geographic context for localized risk drivers, including circuit topology and weather exposure. This context is relevant because the WiNGS-Planning model suite evaluates risk using localized inputs, including weather, vegetation, asset conditions, topography, and feeder-segment-level system configuration (Section I.D).

4. Risk Rank Comparison Chart

The Risk Rank Comparison Chart shows the selected segment's risk neutral risk rank and total monetized risk relative to other evaluated segments. The horizontal x-axis shows segment risk rank, with a rank of 1 representing the highest-risk segment. The vertical y-axis shows total monetized risk, which reflects the modeled Wildfire, PSPS, and PEDS risk calculated by the WiNGS-Planning model suite (Section I.D).

The displayed risk ranks are determined using SDG&E's default model assumptions for key input parameters. These default assumptions correspond to the default risk-neutral scenario identified by the diamond symbol in the Cost-Effectiveness – Mitigation Selection Scenarios Chart. The key input parameters include, but are not limited to, Risk Aversion Factor, Climate Change Factor, CCC Mitigation Effectiveness, SUG Mitigation Effectiveness, CCC Implementation Cost Per Mile, and SUG Implementation Cost Per Mile. The default values for these parameters are detailed in Table JW-43.

The yellow diamond symbol in the Risk Rank Comparison Chart identifies the selected segment. The green dots identify segments included in the proposed 2028 GRC grid hardening portfolio. The gray line shows the risk ranks of other segments in the HFTD. Together, these markers show whether the selected segment is among the highest-risk segments and how its total monetized risk compares with both GRC portfolio segments and other segments in the HFTD.

The chart also reports the selected segment's monetized risk percentile and total monetized risk. The percentile indicates where the selected segment falls within the risk distribution of evaluated segments. A higher percentile indicates that the segment has higher modeled risk than a larger share of segments. The total monetized risk value reports the selected segment's modeled risk in dollars under the default model assumptions.

The chart should be interpreted as a relative ranking and context-setting visual. It does not determine the proposed mitigation by itself. Instead, it provides supporting context for the segment's risk position.

5. PSPS Event Duration Chart

The PSPS Event Duration Chart shows the total historical annual PSPS outage duration, in hours, from 2017 to 2025 for the selected feeder segment. Each annual bar represents the cumulative duration of PSPS outages affecting the selected segment in that year. The "Total" bar represents the sum of PSPS outage duration across the 2017-2025 historical period shown in the chart.

This chart is intended to provide historical PSPS exposure context for the selected feeder segment. It shows whether the segment has experienced relatively high PSPS outage duration in prior years. It is not intended to evaluate improvements in PSPS operational efficiency or changes in PSPS decision-making practices over time. PSPS risk is modeled using likelihood and consequence inputs, including the probability that a feeder segment would be de-energized and the resulting customer impacts (Section I.D.1.c).

The chart also provides context for potential PSPS impact reduction from SUG. If SUG is selected and implemented for the segment, it may reduce the segment's future exposure to PSPS de-energization risk, depending on upstream and downstream system hardening and other operational factors. This chart does not show that historical PSPS hours would have been avoided. Instead, it identifies whether the segment has a history of PSPS outage duration that is relevant to evaluating future PSPS risk reduction.

The maximum and average total PSPS event duration values explain the scale of the selected segment's historical PSPS exposure.

- The maximum value is the highest total historical PSPS outage duration among all segments in the service territory.
- The average value provides a system-wide reference point for comparison.

6. Lifecycle Cost Over 55 Years Chart

The Lifecycle Cost Over 55 Years Chart compares the lifecycle costs of CCC and SUG for the selected feeder segment over a period of 55 years. The horizontal x-axis shows the number of years after implementation, and the vertical y-axis shows cumulative lifecycle costs in dollars. Each line represents the Lifecycle Costs of one mitigation option (CCC or SUG), including Implementation Costs at year 0 and Long-Term Operational Mitigation Annual Costs that increase accumulatively after year 0. The Lifecycle Cost Assessment (Section I.E) estimates total implementation (year 0) and long-term operational O&M costs over a 55-year period.

The chart should be read as an overall cost comparison, not an annual cost comparison. A higher value at a given year means that the mitigation option has a higher total cost through that point in time. SUG generally has higher upfront implementation costs but lower ongoing O&M costs, while CCC generally has lower upfront implementation costs but higher ongoing overhead-related O&M costs.

The yellow diamond symbol identifies the crossover point, which is the year when CCC and SUG total lifecycle costs are approximately equal. Before the crossover year, CCC has lower total lifecycle costs than SUG. After the crossover year, SUG has lower total lifecycle costs than CCC.

The chart assumes that a single mitigation option is selected and evaluated over the full 55-year period. The crossover point should not be interpreted as indicating that CCC would be installed first and then replaced with SUG at the crossover year to optimize savings. Rather, the crossover point provides a comparison of the overall lifecycle costs of CCC and SUG separately, each evaluated as a standalone mitigation option for the selected segment.

7. Upstream Hardened Miles Chart

The Upstream Hardened Miles Chart summarizes the current, as-built hardening condition of the selected feeder segment and related segments on the same circuit. The chart reports existing primary miles by hardening state for each listed segment and is intended to provide present-day configuration context, not the planned or future hardening state.

Each row represents a circuit segment, and the horizontal stacked bar shows the total existing primary miles for that segment, subdivided by hardening state:

- Traditional Overhead (OH) hardening is shown in red.
- Covered Conductor (CC) is shown in blue.
- Underground (UG) is shown in green.

The sum of the colored sections equals the segment's total existing primary miles, shown on the x-axis ("Total Existing Primary Miles").

Segments are ordered top-to-bottom by circuit hierarchy, with the most upstream segment shown at the top and progressively more downstream segments shown toward the bottom. This ordering supports interpretation of how upstream hardening conditions may relate to the selected segment's circuit context.

Each segment row includes:

- Rank: The segment's risk rank. This is the same risk rank referenced in the Risk Rank Comparison Chart (based on SDG&E's default model assumptions for key input parameters).
- Mit: Indicates the recommended mitigation for that segment (SUG, CCC, or No Mitigation).

8. Risk Breakdown Chart

The Risk Breakdown Chart shows the modeled risk neutral baseline risk for the selected segment and the estimated risk reduction associated with CCC and SUG separately. Baseline risk is shown by risk category: Wildfire, PSPS, and PEDS. Baseline and post-mitigation risk is estimated using the WiNGS-Planning model suite (Section I.D).

The chart then shows the modeled risk reduction for CCC and SUG separately. These values are presented for comparison and should not be added together. The residual risk shown in the chart represents risk that remains after application of the applicable mitigation. This residual risk is not eliminated by grid hardening and must be managed through the broader wildfire mitigation portfolio, including operational mitigations, PSPS, and situational awareness.

9. Cost-Effectiveness – Mitigation Selection Scenarios Chart

The Cost-Effectiveness – Mitigation Selection Scenarios Chart is a scatterplot that illustrates segment-level modeled BCR outcomes, supporting a comparison of the relative cost-effectiveness of SUG and CCC mitigation strategies. The chart supports the Grid-Hardening Mitigation Selection Process (Section 1.G) by showing how each mitigation option performs across simulated mitigation selection scenarios that vary key model assumptions, including risk neutral and risk averse scenarios.

Each point on the scatterplot represents a modeled mitigation selection scenario for the segment. The horizontal x-axis shows the BCR calculated for SUG, while the vertical y-axis shows the BCR calculated for CCC, both under the WACC discount scenario. BCR values are developed using modeled risk reduction benefits and lifecycle cost inputs, including implementation costs and Net O&M costs, consistent with the Lifecycle Cost Assessment (Section I.E) and Benefit-Cost Ratio Framework (Section I.F) described in this testimony.

The yellow diamond symbol on the left-hand scatterplot identifies the default risk neutral mitigation selection scenario (i.e., "Default Scenario" in the legend), while the yellow diamond symbol on the right-hand scatterplot identifies the risk averse default scenario. These scenarios represent the mitigation selection result produced using SDG&E's default model assumptions for key input parameters, including, but not limited to, the Risk Aversion Factor, Climate Change Factor, CCC Mitigation Effectiveness, SUG Mitigation Effectiveness, CCC Implementation Cost Per Mile, and SUG Implementation Cost Per Mile. The Default Scenario provides a reference point for comparing the segment's mitigation selection under SDG&E's standard assumptions against the broader range of mitigation selection scenarios shown in the scatterplot.

The diagonal dashed reference line is the primary interpretive feature of the chart.

- Points below the diagonal indicate scenarios where the SUG BCR is higher than the CCC BCR. In those scenarios, SUG provides greater cost-effectiveness (i.e., greater modeled risk reduction value per unit of cost) than CCC.
- Points above the diagonal indicate scenarios where the CCC BCR is higher than the SUG BCR. In those scenarios, CCC provides greater cost-effectiveness than SUG.
- Points in gray represent model recommendations of no mitigation.

The distance of each point from the diagonal shows the relative difference between the two mitigation options.

- Points close to the diagonal indicate scenarios where SUG and CCC have similar modeled cost-effectiveness.
- Points farther below the diagonal indicate scenarios where the modeled cost-effectiveness of SUG materially outperforms CCC.
- Points farther above the diagonal indicate scenarios where the modeled cost-effectiveness of CCC materially outperforms SUG.

The scatterplot should be interpreted together with the selected mitigation shown in the Title of the Segment Profile Card.

- A greater concentration of points below the diagonal indicates that SUG is more cost-effective than CCC across a greater share of modeled scenarios.
- A greater concentration of points above the diagonal indicates that CCC is more cost-effective than SUG across a greater share of modeled scenarios.

The selected mitigation reflects this cost-effectiveness comparison, together with segment-specific risk reduction, lifecycle costs, engineering, feasibility, constructability, bundling opportunities, and other considerations evaluated through the Grid-Hardening Mitigation Selection Process.

The chart also helps explain the effect of uncertainty on key inputs. Because the scatterplot includes multiple modeled scenarios, it shows whether the relative cost-effectiveness of SUG and CCC remains stable when assumptions change.

- If most scenario points remain on the same side of the diagonal, the relative mitigation preference is less sensitive to the modeled assumptions.
- If points are distributed on both sides of the diagonal, the relative cost-effectiveness of SUG and CCC is more sensitive to the assumptions evaluated.

Risk Aversion is an important consideration when interpreting the chart. Scenarios that include Risk Aversion place additional weight on low-probability, high-consequence wildfire outcomes. As a result, mitigations that reduce catastrophic wildfire tail risk may show higher BCR performance under Risk Aversion scenarios than under risk-neutral scenarios. The scatterplot therefore provides a visual basis for evaluating how mitigation selection changes, or remains stable, when the analysis accounts for societal risk aversion to catastrophic wildfire outcomes.

The scatterplot is not intended to show that a selected mitigation eliminates wildfire risk. Rather, it shows the modeled relationship between mitigation cost and monetized risk reduction under the assumptions evaluated. The residual risk remaining after mitigation is addressed through the broader wildfire mitigation portfolio, including operational mitigations, PSPS, and situational awareness.

This concludes my prepared direct testimony.

APPENDIX A

GLOSSARY OF TERMS

APPENDIX A - GLOSSARY OF TERMS

ACRONYM	DEFINITION
AAL	Average Annual Loss
AFN	Access and Functional Needs
BCR	Benefit-Cost Ratio
C&I	Commercial & Industrial
CAPEX	Capital Expenditures
CAVA	Climate Adaptation and Vulnerability Assessment
CCC	Combined Covered Conductor
CMI	Customer Minutes Interrupted
CoRE	Consequence of Risk Events
DOE	Department of Energy
DVC	Disadvantaged and Vulnerable Community
EUP	Electric Undergrounding Plan
FPI	Fire Potential Index
FRSM	Fire Risk Simulation Model
GCM	Global Climate Models
GIS	Geographic Information Systems
GH	Grid Hardening
GRC	General Rate Case
GRI	Gas Research Institute
GSA	General Services Administration
HFTD	High-Fire Threat District
HTM	Homogeneous Tranching Methodology
IC	Ignition Component
ICE	Interruption Cost Estimate
IMP	Ignition Management Program
LiDAR	Light Detection and Ranging
LORE	Likelihood of a Risk Event
LUCAS	Land Use and Carbon Scenario Simulator
Net O&M	Net Operations and Maintenance
OPEX	O&M Expenditures
PEDS	Protective Equipment Device Settings
PLS-CADD	Power Line Systems Computer Aided Design and Drafting
POF	Probability of Failure
PoI|F	Conditional Probability of Ignition
PoI	Probability of Ignition
PSPS	Public Safey Power Shutoff
PTTA	Phase Three Tranching Approach
PV	Present Value
RAMP	Risk Assessment Mitigation Phase

RBME	Risk-Based Mitigation Effectiveness
RDF	Risk-Based Decision-Making Framework
SANDAG	San Diego Association of Governments
SB	Senate Bill
SDG&E	San Diego Gas & Electric
SIF	Serious Injuries and Fatalities
SMOTE	Synthetic Minority Over-Sampling Technique
SSP	Shared Socioeconomic Pathway
SUG	Strategic Undergrounding
VRI	Vegetation Risk Index
WFA-E WRRM	Wildfire Analyst Enterprise Risk Reduction Model
WiNGS	Wildfire Next Generation System
WMP	Wildfire Mitigation Plan
XGBoost	eXtreme Gradient Boosting

APPENDIX B

RISK MODELING ASSUMPTIONS AND LIMITATIONS

APPENDIX B – RISK MODELING ASSUMPTIONS AND LIMITATIONS

Assumption	**Justification**	**Limitation**	**Applicable Model Suite**
Average duration of PSPS de-energization for every SCADA Sectionalizing Device	Historical average PSPS de-energization in the service territory, along with subject matter expertise, is used to determine this value.	Estimating the potential duration of a PSPS de-energization at each SCADA Sectionalizing Device is a complex task as multiple variables are in play (e.g., weather forecast, firefighting resources, existing wildfires, crew availability).	- WiNGS-Ops - WiNGS-Planning
Customer impact scaling factor	Subject matter expertise is used to determine a scaling factor to more accurately represent PSPS impacts to the critical and vulnerable population.	There is a lack of reliable data on how to quantify PSPS impacts on customers, specifically to subsets of customers such as critical and vulnerable.	- WiNGS-Ops - WiNGS-Planning
Serious injuries and fatalities (SIFs) per customer minute de-energized	Historical data and subject matter expertise is used to determine an estimation of the potential number of fatalities and serious injuries due to a PSPS.	There is a lack of historical data on serious injuries or fatalities due to PSPS de-energizations in California.	- WiNGS-Ops - WiNGS-Planning
Financial impact during a PSPS de-energization	Subject matter expertise is used to estimate this value based on proxies derived from the federal per diem rate for lodging, meals, and incidentals in San Diego County.	There is a lack of historical data on financial impacts to SDG&E customers due to PSPS de-energizations.	- WiNGS-Ops - WiNGS-Planning
Number of SIFs per structure destroyed in case of a wildfire	Subject matter expertise is used to estimate this value based on worst-case estimations of acres burned calculated by Technosylva.	Estimating fatalities per structure destroyed in the service territory is challenging due to several factors. This metric is highly dependent on the availability and effectiveness of firefighting resources, the timeliness and clarity of evacuation notices, the specific location of the event, and the prevailing weather conditions at the time.	- WiNGS-Ops - WiNGS-Planning

Assumption	**Justification**	**Limitation**	**Applicable Model Suite**
Outage duration in case of a wildfire	Subject matter expertise is used to estimate this value based on estimates of outage duration and assumed restoration duration.	Estimating restoration time following a catastrophic wildfire is inherently challenging due to the numerous variables involved. The severity of the event plays a crucial role, as more severe wildfires can cause extensive damage to infrastructure, making restoration efforts more complex and time-consuming. Additionally, factors such as the availability of resources, accessibility of affected areas, weather conditions, and the extent of damage to critical infrastructure all contribute to the difficulty in providing accurate restoration time estimates.	- WiNGS-Ops - WiNGS-Planning
Financial impacts in case of a wildfire	Subject matter expertise is applied to estimate this value using simulation outputs, including the number of buildings destroyed and acres impacted.	Property value estimates are based on general assumptions and do not take into account the size, condition, location, or market value of the property	- WiNGS-Ops - WiNGS-Planning
Annual risk event rates	Historic data is used to normalize wildfire, PSPS, and PEDS risks and quantify expected value averages.	Annual frequency rates are calibrated based on historical observations, ensuring they accurately reflect past trends. However, these rates do not account for potential future conditions or changes. This means that while the model provides a reliable estimate based on historical data, it may not fully capture the impact of evolving factors such as climate change, new infrastructure developments, or changes in vegetation and land use.	- WiNGS-Ops - WiNGS-Planning
Burn probability	Subject matter expertise is used to select a representation of the worst fire weather days in the service territory. The burn probability is assumed to be 100% for these days.	Subject matter experts select these days to balance a representative sample of days with fire weather conditions present in the HFTD. This approach aims to accurately estimate the potential impacts of catastrophic wildfires while considering current weather conditions, community insights, and local knowledge (e.g., terrain, fuels, vegetation). Additionally, it takes into account computational resources, given the time and cost involved in conducting this analysis.	- WiNGS-Ops - WiNGS-Planning

Assumption	**Justification**	**Limitation**	**Applicable Model Suite**
Wildfire hazard intensity	Data from the 116 worst fire weather days is identified by subject matter experts at SDG&E and is used by Technosylva to calculate this value. Technosylva simulated outputs include flame length, rate of spread, acres burned, buildings threatened, buildings destroyed, and population impacted.	Technosylva unsuppressed simulations have a duration of 24 hours. Wildfire consequence values are calculated based on acres burned and structures destroyed.	- WiNGS-Ops - WiNGS-Planning
PEDS annual frequency	This value is determined using historical data on PEDS outage durations in HFTD portions of the service territory.	This annual frequency may not accurately represent future outage frequencies, as the number of future device installations and outages are unknown and difficult to estimate. SDG&E activates settings only during extreme or elevated fire weather conditions.	WiNGS-Planning
PEDS event consequence values	This value is determined using historical data on PEDS outage durations recorded in the SAIDIDAT database.	Historical duration and CMI estimates may not accurately reflect future PEDS consequence impact estimates.	WiNGS-Planning
Annual PSPS de-energization during high fire risk days	This value is determined using meteorology subject matter expertise and historical event records.	The current methodology is calibrated using past PSPS de-energizations and may not adequately account for the increasing frequency and severity of fire weather conditions.	WiNGS-Planning
Overhead-to-underground mile conversion rate	This contingency value is applied to non-roadway miles to account for additional miles to underground.	Roadway miles based on buffer of roadway with intersecting spans	WiNGS-Planning
Grid-hardening lifecycle years	Subject matter expertise is used to determine this value.	Expected lifespan in years	WiNGS-Planning
Mitigation installation cost-per-mile	Historical grid-hardening data and subject matter expertise are used to determine this value.	Does not take into account site and grid specific attributes	WiNGS-Planning
Mitigation effectiveness rates	Data on effectiveness studies for each mitigation option is used to determine this value.	Limited to internal risk event data available	WiNGS-Planning

Assumption	**Justification**	**Limitation**	**Applicable Model Suite**
Hardening-State Station Alert Speed Thresholds	Operational wind gust thresholds determined during the latest PSPS are used to determine this value.	These thresholds are defined for each event and take into account numerous factors, such as the magnitude and severity of forecasted weather conditions, fuel moisture content, available firefighting resources, and other relevant variables. This comprehensive approach ensures that the PSPS alert thresholds are tailored to the specific circumstances of each event, enhancing the effectiveness of the response and minimizing risks to public safety.	WiNGS-Planning

APPENDIX C

CLIMATE CHANGE APPENDIX

APPENDIX C – CLIMATE CHANGE APPENDIX

Climate continues to change, and SDG&E is evaluating multiple approaches to capture associated future risks. SDG&E's focus has been on capturing the projected potential increase in acres burned compared with historical records. By identifying this increased risk, SDG&E can update its WiNGS-Planning framework to better estimate future wildfire risk scenarios.

One potential procedure, described herein, estimates the annual percentage increase in annual area burned due to climate change. The reason for using annual area burned is because this value is an output of the fire spread models used in SDG&E's risk modeling. Thus, this approach, which relies on rigorous projections of future climate, is directly compatible with the current approach to fire modeling. The estimates aggregate mapped projections of annual area burned through year 2100 over several different geographic regions, including HFTD Tier 2 and 3 areas within SDG&E's service territory, the full SDG&E service territory, and all of California. An exponential growth curve[1] is fit to the aggregated values to estimate the annual percentage increase in area burned for a given climate model, global warming scenario, and region.

The analysis is based on maps of average annual area burned that have been produced on a 3 km grid of California as part of the Westerling FRSM through the Pyregence Consortium.[2,3] The maps were generated based on wildfire simulations through 2100 using inputs from various GCMs and for various SSP scenarios. The maps are informed by future climate projections based on two separate downscaling methodologies (LOCA2[4] and WRF[5]) for various GCMs for three SSP scenarios, SSP2-4.5, SSP3-7.0, and SSP5-8.5. A summary of the available annual area burned maps for each downscaling method, SSP scenario, GCM, and realization are provided in Table JW-C-1.

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[1] This functional form is used because it yields an annual percentage increase in area burned, which is compatible with the financial modeling methodology.

[2] https://www.pyregence.org/frsm/

[3] https://data.pyregence.org/wg4/CEC-Submitted/

[4] https://loca.ucsd.edu/

[5] https://dept.atmos.ucla.edu/alexhall/downscaling-cmip6

TABLE JW-C-1
Climate models and realizations available in the Westerling Fire Model through Pyregence

Downscaling	Scenario	Global Climate Model	Realizations
LOCA2	SSP2-4.5	ACCESS-CM2	r1i1p1f1
		EC-Earth3-Veg	r5i1p1f1
		INM-CM5-0	r1i1p1f1
		MPI-ESM1-2-HR	r1i1p1f1
	SSP3-7.0	ACCESS-CM2	r1i1p1f1
		CNRM-ESM2-1	r1i1p1f2
		EC-Earth3	r1i1p1f1
		EC-Earth3-Veg	r1i1p1f1, r4i1p1f1
		MIROC6	r1i1p1f1
		MPI-ESM1-2-HR	r3i1p1f1
		MPI-ESM2-0	r4i1p1f1
	SSP5-8.5	ACCESS-CM2	r1i1p1f1
		CNRM-ESM2-1	r1i1p1f2
		EC-Earth3-Veg	r4i1p1f1
		HadGEM3-GC31-LL	r1i1p1f3, r3i1p1f3
WRF	SSP3-7.0	CESM2	r11i1p1f1
		CNRM-ESM2-1	r1i1p1f2
		EC-Earth3-Veg	r1i1p1f1
		FGOALS-g3	r1i1p1f1

Note: The Ensemble members are described using ripf nomenclature: the numeral following r denotes a realization, i an initialization method, p physics, and f forcing.

For each SSP, GCM, and GCM realization, a banding operation is performed such that the mapped values for a given year are taken as the pixel-wise average of all years within a [-10, +9] range of that year. Next, when multiple realizations are available per GCM, the realizations are averaged to produce a model average map of annual area burned. Finally, an ensemble average is taken across all GCMs for each SSP. The result is an ensemble average map for a given year and SSP, where each 3km pixel represents the average number of hectares burned in a year.

Aggregation for Incorporation into Risk Model

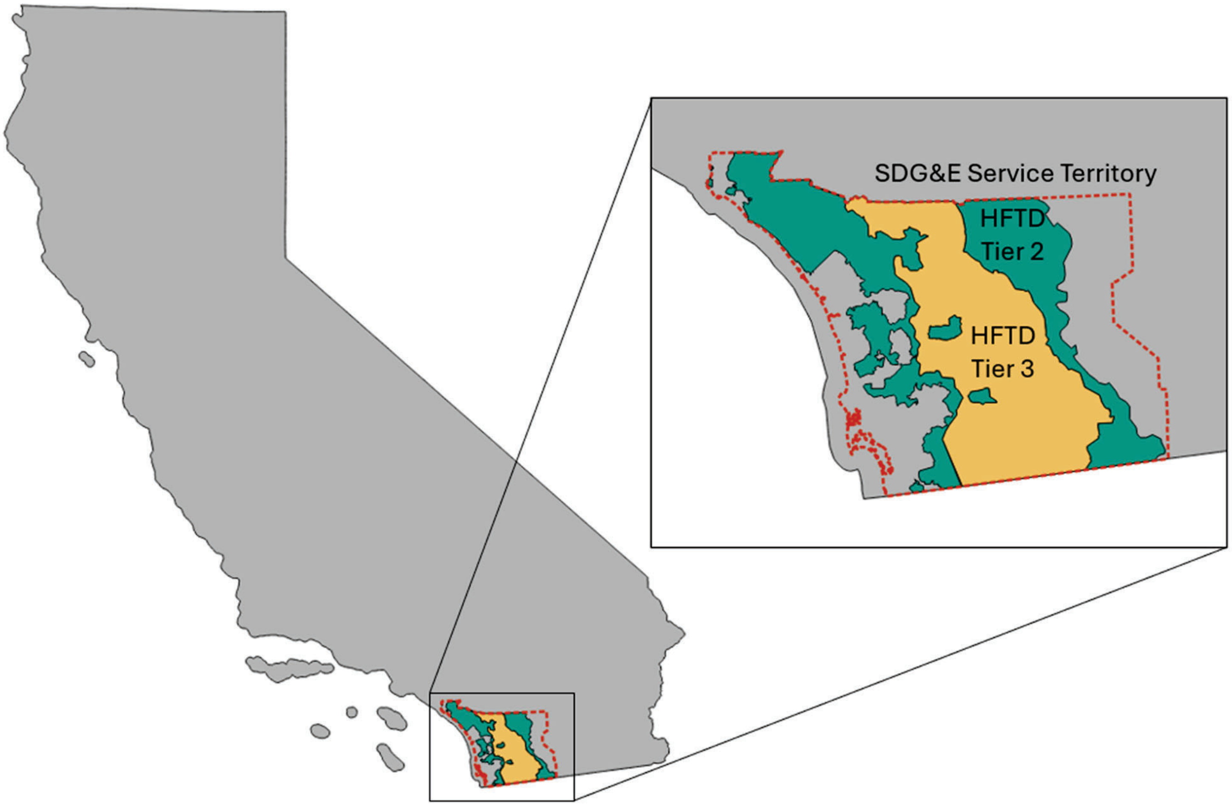
The data are aggregated by selecting a geographic region of interest and summing all pixels within that region to get a total annual area burned for a given year and SSP. Five geographic areas, shown in Figure JW-C-1, are considered: (1) SDG&E's service territory, (2) HFTD Tier 2 areas within SDG&E's service territory, (3) HFTD Tier 3 areas within SDG&E's service territory, (4) the combined HFTD Tier 2 and 3 areas, and (5) all of California. This calculation of total area burned is repeated for each year. A curve of the following form can be fit to the resulting time series of total annual area burned:

$$P = P_0(1 + r)^{t - t_0}$$

where P is annual area burned in year t, P_0 is the starting area burned in year t_0, and r is the annual percentage increase in area burned. This form was selected because the resulting annual percent increase, r, can be treated as an inflation factor, which allows straightforward compatibility with the financial model. Furthermore, because this value is scaled directly in the financial model as opposed to at the event level, it is not affected by risk scaling, and the approach tends to underrepresent risk. In other words, the multiplier to account for increases is acres burned is applied in the financial model instead of directly to the acres burned, thus consideration of risk aversion/scaling occurs prior to the adjustment for climate, resulting in lower scaled risk compared to if the multiplier for climate is applied prior to scaling risk. Three time horizons are considered for the curve-fitting operation: (1) 2020-2090, to encompass the extent of available future projections, (2) 2028-2080, and (3) 2028-2085 to encompass the extent of the GRC and anticipated asset lifetimes.

This annual percentage increase can be calculated for annual area burned maps for various SSP scenarios and GCM downscaling methodologies. It is intended that the annual percentage increase in acres burned be applied to the wildfire consequences used in WiNGS-Planning to scale wildfire losses in future years. This is an important addition to WiNGS-Planning to properly account for the wildfire consequences over the lifetime of mitigation projects in Benefit-Cost Ratio calculations.

FIGURE JW-C-1
Regions considered for annual percentage area burned increases.



Results

Summaries of annual percentage increase in area burned for each downscaling approach and SSP scenario are presented for time horizons 2020-2090, 2028-2080, and 2028-2085 in Table JW-C-2, Table JW-C-3, and Table JW-C-4, respectively.

TABLE JW-C-2
Annual Percentage Increase Burn Area Summary 2020-2090

	Scenario	HFTD Tier 2	HFTD Tier 3	HFTD Tier 2 and 3	SDG&E Territory	California
WRF	SSP3-7.0	0.92%	0.85%	0.88%	0.87%	0.99%
LOCA2	SSP2-4.5	0.37%	0.42%	0.40%	0.37%	0.64%
	SSP3-7.0	0.84%	0.90%	0.88%	0.88%	1.05%

	Scenario	HFTD Tier 2	HFTD Tier 3	HFTD Tier 2 and 3	SDG&E Territory	California
	SSP5-8.5	1.08%	1.06%	1.07%	1.09%	1.44%

TABLE JW-C-3
Annual Percentage Increase Burn Area Summary 2028-2080

	Scenario	HFTD Tier 2	HFTD Tier 3	HFTD Tier 2 and 3	SDG&E Territory	California
WRF	SSP3-7.0	0.85%	0.78%	0.81%	0.78%	0.91%
LOCA2	SSP2-4.5	0.29%	0.37%	0.34%	0.30%	0.63%
	SSP3-7.0	0.66%	0.70%	0.68%	0.67%	0.95%
	SSP5-8.5	0.98%	0.98%	0.98%	1.00%	1.41%

TABLE JW-C-4
Annual Percentage Increase Burn Area Summary 2028-2085

	Scenario	HFTD Tier 2	HFTD Tier 3	HFTD Tier 2 and 3	SDG&E Territory	California
WRF	SSP3-7.0	0.92%	0.84%	0.88%	0.85%	0.96%
LOCA2	SSP2-4.5	0.30%	0.36%	0.34%	0.30%	0.61%
	SSP3-7.0	0.76%	0.82%	0.79%	0.79%	1.00%
	SSP5-8.5	1.00%	0.99%	0.99%	1.02%	1.41%

Examples of annual area burned time series are presented in the following figures. To illustrate variation across the considered geographic regions, examples of the curve fitting for WRF downscaling for SSP3-7.0 for combined HFTD Tier 2 and 3, SDG&E's service territory, and for all of California are shown in Figure JW-C-5, Figure JW-C-6, and Figure JW-C-7. To illustrate variation by SSP scenario, examples of curve fitting for LOCA2 downscaling for combined HFTD Tier 2 and 3 for SSP2-4.5, SSP3-7.0, and SSP5-8.5 are shown in Figure JW-C-8, Figure JW-C-9, and Figure JW-C-10.

FIGURE JW-C-5
Annual area burned by year in HFTD Tier 2 and 3 areas within SDG&E's service territory with best fit curve for the WRF models for the SSP3-7.0 scenario.

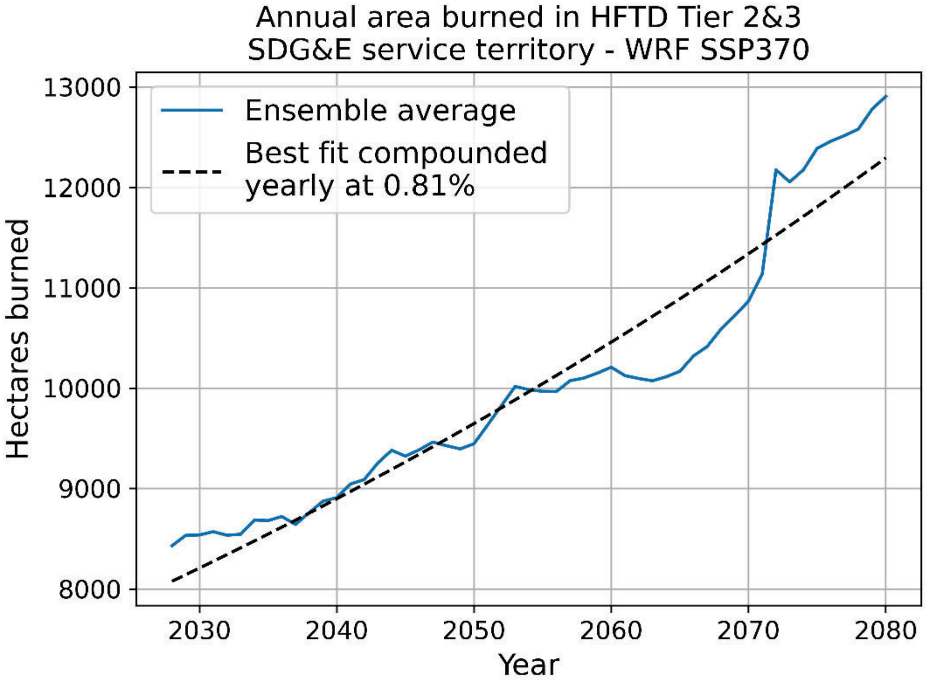


FIGURE JW-C-6
Annual area burned by year in SDG&E's service territory with best fit curve for the WRF models for the SSP3-7.0 scenario.

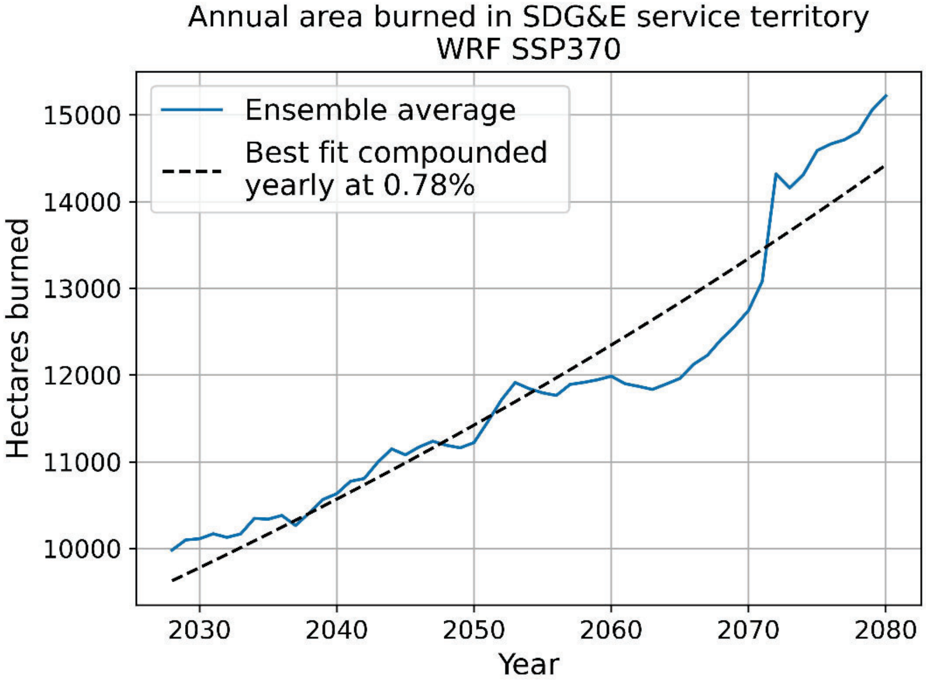


FIGURE JW-C-7
Annual area burned by year in California with best fit curve for the WRF models for the SSP3-7.0 scenario.

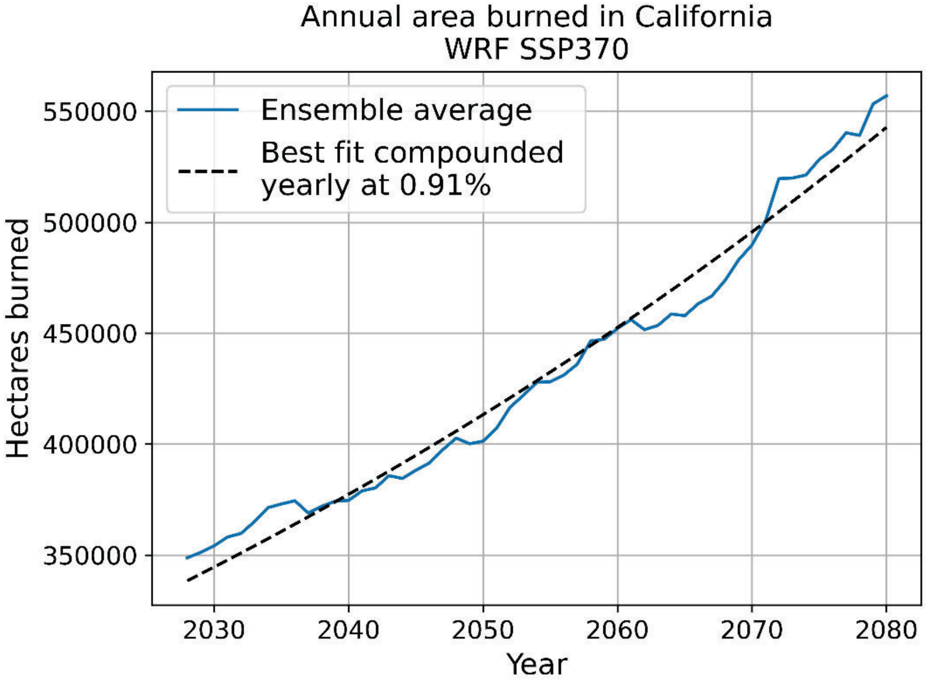


FIGURE JW-C-8
Annual area burned by year in HFTD Tier 2 and 3 areas within SDG&E's service territory with best fit curve for the LOCA2 models for the SSP2-4.5 scenario.

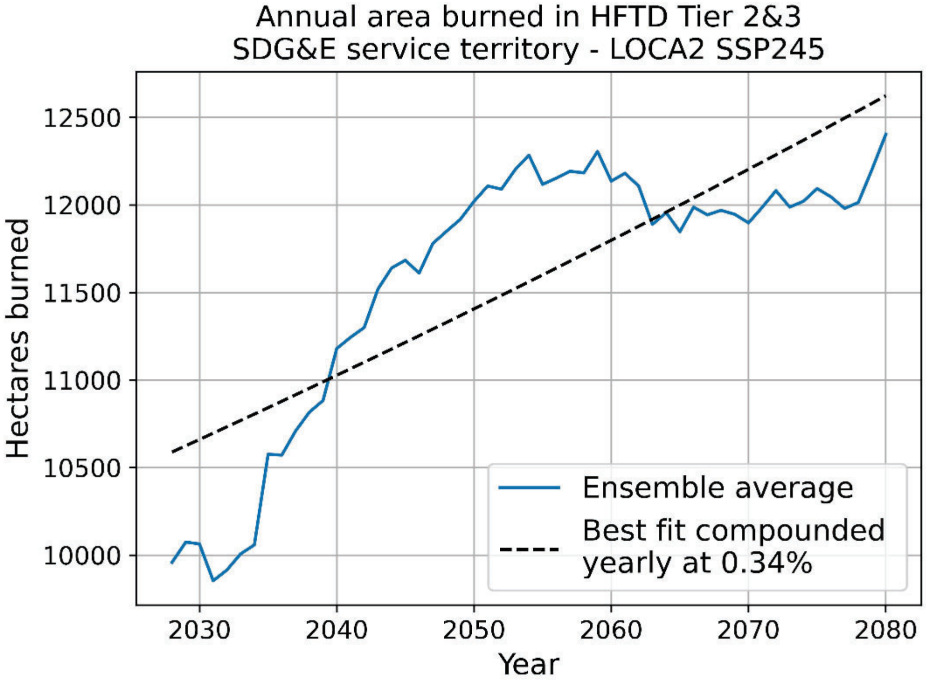


FIGURE JW-C-9
Annual area burned by year in HFTD Tier 2 and 3 areas within SDG&E's service territory with best fit curve for the LOCA2 models for the SSP3-7.0 scenario.

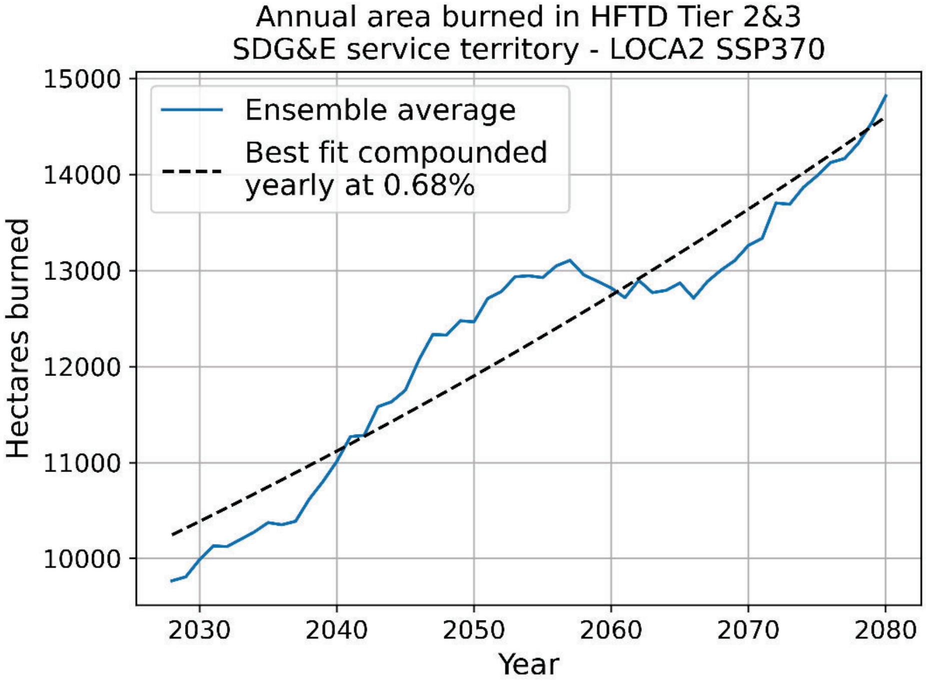
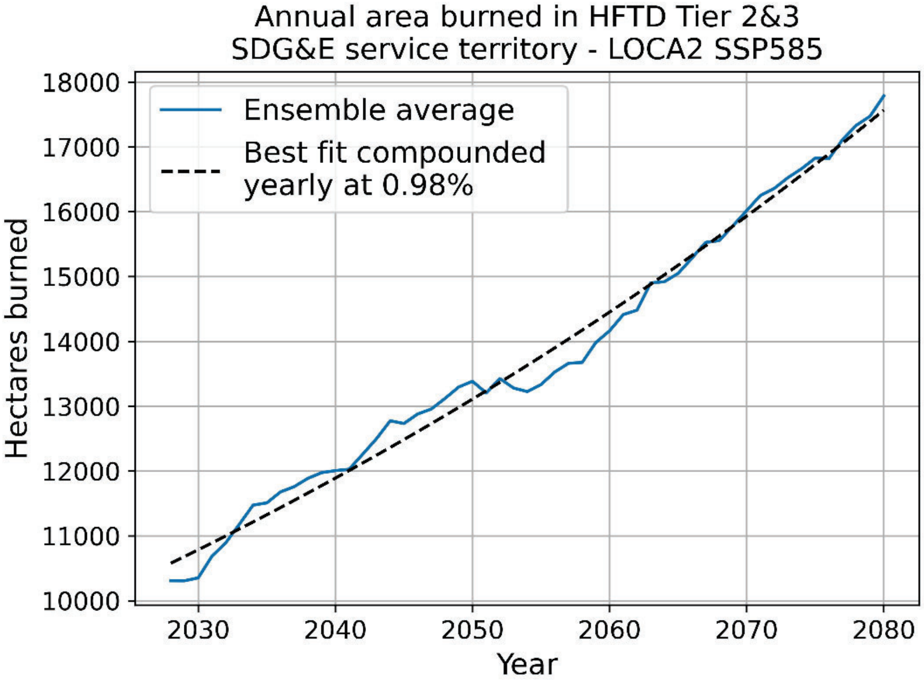


FIGURE JW-C-10
Annual area burned by year in HFTD Tier 2 and 3 areas within SDG&E's service territory with best fit curve for the LOCA2 models for the SSP5-8.5 scenario.



SDG&E has selected to use the following parameters:

- For the geographic region, the combined HFTD Tier 2 and 3 area within SDG&E's service territory because this is the area where mitigation efforts are being considered.
- SSP3-7.0 scenario because this has been selected as the baseline climate scenario.[6]
- Time horizon 2028-2080 to account for the beginning of the GRC timeframe in 2028 and the anticipated lifetime of SDG&E's assets. 2080 is selected as the end year relative to 2085 because this produces more conservative (lower percent annual increase) results.
- LOCA2 models over WRF models because the LOCA2 was the main dataset used for SDG&E's 2025 CAVA filing.

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[6] SSP3-7.0 is the designated reference scenario by CPUC for climate change (see the ordering paragraphs 2 and 3 (pages 84-85) in https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M537/K988/537988980.PDF)

These parameters result in a value of 0.68% annual increase in acres burned.

Discussion

Currently, the FRSM results are based on static land use inputs. SDG&E plans to analyze fire simulations from the FRSM coupled with the LUCAS land use and land change projections when they become available, and, based on the results of that review, may incorporate those outputs in future analysis.[7] These fire simulations may yield more refined predictions of annual area burned because the coupled models exchange information about fuel loads, land use, and wildfire activity at each time step.

The results presented herein are also based on fire simulations throughout the year. While it may seem reasonable to only consider fires that occur during months with high fire incidence (e.g., from July through January), the duration and timing of elevated wildfire risk are expected to evolve over the study horizon.[8] Thus, fires occurring throughout the year will need to be considered.

The current climate integration approach is focused on estimating an annual percentage increase in acres burned and applying this value as a scalar to the consequence calculation, thus resulting in an increased wildfire risk projection. This is applied as a factor within the financial model, similar to the way inflation is applied. It is assumed that increases in acres burned do not affect PSPS and PEDS risk; therefore, the annual percentage increase is proportionally reduced to apply only to the portion of total risk attributable to wildfire consequences (e.g., acres burned, structures damaged, and associated impacts), excluding increases in PSPS and PEDS impacts. For example, if the annual percentage increase in acres burned is 0.7%, and acres burned, structures burned, and equivalent fatalities represent 88% of the wildfire risk (the balance being PSPS and PEDS risk), the annual percentage increase in wildfire losses applied within the financial model is 0.88 * 0.7% = 0.62% annual increase. However, climate change may impact PSPS and PEDS risk, and SDG&E will continue to evaluate and update risk models with new climate change information in the future.

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[7] LUCAS Model. https://www.usgs.gov/centers/western-geographic-science-center/science/lucas-model

[8] Madakumbura, G. D., Moritz, M. A., McKinnon, K. A., Williams, A. P., Rahimi, S., Bass, B., Norris, J., Fu, R., Hall, A. (2025). Anthropogenic warming drives earlier wildfire season onset in California. *Science Advances*, *11*(32), eadt2041. DOI:10.1126/sciadv.adt2041.

While this method ensures compatibility with existing risk models and BCR calculations, it does not explicitly account for how shifts in environmental variables may influence the failure rate and ignition rates. Furthermore, while the method does consider spatial distribution of fires by only considering fires within specific geographic areas (e.g., HFTD Tier 2 and 3), it does not explicitly account for how those areas may evolve under a changing climate.

Where these fires may occur can materially affect accuracy of the projected risk based on the characteristics of the changes where the fires occur, including land use changes and asset locations. In addition, the underlying projected fire simulations reflect all wildfire ignitions rather than being limited to utility caused events co-located with electric infrastructure. This introduces additional uncertainty when translating projected climate impacts on wildfire to utility-specific wildfire risk. SDG&E's current implementation implicitly incorporates changing weather conditions on expected wildfire consequences in SDG&E HFTD, but it does not explicitly incorporate projected changes in wind regimes or fire weather extremes into SDG&E electric equipment failure rate or ignition modeling, factors that could influence the likelihood and potential growth of future wildfire events.

Future enhancements to climate integration are expected to improve both the spatial resolution and causal representation of wildfire risk drivers. SDG&E will explore if climate-driven environmental variables, such as temperature, relative humidity, and precipitation, may need to feed directly into asset failure-rate and ignition-probability models, as well as into wildfire event simulations, allowing projected increases in fire size, intensity, and consequence distributions to emerge endogenously through those models. However, explicitly incorporating hourly variations in climate conditions into wildfire spread modeling over a 55-year time horizon would materially increase model complexity and computational burden, potentially by an order of magnitude, raising significant concerns regarding scalability, cost, and overall affordability. Advancing these capabilities remains challenging given that many components of the existing models are statistically derived from historical observations; however, continued development in this area is expected to incrementally improve long-term climate-informed wildfire risk estimates.

APPENDIX D

FOUNDATIONAL PROGRAMS AND COSTS

		Baseline Cost Allocation		Post Hardening Cost Conversion Multiplier									
ID	Work Paper Title	OH HFTD	UG HFTD	If CCC	If SUG	CAP/OM	RAMP Workpaper	2028 GRC OPEX Workpaper	2028 GRC CAPEX Workpaper	2028 GRC Workpaper/Cost Center Title	Frequency	Unit Cost	Unit Cost Estimation
C504	Standby Power Programs (Fixed Backup Power Commercial)	100%	0%	100%	0%	OPEX	1OR04C504	1WM001.504		Standby Power Programs (Fixed Backup Power Commercial)	Annual	$275.97	cost per mile = total cost allocated to overhead / oh hftd miles
C512	Customized Resiliency Assessment	100%	0%	100%	0%	OPEX	1OR04C512	1WM001.512		Customized Resiliency Assessments	Annual	$1,086.62	cost per mile = total cost allocated to overhead / oh hftd miles
C516	Generator Assistance Programs	100%	0%	100%	0%	OPEX	1OR04C516	1WM001.516		Generator Assistance Programs	Annual	$185.22	cost per mile = total cost allocated to overhead / oh hftd miles
C546	Aviation Firefighting Program	100%	0%	100%	100%	OPEX+CAPEX	1OR04C546 1CR04C546	1WM001.546	202770.001	Aviation Program	Annual	OPEX: $1399.87 CAPEX: $115.43	cost per mile = total cost allocated to overhead / oh hftd miles
C548	Wildfire Infrastructure Protection Teams	75%	25%	100%	50%	OPEX	1OR04C548	1WM001.548		Wildfire Infrastructure Protection Teams	Annual	$928.40	cost per mile = total cost allocated to overhead / oh hftd miles
C552	PSPS Sectionalizing Enhancements	100%	0%	100%	100%	OPEX+CAPEX	1OR04C552 1CR04C552	1WM001.552	192450.001	PSPS Sectionalizing Enhancements	Annual	OPEX: $5.57 CAPEX: $566.20	cost per mile = total cost allocated to overhead / oh hftd miles
C556	Engagement with AFN Populations	50%	50%	100%	100%	OPEX	1OR04C556	1WM004.556		Engagement with AFN Populations	Annual	$242.80	cost per mile = total cost allocated to overhead / oh hftd miles
C557	Public Outreach and Education Awareness	50%	50%	100%	100%	OPEX	1OR04C557 1OR04C571	1WM004.557		Public Outreach and Education Awareness	Annual	$461.28	cost per mile = total cost allocated to overhead / oh hftd miles
C558	Risk Methodology and Assessment	50%	50%	100%	50%	OPEX+CAPEX	1OR04C558 1CR04C558	1WM007.558	238750.001	Risk Methodology and Assessment	Annual	OPEX: $982.04 CAPEX: $936.86	cost per mile = total cost allocated to overhead / oh hftd miles
C561	Fire Potential Index	50%	50%	100%	100%	OPEX	1OR04C561 1OR04C572	1WM003.561		Fire Potential Index	Annual	$143.29	cost per mile = total cost allocated to overhead / oh hftd miles
C562	Weather Station Maintenance and Calibration	75%	25%	100%	100%	OPEX+CAPEX	1OR04C562 1OR04C572	1WM003.562	192470.001	Weather Network & Technology Programs	Annual	OPEX: $75.23 CAPEX: $348.28	cost per mile = total cost allocated to overhead / oh hftd miles
C563	Wildfire Mitigation Strategy Development	50%	50%	100%	50%	OPEX	1OR04C563 1OR04C558	1WM006.563		Wildfire Mitigation Strategy Development	Annual	$506.96	cost per mile = total cost allocated to overhead / oh hftd miles
C564	Distribution Communications Reliability Improvements	50%	50%	100%	50%	OPEX+CAPEX	1OR04C564 1CR04C564	1WM001.564	198720.001	Distribution Communications Reliability Improvements	Annual	OPEX: $381.31 CAPEX: $0	cost per mile = total cost allocated to overhead / oh hftd miles
C566	Enterprise Data Foundation	50%	50%	100%	100%	OPEX+CAPEX	1OR04C566 1CR04C566	1WM005.566	248770.001 248770.002 248770.003	Enterprise Data Foundation	Annual	OPEX: $340.18 CAPEX: $1,463.75	cost per mile = total cost allocated to overhead / oh hftd miles
C567	Public Emergency Communication Strategy	50%	50%	100%	100%	OPEX+CAPEX	1OR04C567 1CR04C567	1WM004.567	258820.001	Public Emergency Communication Strategy	Annual	$820.60	cost per mile = total cost allocated to overhead / oh hftd miles
C571	Emergency Preparedness and Recovery Plan (non-activation)	50%	50%	100%	100%	OPEX+CAPEX	1OR04C571 1CR04C571	1WM004.571	228790.001 228790.002 228790.003 228790.004	Emergency Preparedness and Recovery Plan	Annual	OPEX: $4,275.36 CAPEX: $1,194.29	cost per mile = total cost allocated to overhead / oh hftd miles
C572	Situational Awareness and Forecasting	50%	50%	100%	100%	OPEX	1OR04C572 1OR04C328	1WM003.572		Situational Awareness and Forecasting	Annual	$361.94	cost per mile = total cost allocated to overhead / oh hftd miles
C582	Application Support and Risk Analytics	100%	0%	100%	100%	OPEX+CAPEX	1OR04M582 1OR04C558 1OR04C575	1WM002.582	268860.001 268860.002 268860.003	Application Support and Risk Analytics	Annual	OPEX: $577.41 CAPEX: $786.31	cost per mile = total cost allocated to overhead / oh hftd miles
C584	Integrated Work Management & Risk Assessment Platform	100%	0%	100%	100%	OPEX+CAPEX	1OR04M584 1CR04M584	1WM002.584	268900.001 268900.002	Integrated Work Management & Risk Assessment Platform	Annual	OPEX: $70.72 CAPEX: $786.31	cost per mile = total cost allocated to overhead / oh hftd miles
C267	SDG&E-Risk-5 Electric Infrastructure Integrity Damage Prevention Activities Electric	0%	25%	0%	100%	OPEX	1OR05C267	1GD000.002		Field O&M - Damage Prevention (Electric Fiber Optic & Gas)	Annual	$300	cost per mile = total cost allocated to overhead / oh hftd miles

APPENDIX E

OPERATIONAL MITIGATION COSTS BY BASELINF MITIGATION, CCC and SUG

Mitigation Category	Workpaper/Program Title	Baseline	If CCC	If SUG	CAP/OM	RAMP Workpaper	2028 GRC OPEX Workpaper	2028 GRC CAPEX Workpaper	2028 GRC Workpaper/Cost Center Title	Frequency	Unit Cost	Unit Cost Estimation	Other Parameters Used in Cost Calculation	Notes
Inspections & Maintenance	Distribution Overhead Detailed Inspections	Yes	Persistent	Removed	OPEX	1OR04C526	1WM001.526	n/a	Distribution Overhead Detailed Inspections	5 year	$29.89	cost per pole		
	Distribution Overhead Patrol Inspections	Yes	Persistent	Removed	OPEX	1OR04C536	1WM001.536	n/a	Distribution Overhead Patrol Inspections	Annual	$4.22	cost per pole		
	Distribution Wood Pole Intrusive Inspections	Yes	Removed	Removed	OPEX	1OR04C530	1WM001.530	n/a	Distribution Wood Pole Intrusive Inspections	10 year	$125.03	cost per wood pole		
	Risk-Informed Drone Inspection	Yes	Persistent	Removed	OPEX+CAPEX	1OR04C534 1CR04C534	1WM001.534	222590.001	Risk-Informed Drone Inspections	Risk based	OPEX: $147.89 CAPEX: $77.78	cost per pole		
	Repair and Replacement	Yes	Persistent*	Removed	OPEX+CAPEX	1OR04C507 1OR04C526 1OR04C534 1CR04C507	1WM001.507	002390.001 002390.002	CMP Repairs & Replacements	Age based find rate derived from historical data	OPEX: $3,672.99 CAPEX Equip: $8,601.50 CAPEX Pole: $27,224	avg cost per mile = average cost per job * finding rate per structure inspected * structures per mile * inspections per age period	overhead structures per mile in HFTD	OPEX uses historical unit cost in HFTD as unit counts are not defined in workpaper.
Inspections & Maintenance (Underground Asset)	Padmount (dead front AGI) Inspections	No	NA	New	OPEX	NA	1ED005	n/a	Electric Regional Operations	5 year	$35.65	cost per above-ground structure	above-ground structures per mile in HFTD	Unit cost is based on historical estimates as this cost is grouped with other costs in the workpaper.
	Subsurface Inspections (SS10)	No	NA	New	OPEX	NA	1ED005	n/a	Electric Regional Operations	10 year	$115.79	cost per subsurface structure	subsurface structures per mile in HFTD	Unit cost is based on historical estimates as this cost is grouped with other costs in the workpaper.
	Patrol Inspections	No	NA	New	OPEX	NA	1ED005	n/a	Electric Regional Operations	Annual	$72.85	cost per mile	underground mile conversion	Unit cost is based on historical estimates as this cost is grouped with other costs in the workpaper.
	Repair Replacement	No	NA	New	OPEX+CAPEX	1CR05C212	1ED005	002290.002	RAMP - CORRECTIVE MAINTENANCE PROGRAM (CMP) - UNDERGROUND	Age based find rate derived from historical data	AGI OPEX: $3,652.58 AGI CAPEX: $11,087.19 SS10 OPEX: $9,121.69 SS10 CAPEX: $18,477.07	avg cost per mile = average cost per job * finding rate per structure inspected * structures per mile * inspections per age period	above-ground/subsurface structure per mile in HFTD	Unit cost is based on historical cost in HFTD as this cost is grouped with other costs in the workpaper
Unplanned Outage Restoration	Overhead Asset Restoration	Yes	Persistent*	Removed	CAPEX	1CR05C253		002360.001	Restoration of Service	Annual	$236.53	avg cost per mile = average cost per job * job per mile		Calculations are based on historical unit cost data in HFTD to get the representitive costs. HFTD vs Non-HFTD are grouped into one forecast in the workpaper
	Undergrou Asset Restoration	No	NA	New	CAPEX	1CR05C253 1CR05C254		002360.001 002300.001	Restoration of Service	Annual	$297.18	avg cost per mile = average cost per job * job per mile	underground mile conversion	Calculations are based on historical unit cost data in HFTD to get the representitive costs. HFTD vs Non-HFTD are grouped into one forecast in the workpaper
Veg Management	Detailed Inspections	Yes	Persistent	Removed	OPEX	1OR04C554 1OR05C554	1WM002.554	n/a	Detailed Inspections	Annual	$16.42	cost per tree		Unit counts estimated using historical rates as unit counts are not defined in workpaper. The total cost was then divided by this estimated unit counts to calculate the unit cost
	Prune and Removal (Clearance)	Yes	Persistent	Removed	OPEX	1OR04C551 1OR05C551 1OR04C540	1WM002.551	n/a	Prune and Removal (Clearance)	Rate is based on historical estimate- 40%	$317.43	cost per tree		
	QA/QC of Vegetation Management	Yes	Persistent	Removed	OPEX+CAPEX	1OR04C578 1OR05C578 1CR04C578	1WM002.578	26886A.001	QA/QC of Vegetation Management	Rate is based on historical estimate - 25%	$38.40	cost per qaqc		
	Pole Clearing	Yes	Persistent	Removed	OPEX	1OR04C544	1WM002.544		Pole Clearing	Annual	$244.82	cost per pole		
	Off-Cycle Patrol	Yes	Persistent	Removed	OPEX+CAPEX	1OR04C537 1CR04C537	1WM002.537	26886B.001	Off-Cycle Patrol	Annual	OPEX: $6.08 CAPEX: $1.63	cost per tree		
	Fuels Management Distribution - incl. poles and grand	Yes	Persistent	Removed	OPEX	1OR04C540	1WM002.540	n/a	Fuels Management Program	500 poles	$3,512.31	cost per pole		The Fuels Management Program was split into pole-related work and non-pole activities (including grants and grazing) to better reflect cost drivers. Unit costs were calculated separately for each component.
	Fuels Management - Other	Yes	Persistent	Removed	OPEX	1OR04C540	1WM002.540	n/a	Fuels Management Program	Annual	$374.59	cost per mile		The Fuels Management Program was split into pole activites and non-pole activities (including grants and grazing) to better reflect cost drivers. Unit costs were calculated separately for each component.
PSPS	Emergency Preparedness and Recovery Plan (activation only)*	Yes	Persistent*	Persistent*	OPEX	1OR04C571	1WM004.571	n/a	Emergency Preparedness and Recovery Plan	Monte Carlo simulated event frequency	$24,412.06	cost per circuit mile event		Unit counts are based on simulated frequency estimations. The total cost towards activation was divided by the simulated location and miles where frequency is greater than 0 to generate the unit cost.
EFD&FCP	Early Fault Detection (O&M Maintenance Cost Only)	No	New	NA	CAPEX	1CR04C573		222560.001	Early Fault Detection	18 year replacement cycle	$525.78	cost per mile = total cost / miles covered		Unit counts are estimated as miles covered by the device. The unit cost was then estimated as the total cost divided by the miles covered.
	Advanced Protection - FCP O&M only	No	New	NA	CAPEX	1CR04C508		152590.001	Advanced Protection	18 year replacement cycle	$9,795.00	cost per mile = total cost / miles covered		Unit counts are estimated as miles covered by the device. The unit cost was then estimated as the total cost divided by the miles covered.
Foundational	Total O&M Cost	Yes	Persistent	Persistent*	OPEX					Annual	$13,120.76	cost per mile = total cost allocated to overhead / oh hftd miles		
	Total Capital Cost	Yes	Persistent	Persistent*	CAPEX					Annual	$6,319.74	cost per mile = total cost allocated to overhead / oh hftd miles		

Note:
Foundational costs are detailed in another sheet
Emergency Preparedness and Recovery Plan (activation only)* only includes activation activities related costs. The rest cost is treated as part of foundational cost.

APPENDIX F

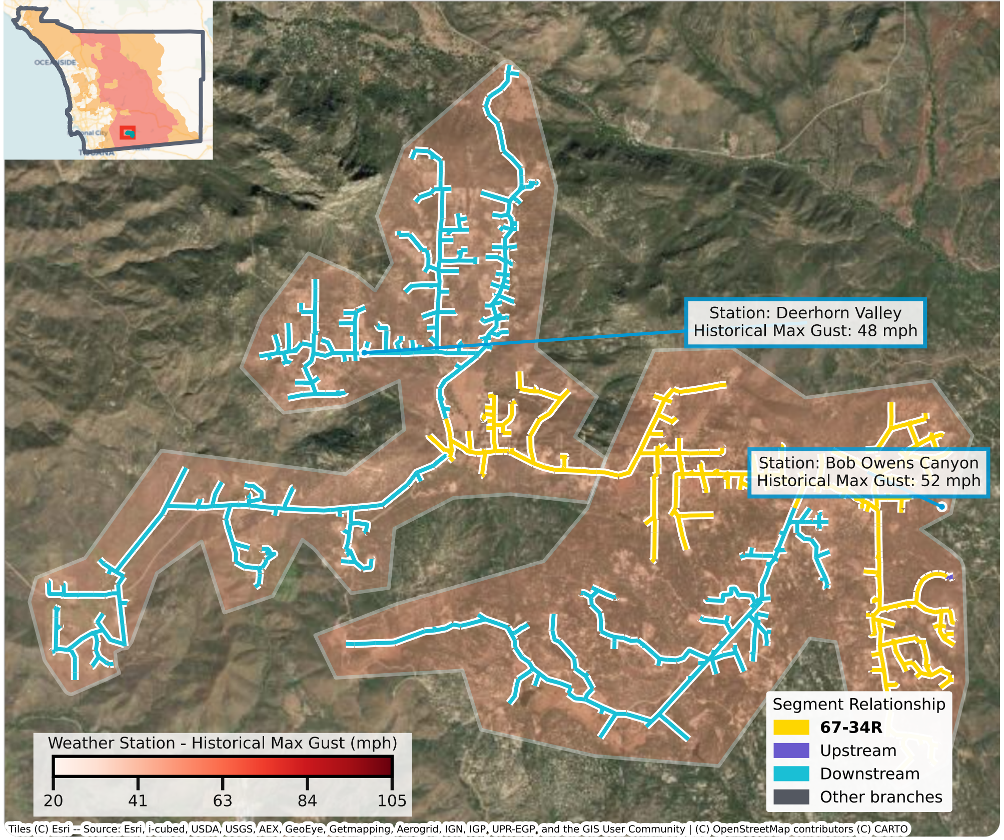
SEGMENT PROFILE CARDS

67-34R | Rank: 75 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
593 Total		With AFN Flag	3	CRITICAL FACILITIES
Residential	Non-Residential			
511	82	22		

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (67-1728R, 67-1726R, 67-1724R) supported the selection of **CCC**.

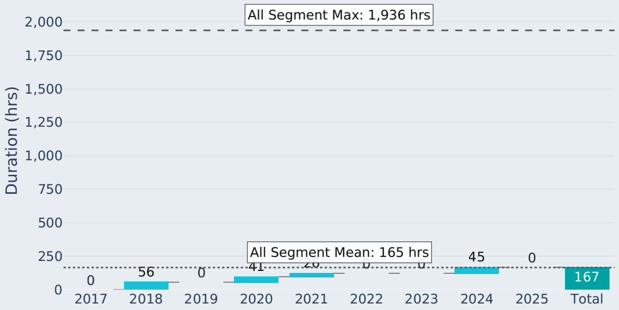
Circuit 67 Map



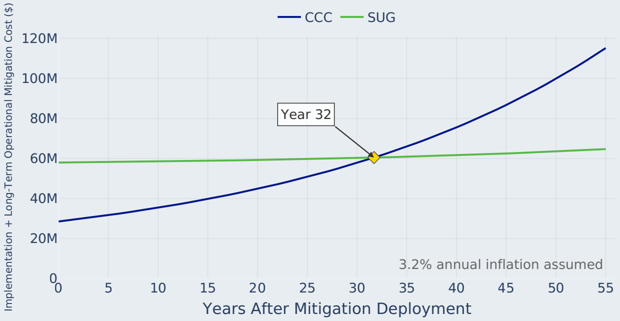
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

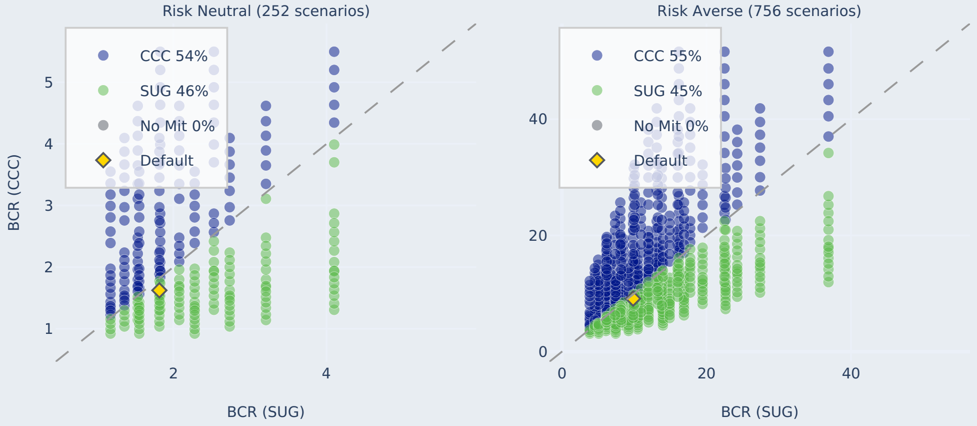
67-34R PSPS Event Duration (hrs)



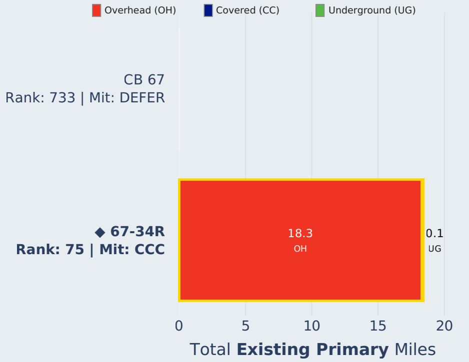
67-34R Lifecycle Nominal Cost Over 55 Years



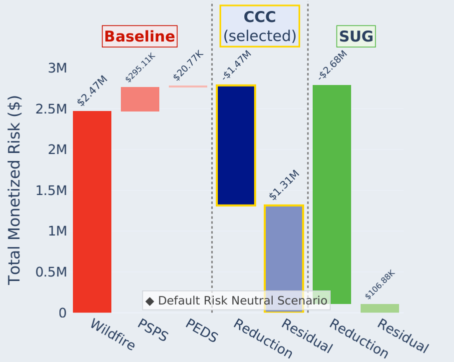
67-34R Cost-Effectiveness - Mitigation Selection Scenarios



67-34R Upstream Hardened Miles



67-34R Risk Breakdown



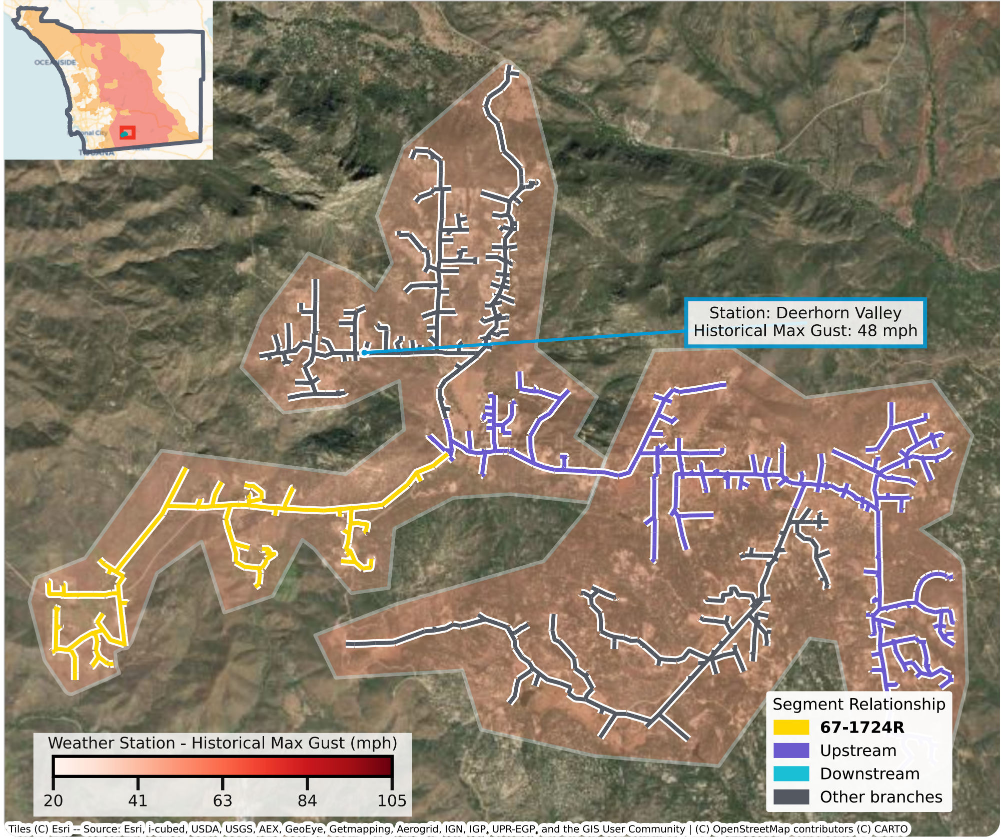
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

67-1724R | Rank: 322 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
82 Total		With AFN Flag	3	CRITICAL FACILITIES
Residential	Non-Residential			
68	14	5		

Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (67-34R, 67-1728R, 67-1726R) supported the selection of **CCC**.

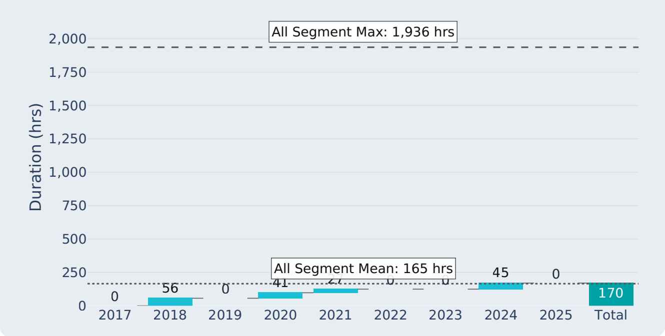
Circuit 67 Map



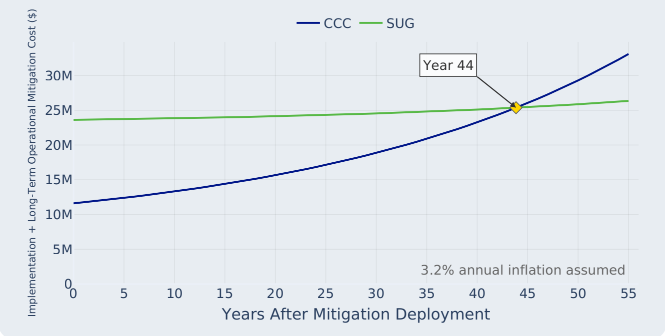
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

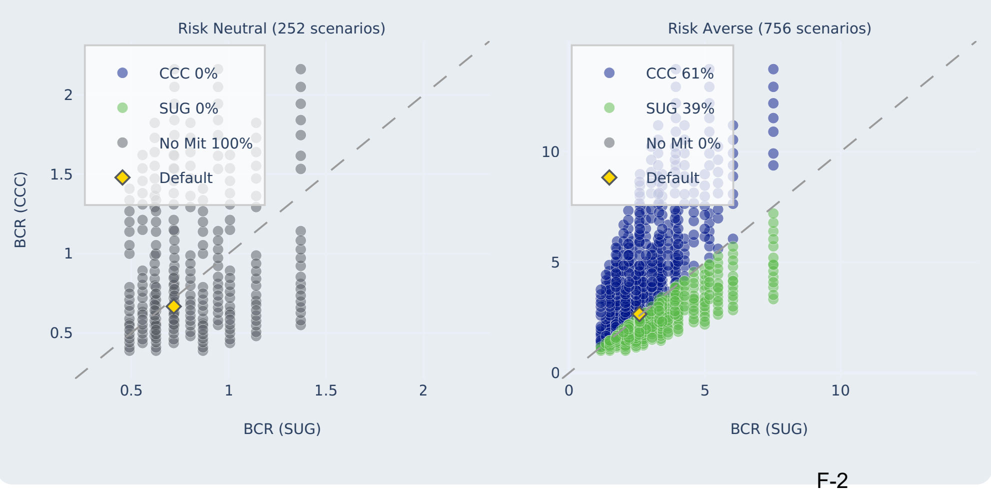
67-1724R PSPS Event Duration (hrs)



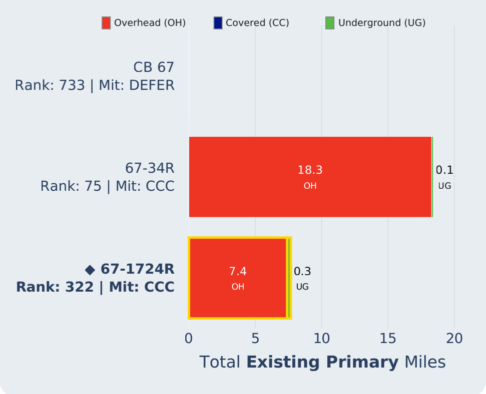
67-1724R Lifecycle Nominal Cost Over 55 Years



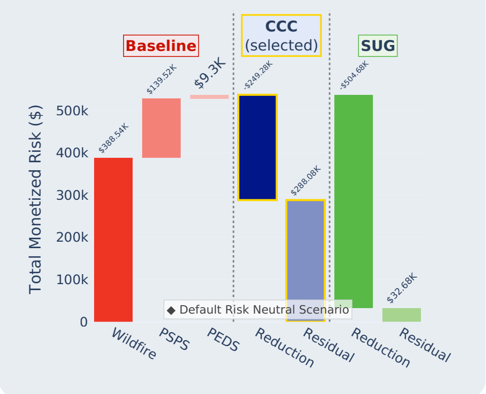
67-1724R Cost-Effectiveness - Mitigation Selection Scenarios



67-1724R Upstream Hardened Miles



67-1724R Risk Breakdown

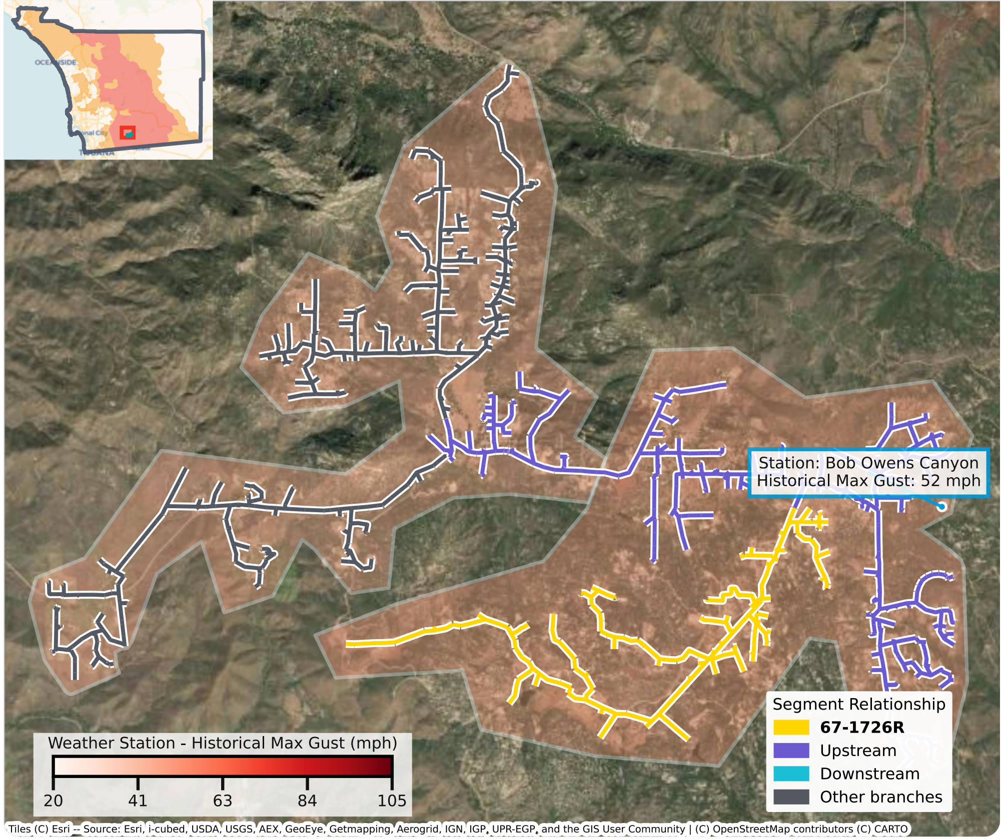


67-1726R | Rank: 213 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
107 Total		With AFN Flag		
Residential	Non-Residential		3	CRITICAL FACILITIES
90	17	9		

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (67-34R, 67-1728R, 67-1724R) supported the selection of **CCC**.

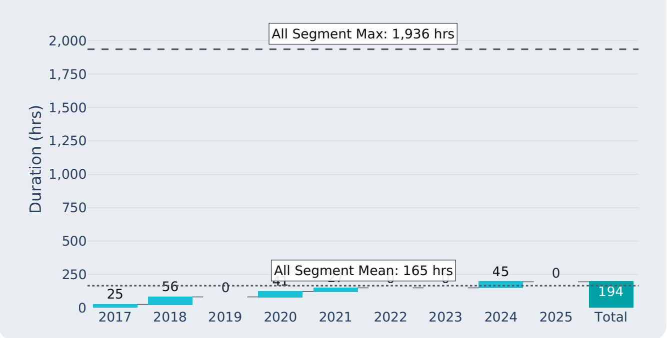
Circuit 67 Map



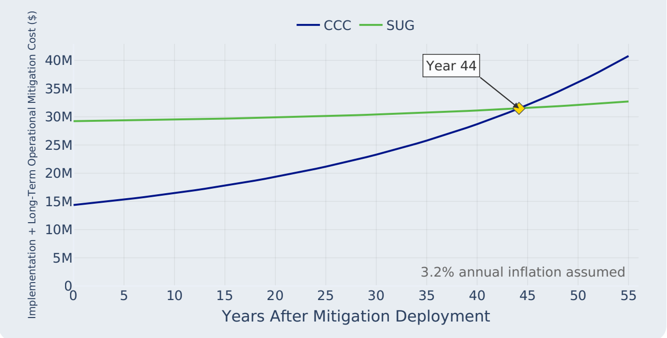
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

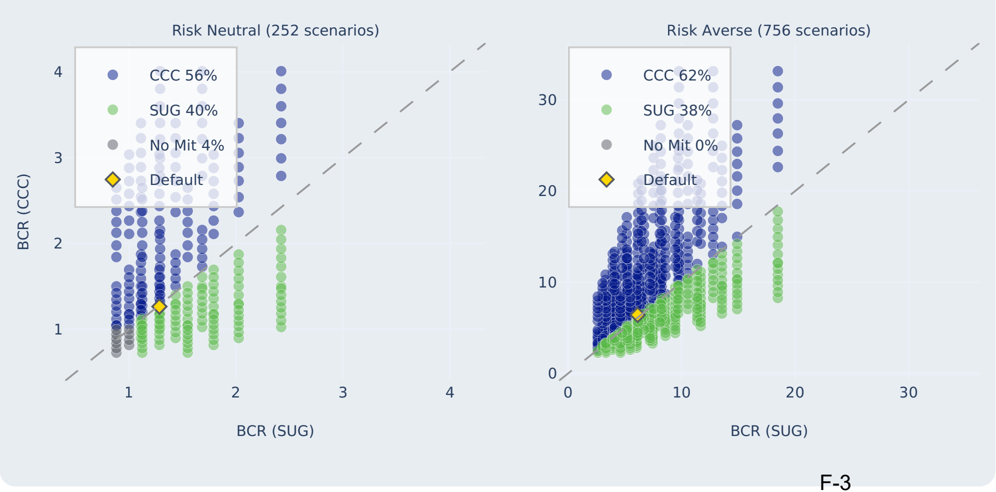
67-1726R PSPS Event Duration (hrs)



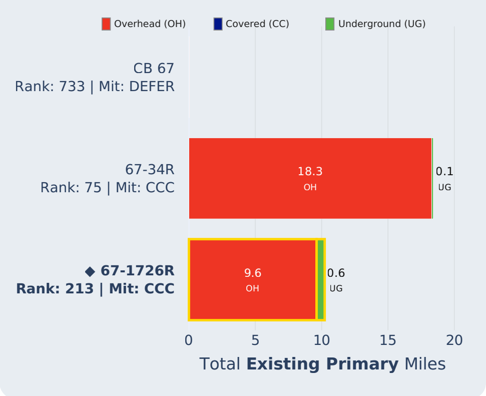
67-1726R Lifecycle Nominal Cost Over 55 Years



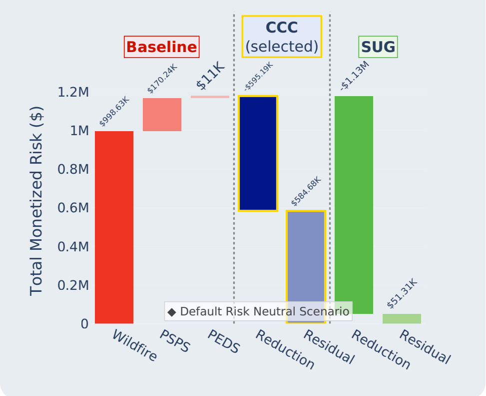
67-1726R Cost-Effectiveness - Mitigation Selection Scenarios



67-1726R Upstream Hardened Miles



67-1726R Risk Breakdown

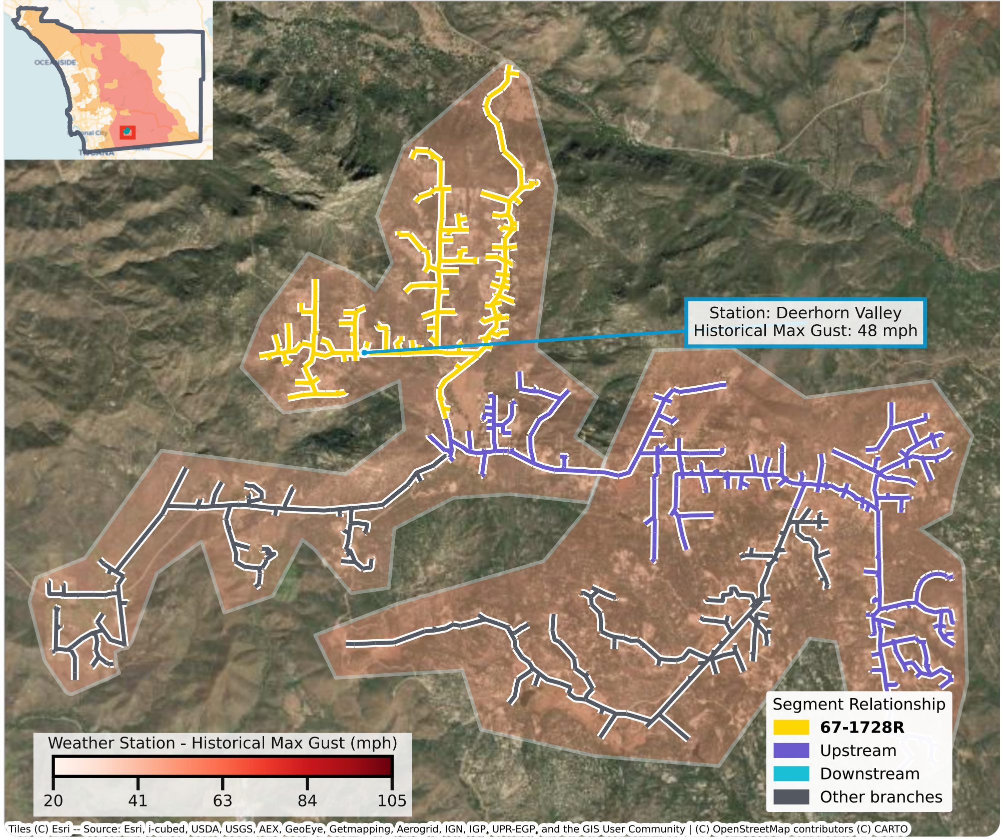


67-1728R | Rank: 162 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
156 Total		With AFN Flag		
Residential	Non-Residential		3	CRITICAL FACILITIES
134	22	15		

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (67-34R, 67-1726R, 67-1724R) supported the selection of **CCC**.

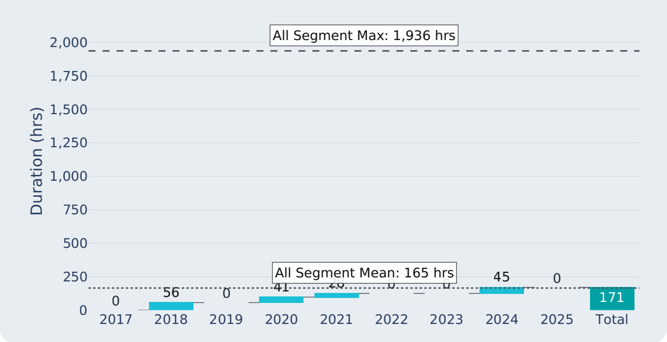
Circuit 67 Map



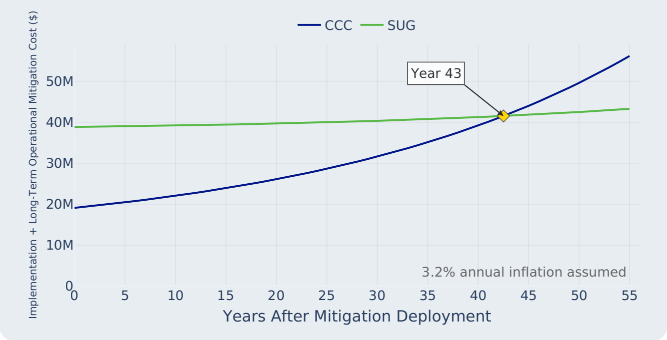
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

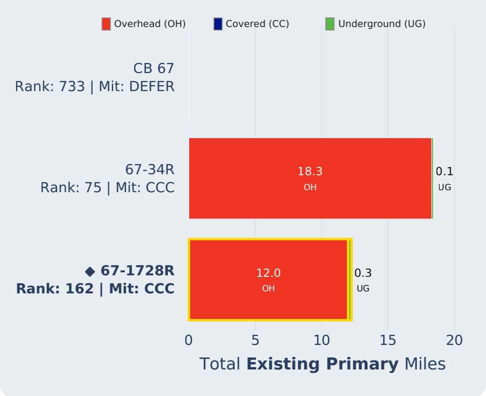
67-1728R PSPS Event Duration (hrs)



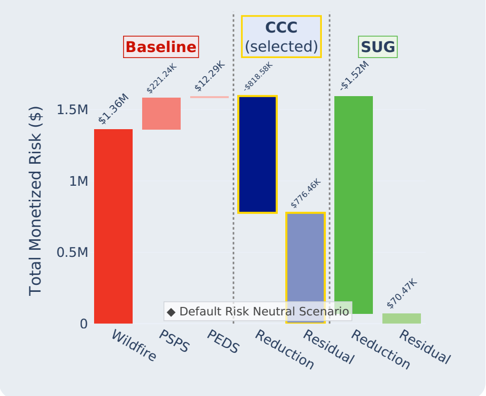
67-1728R Lifecycle Nominal Cost Over 55 Years



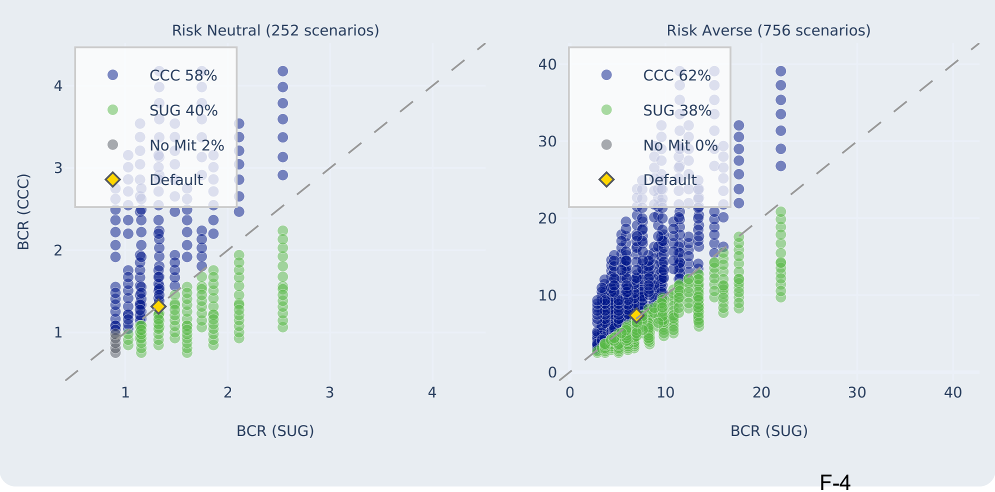
67-1728R Upstream Hardened Miles



67-1728R Risk Breakdown



67-1728R Cost-Effectiveness - Mitigation Selection Scenarios

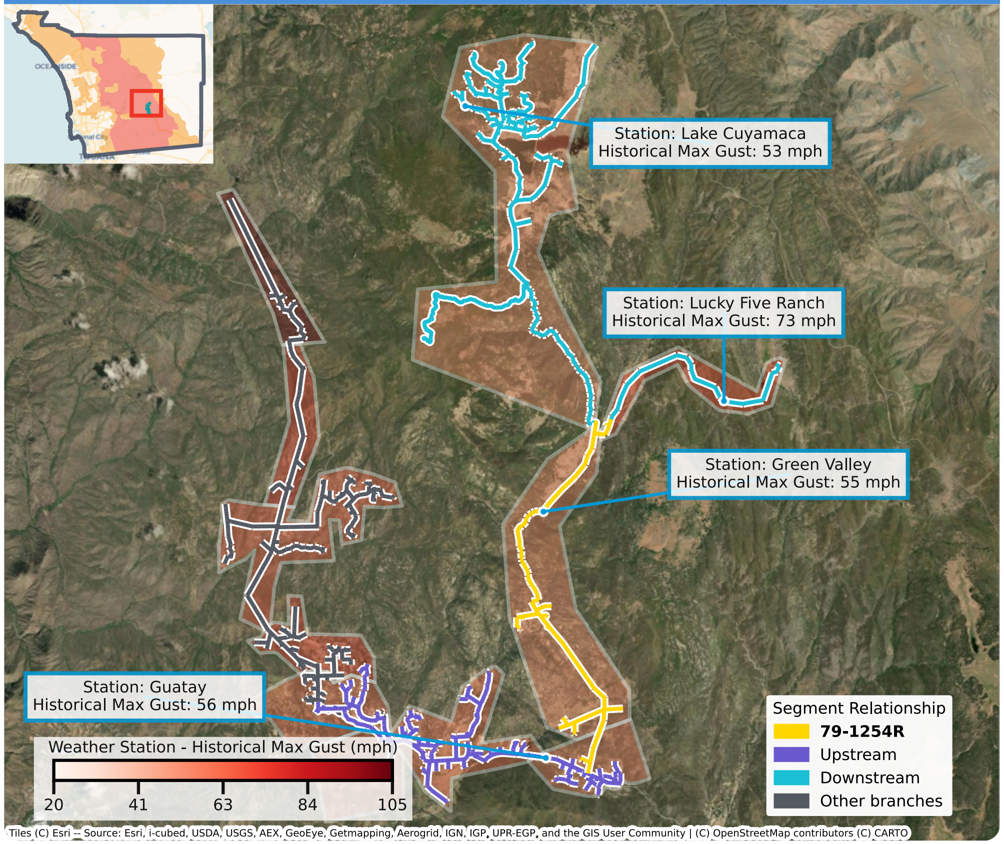


79-1254R | Rank: 29 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
252 Total		With AFN Flag		
Residential	Non-Residential			
175	77	1	3	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

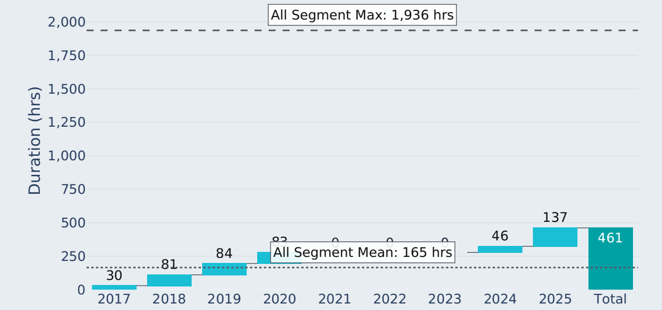
Circuit 79 Map



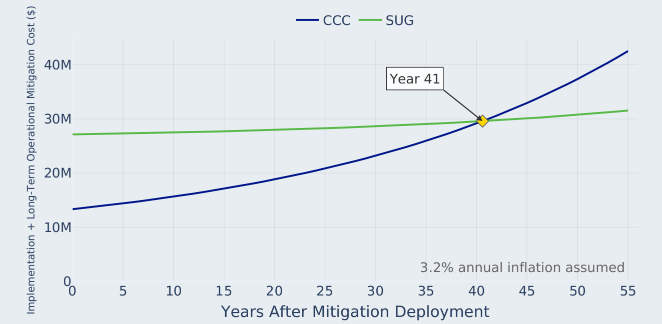
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

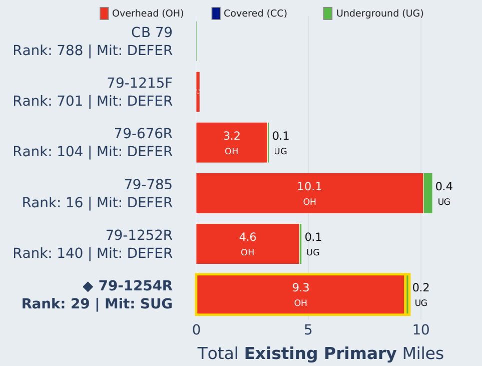
79-1254R PSPS Event Duration (hrs)



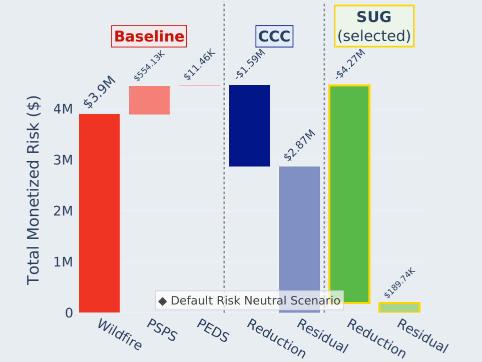
79-1254R Lifecycle Nominal Cost Over 55 Years



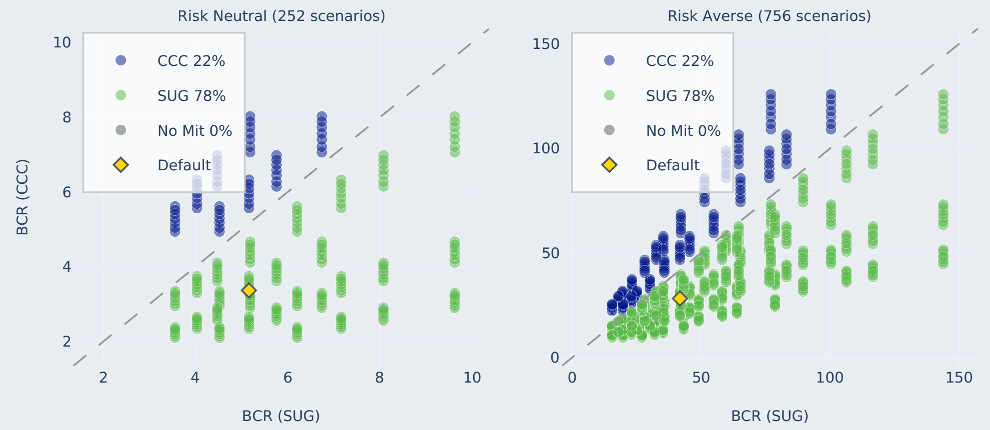
79-1254R Upstream Hardened Miles



79-1254R Risk Breakdown



79-1254R Cost-Effectiveness - Mitigation Selection Scenarios

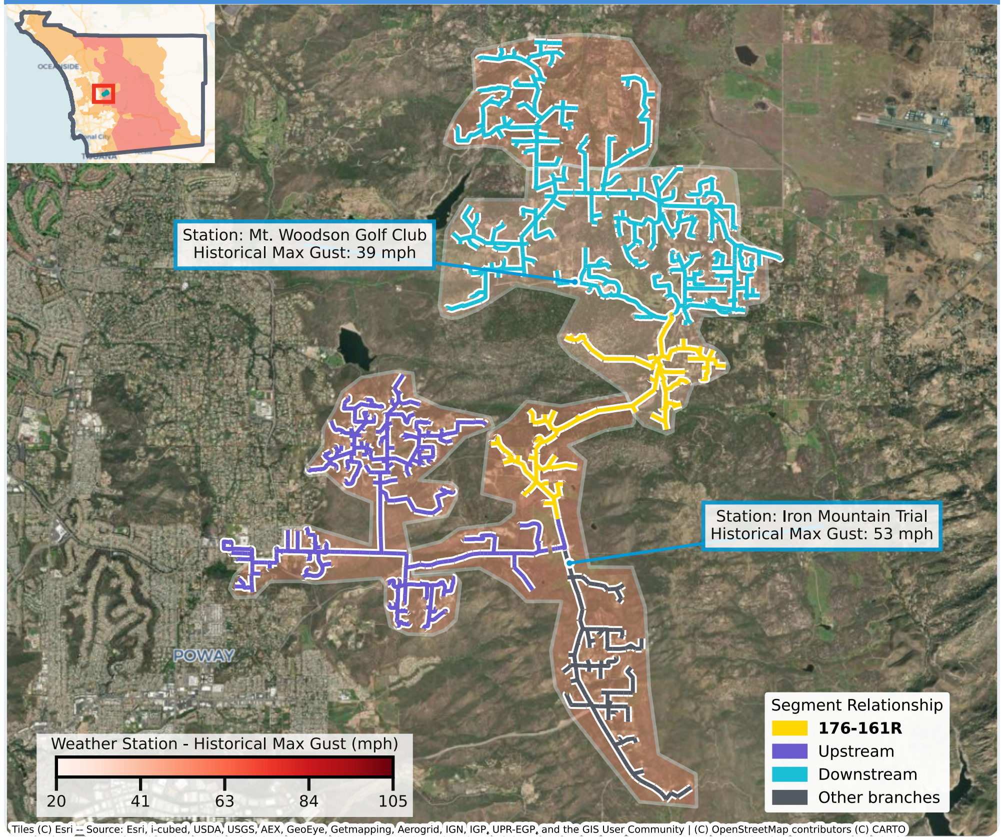


176-161R | Rank: 61 | Mitigation: CCC

<table>
<tr><th colspan="3">Downstream Customers</th><th rowspan="2">HFTD Tier</th><th rowspan="2">Community</th></tr>
<tr><td colspan="2">809 Total</td><td rowspan="2">With AFN Flag</td></tr>
<tr><td>Residential</td><td>Non-Residential</td><td rowspan="2">3</td><td rowspan="2">CRITICAL FACILITIES</td></tr>
<tr><td>686</td><td>123</td><td>9</td></tr>
</table>

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (176-197F, 176-1834R) supported the selection of **CCC**. Furthermore, the presence of **existing Covered Conductor (CC)** and **existing steel poles** were factors in the decision to select **CCC**. Having both can further reduce installation costs and complexity, as the infrastructure is already partially upgraded.

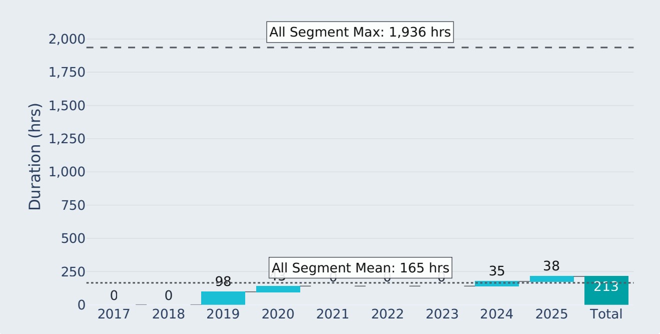
Circuit 176 Map



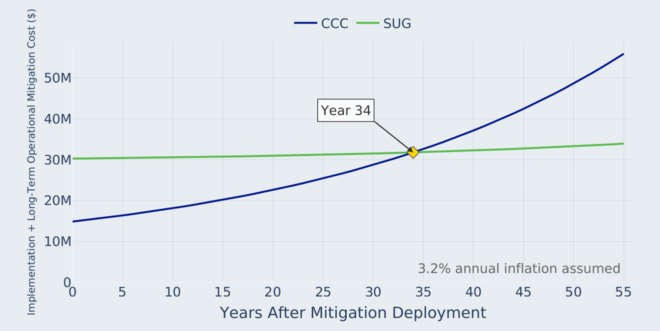
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

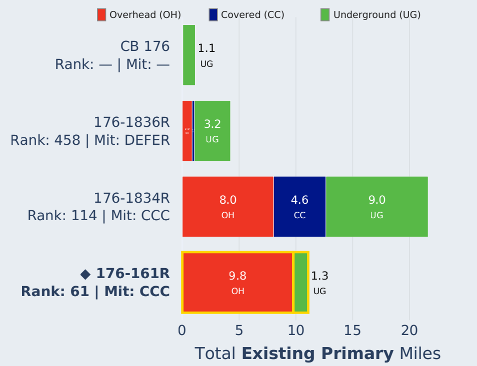
176-161R PSPS Event Duration (hrs)



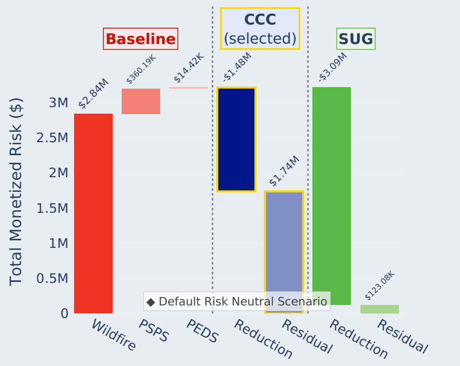
176-161R Lifecycle Nominal Cost Over 55 Years



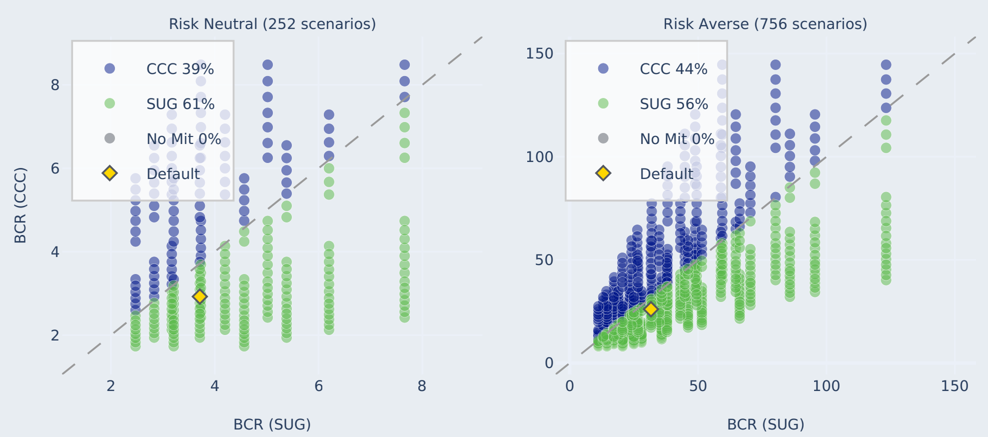
176-161R Upstream Hardened Miles



176-161R Risk Breakdown



176-161R Cost-Effectiveness - Mitigation Selection Scenarios

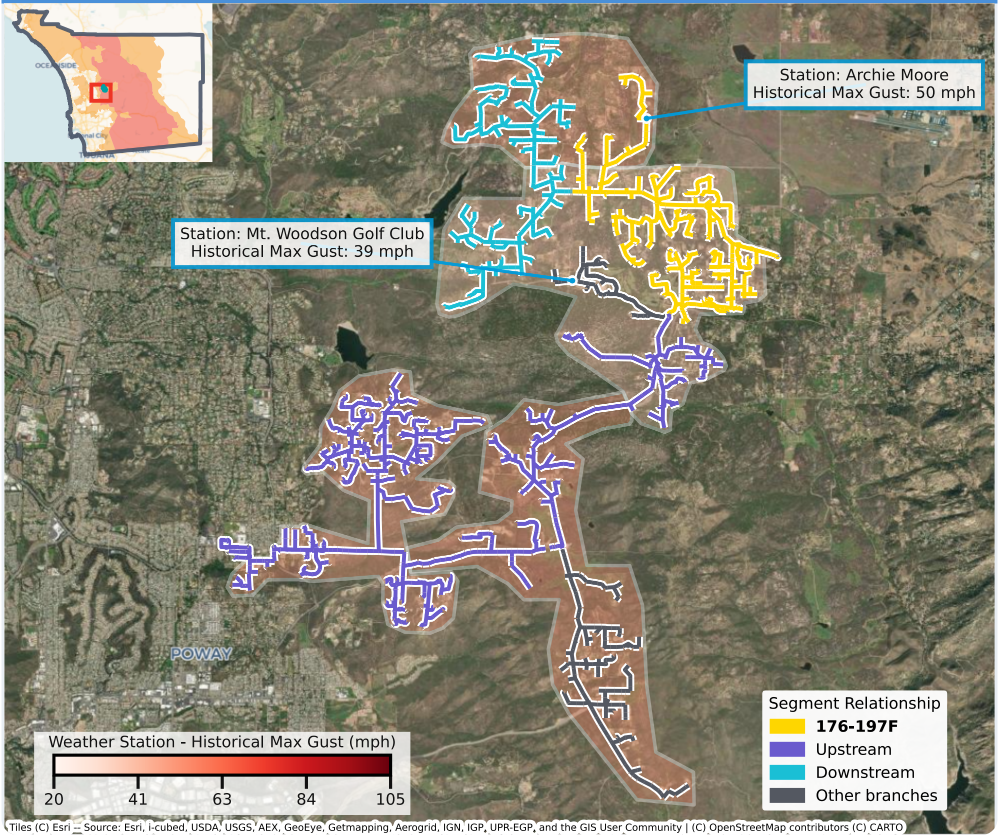


176-197F | Rank: 46 | Mitigation: CCC

Downstream Customers		With AFN Flag	HFTD Tier	Community
524 Total				
Residential	Non-Residential			
440	84	36	3	CRITICAL FACILITIES

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (176-161R, 176-1834R) supported the selection of **CCC**. Furthermore, the presence of **existing Covered Conductor (CC)** and **existing steel poles** were factors in the decision to select **CCC**. Having both can further reduce installation costs and complexity, as the infrastructure is already partially upgraded.

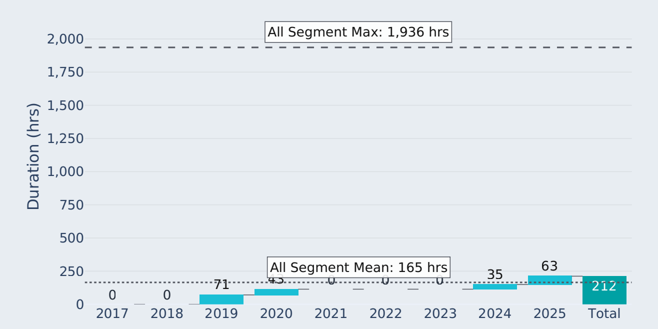
Circuit 176 Map



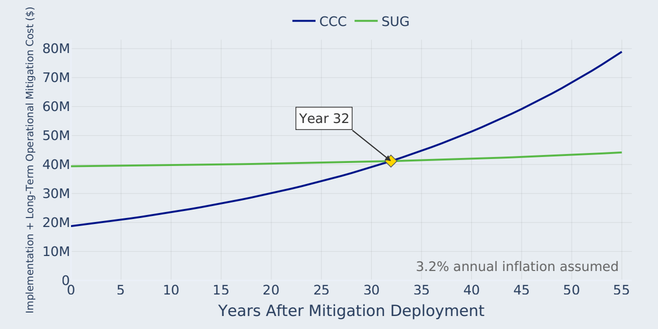
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

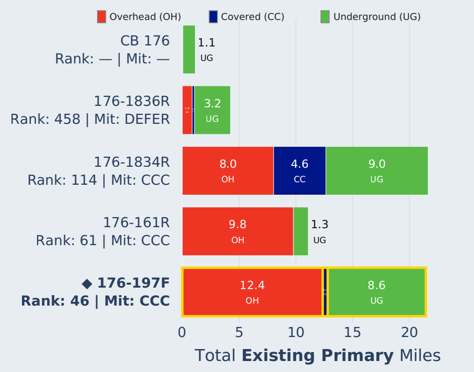
176-197F PSPS Event Duration (hrs)



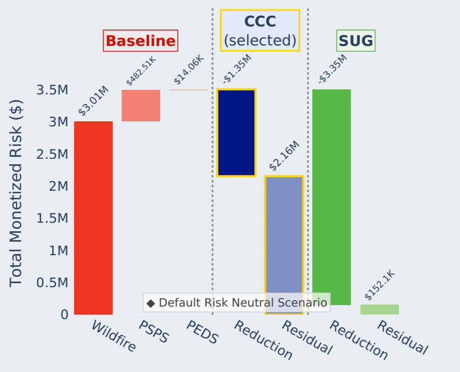
176-197F Lifecycle Nominal Cost Over 55 Years



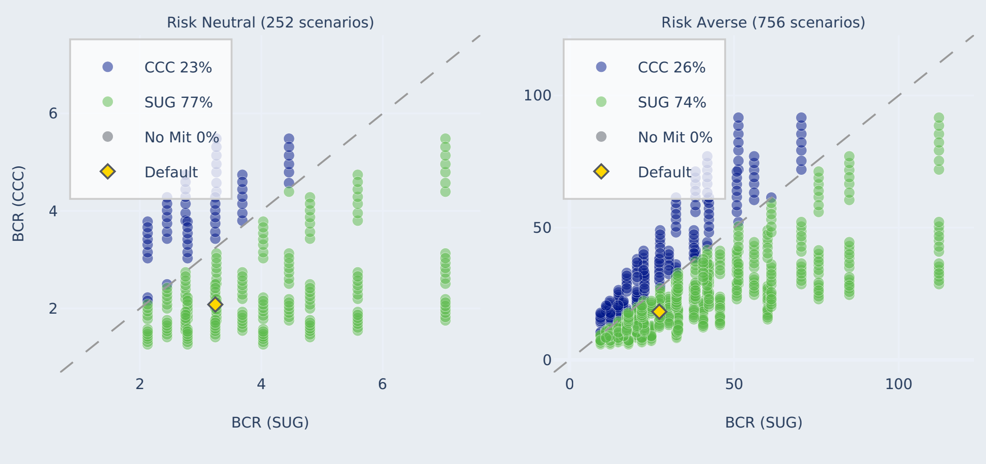
176-197F Upstream Hardened Miles



176-197F Risk Breakdown



176-197F Cost-Effectiveness - Mitigation Selection Scenarios

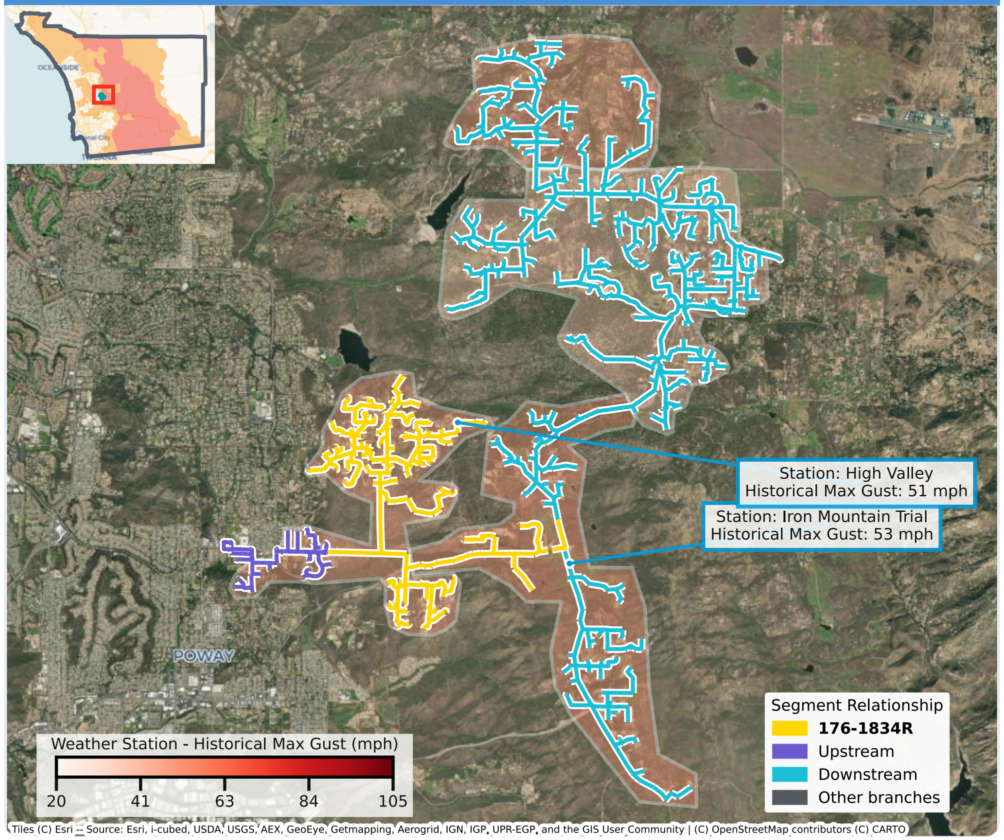


176-1834R | Rank: 114 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
1179 Total		With AFN Flag		
Residential	Non-Residential		3	CRITICAL FACILITIES
999	180	14		

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (176-197F, 176-161R) supported the selection of **CCC**. Furthermore, the presence of **existing Covered Conductor (CC)** and **existing steel poles** were factors in the decision to select **CCC**. Having both can further reduce installation costs and complexity, as the infrastructure is already partially upgraded.

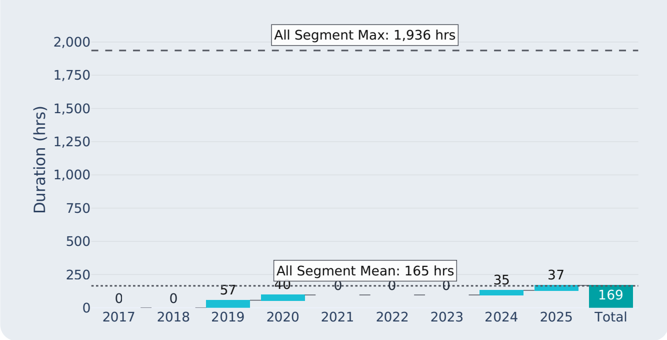
Circuit 176 Map



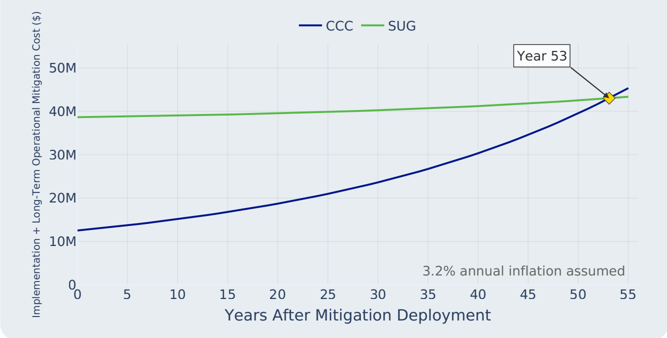
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

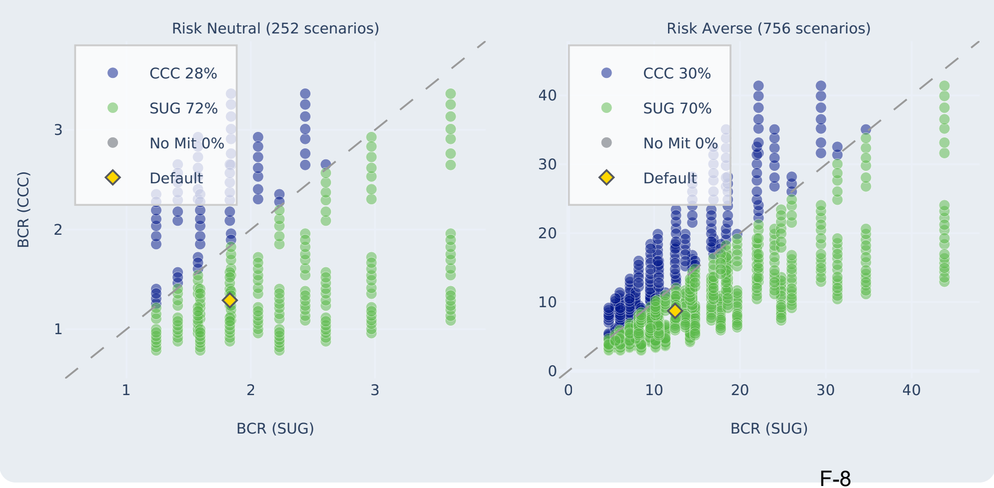
176-1834R PSPS Event Duration (hrs)



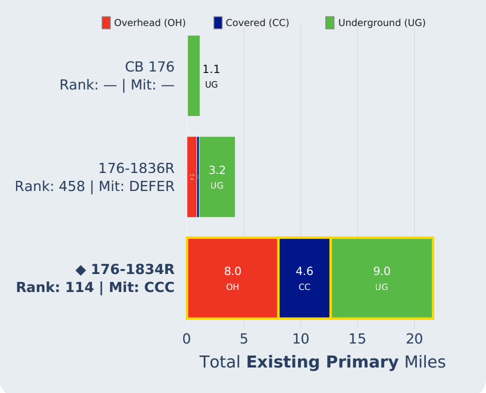
176-1834R Lifecycle Nominal Cost Over 55 Years



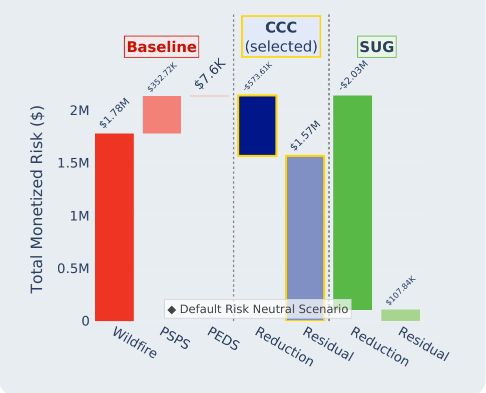
176-1834R Cost-Effectiveness - Mitigation Selection Scenarios



176-1834R Upstream Hardened Miles



176-1834R Risk Breakdown

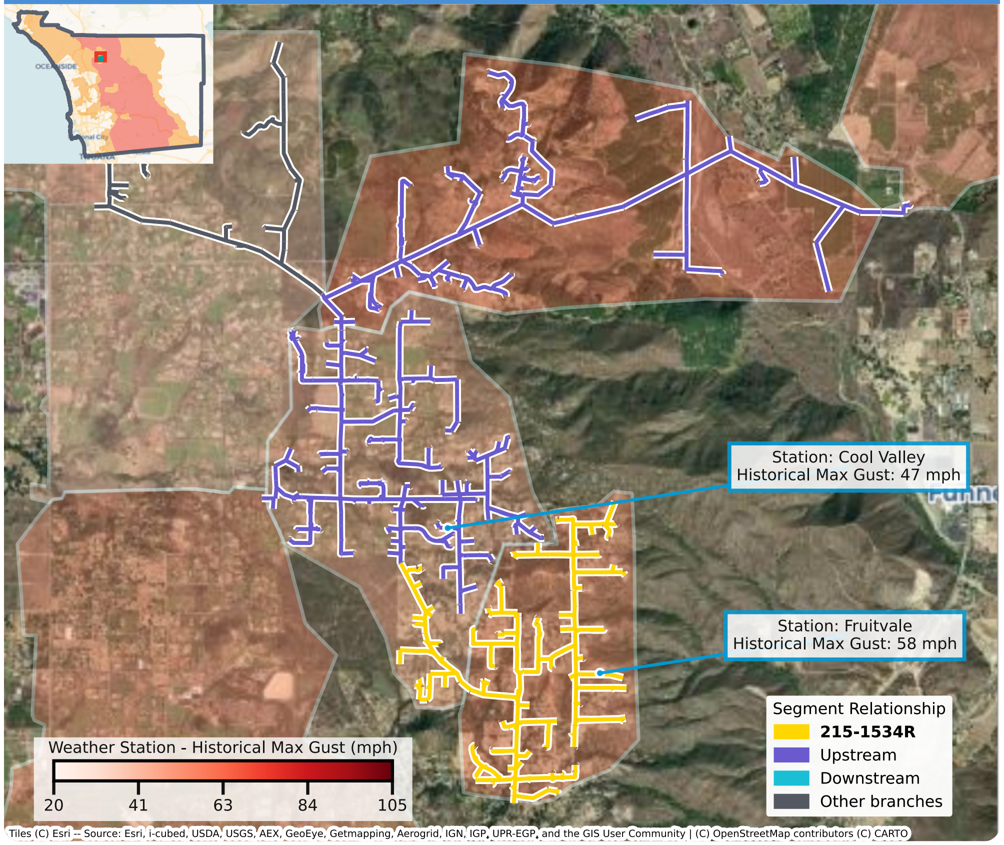


215-1534R | Rank: 44 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
190 Total		With AFN Flag		
Residential	Non-Residential			
179	11	10	2	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

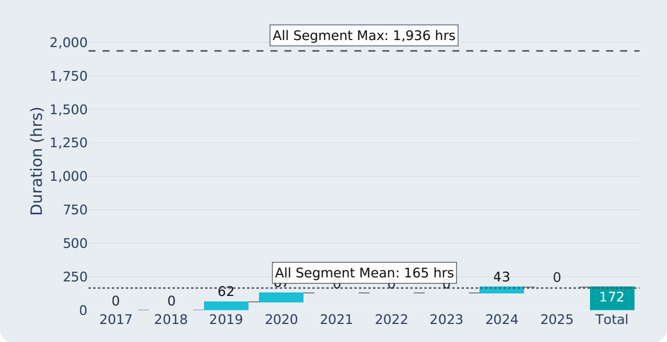
Circuit 215 Map



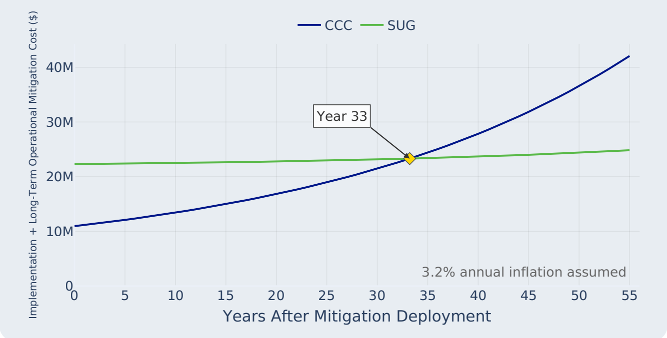
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

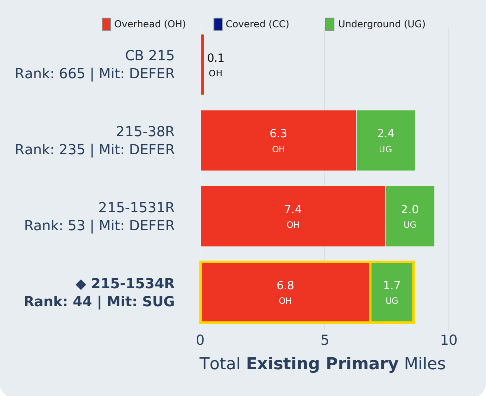
215-1534R PSPS Event Duration (hrs)



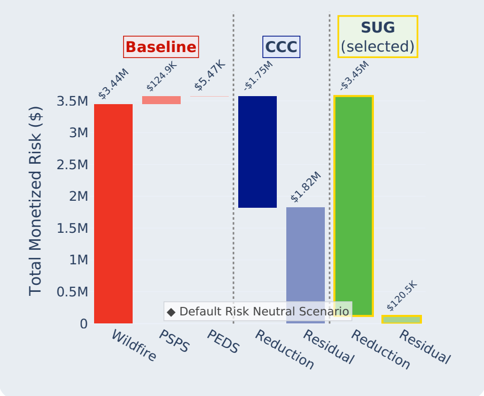
215-1534R Lifecycle Nominal Cost Over 55 Years



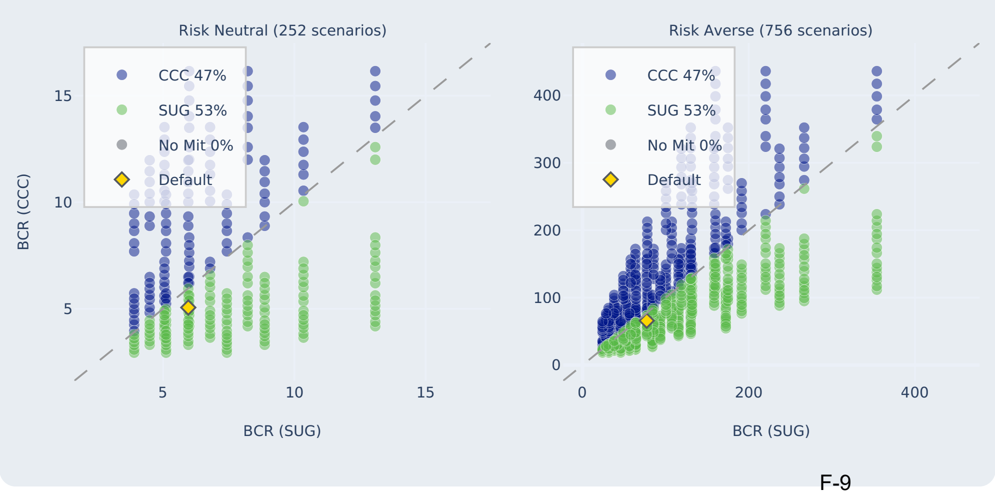
215-1534R Upstream Hardened Miles



215-1534R Risk Breakdown



215-1534R Cost-Effectiveness - Mitigation Selection Scenarios

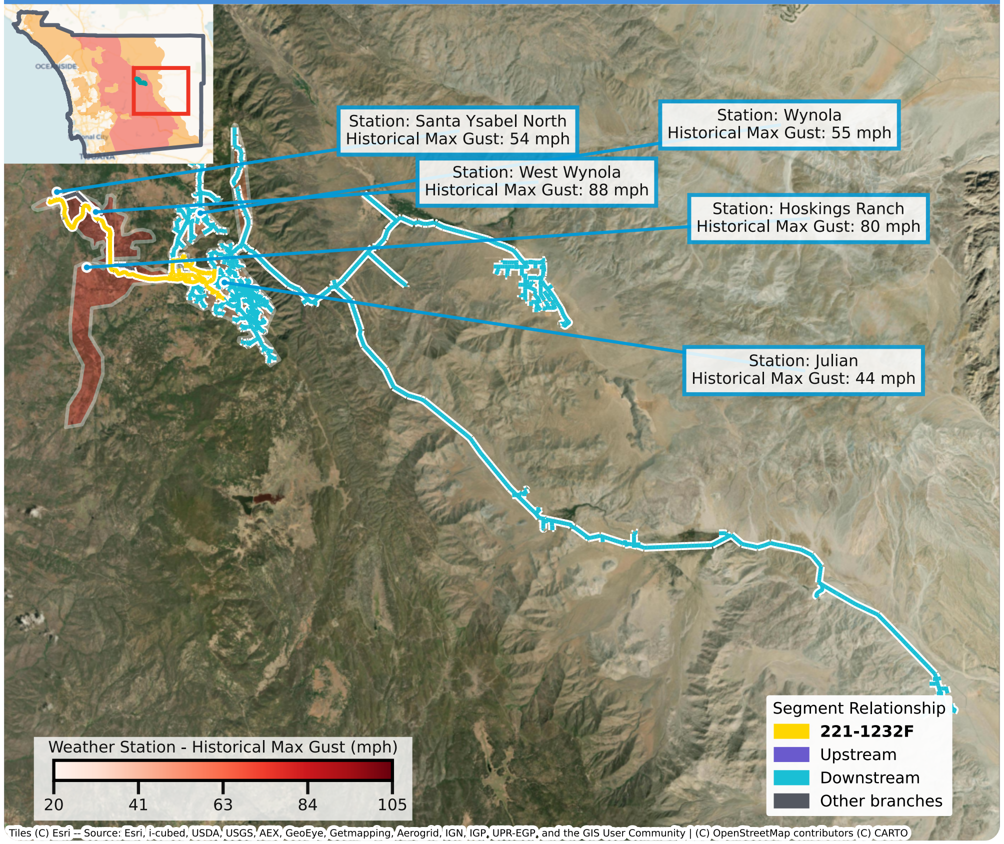


221-1232F | Rank: 40 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
1666 Total		With AFN Flag	3	CRITICAL FACILITIES
Residential	Non-Residential			
1353	313	9		

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

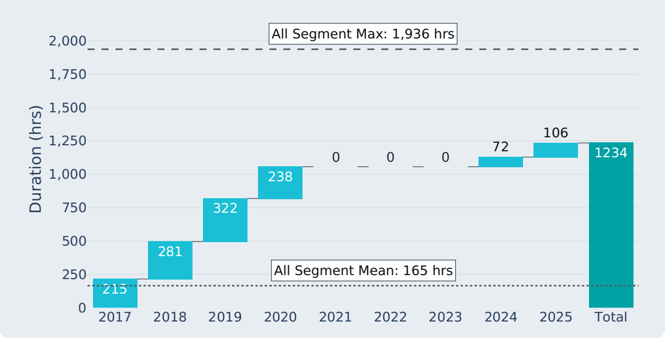
Circuit 221 Map



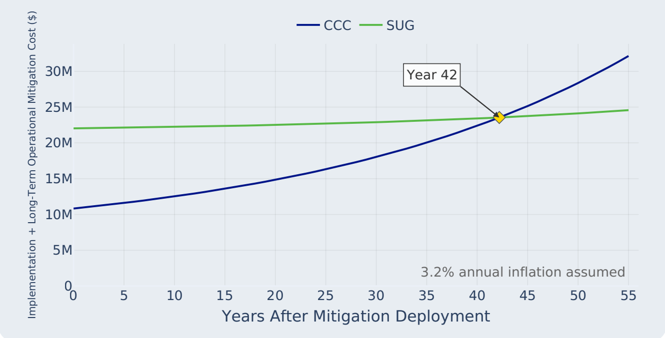
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

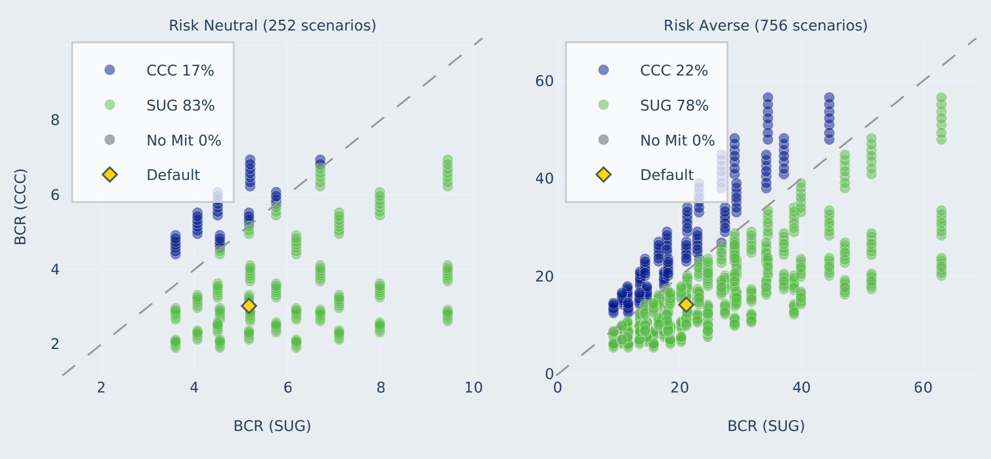
221-1232F PSPS Event Duration (hrs)



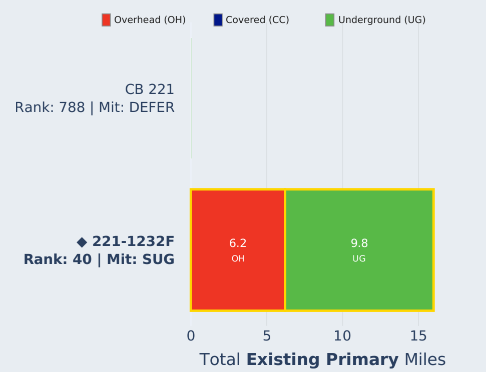
221-1232F Lifecycle Nominal Cost Over 55 Years



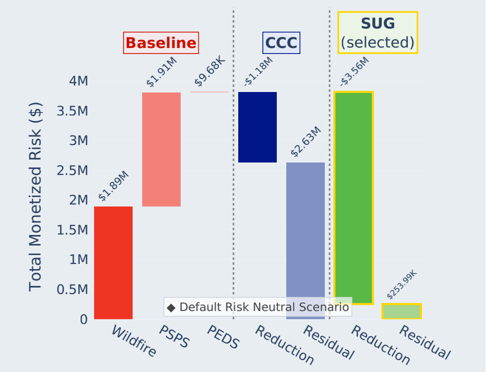
221-1232F Cost-Effectiveness - Mitigation Selection Scenarios



221-1232F Upstream Hardened Miles



221-1232F Risk Breakdown

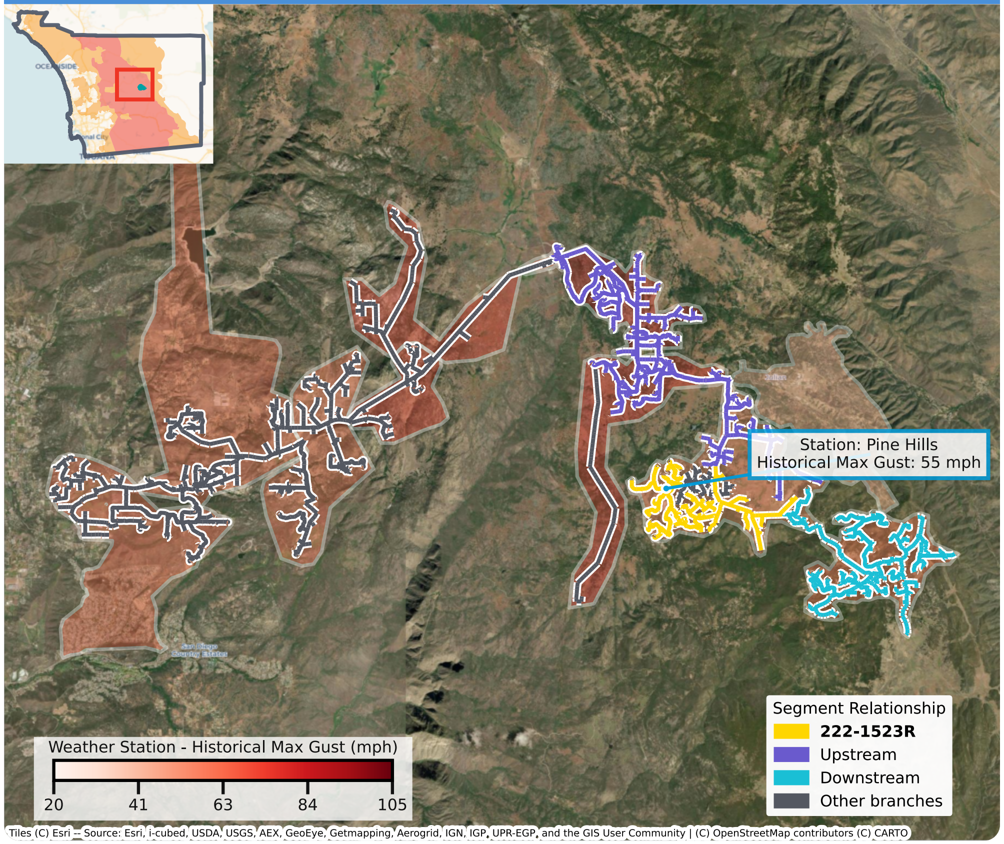


222-1523R | Rank: 39 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
492 Total		With AFN Flag	3	CRITICAL FACILITIES
Residential	Non-Residential			
398	94	14		

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (CB PE1, 222-2085) supported the selection of **SUG**.

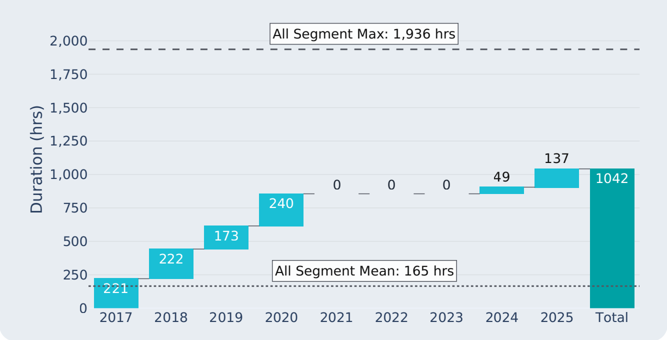
Circuit 222 Map



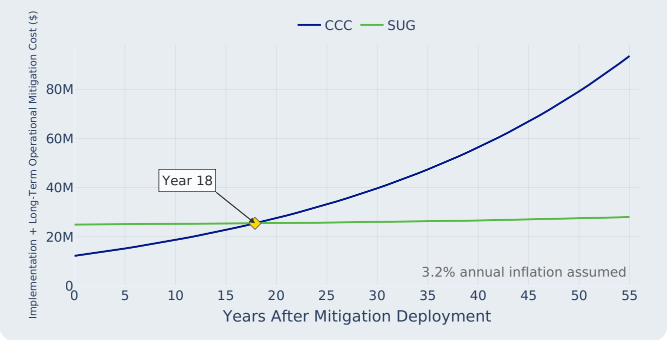
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

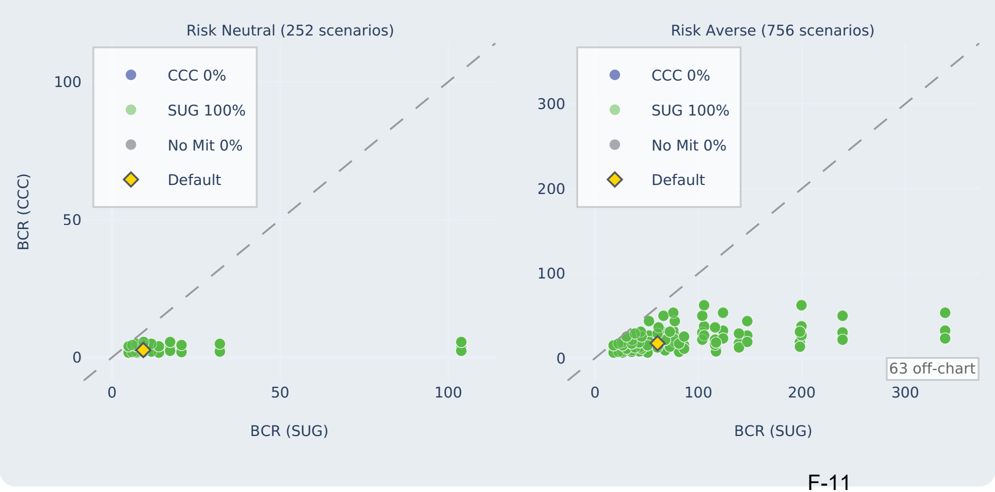
222-1523R PSPS Event Duration (hrs)



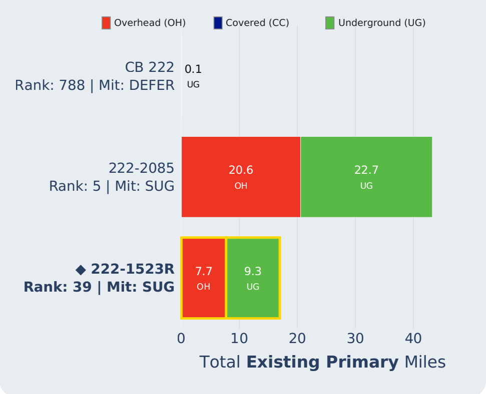
222-1523R Lifecycle Nominal Cost Over 55 Years



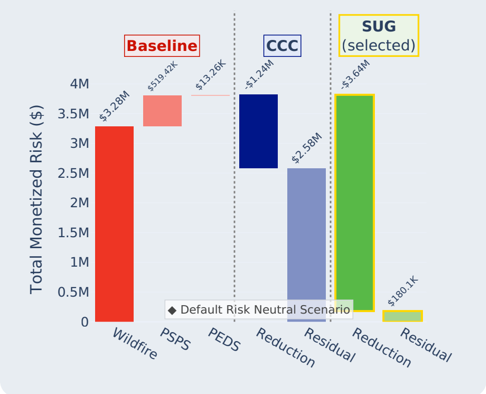
222-1523R Cost-Effectiveness - Mitigation Selection Scenarios



222-1523R Upstream Hardened Miles



222-1523R Risk Breakdown

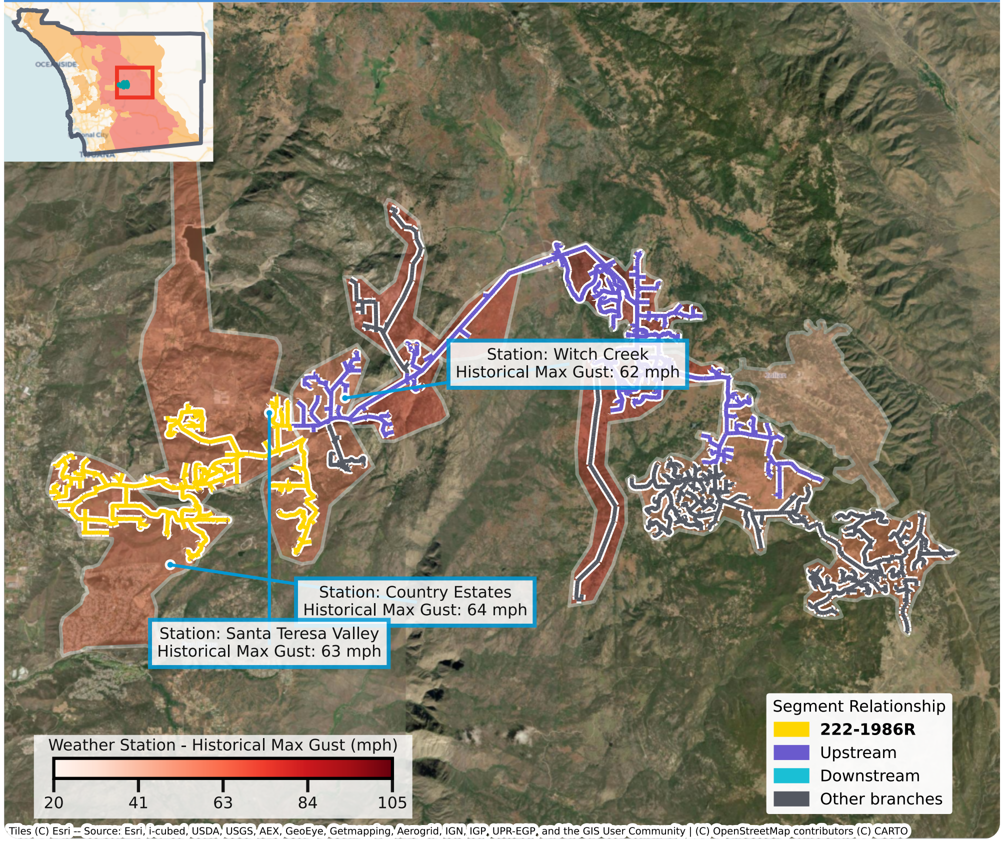


222-1986R | Rank: 2 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
305 Total		With AFN Flag		
Residential	Non-Residential			
220	85	16	3	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1990R) supported the selection of **SUG**.

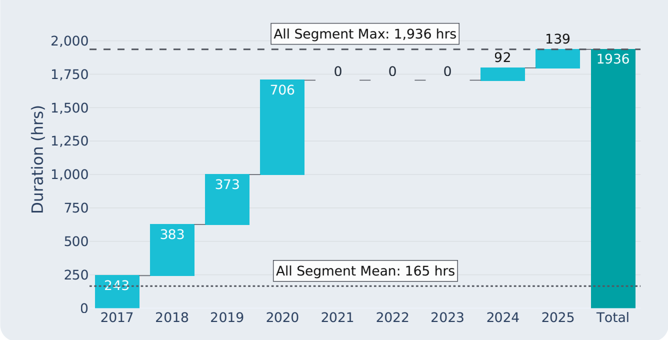
Circuit 222 Map



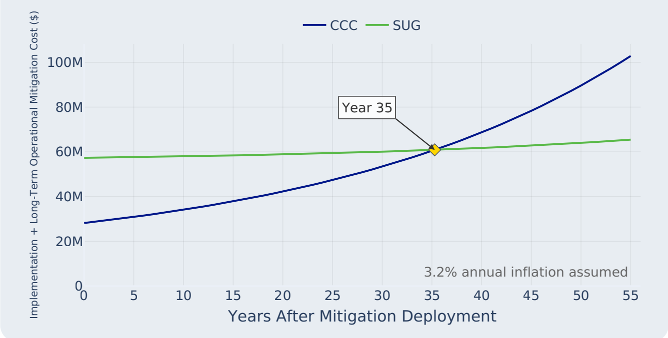
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

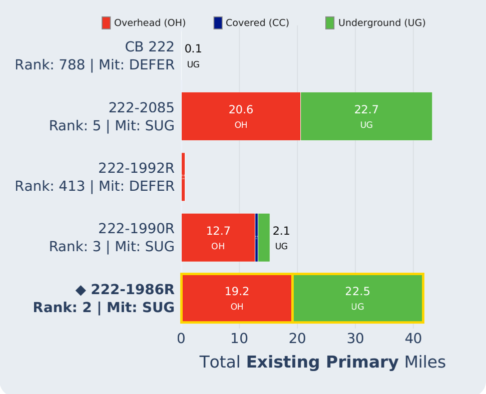
222-1986R PSPS Event Duration (hrs)



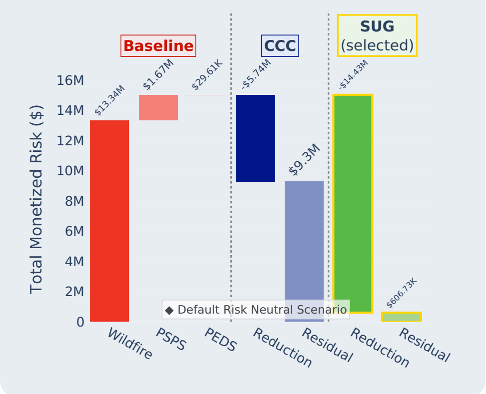
222-1986R Lifecycle Nominal Cost Over 55 Years



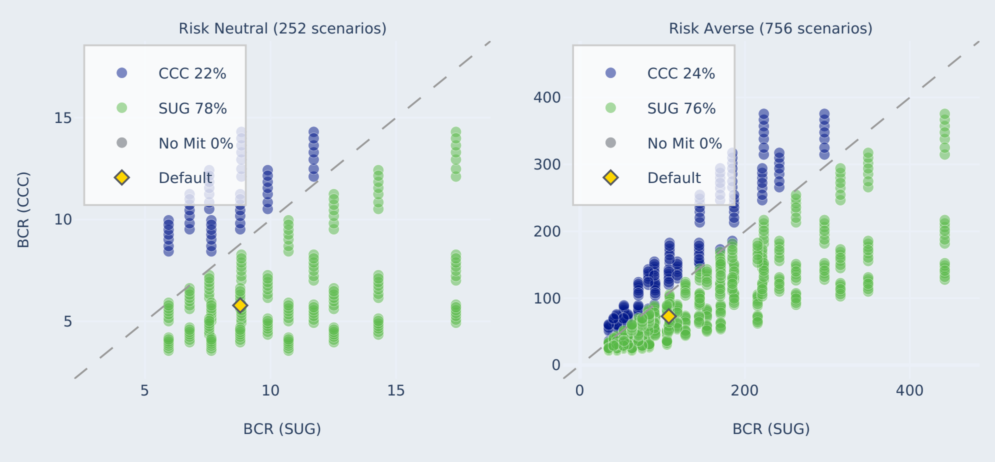
222-1986R Upstream Hardened Miles



222-1986R Risk Breakdown



222-1986R Cost-Effectiveness - Mitigation Selection Scenarios

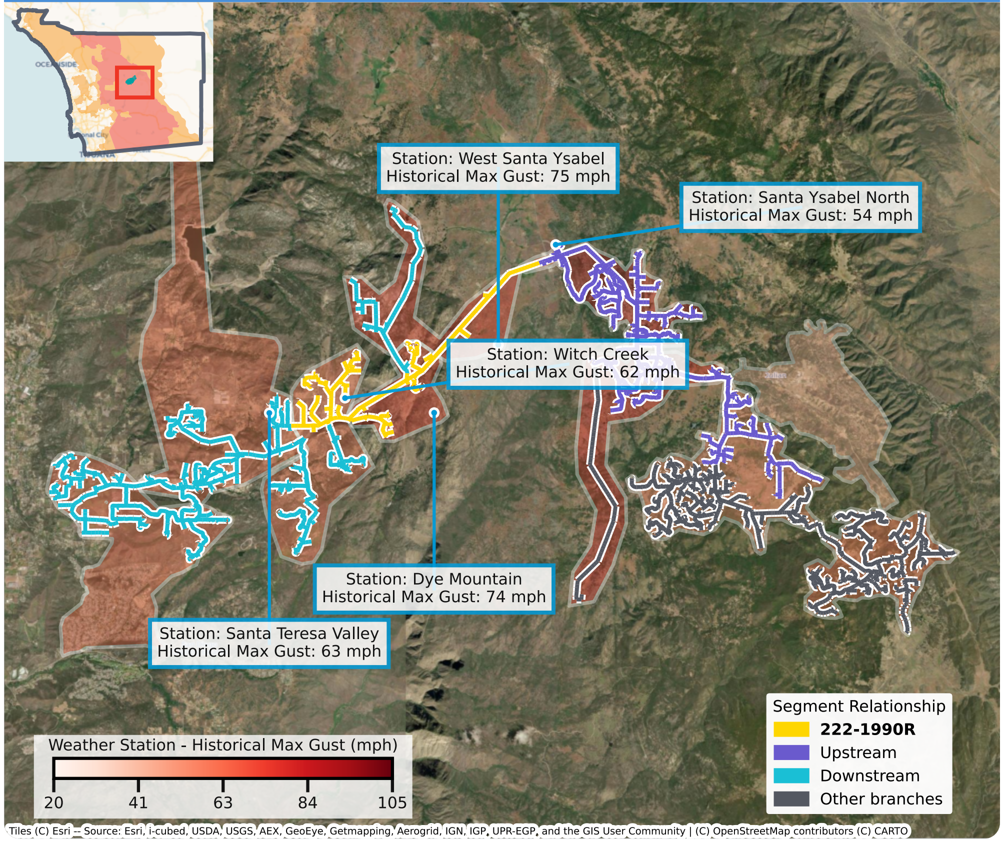


222-1990R | Rank: 3 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
416 Total		With AFN Flag	3	DVC TRIBAL CRITICAL FACILITIES
Residential	Non-Residential			
287	129	6		

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1986R) supported the selection of **SUG**.

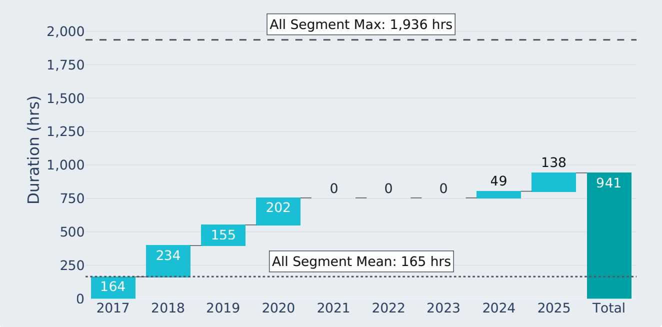
Circuit 222 Map



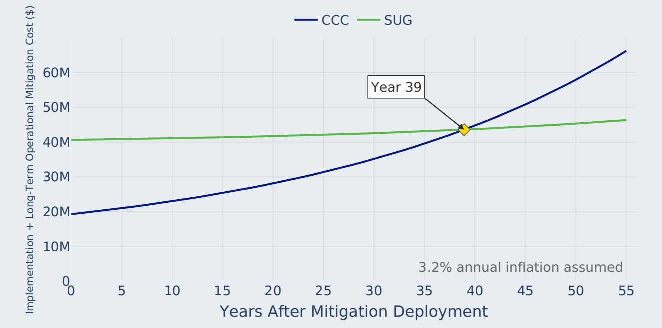
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

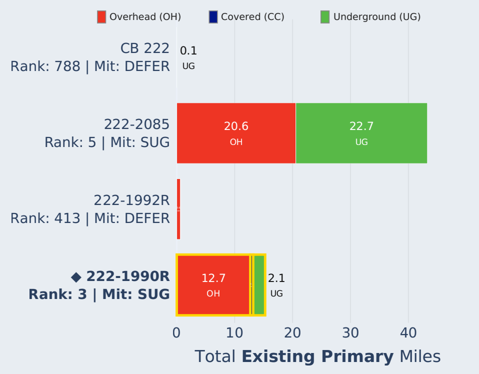
222-1990R PSPS Event Duration (hrs)



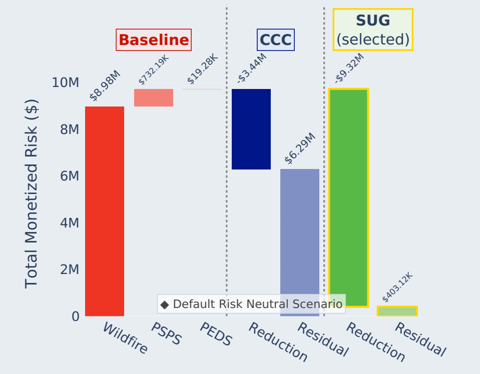
222-1990R Lifecycle Nominal Cost Over 55 Years



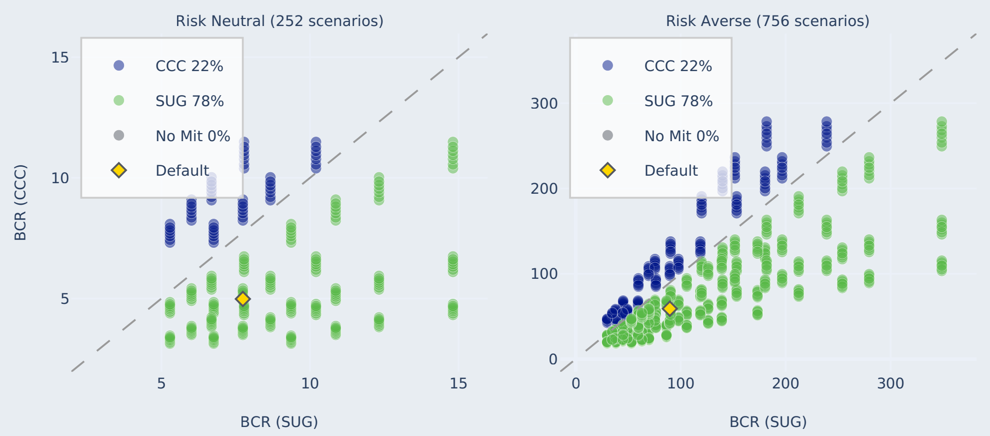
222-1990R Upstream Hardened Miles



222-1990R Risk Breakdown



222-1990R Cost-Effectiveness - Mitigation Selection Scenarios

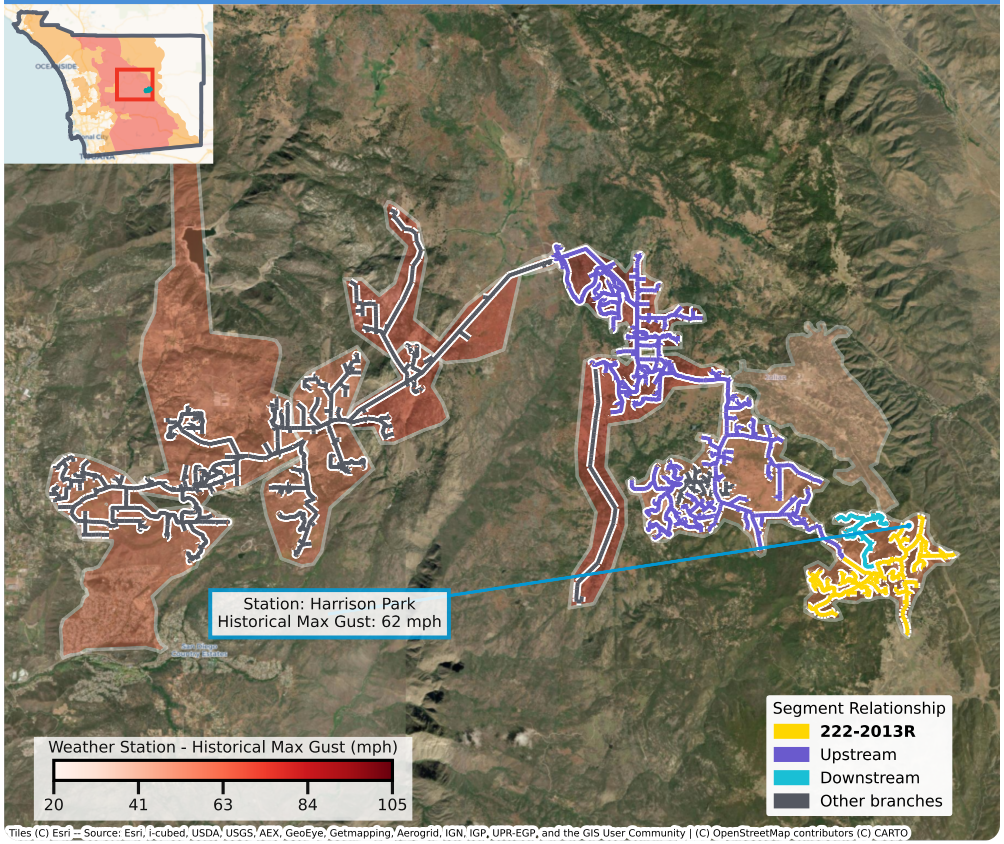


222-2013R | Rank: 17 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
246 Total		With AFN Flag		
Residential	Non-Residential			
198	48	18	3	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

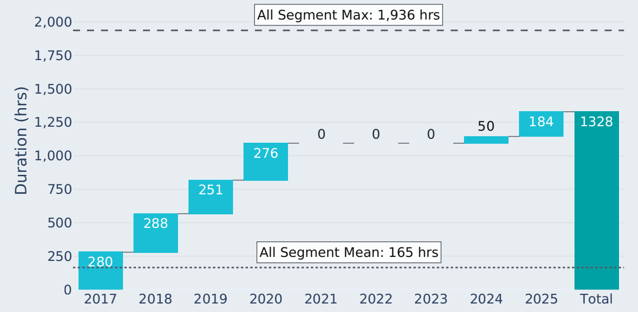
Circuit 222 Map



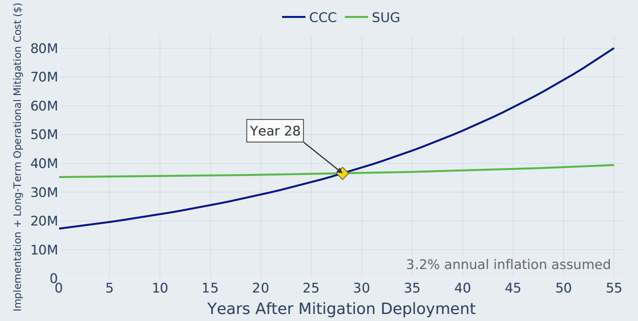
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

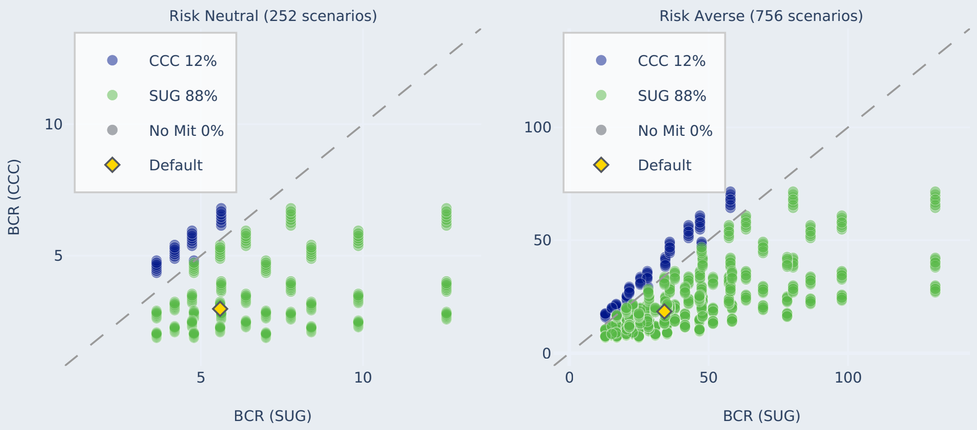
222-2013R PSPS Event Duration (hrs)



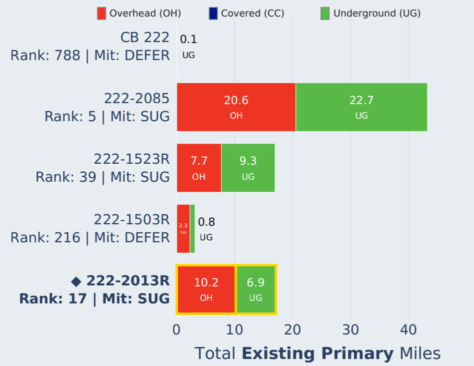
222-2013R Lifecycle Nominal Cost Over 55 Years



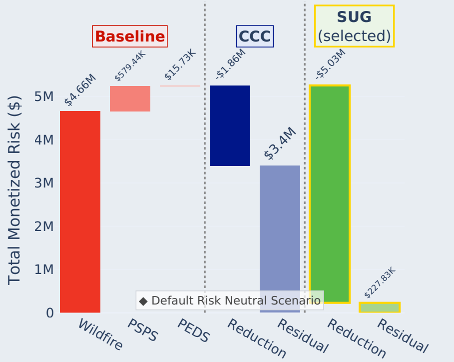
222-2013R Cost-Effectiveness - Mitigation Selection Scenarios



222-2013R Upstream Hardened Miles



222-2013R Risk Breakdown

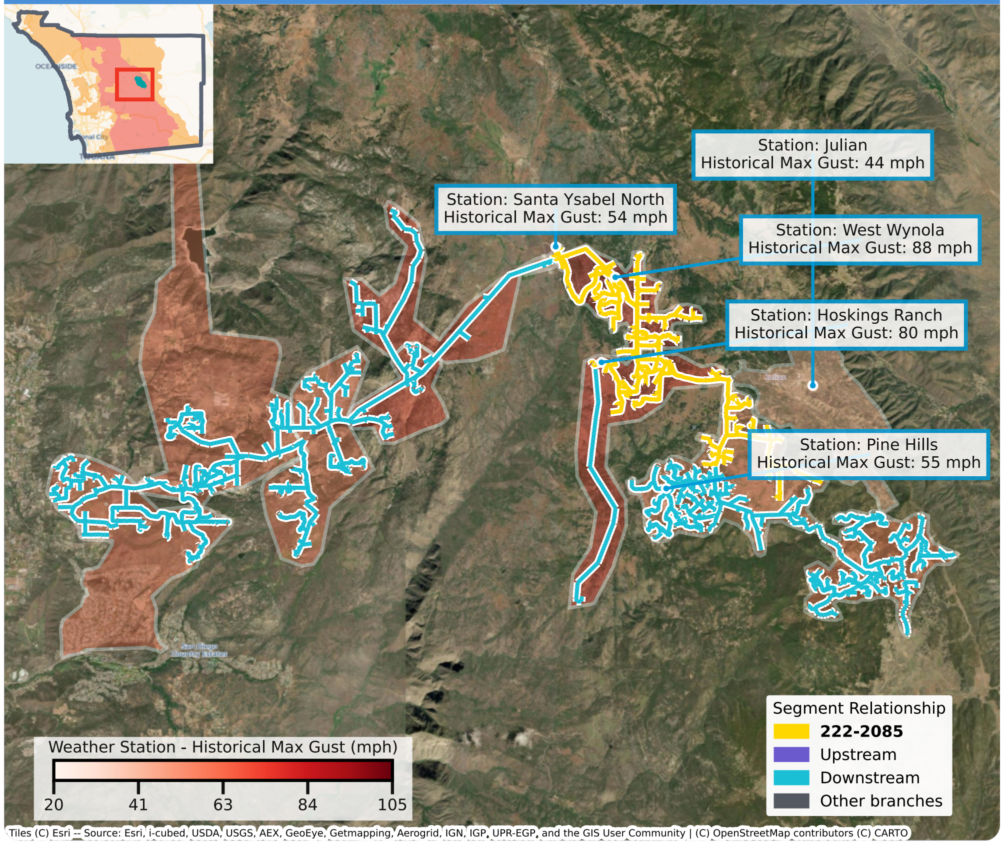


222-2085 | Rank: 5 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
1472 Total		With AFN Flag		
Residential	Non-Residential		3	CRITICAL FACILITIES
1129	343	28		

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1523R, CB PE1) supported the selection of **SUG**.

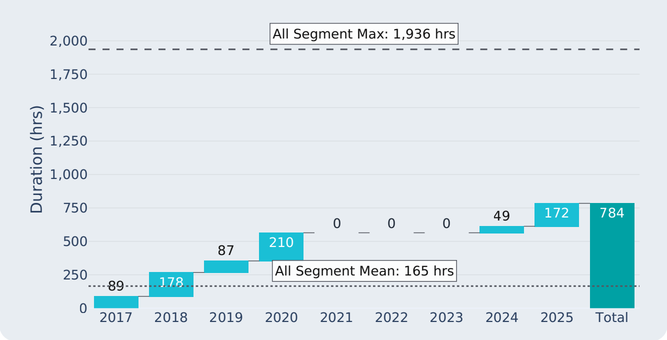
Circuit 222 Map



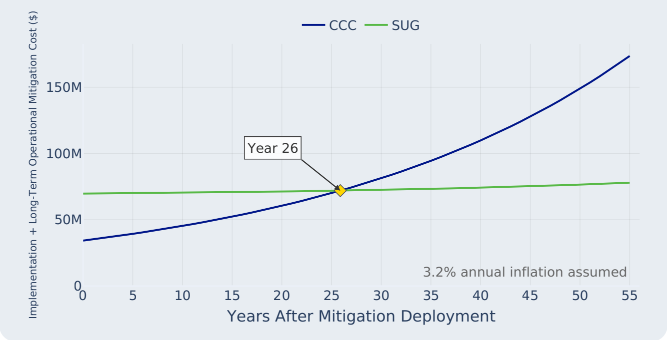
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

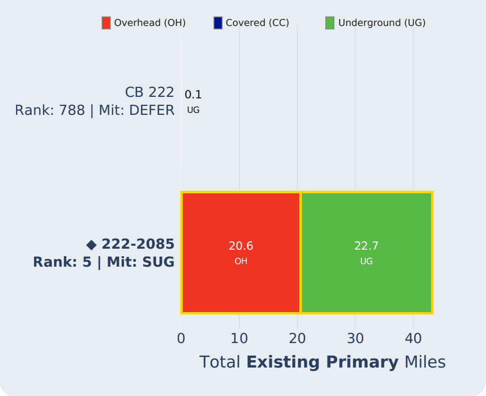
222-2085 PSPS Event Duration (hrs)



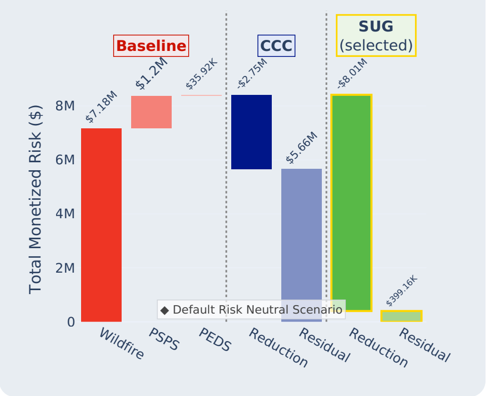
222-2085 Lifecycle Nominal Cost Over 55 Years



222-2085 Upstream Hardened Miles



222-2085 Risk Breakdown



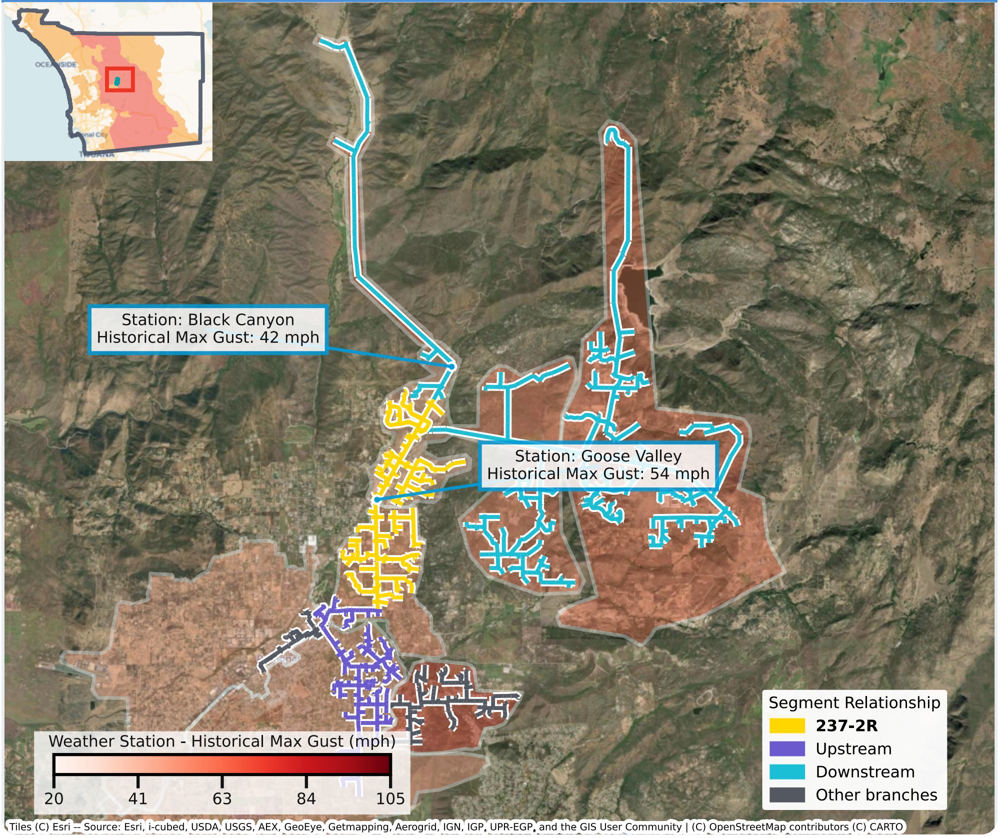
222-2085 Cost-Effectiveness - Mitigation Selection Scenarios

237-2R | Rank: 9 | Mitigation: SUG

Downstream Customers		With AFN Flag	HFTD Tier	Community
694 Total				
Residential	Non-Residential			
556	138	31	3	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, **Tail Risk** was a consideration in the decision to select **SUG**. Furthermore, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Moreover, **Bundling** with other segments (237-30R) supported the selection of **SUG**.

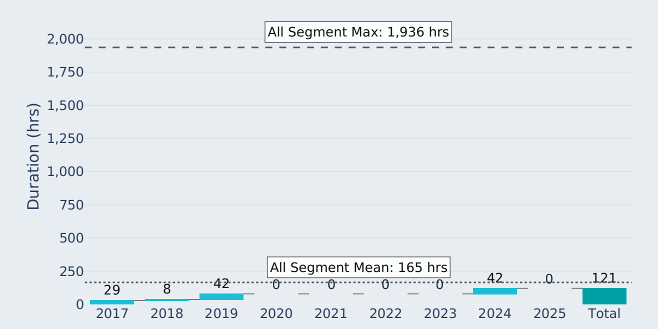
Circuit 237 Map



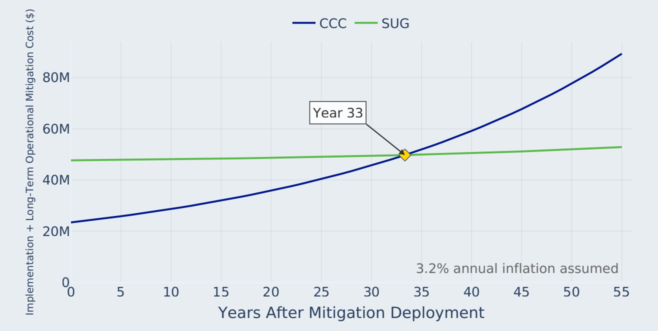
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

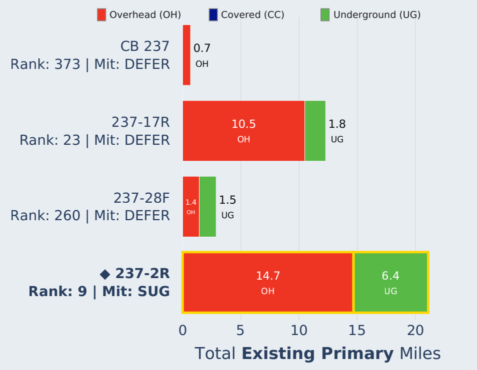
237-2R PSPS Event Duration (hrs)



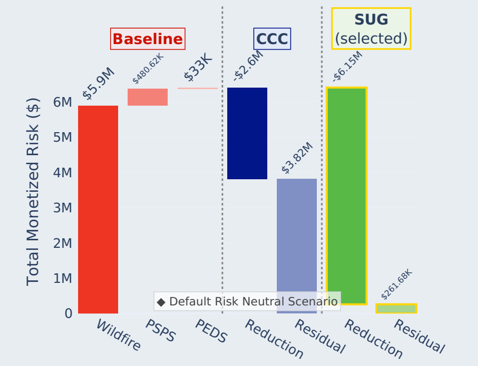
237-2R Lifecycle Nominal Cost Over 55 Years



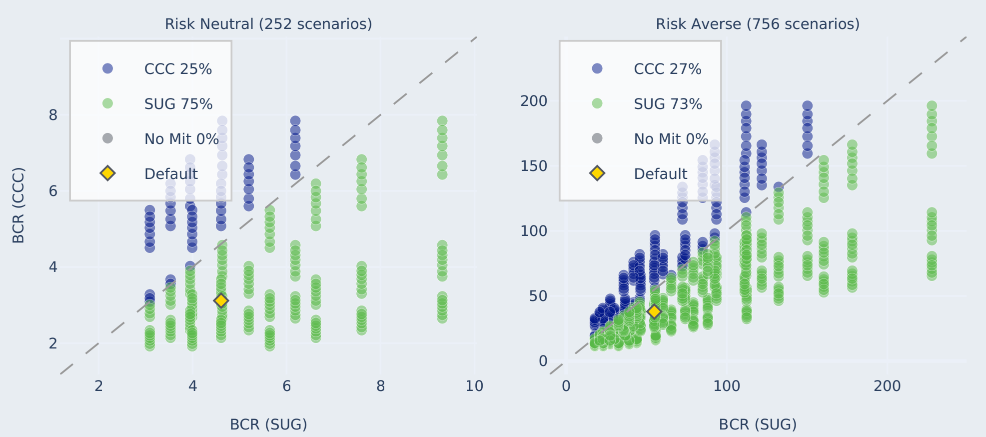
237-2R Upstream Hardened Miles



237-2R Risk Breakdown



237-2R Cost-Effectiveness - Mitigation Selection Scenarios



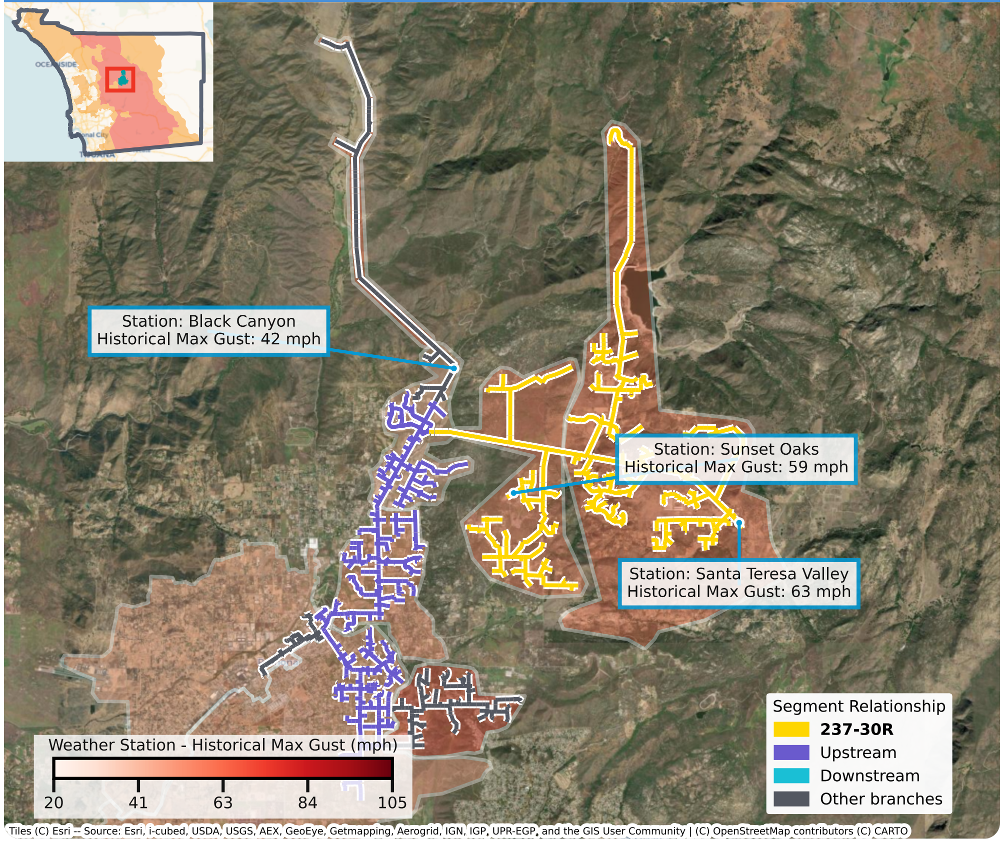
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

237-30R | Rank: 1 | Mitigation: SUG

<table>
<tr><th colspan="2">Downstream Customers</th><th rowspan="2">With AFN Flag</th><th rowspan="2">HFTD Tier</th><th rowspan="2">Community</th></tr>
<tr><td colspan="2">323 Total</td></tr>
<tr><td>Residential</td><td>Non-Residential</td><td rowspan="2">30</td><td rowspan="2">3</td><td rowspan="2">DVC TRIBAL
CRITICAL FACILITIES</td></tr>
<tr><td>255</td><td>68</td></tr>
</table>

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (237-2R) supported the selection of **SUG**.

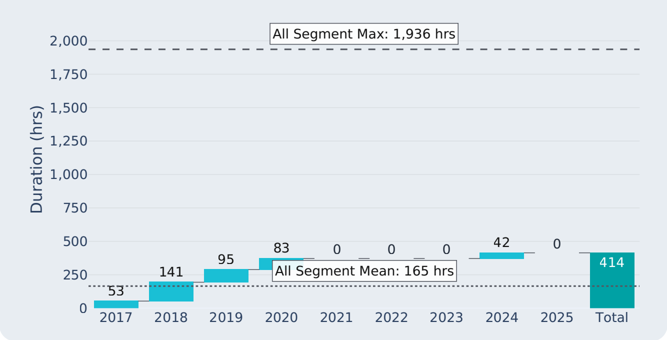
Circuit 237 Map



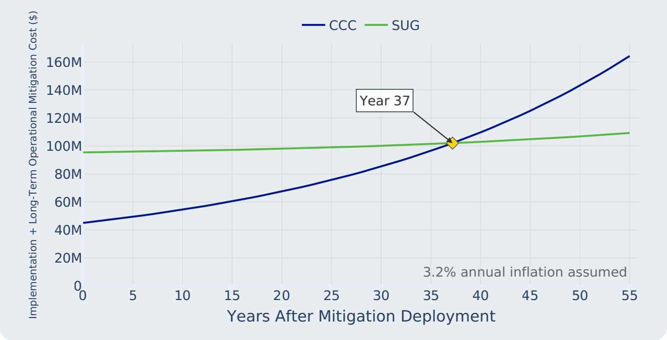
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

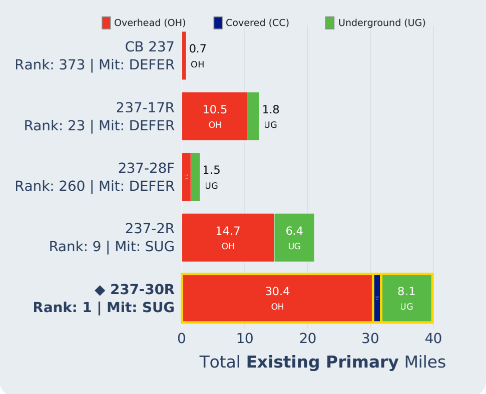
237-30R PSPS Event Duration (hrs)



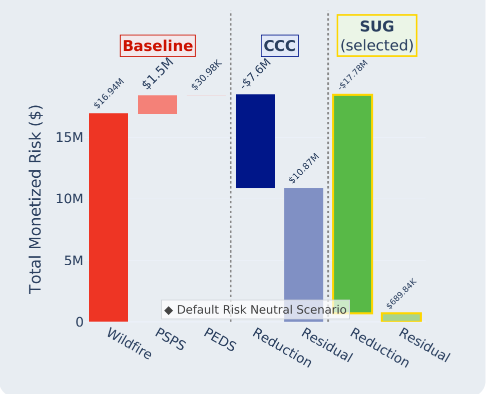
237-30R Lifecycle Nominal Cost Over 55 Years



237-30R Upstream Hardened Miles



237-30R Risk Breakdown



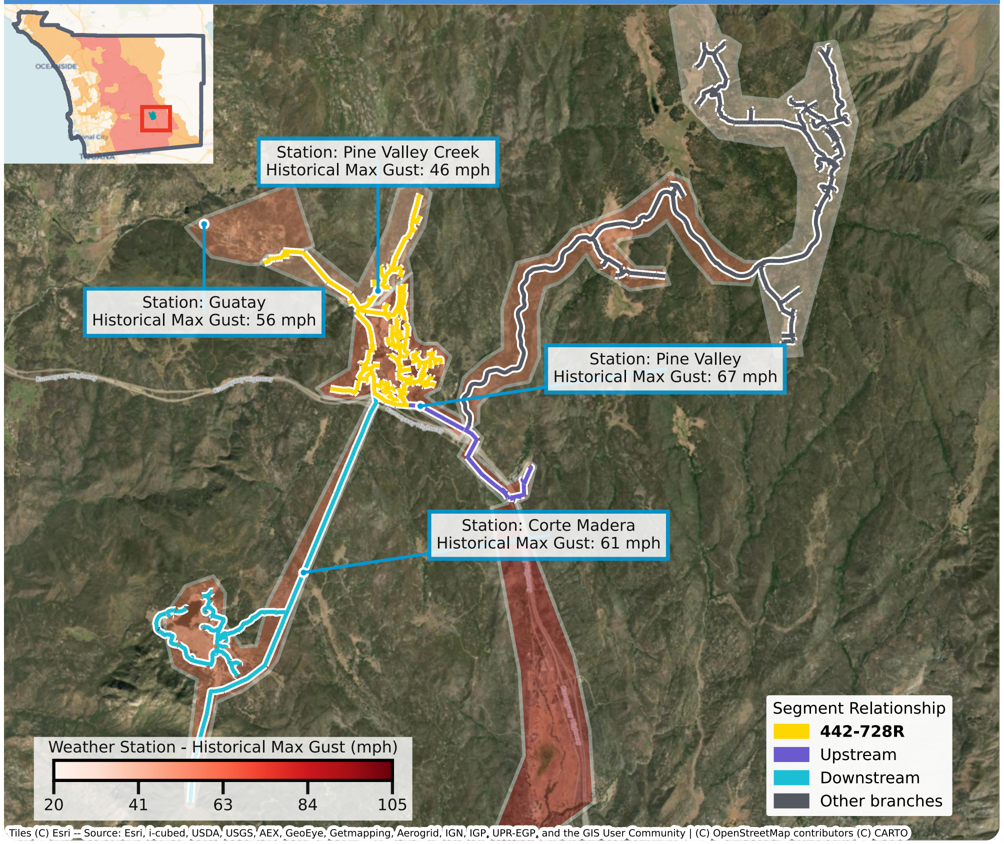
237-30R Cost-Effectiveness - Mitigation Selection Scenarios

442-728R | Rank: 10 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
867 Total		With AFN Flag	3	CRITICAL FACILITIES
Residential	Non-Residential			
765	102	75		

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

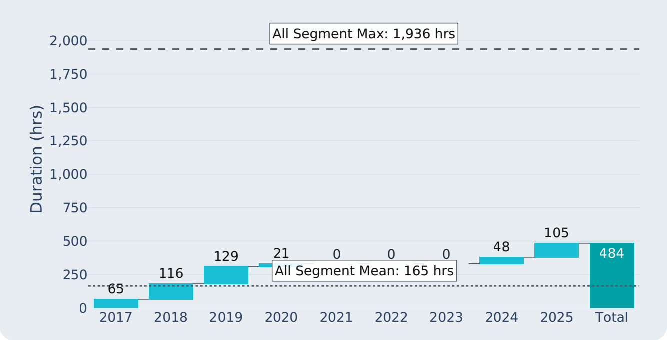
Circuit 442 Map



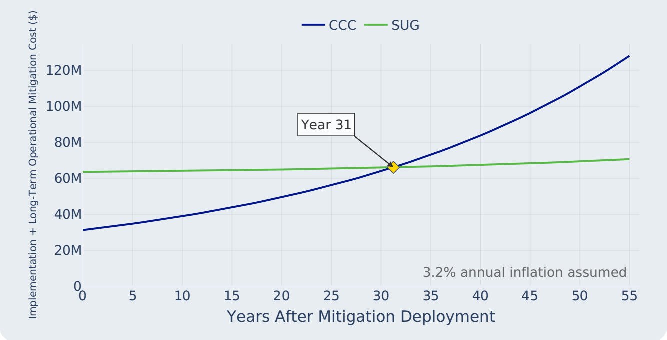
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

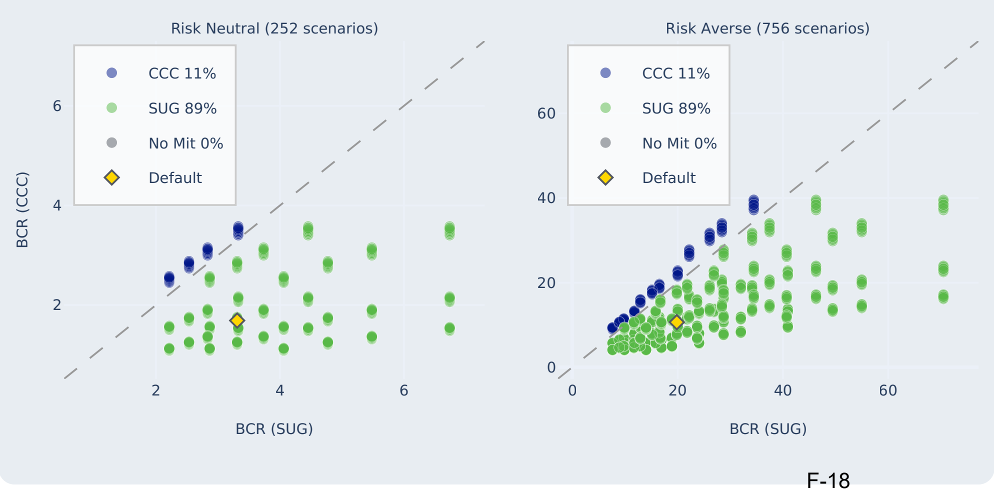
442-728R PSPS Event Duration (hrs)



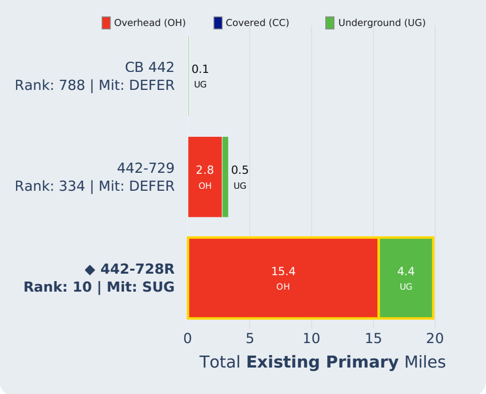
442-728R Lifecycle Nominal Cost Over 55 Years



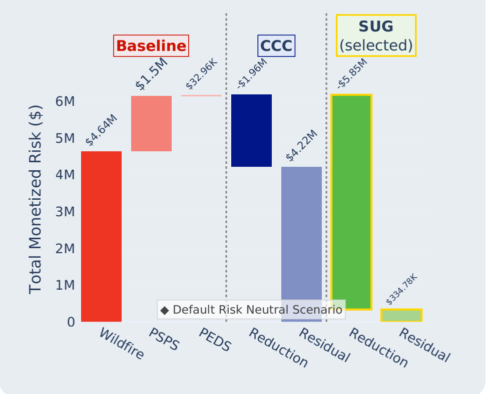
442-728R Cost-Effectiveness - Mitigation Selection Scenarios



442-728R Upstream Hardened Miles



442-728R Risk Breakdown

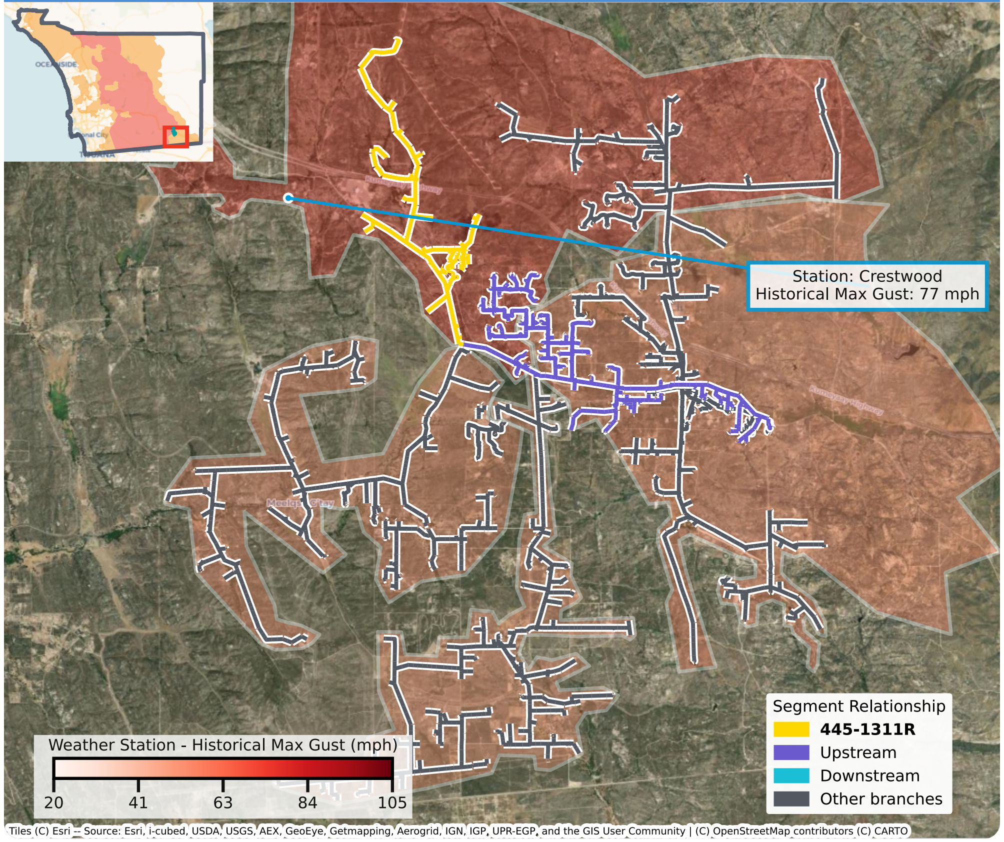


445-1311R | Rank: 28 | Mitigation: SUG

<table>
<tr><th colspan="3">Downstream Customers</th><th rowspan="2">HFTD Tier</th><th rowspan="2">Community</th></tr>
<tr><td colspan="2">130 Total</td><td rowspan="2">With AFN Flag</td></tr>
<tr><td>Residential</td><td>Non-Residential</td><td rowspan="2">3</td><td rowspan="2">DVC TRIBAL
CRITICAL FACILITIES</td></tr>
<tr><td>112</td><td>18</td><td>7</td></tr>
</table>

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

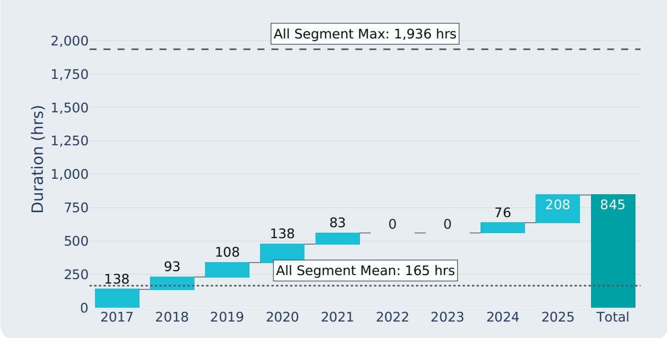
Circuit 445 Map



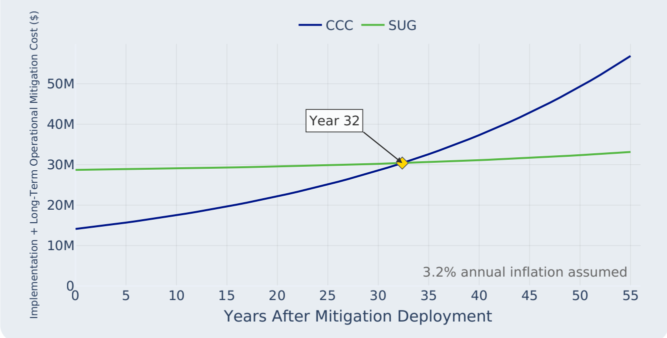
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

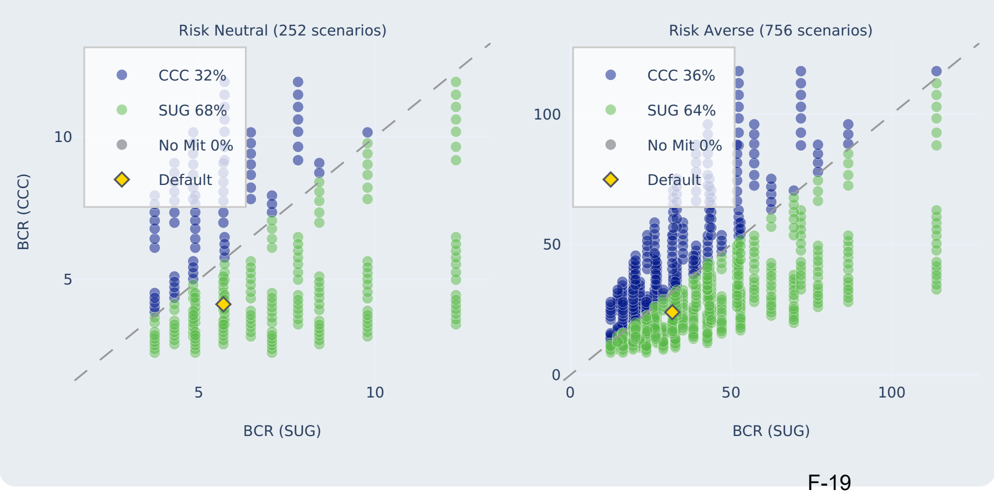
445-1311R PSPS Event Duration (hrs)



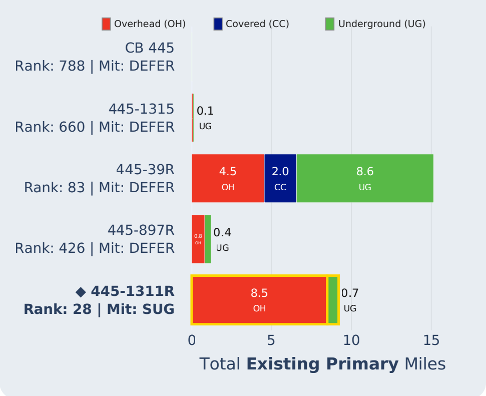
445-1311R Lifecycle Nominal Cost Over 55 Years



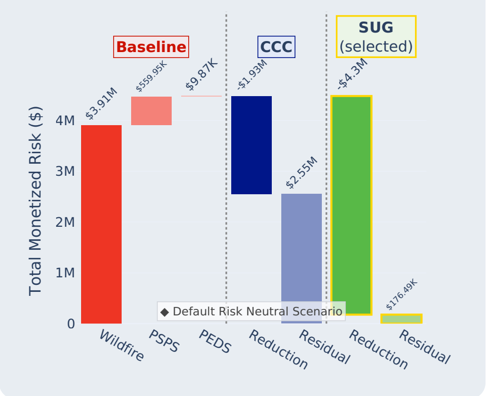
445-1311R Cost-Effectiveness - Mitigation Selection Scenarios



445-1311R Upstream Hardened Miles



445-1311R Risk Breakdown

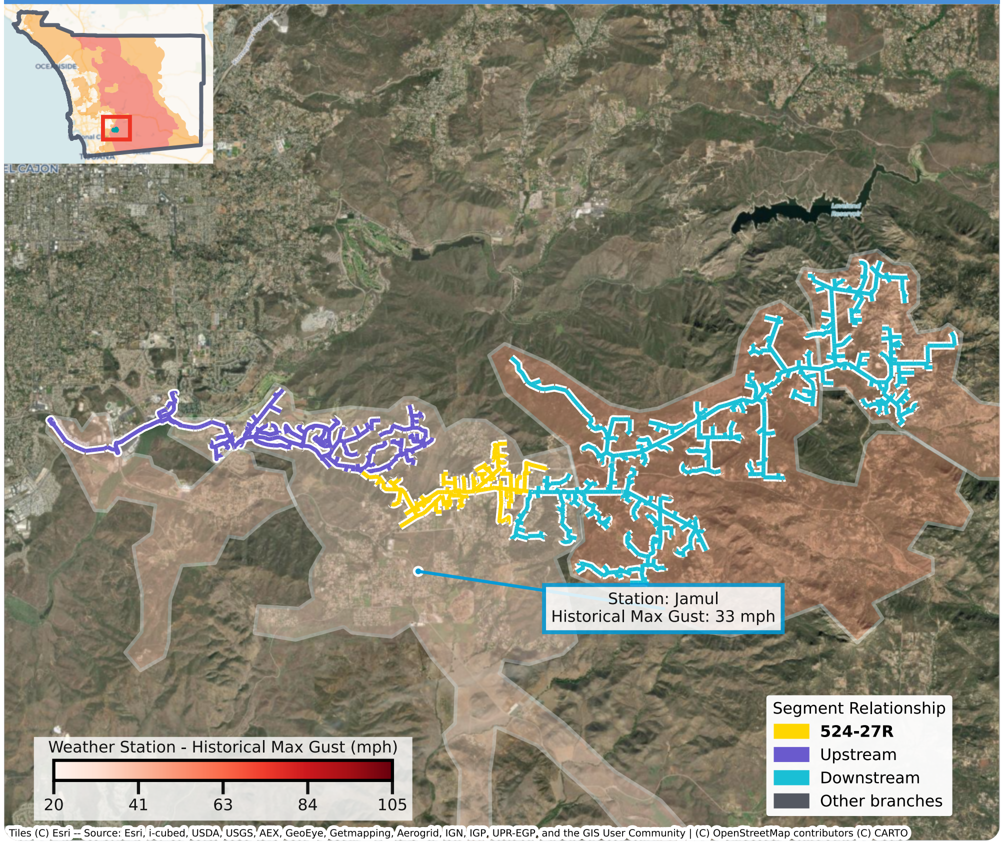


524-27R | Rank: 135 | Mitigation: CCC

Downstream Customers		With AFN Flag	HFTD Tier	Community
1103 Total				
Residential	Non-Residential			
1009	94	36	3	CRITICAL FACILITIES

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-69R, 524-46R, 524-1782F, CB 524) supported the selection of **CCC**.

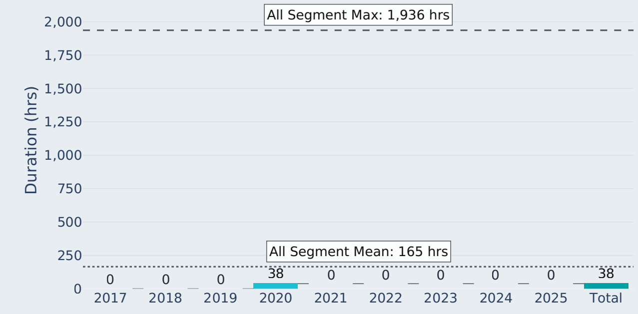
Circuit 524 Map



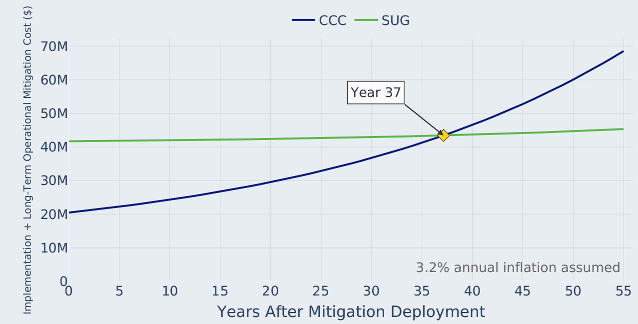
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

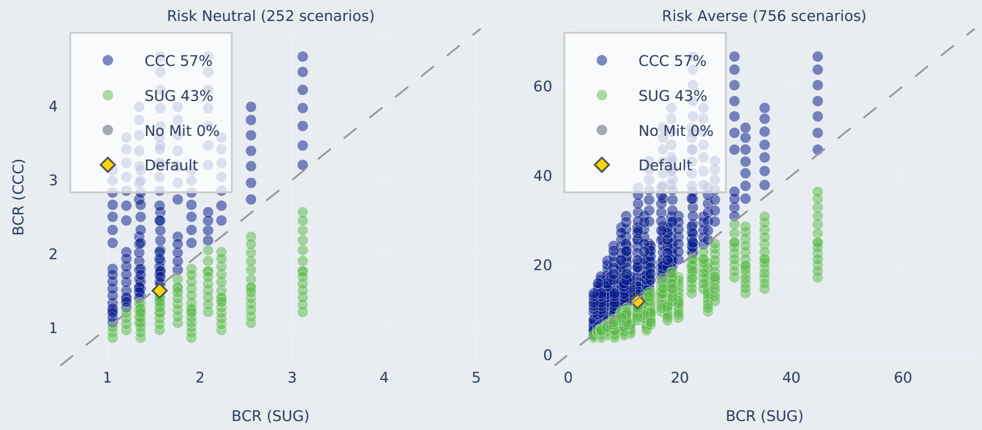
524-27R PSPS Event Duration (hrs)



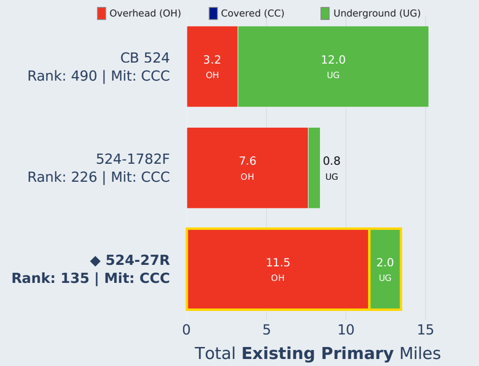
524-27R Lifecycle Nominal Cost Over 55 Years



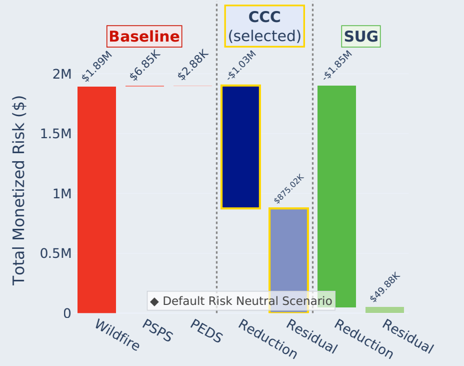
524-27R Cost-Effectiveness - Mitigation Selection Scenarios



524-27R Upstream Hardened Miles



524-27R Risk Breakdown

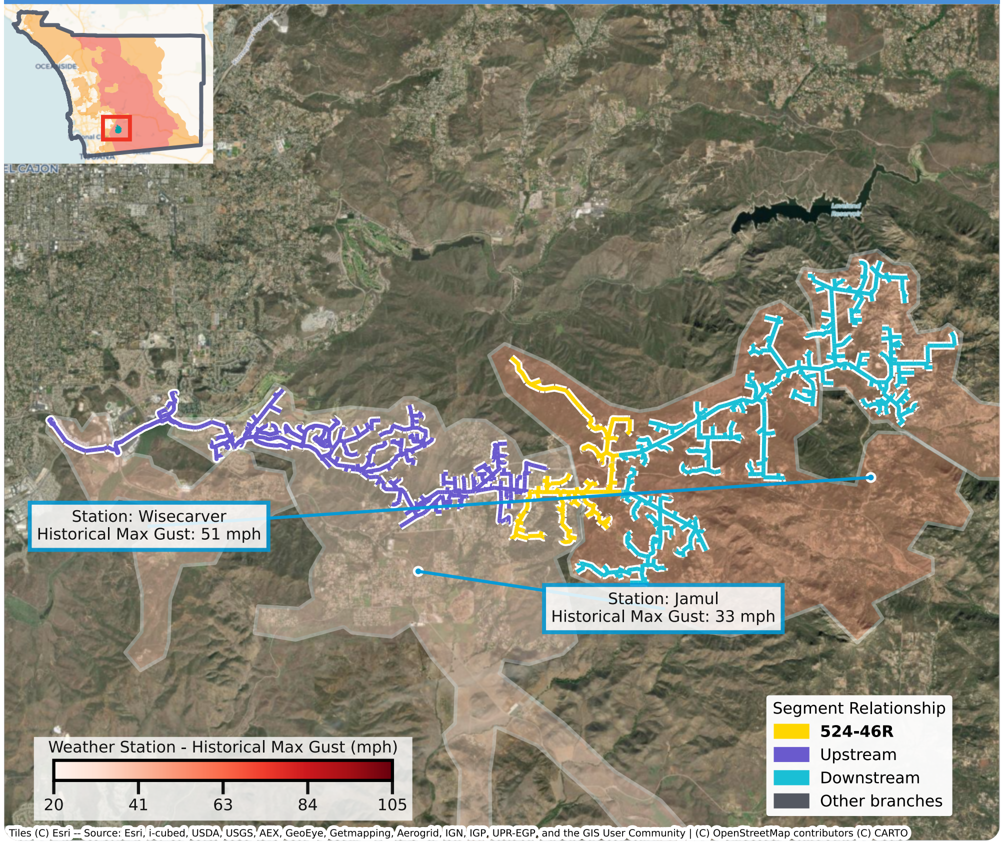


524-46R | Rank: 87 | Mitigation: CCC

Downstream Customers		With AFN Flag	HFTD Tier	Community
736 Total				
Residential	Non-Residential			
654	82	15	3	CRITICAL FACILITIES

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-69R, 524-27R, 524-1782F, CB 524) supported the selection of **CCC**.

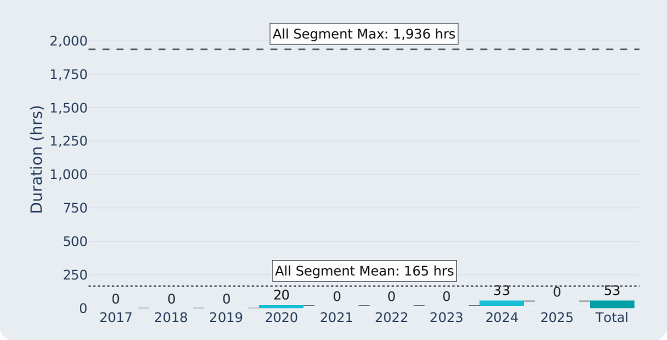
Circuit 524 Map



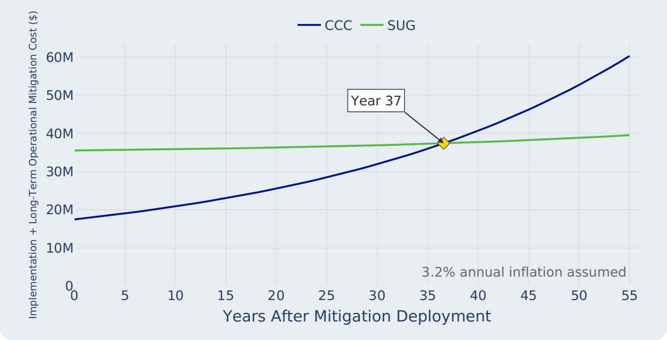
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

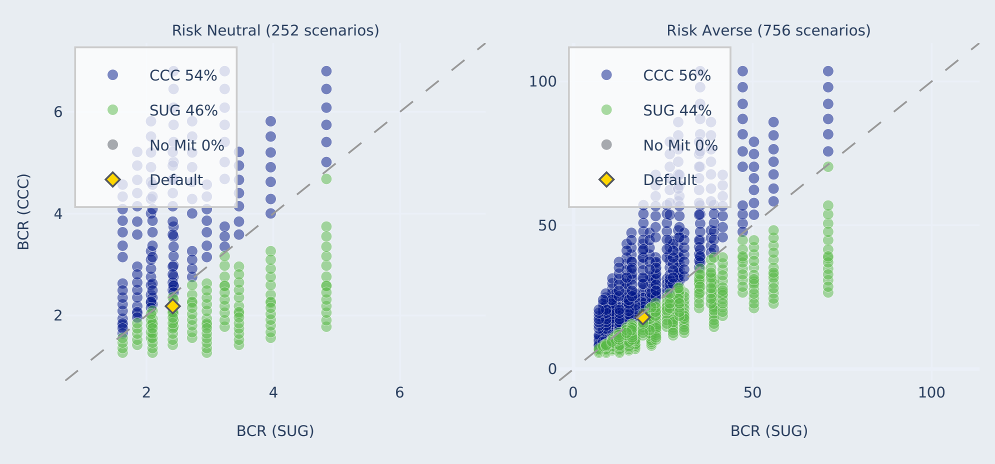
524-46R PSPS Event Duration (hrs)



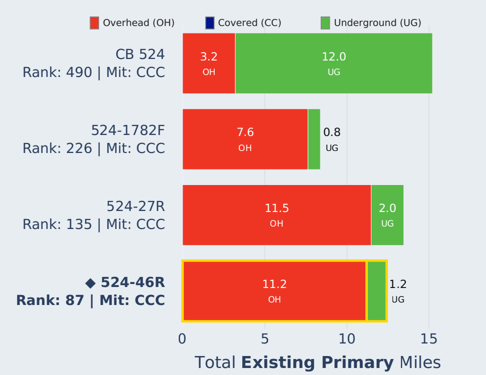
524-46R Lifecycle Nominal Cost Over 55 Years



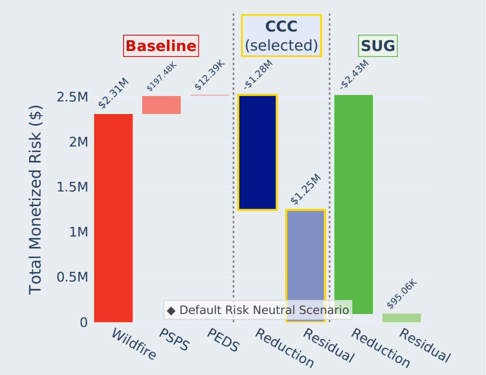
524-46R Cost-Effectiveness - Mitigation Selection Scenarios



524-46R Upstream Hardened Miles



524-46R Risk Breakdown

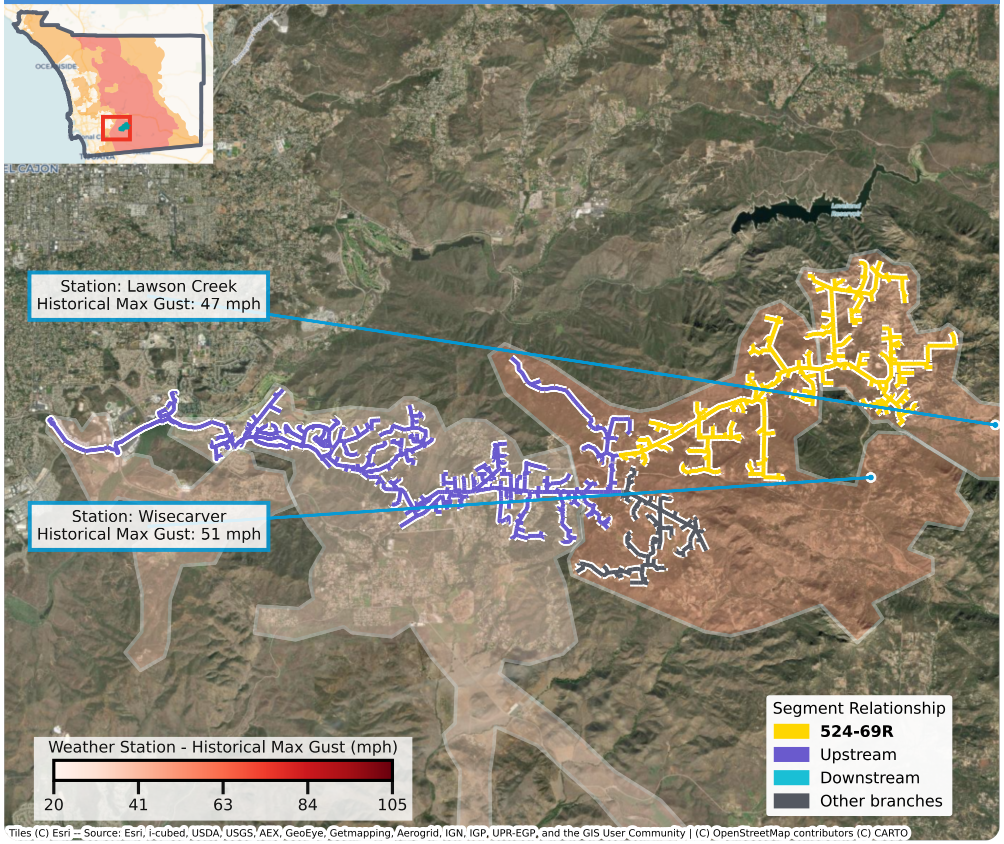


524-69R | Rank: 7 | Mitigation: CCC

<table>
<tr><th colspan="2">Downstream Customers</th><th rowspan="2">With AFN Flag</th><th rowspan="2">HFTD Tier</th><th rowspan="2">Community</th></tr>
<tr><td colspan="2">416 Total</td></tr>
<tr><td>Residential</td><td>Non-Residential</td><td rowspan="2">32</td><td rowspan="2">3</td><td rowspan="2">CRITICAL FACILITIES</td></tr>
<tr><td>378</td><td>38</td></tr>
</table>

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-46R, 524-27R, 524-1782F, CB 524) supported the selection of **CCC**.

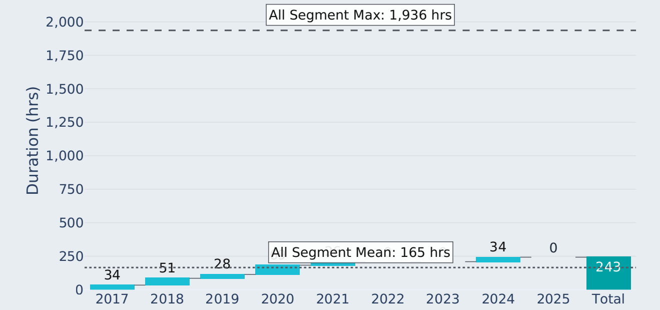
Circuit 524 Map



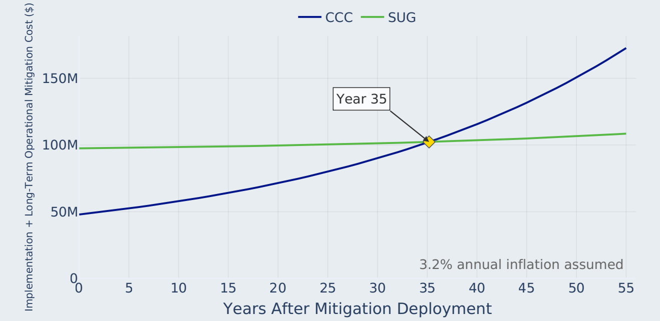
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

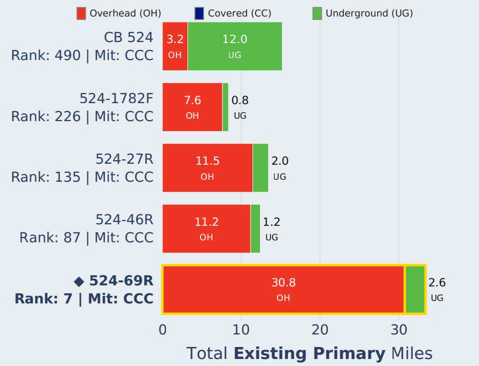
524-69R PSPS Event Duration (hrs)



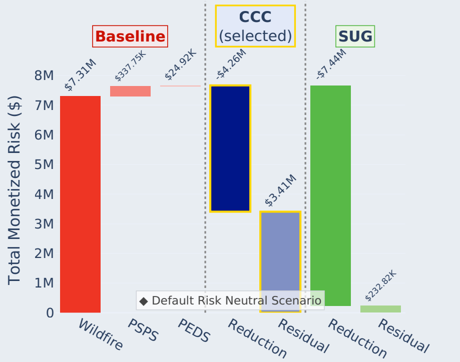
524-69R Lifecycle Nominal Cost Over 55 Years



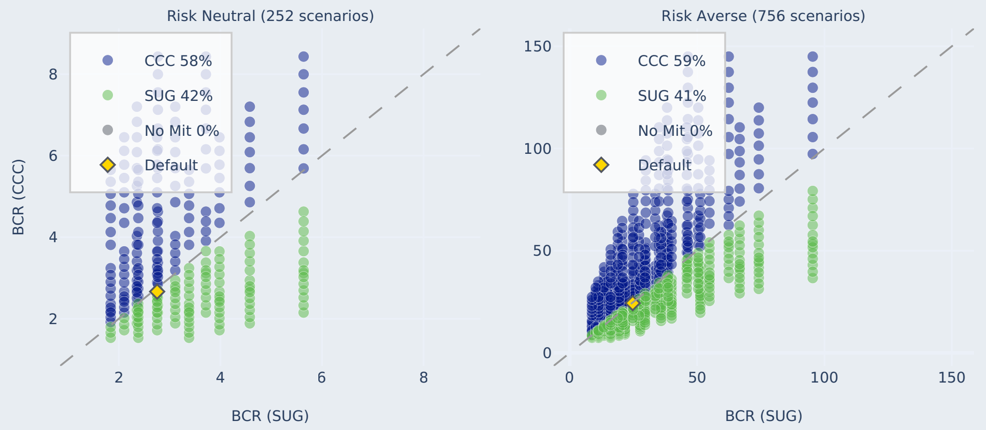
524-69R Upstream Hardened Miles



524-69R Risk Breakdown



524-69R Cost-Effectiveness - Mitigation Selection Scenarios



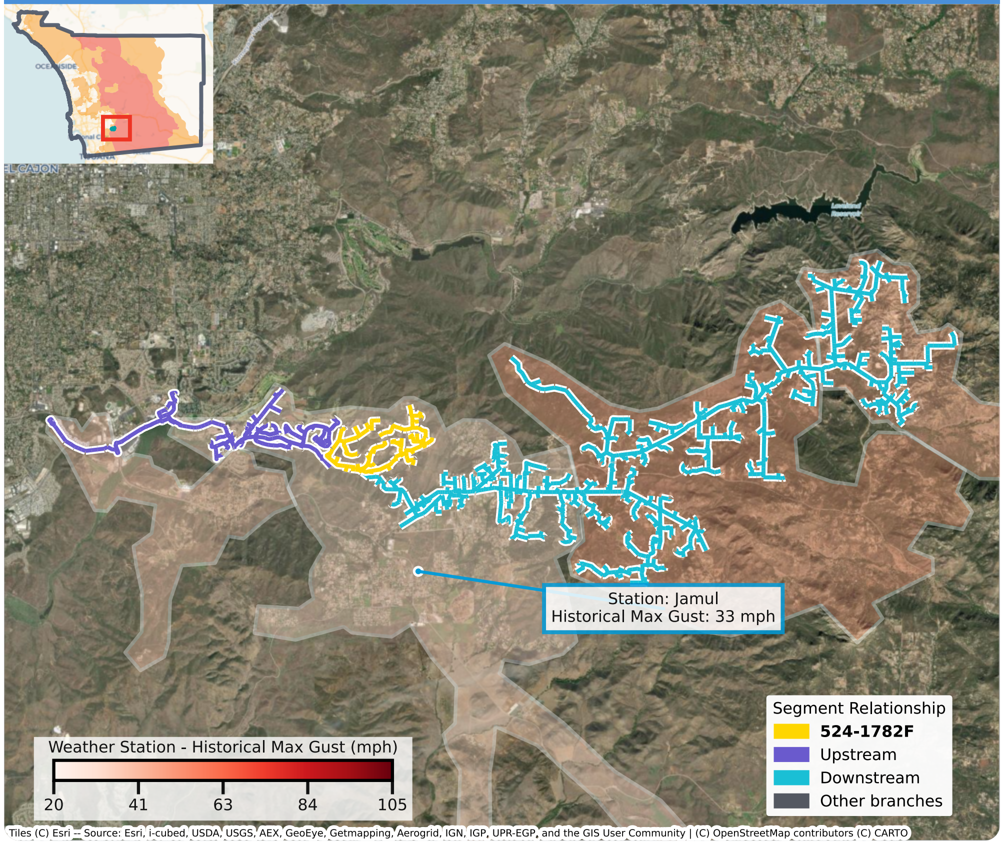
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

524-1782F | Rank: 226 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
1243 Total		With AFN Flag		
Residential	Non-Residential			
1138	105	10	3	—

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, **Bundling** with other segments (524-69R, 524-46R, 524-27R, CB 524) supported the selection of **CCC**.

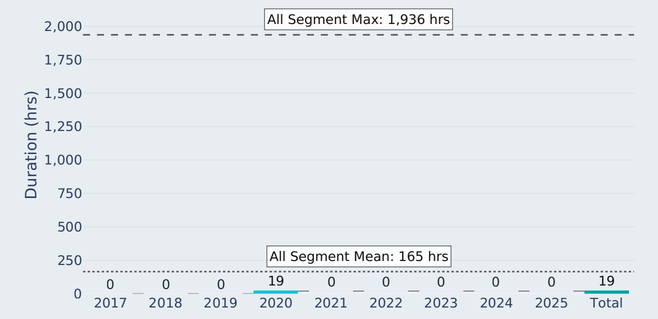
Circuit 524 Map



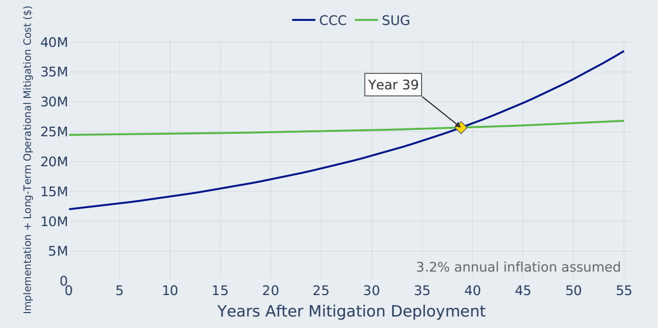
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

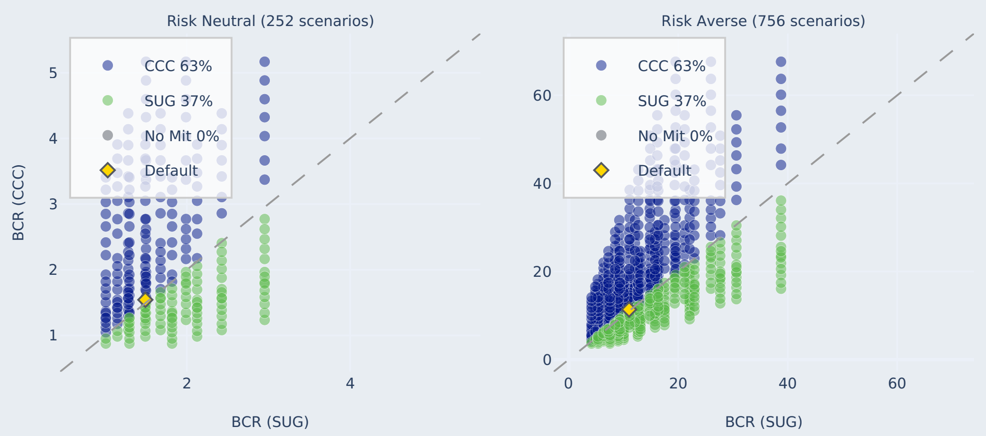
524-1782F PSPS Event Duration (hrs)



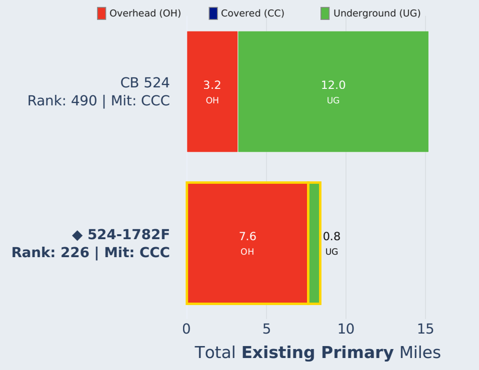
524-1782F Lifecycle Nominal Cost Over 55 Years



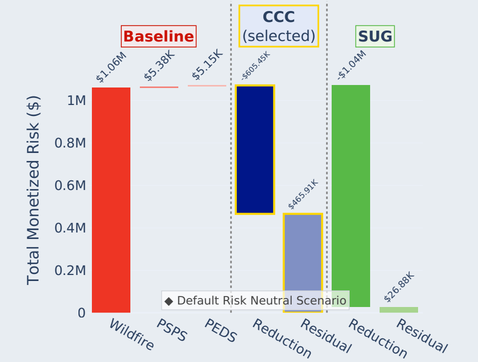
524-1782F Cost-Effectiveness - Mitigation Selection Scenarios



524-1782F Upstream Hardened Miles



524-1782F Risk Breakdown

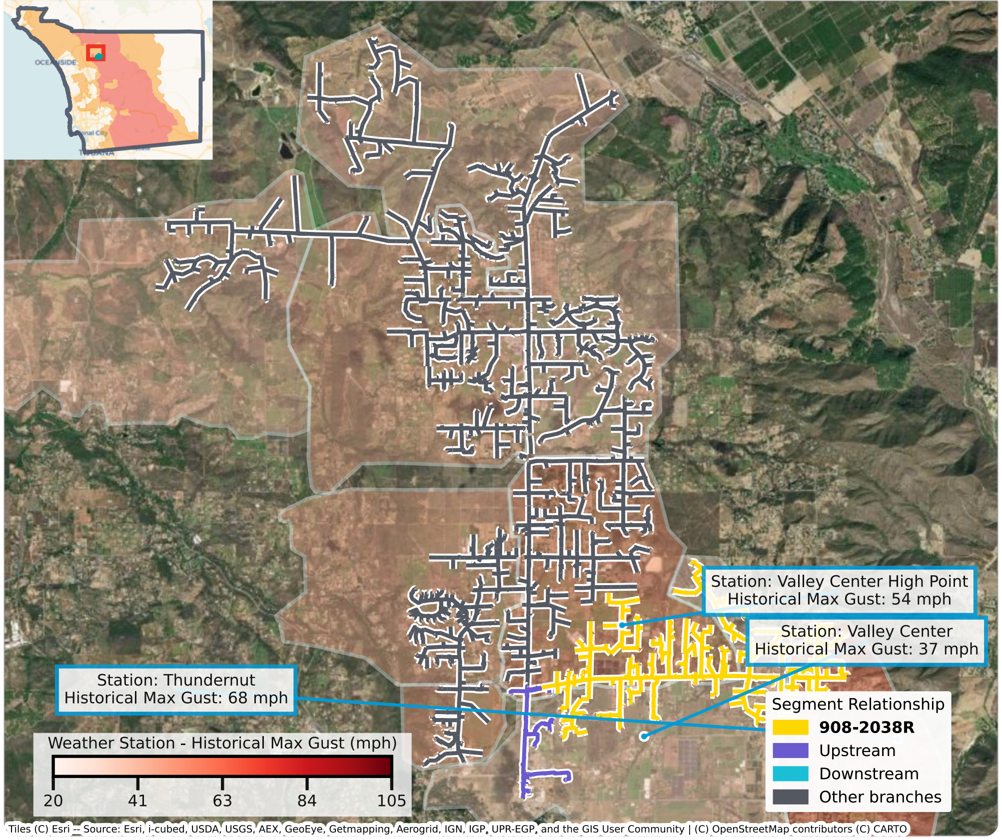


908-2038R | Rank: 6 | Mitigation: SUG

Downstream Customers		With AFN Flag	HFTD Tier	Community
448 Total				
Residential	Non-Residential			
408	40	37	2	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

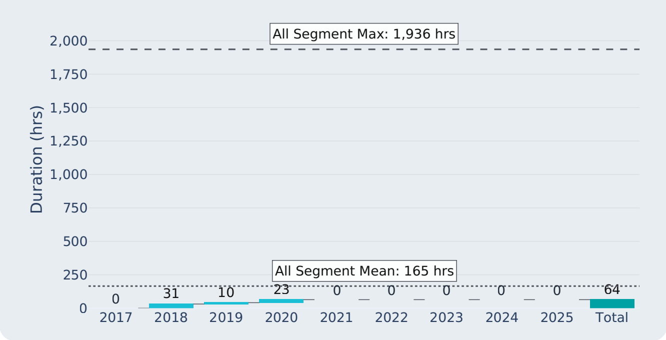
Circuit 908 Map



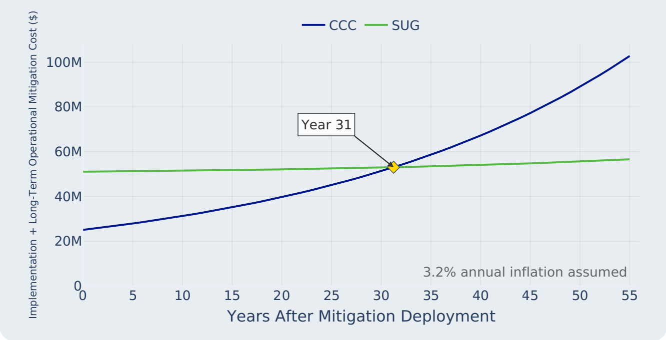
Tiles (C) Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

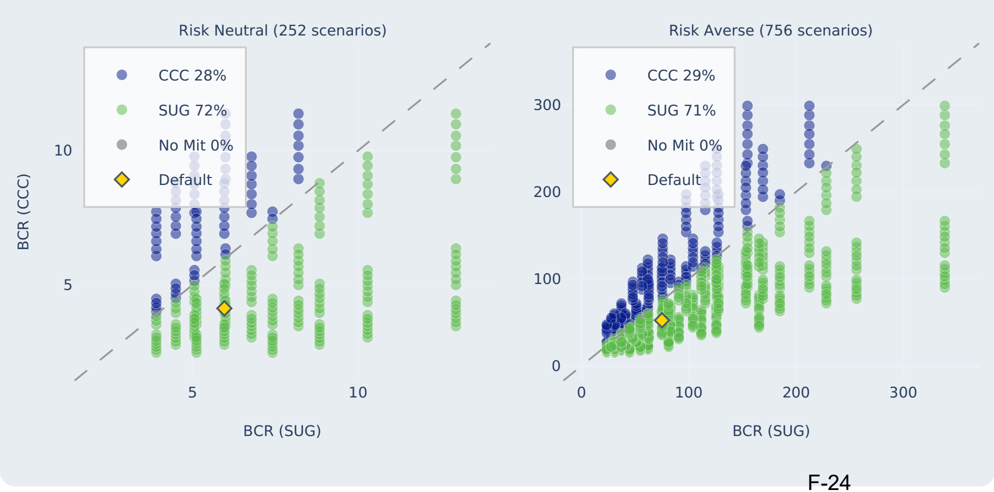
908-2038R PSPS Event Duration (hrs)



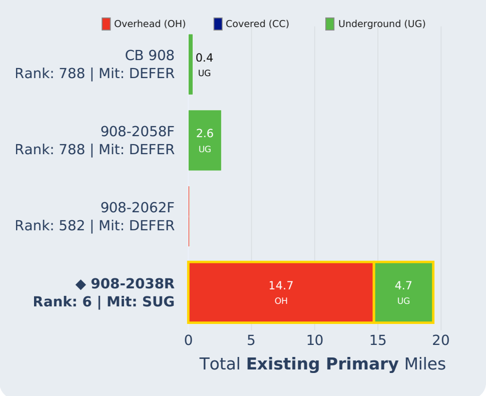
908-2038R Lifecycle Nominal Cost Over 55 Years



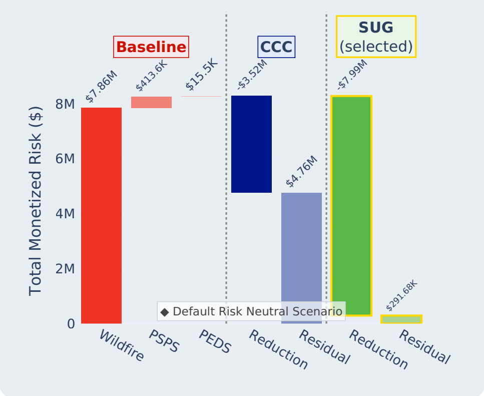
908-2038R Cost-Effectiveness - Mitigation Selection Scenarios



908-2038R Upstream Hardened Miles



908-2038R Risk Breakdown



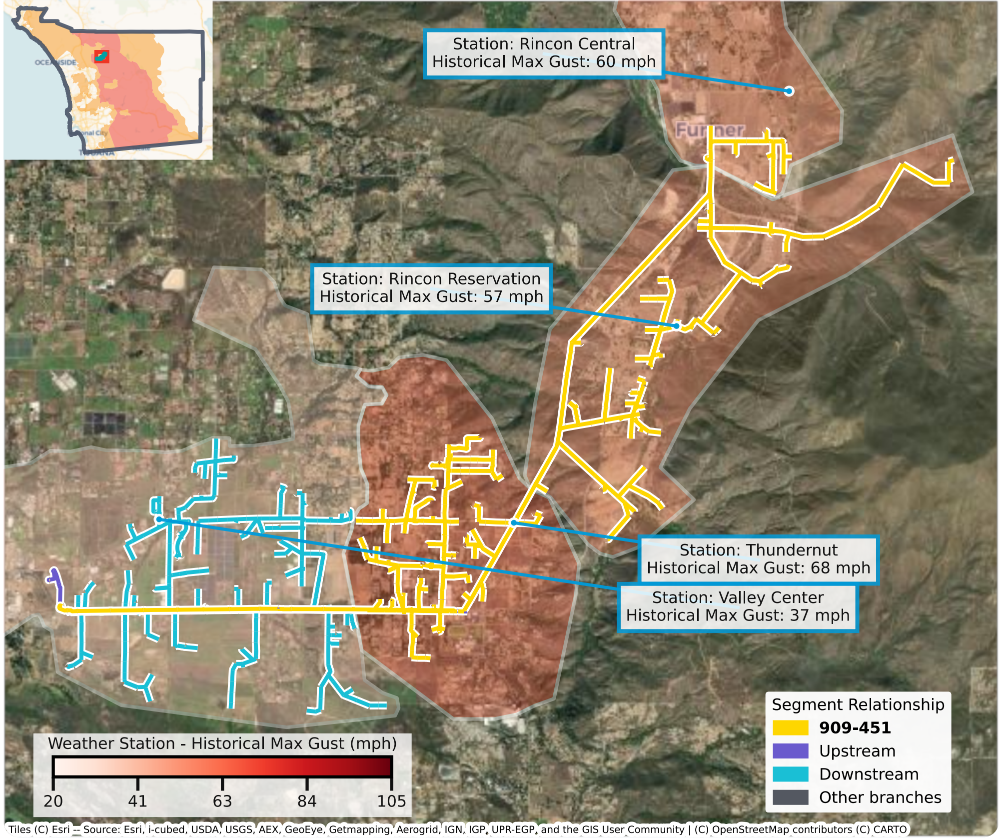
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

909-451 | Rank: 4 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
432 Total		With AFN Flag	3	DVC TRIBAL CRITICAL FACILITIES
Residential	Non-Residential			
330	102	20		

Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **SUG** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (909-805R) supported the selection of **SUG**. Moreover, the presence of **existing Undergrounding (UG)** influenced the choice to select **SUG**.

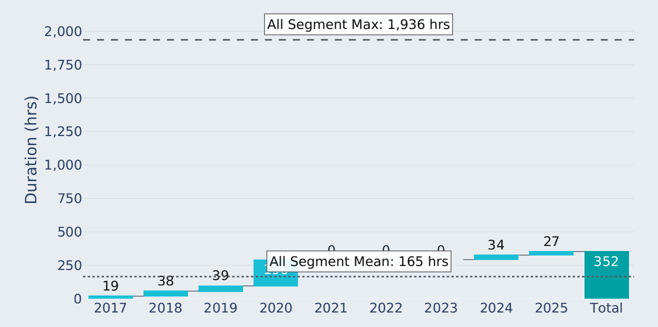
Circuit 909 Map



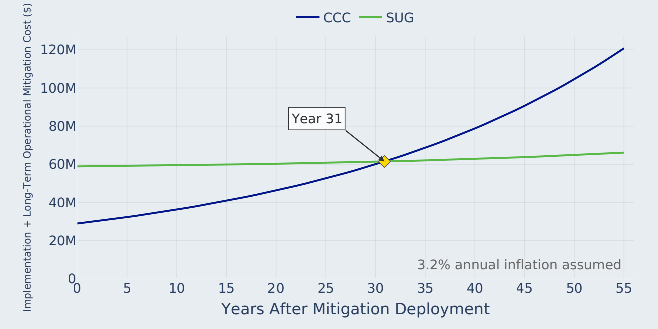
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

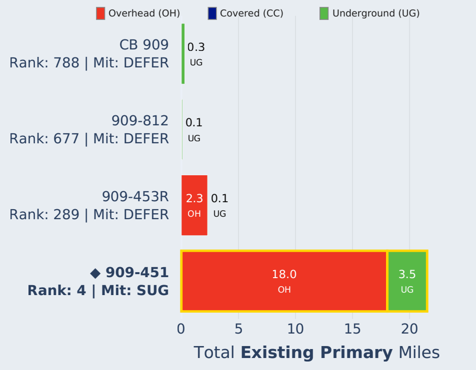
909-451 PSPS Event Duration (hrs)



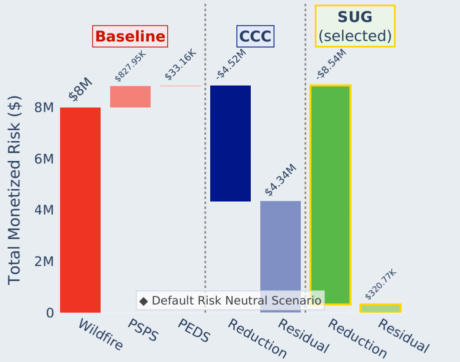
909-451 Lifecycle Nominal Cost Over 55 Years



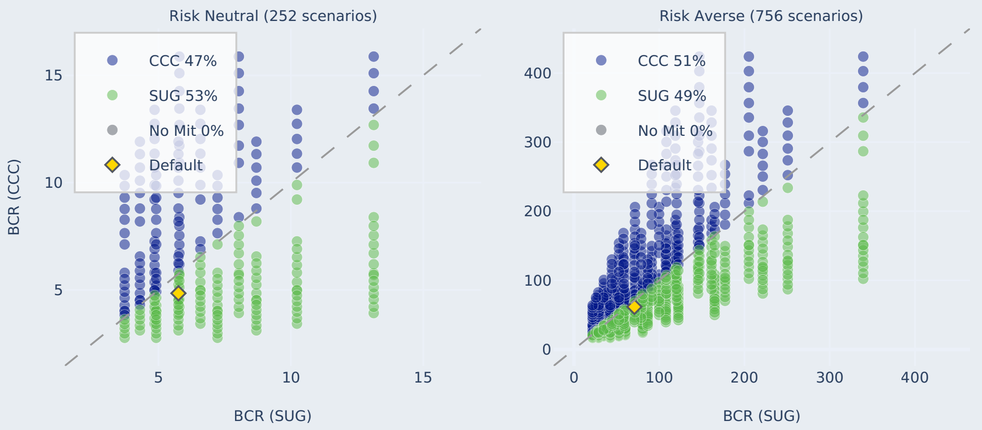
909-451 Upstream Hardened Miles



909-451 Risk Breakdown



909-451 Cost-Effectiveness - Mitigation Selection Scenarios



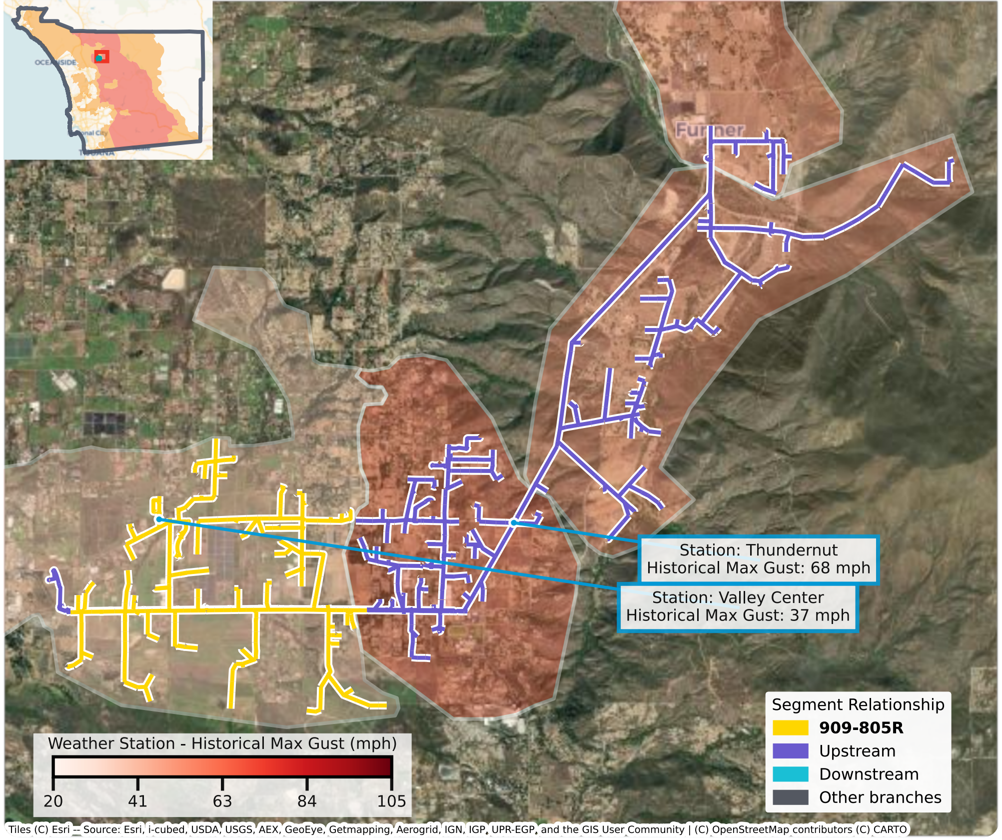
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

909-805R | Rank: 18 | Mitigation: SUG

Downstream Customers		With AFN Flag	HFTD Tier	Community
149 Total				
Residential	Non-Residential			
106	43	10	2	CRITICAL FACILITIES

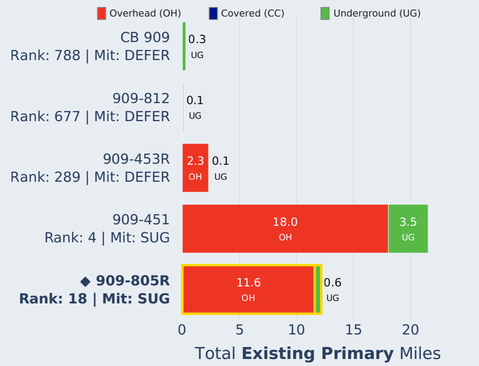
Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **SUG** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (909-451) supported the selection of **SUG**.

Circuit 909 Map

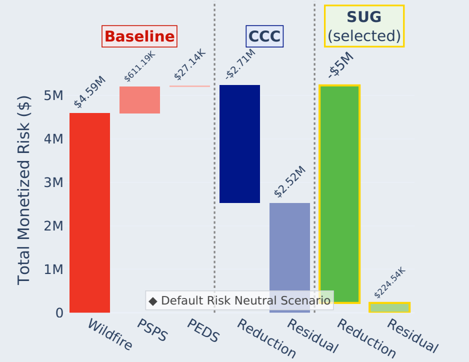


Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

909-805R Upstream Hardened Miles

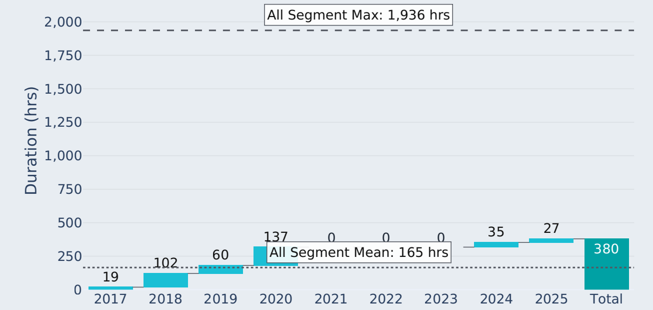


909-805R Risk Breakdown

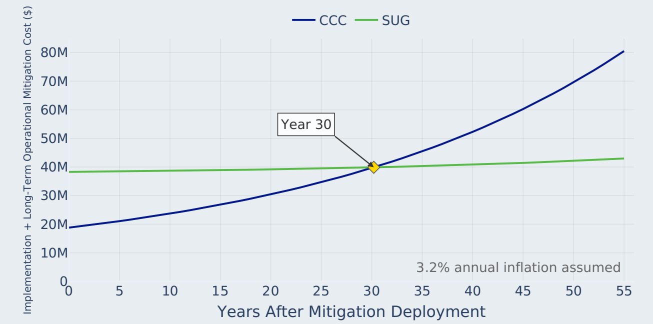


Risk Rank Comparison

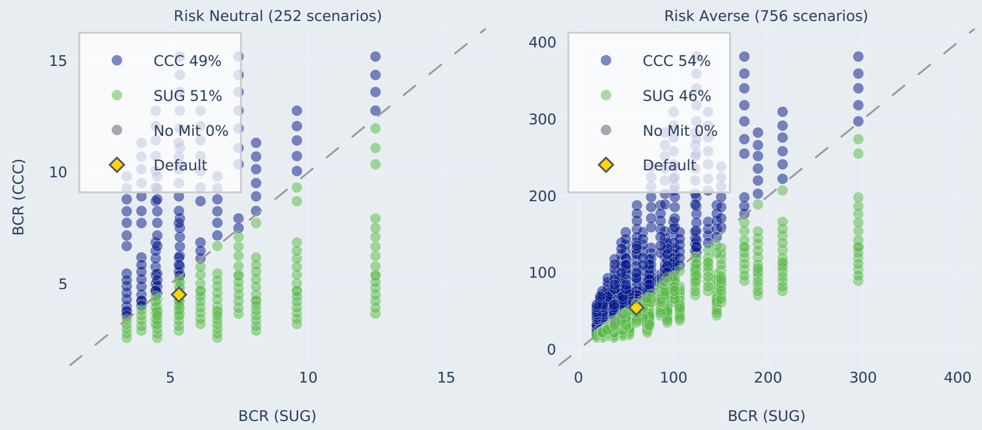
909-805R PSPS Event Duration (hrs)



909-805R Lifecycle Nominal Cost Over 55 Years



909-805R Cost-Effectiveness - Mitigation Selection Scenarios

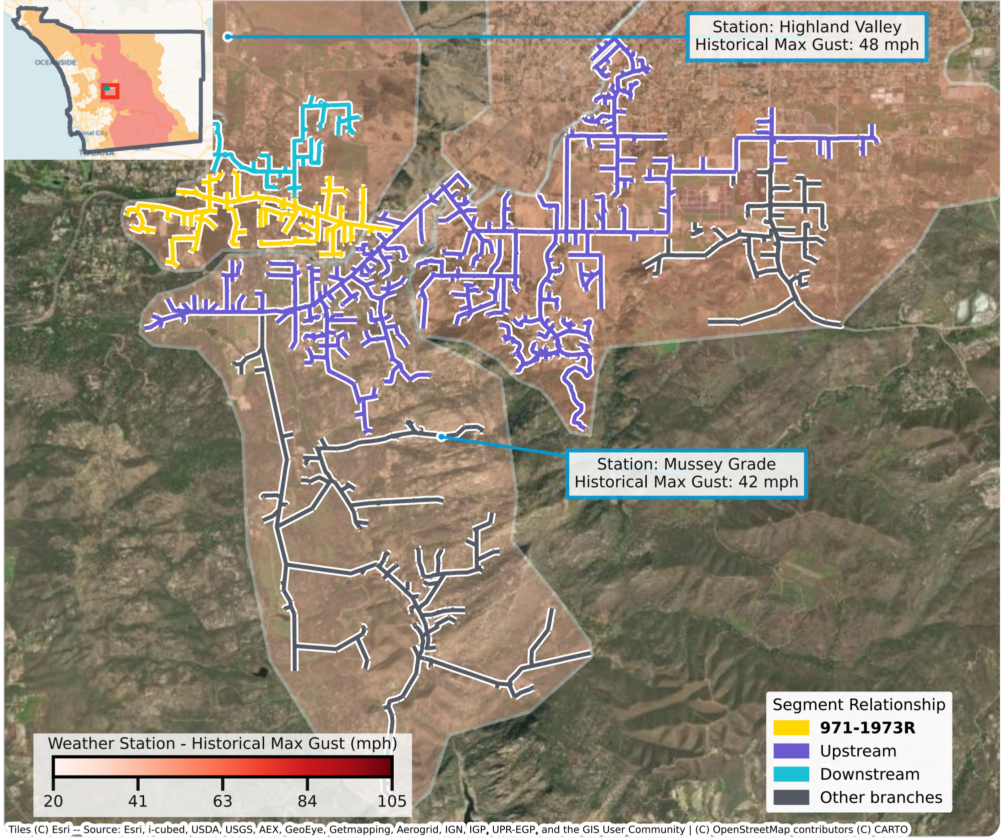


971-1973R | Rank: 37 | Mitigation: CCC

<table>
<tr><th colspan="3">Downstream Customers</th><th rowspan="2">HFTD Tier</th><th rowspan="2">Community</th></tr>
<tr><td colspan="2">305 Total</td><td rowspan="2">With AFN Flag</td></tr>
<tr><td>Residential</td><td>Non-Residential</td><td rowspan="2">3</td><td rowspan="2">CRITICAL FACILITIES</td></tr>
<tr><td>270</td><td>35</td><td>18</td></tr>
</table>

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (CB MOR1) supported the selection of **CCC**.

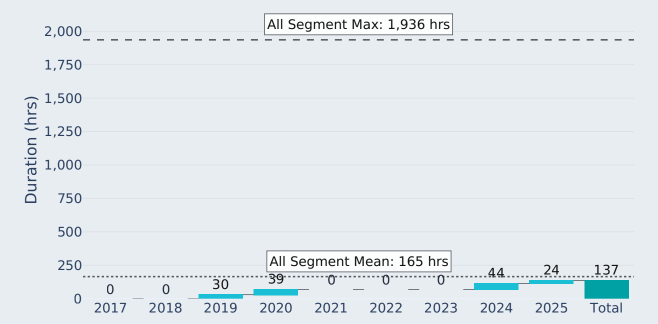
Circuit 971 Map



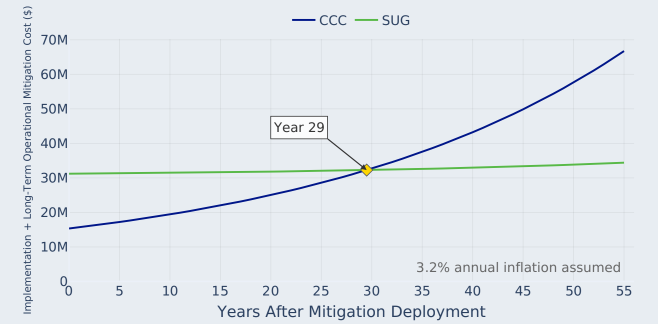
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

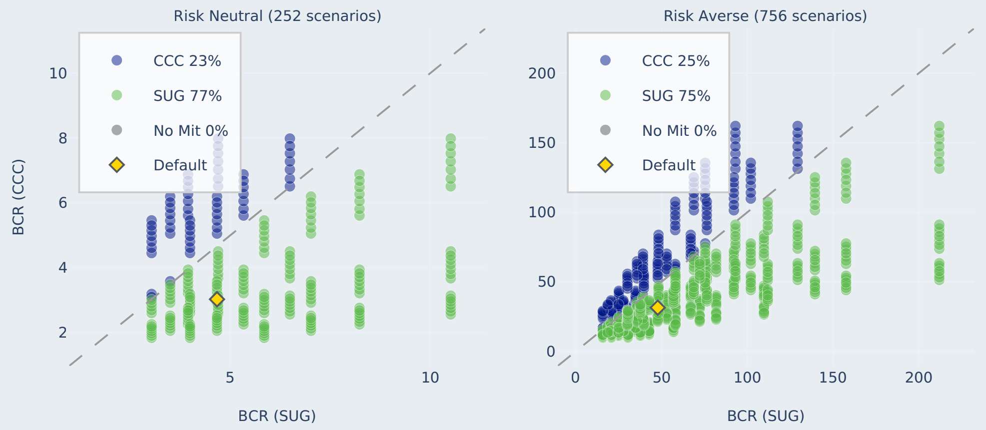
971-1973R PSPS Event Duration (hrs)



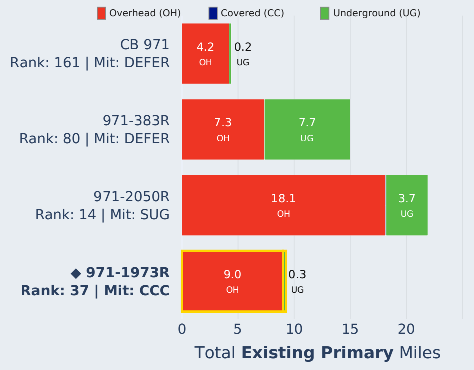
971-1973R Lifecycle Nominal Cost Over 55 Years



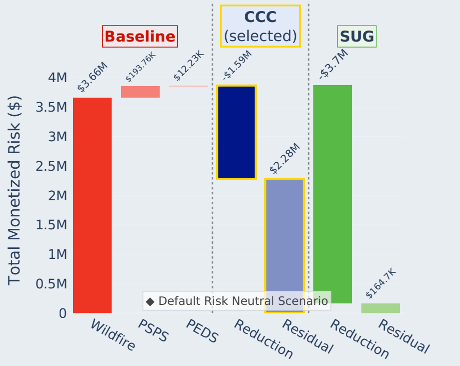
971-1973R Cost-Effectiveness - Mitigation Selection Scenarios



971-1973R Upstream Hardened Miles



971-1973R Risk Breakdown



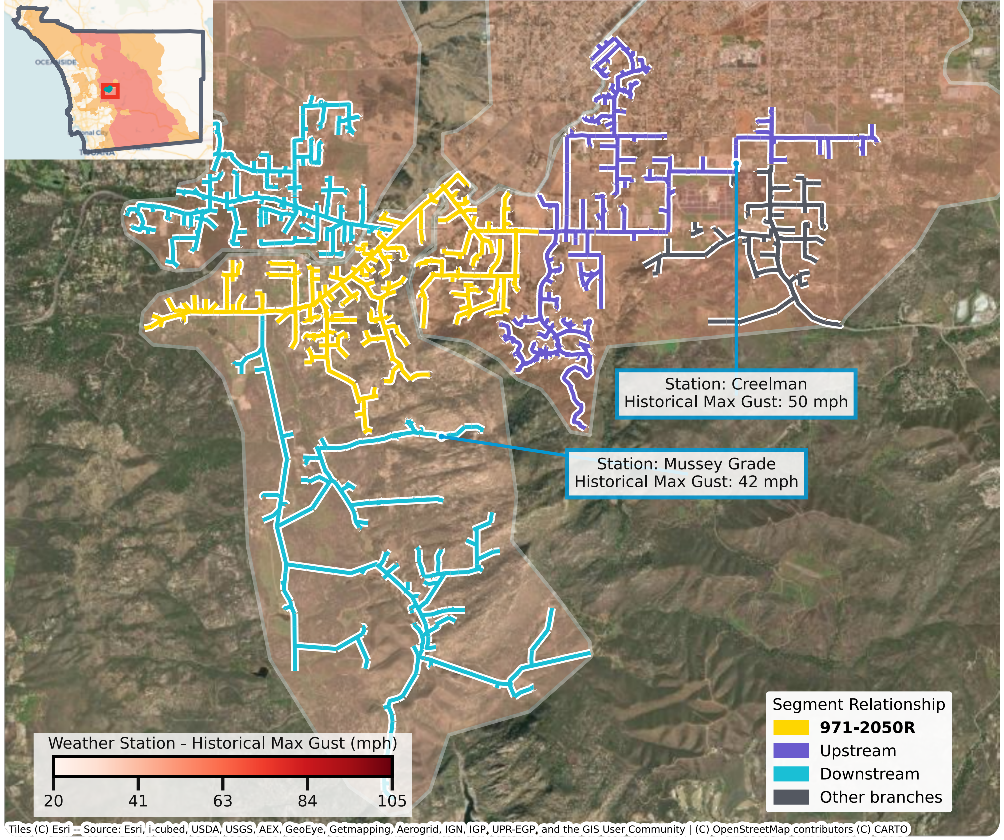
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

971-2050R | Rank: 14 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
898 Total		With AFN Flag		
Residential	Non-Residential			
779	119	37	3	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis.

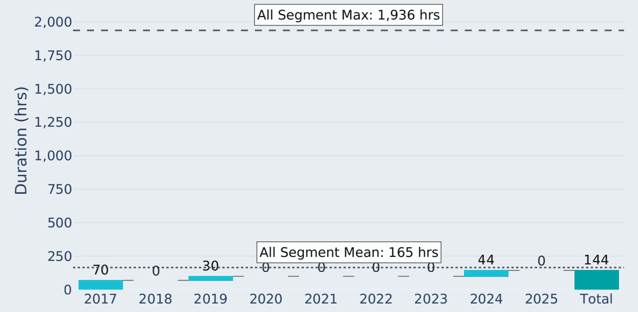
Circuit 971 Map



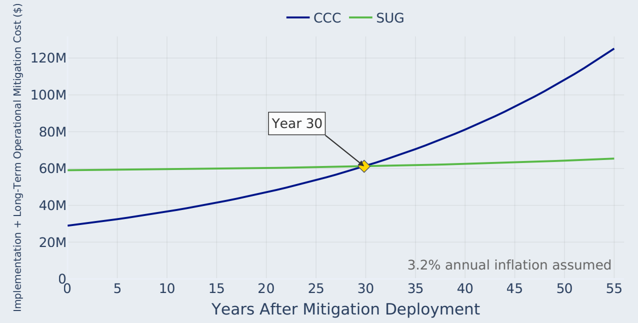
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

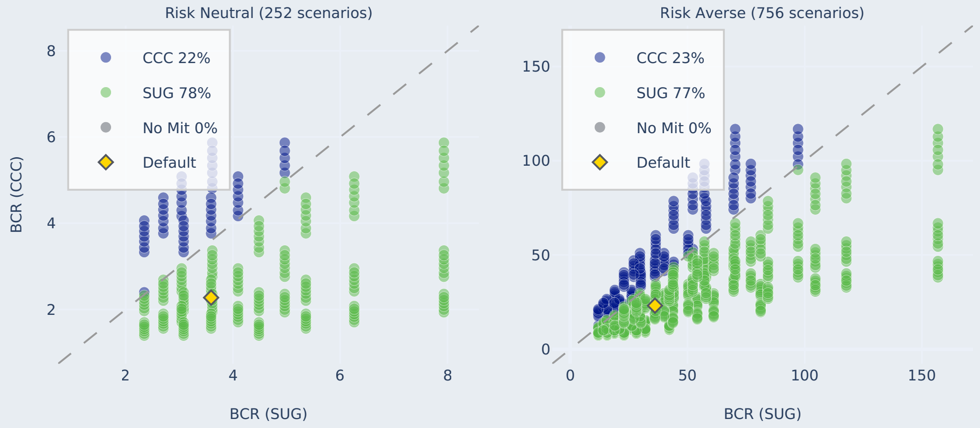
971-2050R PSPS Event Duration (hrs)



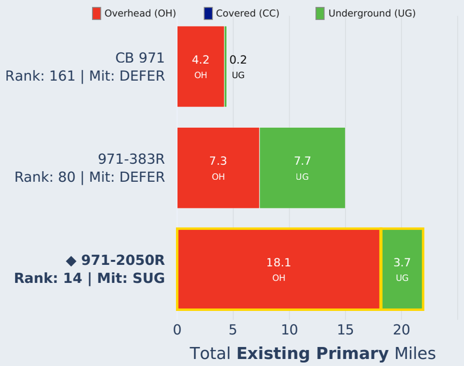
971-2050R Lifecycle Nominal Cost Over 55 Years



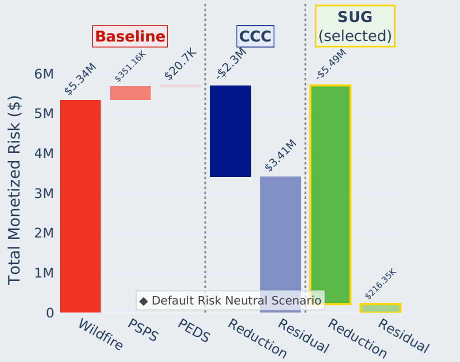
971-2050R Cost-Effectiveness - Mitigation Selection Scenarios



971-2050R Upstream Hardened Miles



971-2050R Risk Breakdown



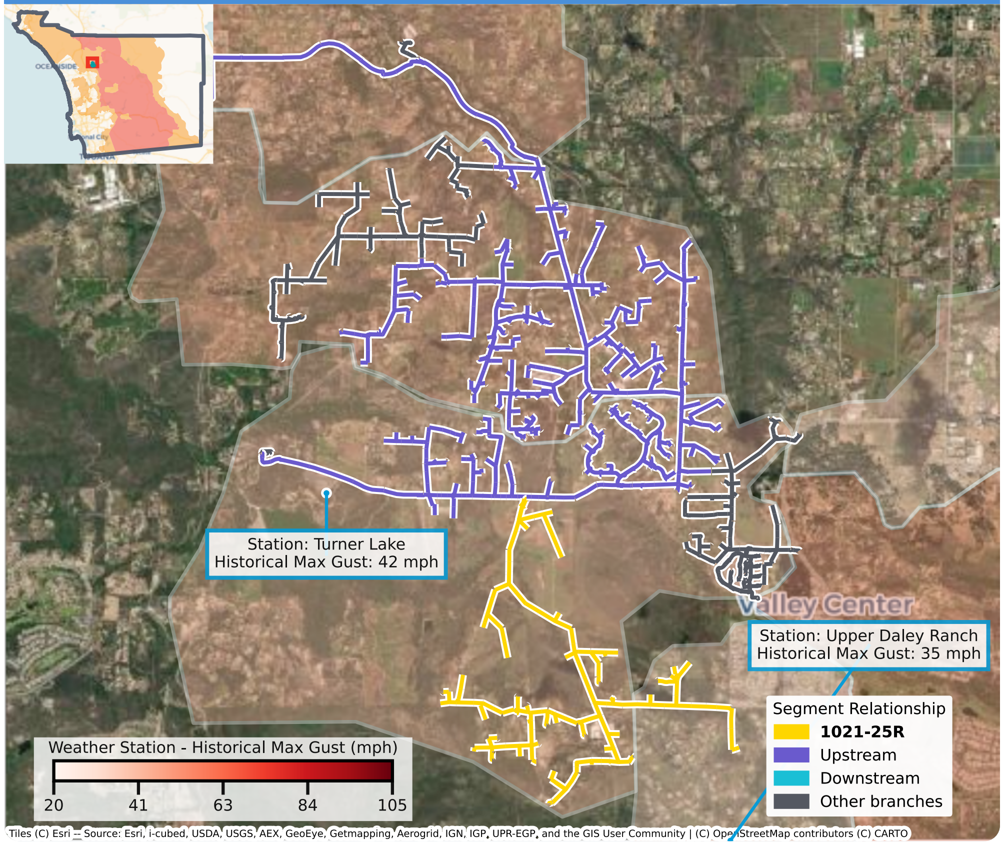
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

1021-25R | Rank: 113 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
80 Total		With AFN Flag		
Residential	Non-Residential			
66	14	6	3	CRITICAL FACILITIES

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-1760R, 1021-855, 1021-883R, 1021-92) supported the selection of **CCC**.

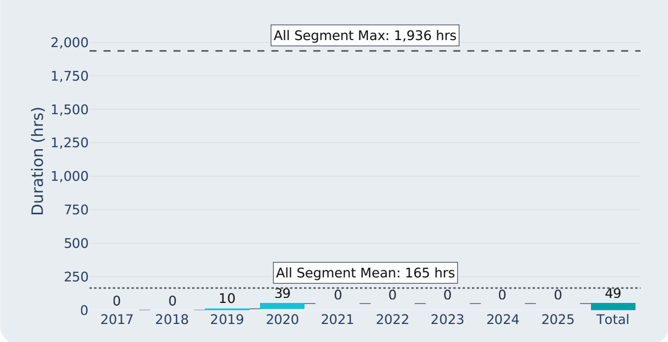
Circuit 1021 Map



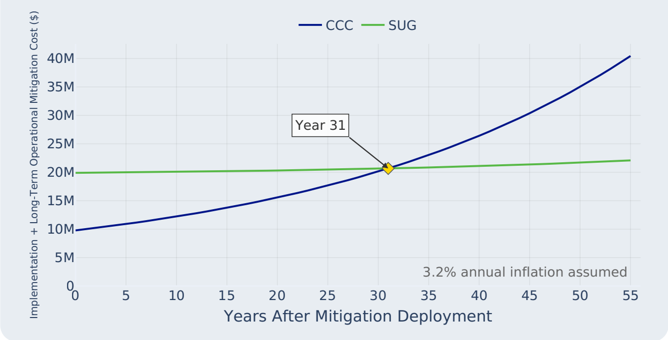
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

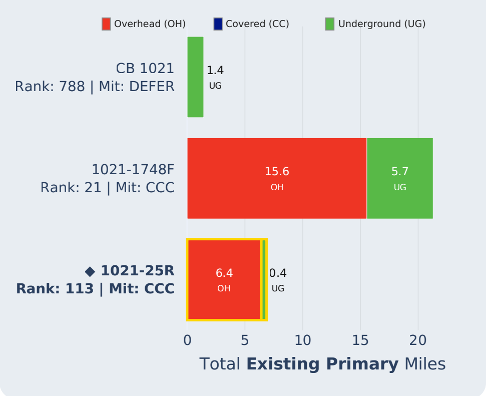
1021-25R PSPS Event Duration (hrs)



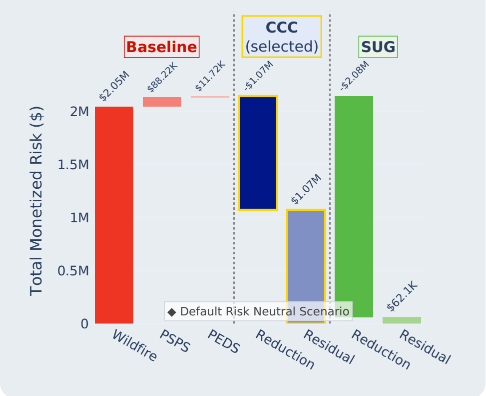
1021-25R Lifecycle Nominal Cost Over 55 Years



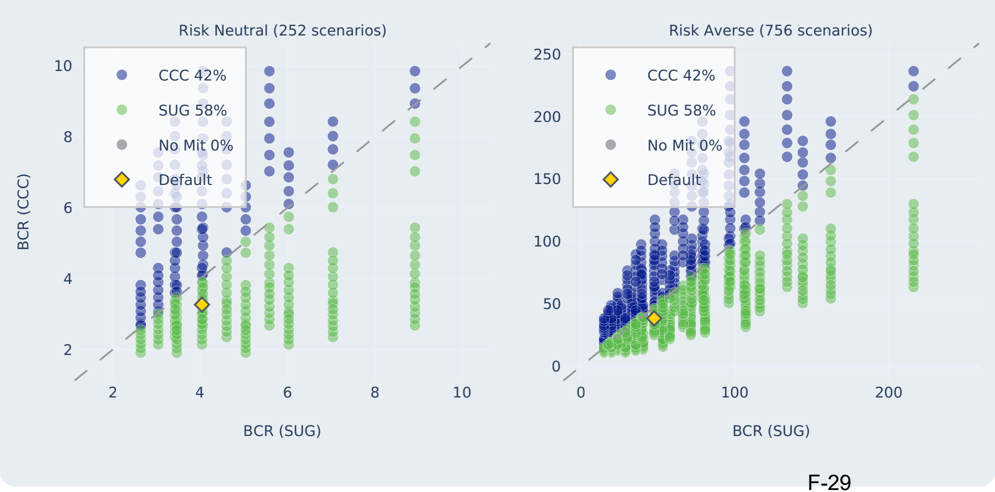
1021-25R Upstream Hardened Miles



1021-25R Risk Breakdown



1021-25R Cost-Effectiveness - Mitigation Selection Scenarios

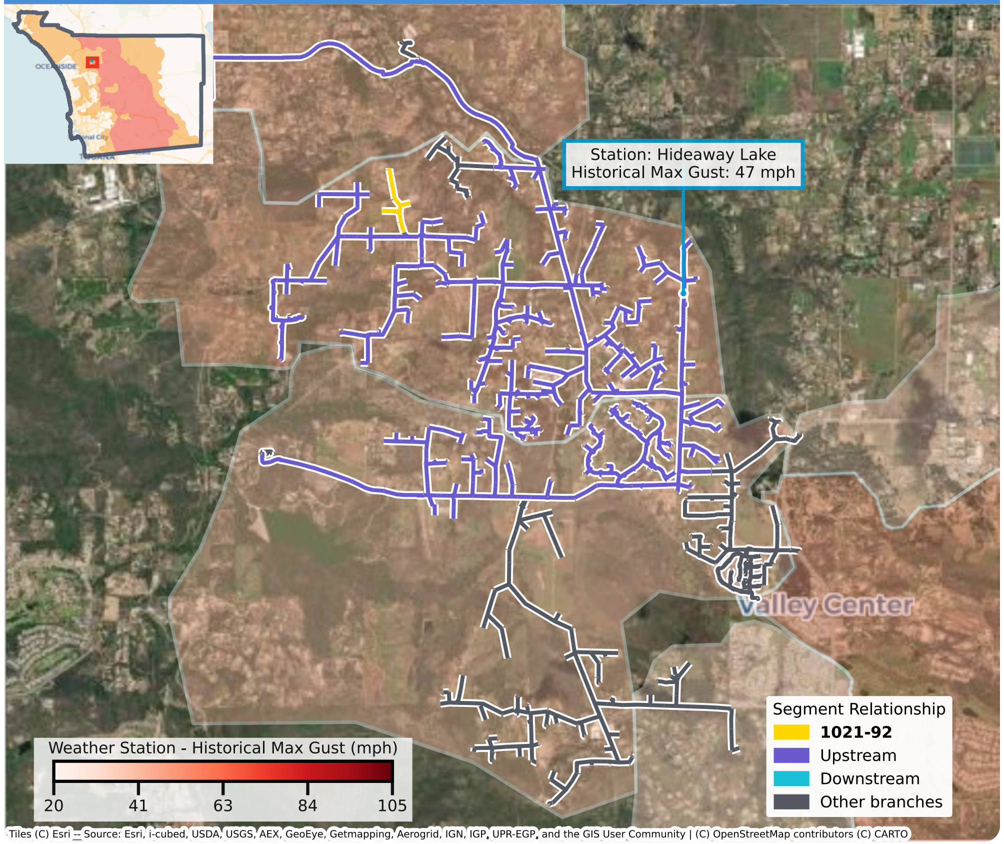


1021-92 | Rank: 532 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
4 Total		With AFN Flag		
Residential	Non-Residential			
2	2	0	3	—

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-1760R, 1021-855, 1021-883R) supported the selection of **CCC**.

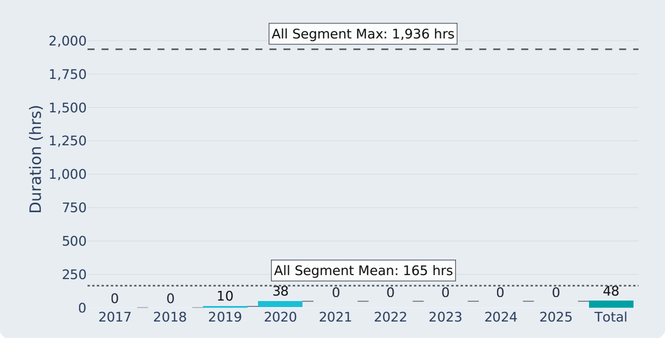
Circuit 1021 Map



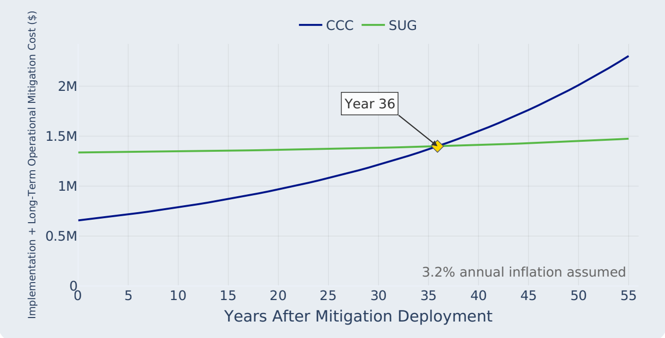
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

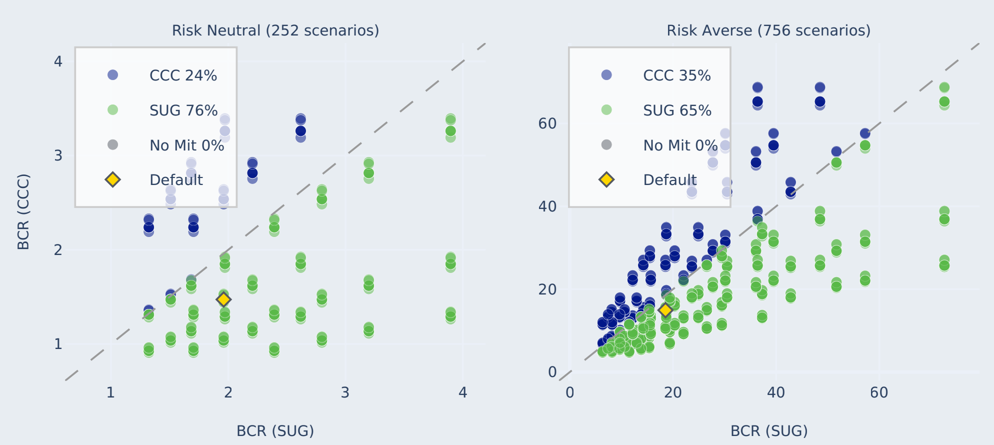
1021-92 PSPS Event Duration (hrs)



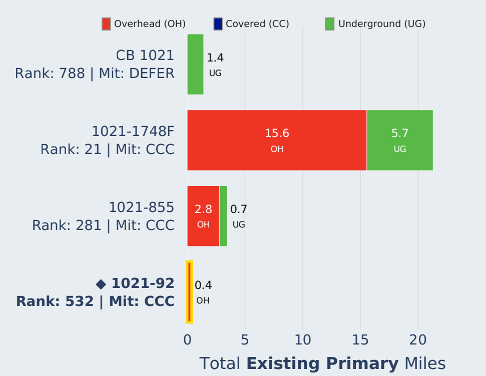
1021-92 Lifecycle Nominal Cost Over 55 Years



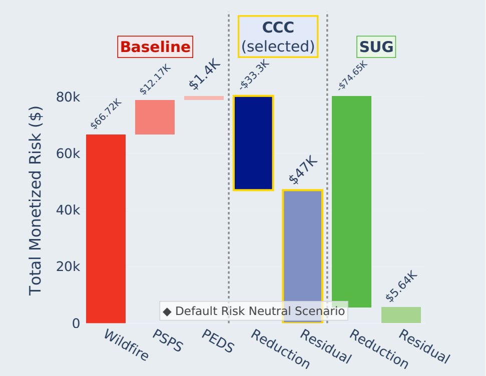
1021-92 Cost-Effectiveness - Mitigation Selection Scenarios



1021-92 Upstream Hardened Miles



1021-92 Risk Breakdown

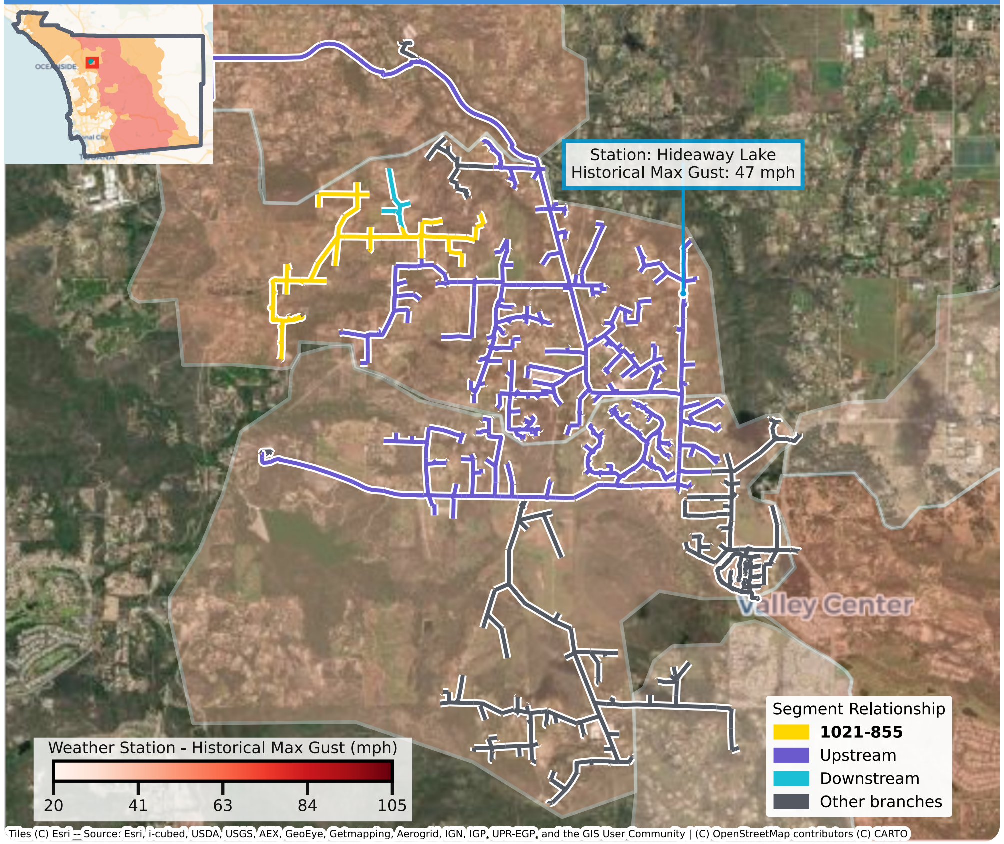


1021-855 | Rank: 281 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
42 Total		With AFN Flag	3	—
Residential	Non-Residential			
36	6	0		

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-1760R, 1021-883R, 1021-92) supported the selection of **CCC**.

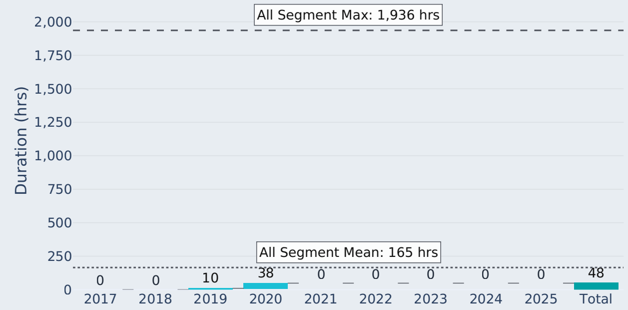
Circuit 1021 Map



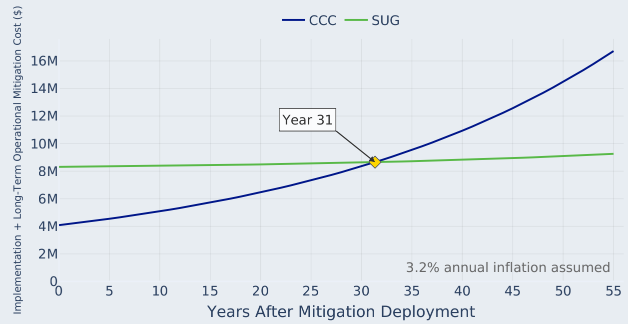
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

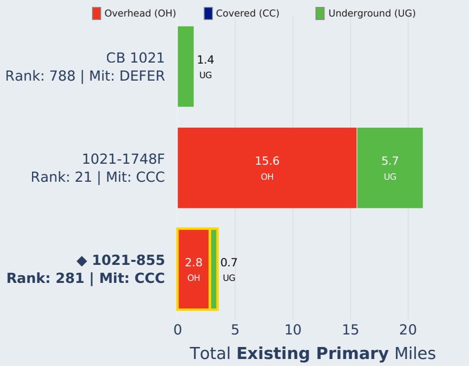
1021-855 PSPS Event Duration (hrs)



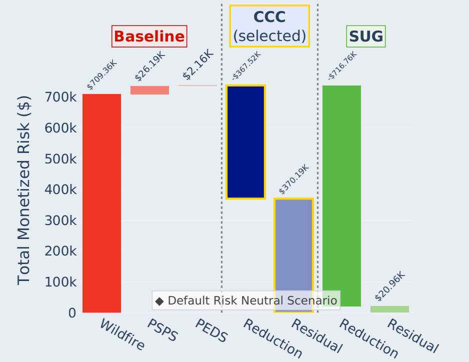
1021-855 Lifecycle Nominal Cost Over 55 Years



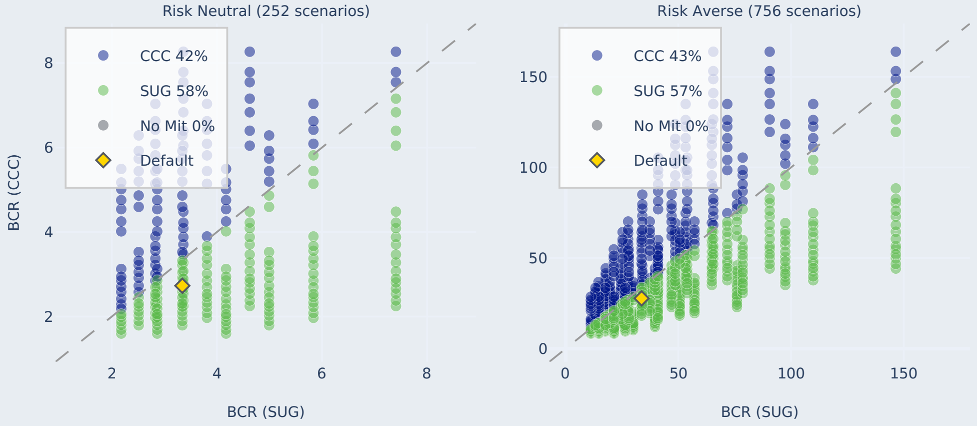
1021-855 Upstream Hardened Miles



1021-855 Risk Breakdown



1021-855 Cost-Effectiveness - Mitigation Selection Scenarios

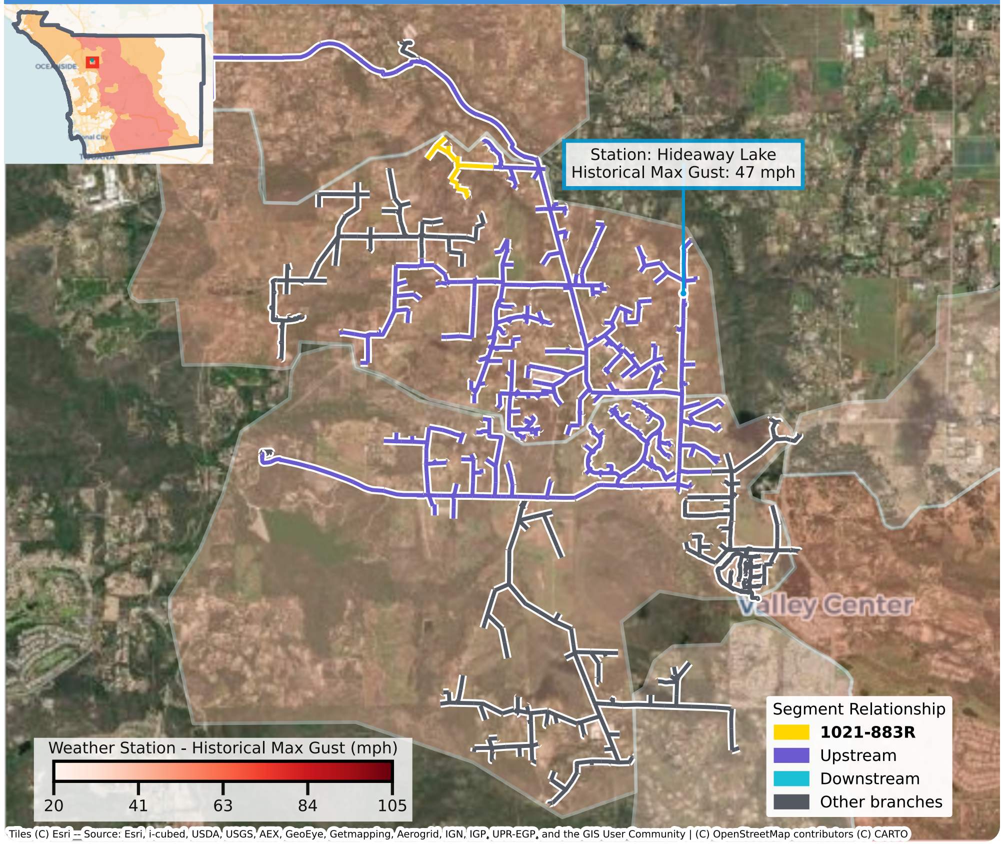


1021-883R | Rank: 439 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
8 Total		With AFN Flag		
Residential	Non-Residential			
8	0	0	3	—

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-1760R, 1021-855, 1021-92) supported the selection of **CCC**.

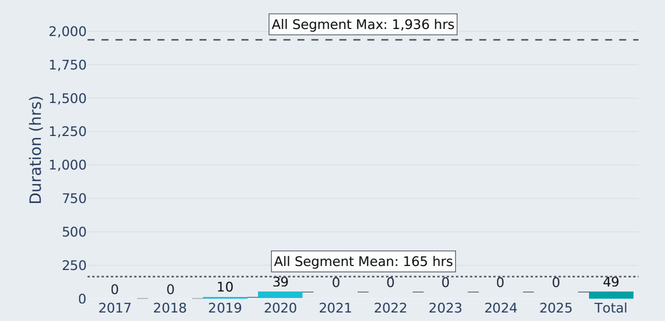
Circuit 1021 Map



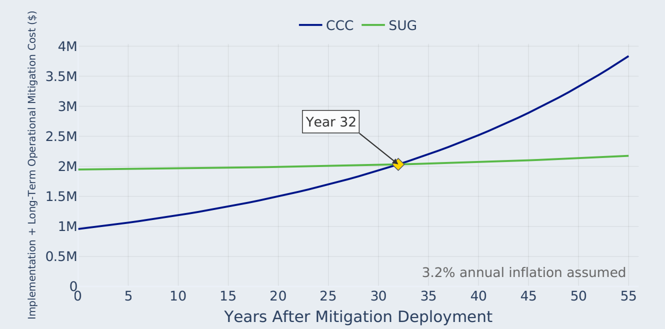
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

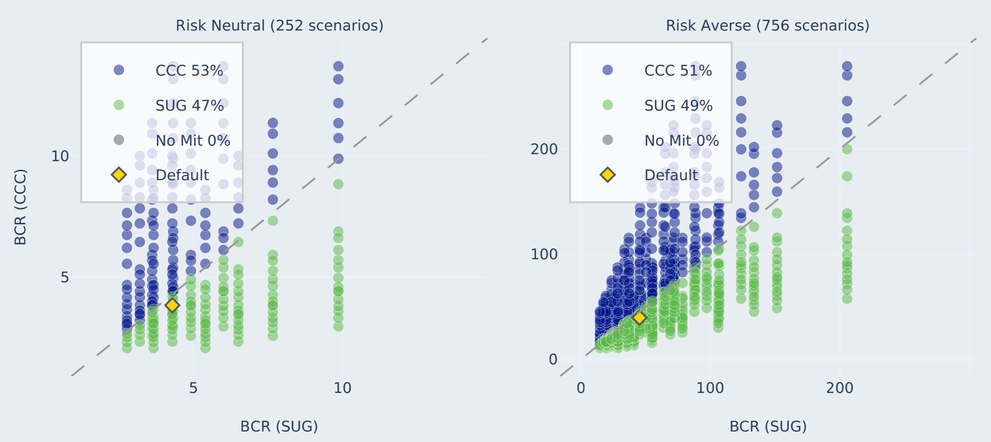
1021-883R PSPS Event Duration (hrs)



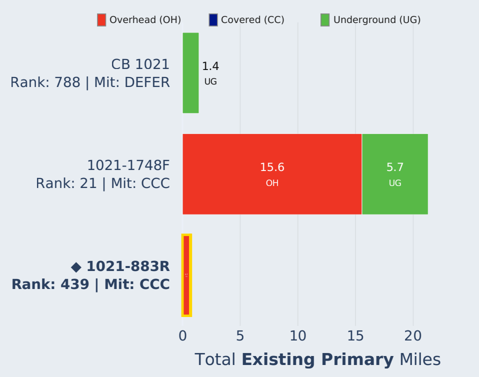
1021-883R Lifecycle Nominal Cost Over 55 Years



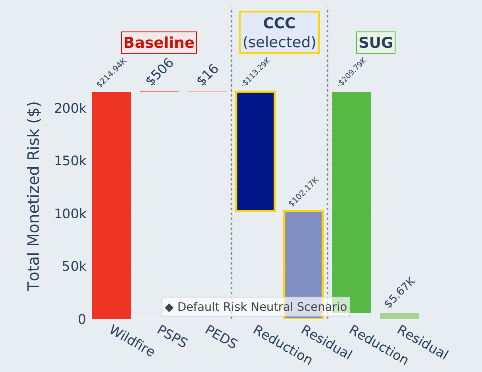
1021-883R Cost-Effectiveness - Mitigation Selection Scenarios



1021-883R Upstream Hardened Miles



1021-883R Risk Breakdown

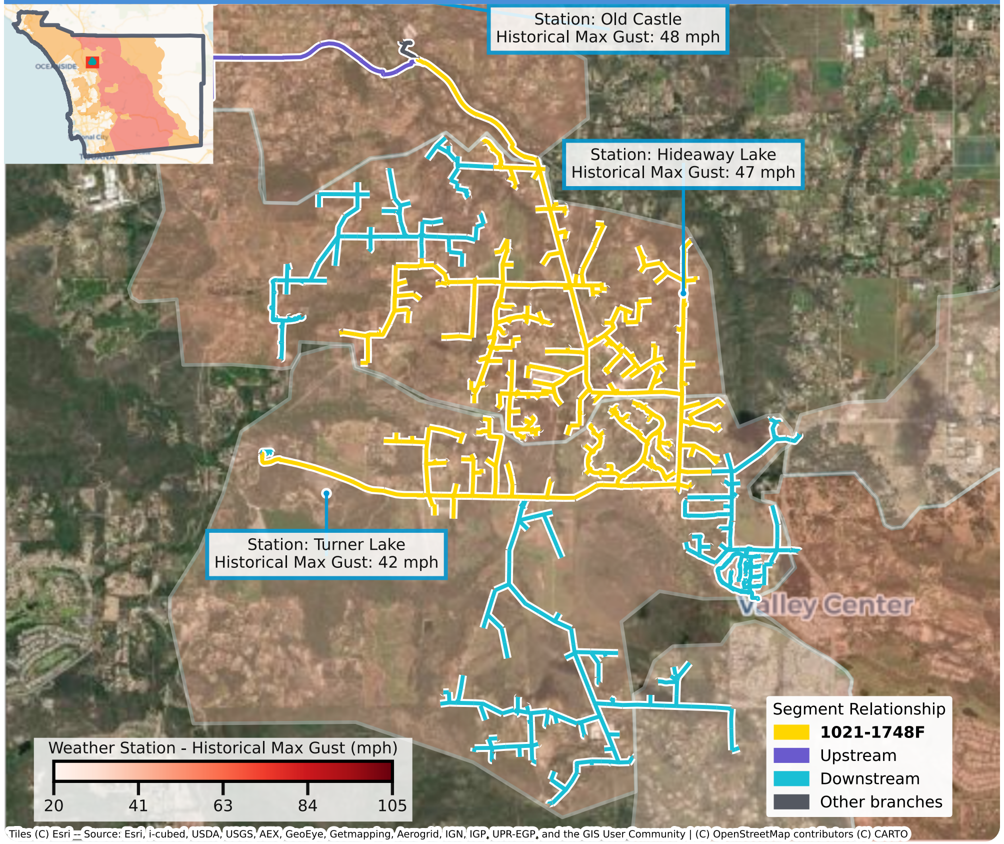


1021-1748F | Rank: 21 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
864 Total		With AFN Flag		
Residential	Non-Residential			
774	90	40	3	CRITICAL FACILITIES

Though scenario analysis indicated that SUG was the preferred option, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-25R, 1021-1760R, 1021-855, 1021-883R, 1021-92) supported the selection of **CCC**.

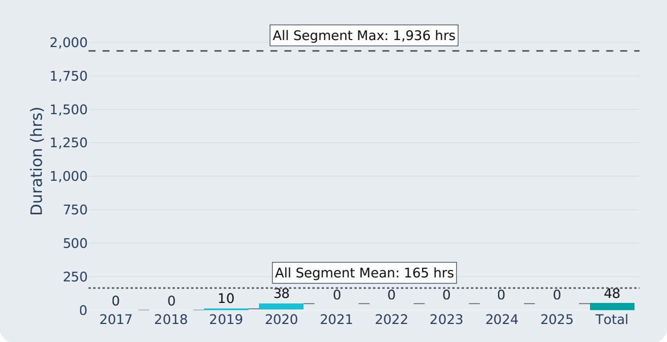
Circuit 1021 Map



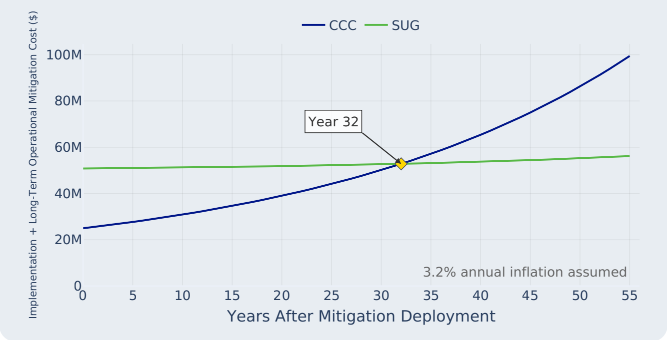
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

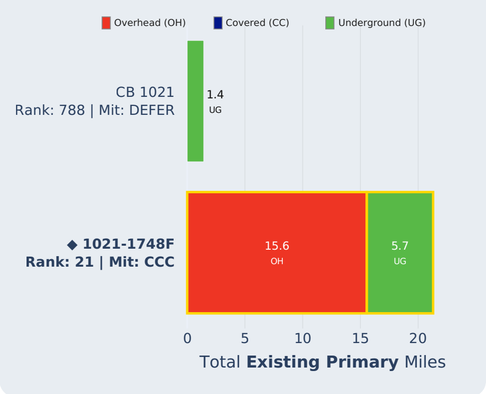
1021-1748F PSPS Event Duration (hrs)



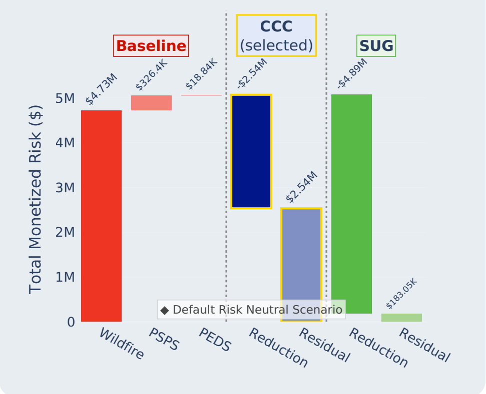
1021-1748F Lifecycle Nominal Cost Over 55 Years



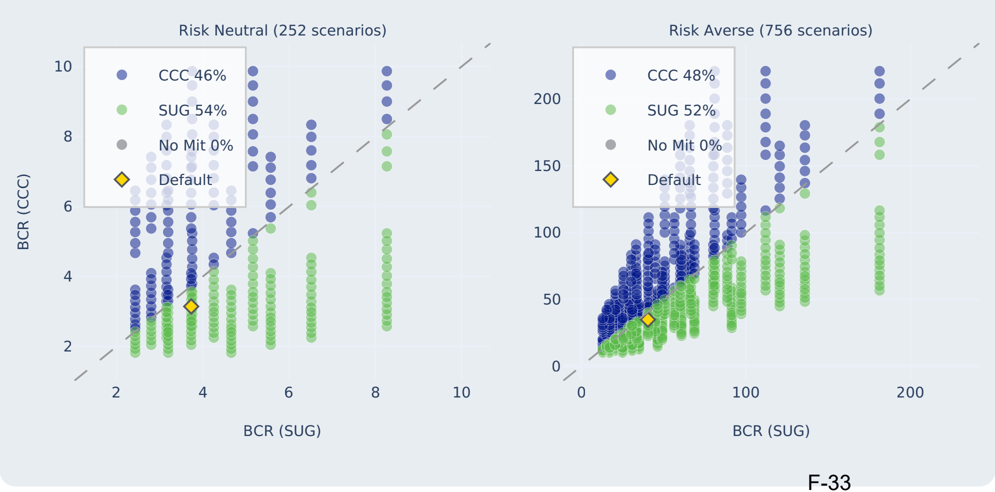
1021-1748F Upstream Hardened Miles



1021-1748F Risk Breakdown



1021-1748F Cost-Effectiveness - Mitigation Selection Scenarios

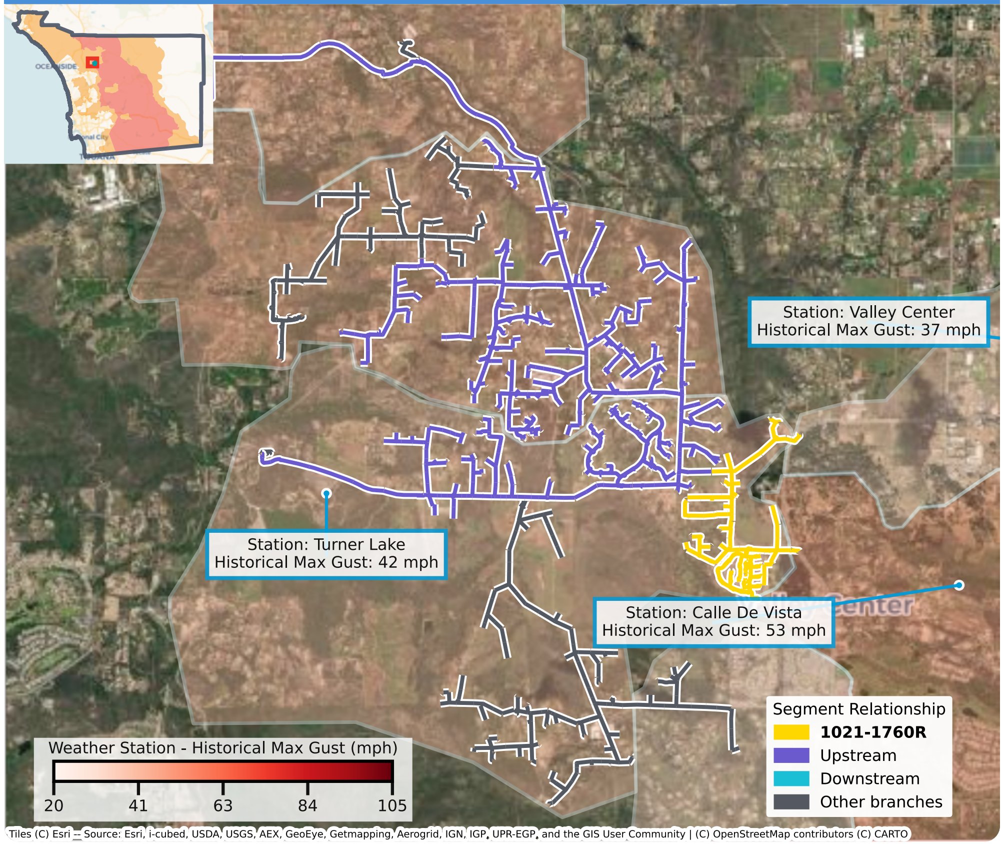


1021-1760R | Rank: 232 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
212 Total		With AFN Flag		
Residential	Non-Residential			
197	15	19	3	CRITICAL FACILITIES

Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (1021-1748F, 1021-25R, 1021-855, 1021-883R, 1021-92) supported the selection of **CCC**.

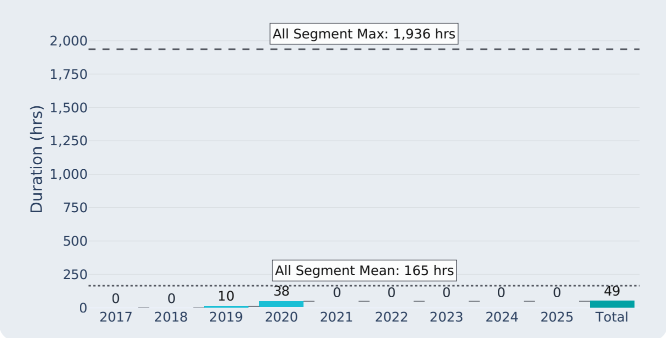
Circuit 1021 Map



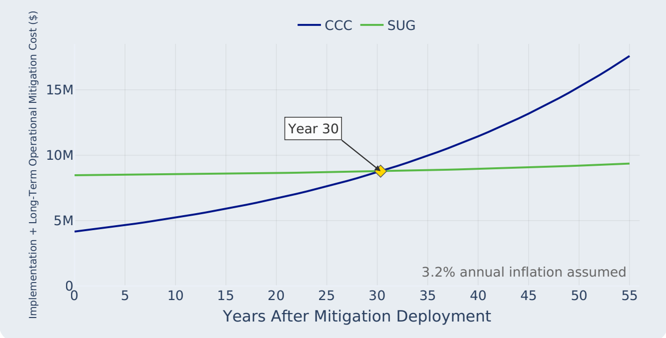
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

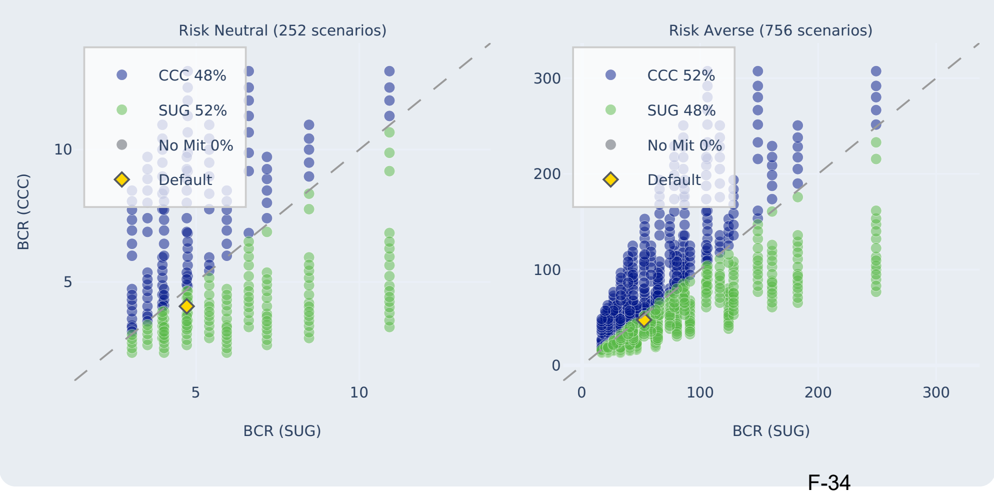
1021-1760R PSPS Event Duration (hrs)



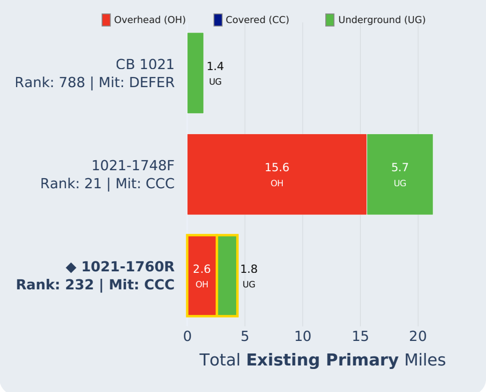
1021-1760R Lifecycle Nominal Cost Over 55 Years



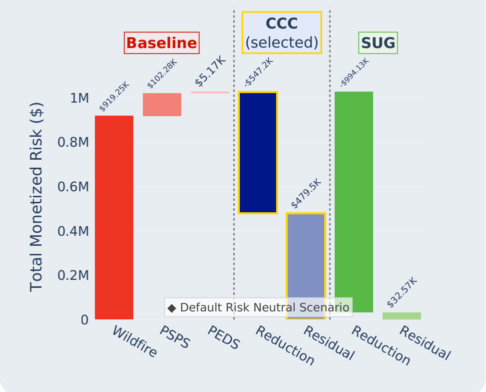
1021-1760R Cost-Effectiveness - Mitigation Selection Scenarios



1021-1760R Upstream Hardened Miles



1021-1760R Risk Breakdown



1030-20R | Rank: 34 | Mitigation: SUG

<table>
<tr><th colspan="3">Downstream Customers</th><th rowspan="2">HFTD Tier</th><th rowspan="2">Community</th></tr>
<tr><td colspan="2">303 Total</td><td rowspan="2">With AFN Flag</td></tr>
<tr><td>Residential</td><td>Non-Residential</td><td rowspan="2">3</td><td rowspan="2">DVC TRIBAL
CRITICAL FACILITIES</td></tr>
<tr><td>213</td><td>90</td><td>9</td></tr>
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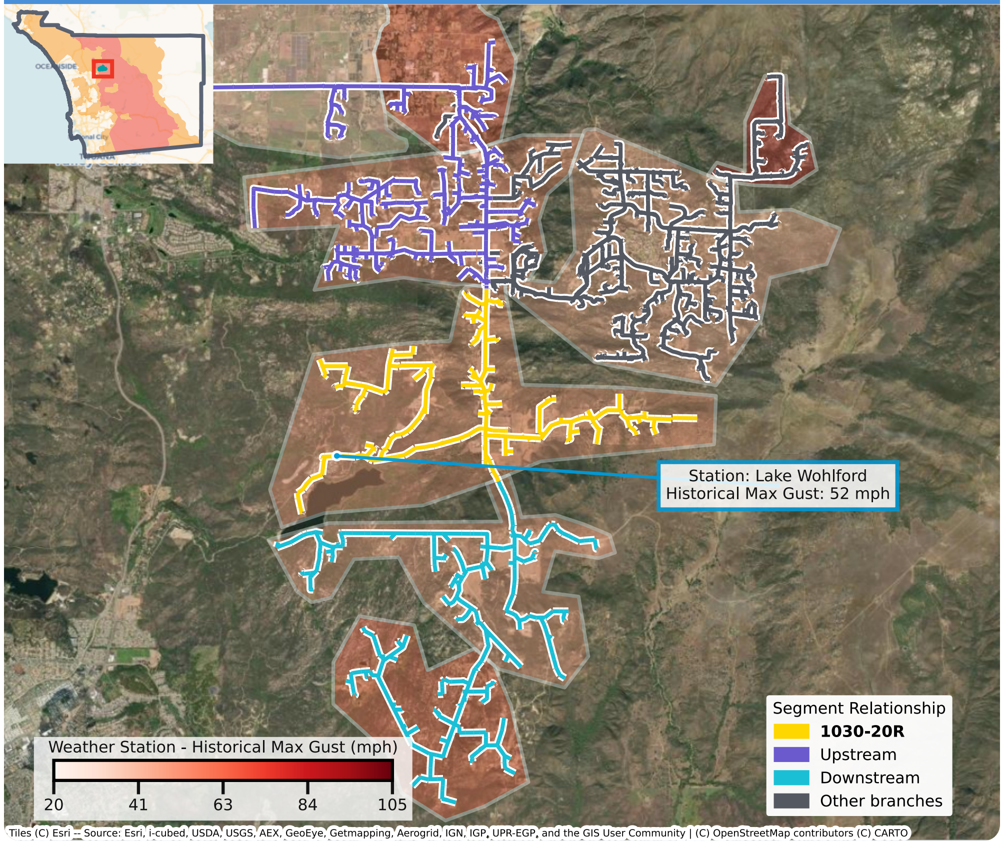
Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (1030-42R, 1030-989R) supported the selection of **SUG**.

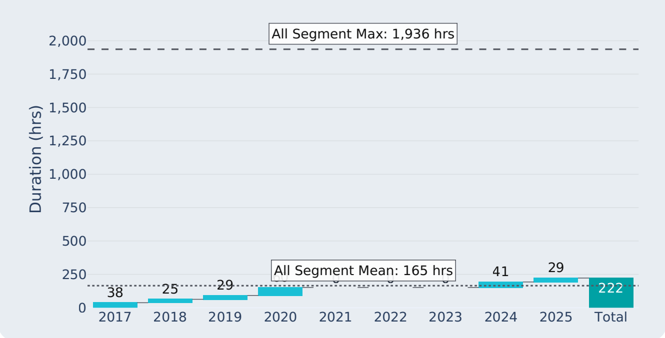
Circuit 1030 Map



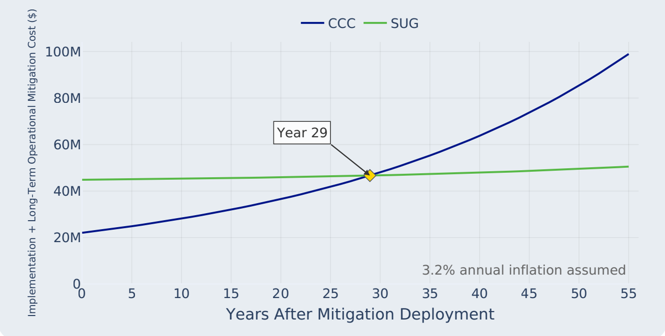
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

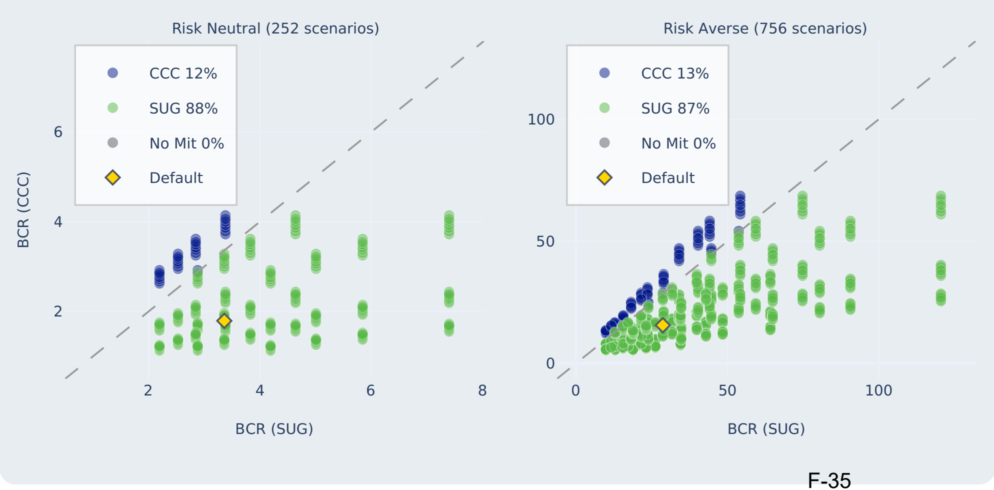
1030-20R PSPS Event Duration (hrs)



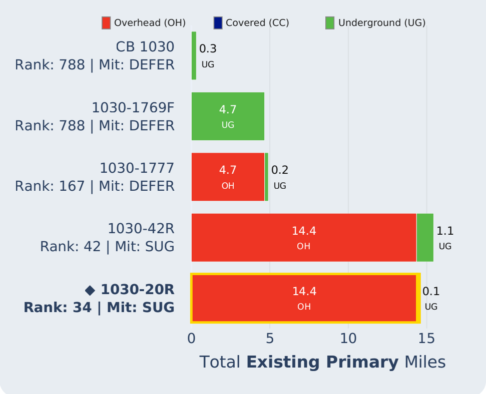
1030-20R Lifecycle Nominal Cost Over 55 Years



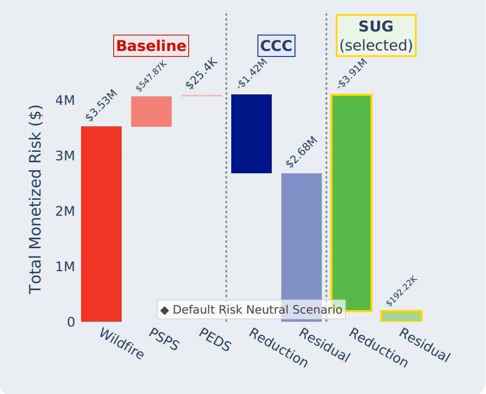
1030-20R Cost-Effectiveness - Mitigation Selection Scenarios



1030-20R Upstream Hardened Miles



1030-20R Risk Breakdown

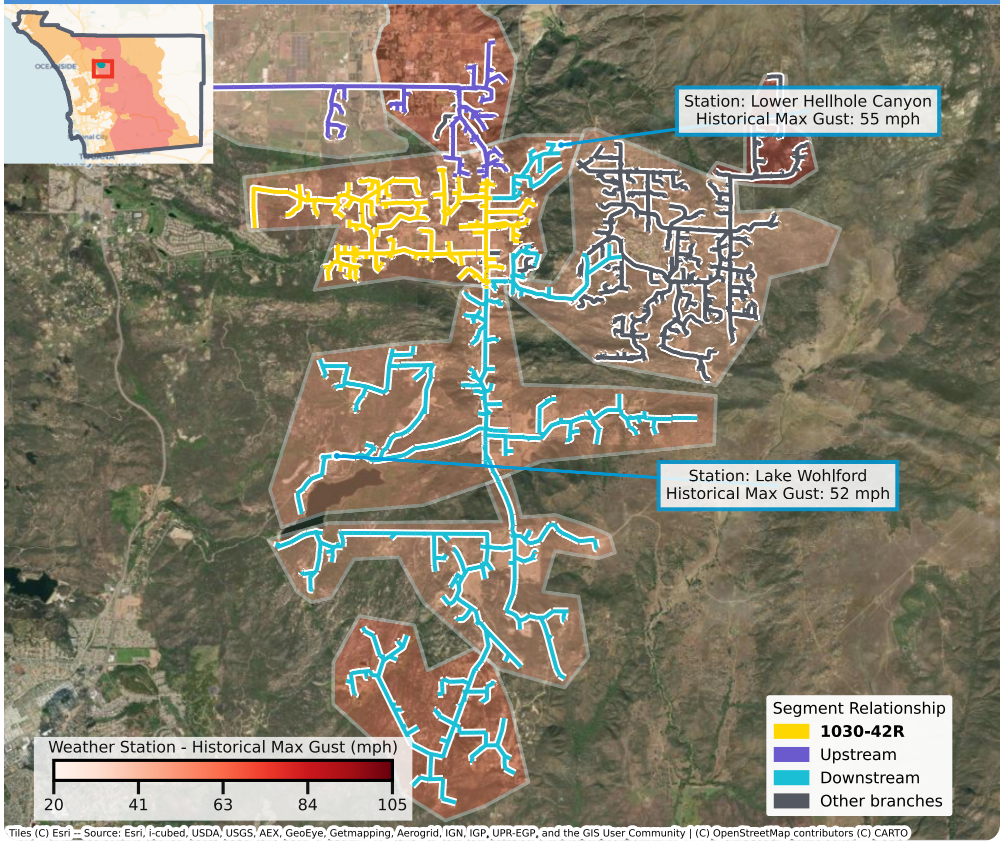


1030-42R | Rank: 42 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
732 Total		With AFN Flag	3	DVC TRIBAL CRITICAL FACILITIES
Residential	Non-Residential			
595	137	13		

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (1030-20R, 1030-989R) supported the selection of **SUG**.

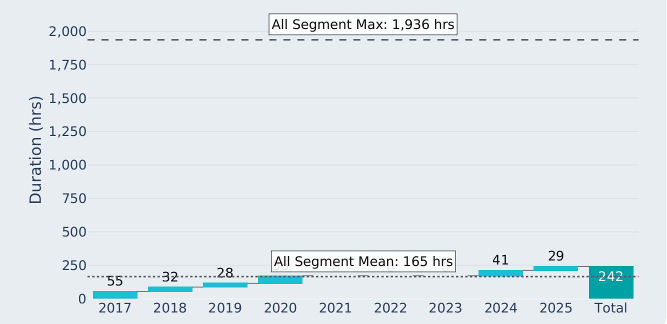
Circuit 1030 Map



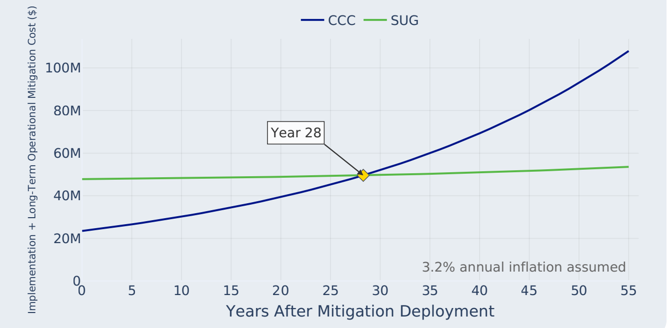
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

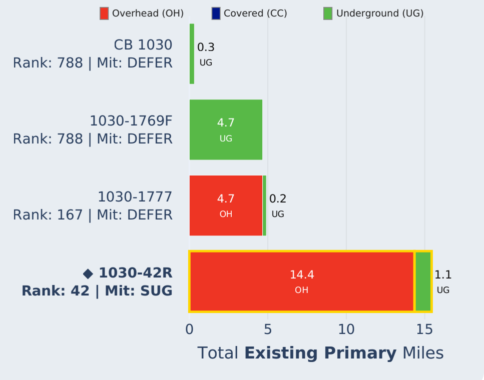
1030-42R PSPS Event Duration (hrs)



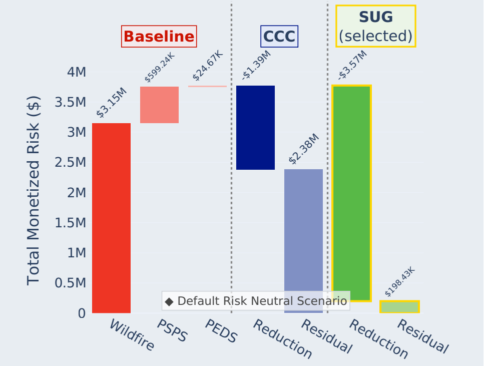
1030-42R Lifecycle Nominal Cost Over 55 Years



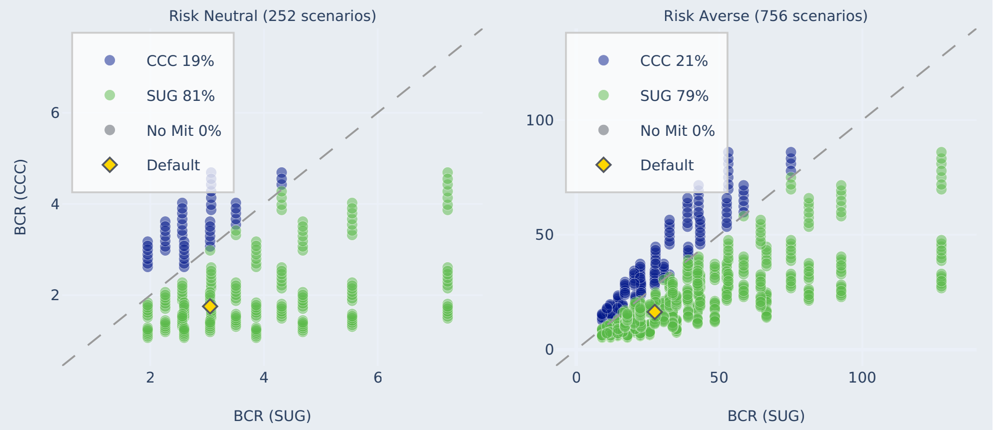
1030-42R Upstream Hardened Miles



1030-42R Risk Breakdown



1030-42R Cost-Effectiveness - Mitigation Selection Scenarios



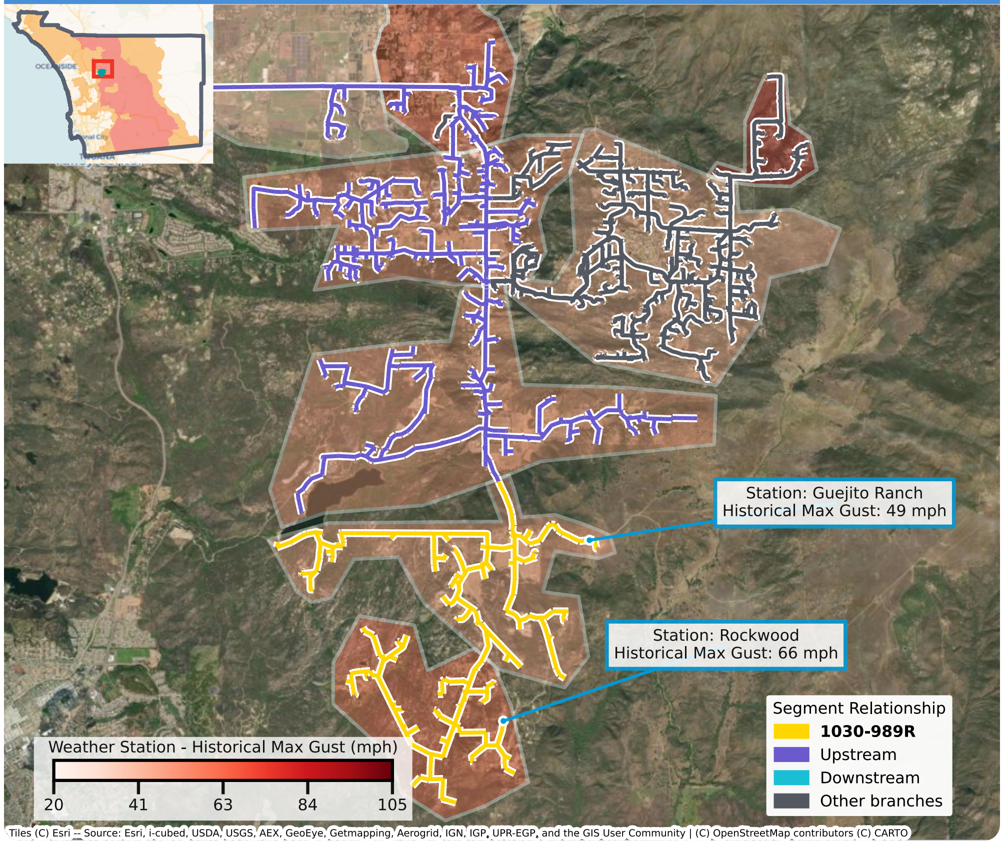
GIS Date: 2026-01-01 | Version: 1.2.0 | Revision: 2026_GRC_rev4

1030-989R | Rank: 47 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
154 Total		With AFN Flag		
Residential	Non-Residential			
103	51	10	3	CRITICAL FACILITIES

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (1030-20R, 1030-42R) supported the selection of **SUG**.

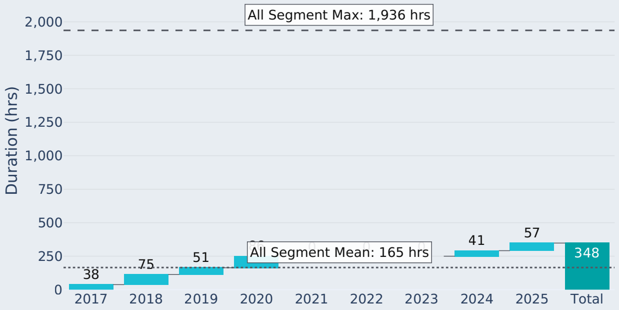
Circuit 1030 Map



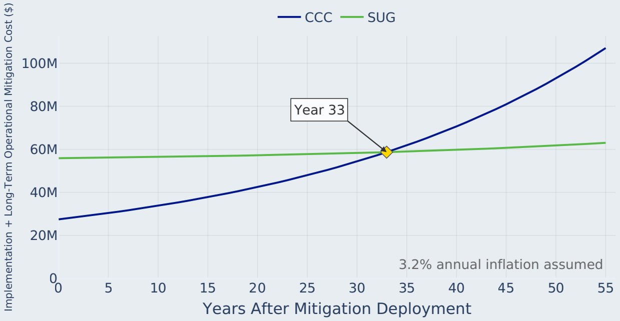
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

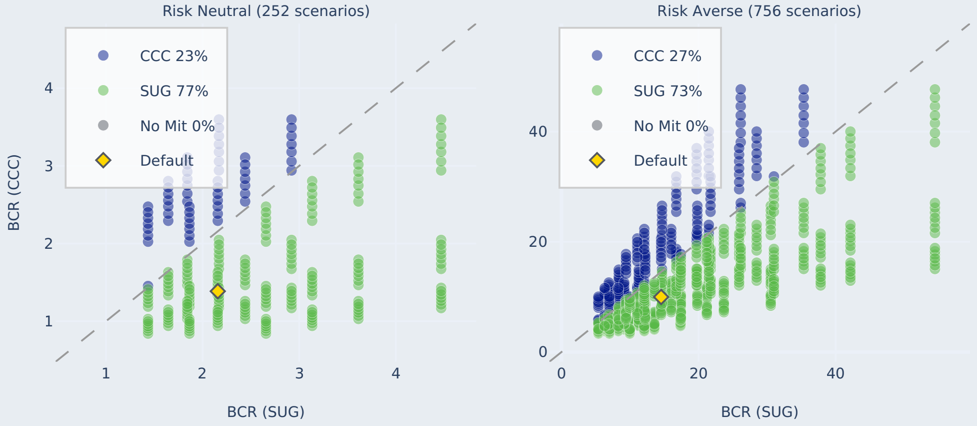
1030-989R PSPS Event Duration (hrs)



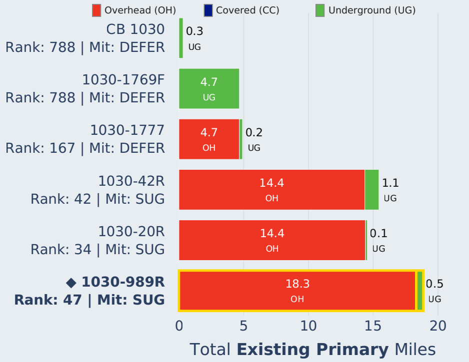
1030-989R Lifecycle Nominal Cost Over 55 Years



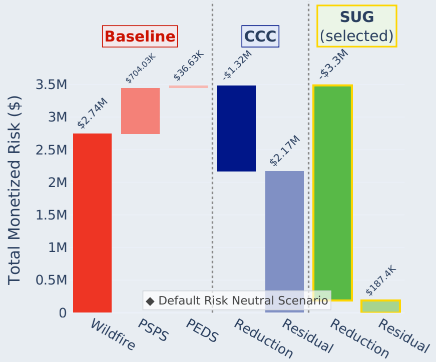
1030-989R Cost-Effectiveness - Mitigation Selection Scenarios



1030-989R Upstream Hardened Miles



1030-989R Risk Breakdown

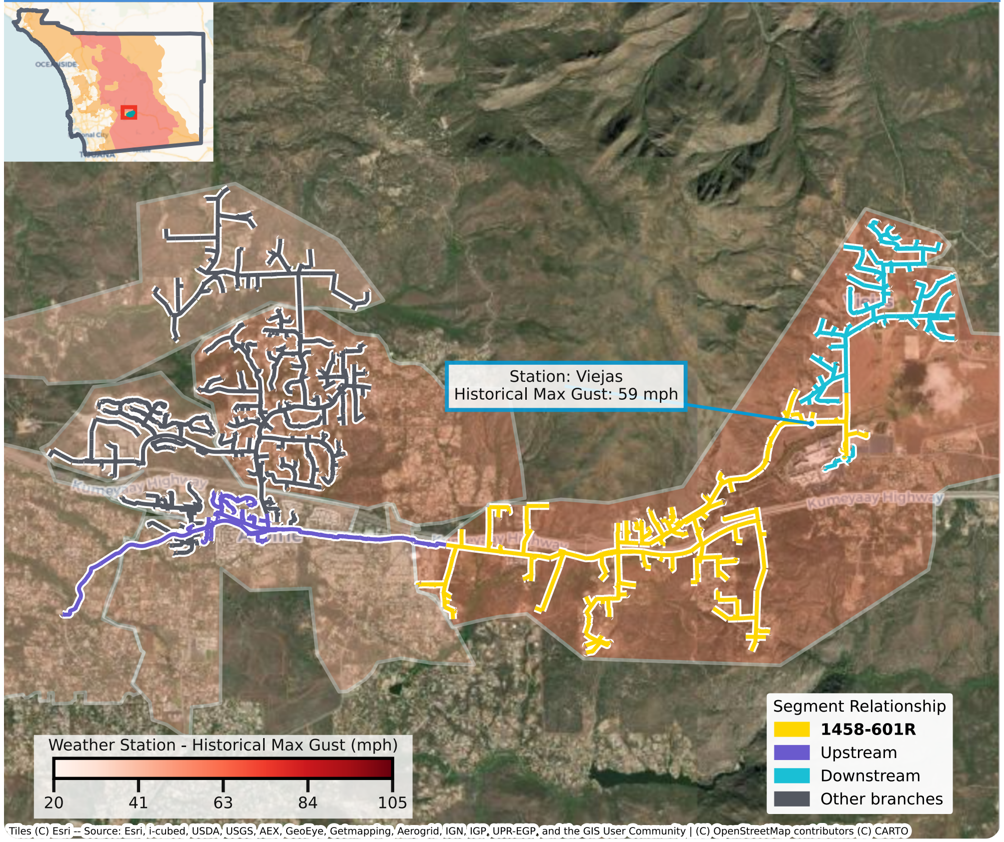


1458-601R | Rank: 11 | Mitigation: SUG

Downstream Customers			HFTD Tier	Community
450 Total		With AFN Flag		
Residential	Non-Residential			
367	83	19	3	DVC TRIBAL CRITICAL FACILITIES

Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **SUG** could be a suitable risk mitigation for this segment. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**.

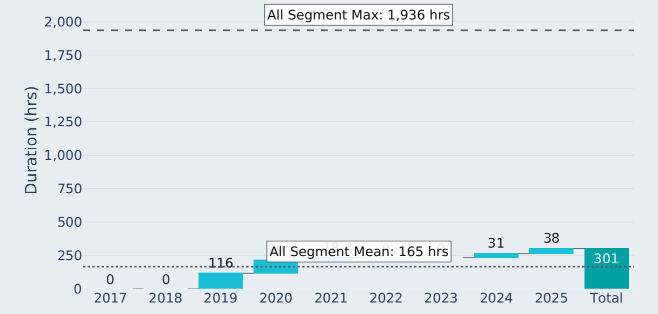
Circuit 1458 Map



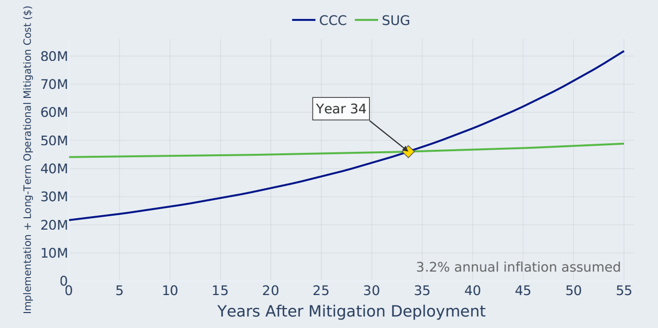
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

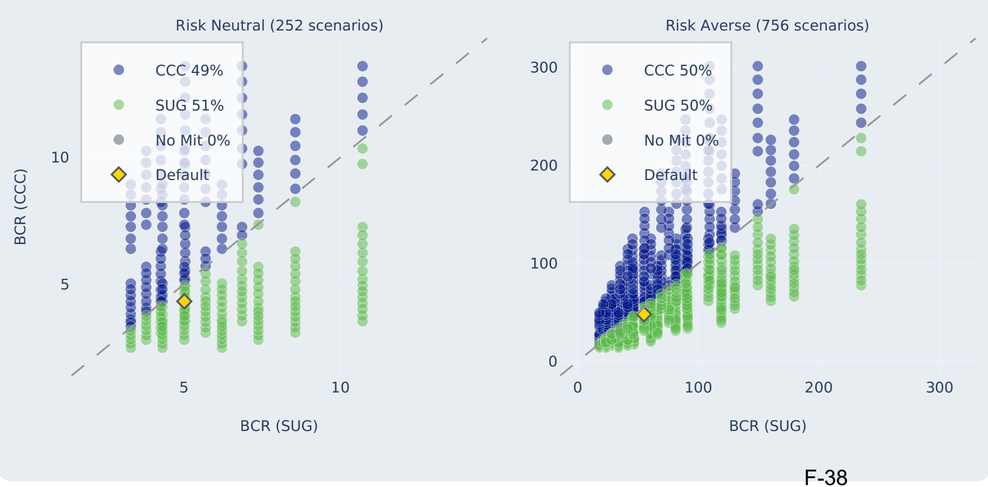
1458-601R PSPS Event Duration (hrs)



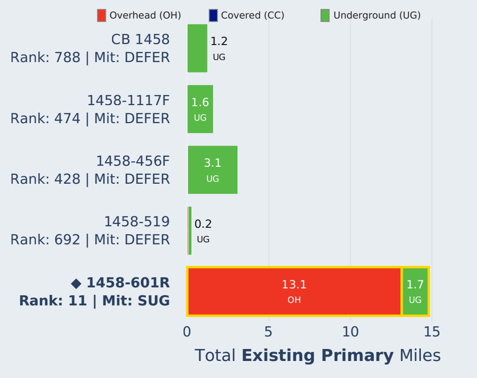
1458-601R Lifecycle Nominal Cost Over 55 Years



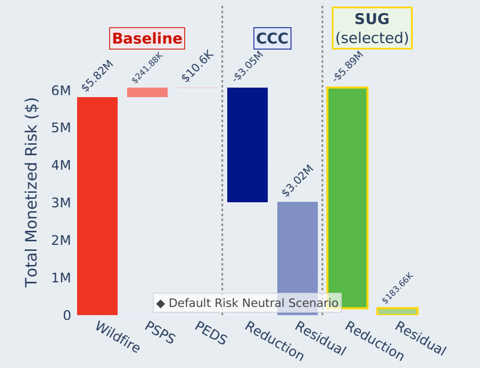
1458-601R Cost-Effectiveness - Mitigation Selection Scenarios



1458-601R Upstream Hardened Miles



1458-601R Risk Breakdown

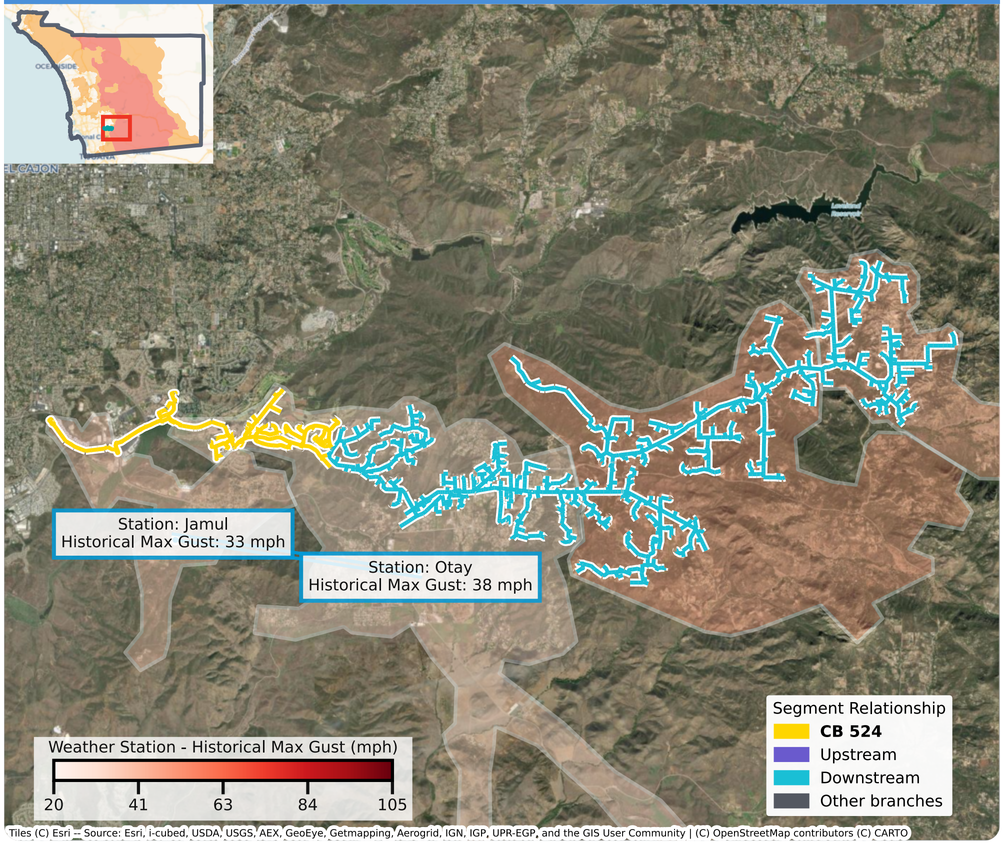


CB 524 | Rank: 490 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
1779 Total		With AFN Flag		
Residential	Non-Residential		3	CRITICAL FACILITIES
1598	181	41		

Though scenario analysis was undetermined for this segment, SDG&E's review of the risks, as well as the balance of the wildfire mitigation portfolio, indicated that **CCC** could be a suitable risk mitigation for this segment. Additionally, **Bundling** with other segments (524-69R, 524-46R, 524-27R, 524-1782F) supported the selection of **CCC**.

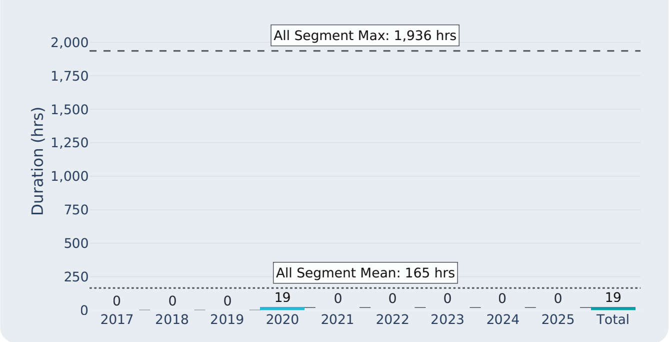
Circuit 524 Map



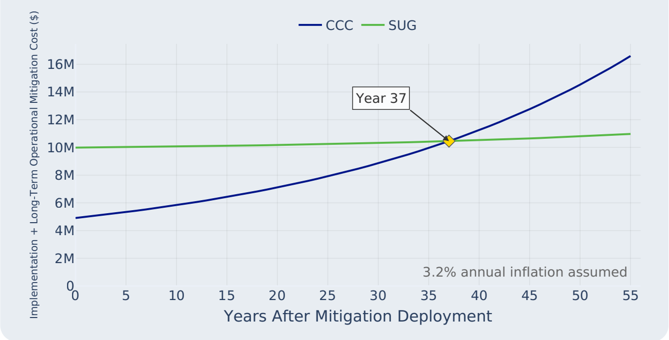
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

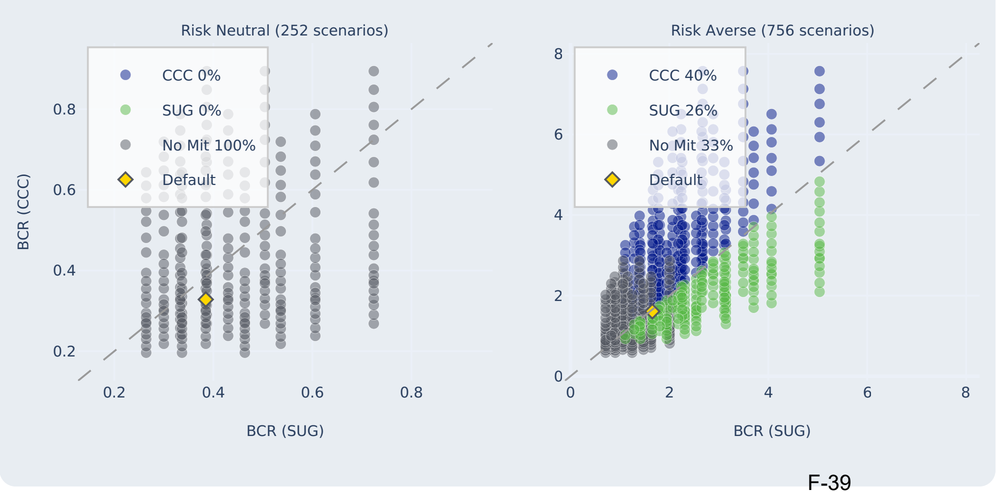
CB 524 PSPS Event Duration (hrs)



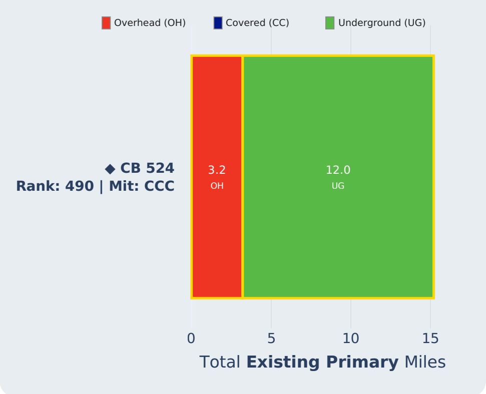
CB 524 Lifecycle Nominal Cost Over 55 Years



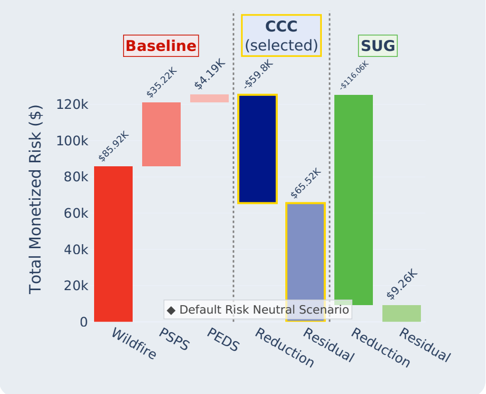
CB 524 Cost-Effectiveness - Mitigation Selection Scenarios



CB 524 Upstream Hardened Miles



CB 524 Risk Breakdown

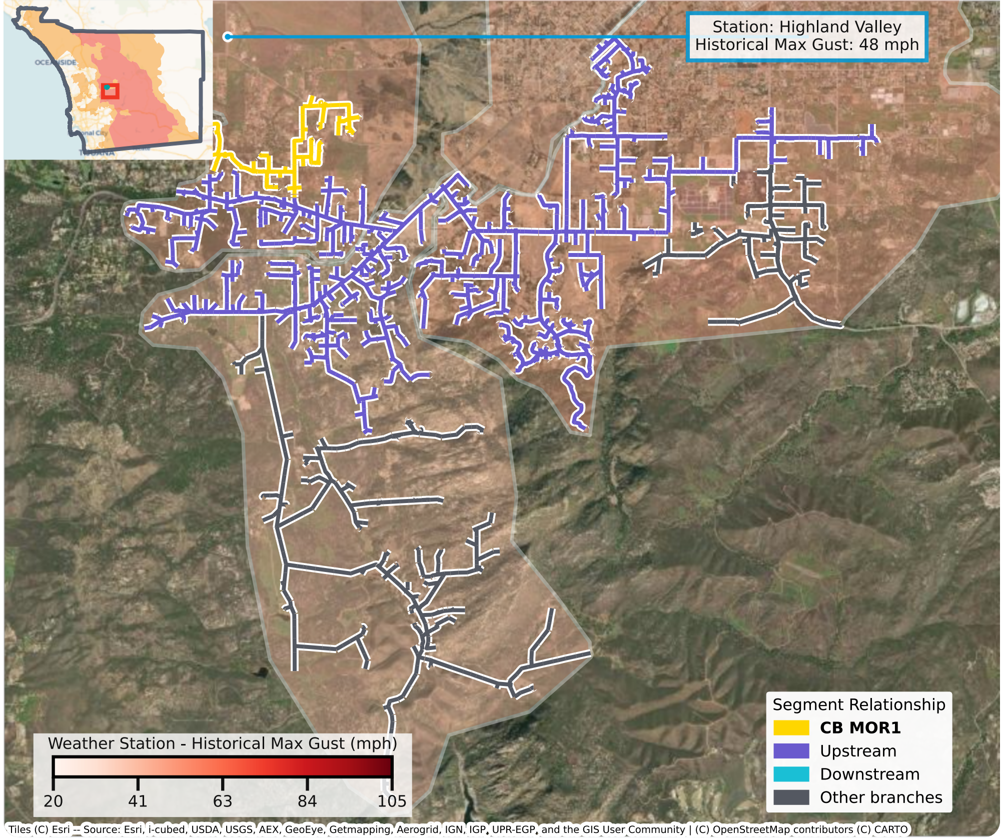


CB MOR1 | Rank: 157 | Mitigation: CCC

Downstream Customers			HFTD Tier	Community
102 Total		With AFN Flag		
Residential	Non-Residential		2	CRITICAL FACILITIES
96	6	6		

Scenario analysis indicated that **CCC** was the preferred option. SDG&E performed a preliminary desktop engineering review, verifying that no constraints (e.g., elevation) would limit the installation of covered conductor. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts less than approximately 50 mph** was a key factor in choosing **CCC**. Furthermore, **Bundling** with other segments (971-1973R) supported the selection of **CCC**.

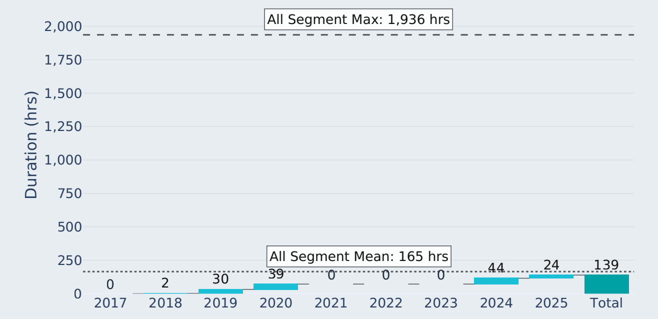
Circuit 971 Map



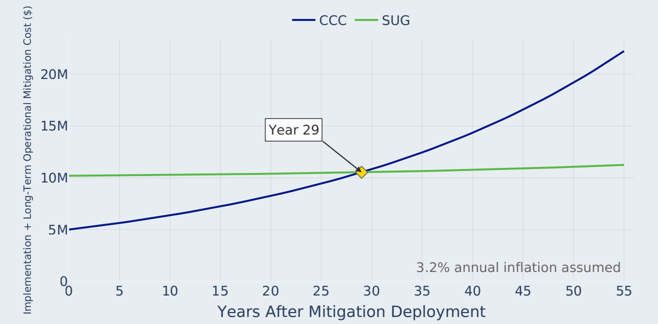
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

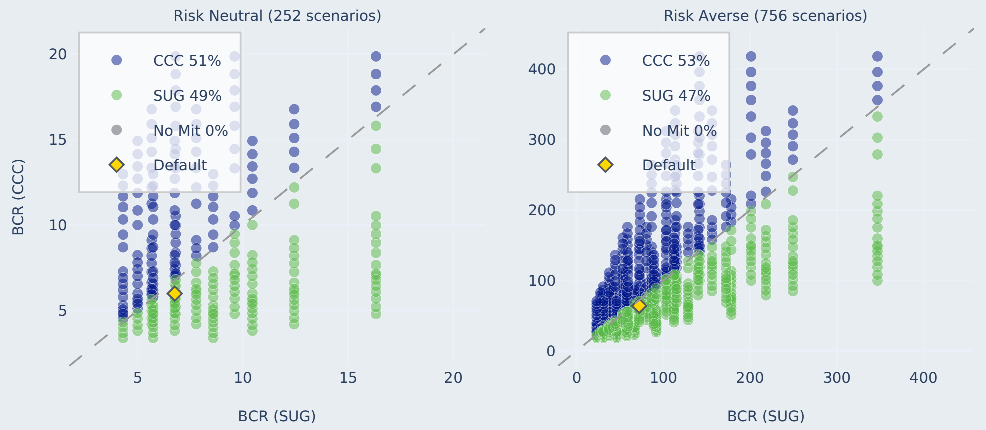
CB MOR1 PSPS Event Duration (hrs)



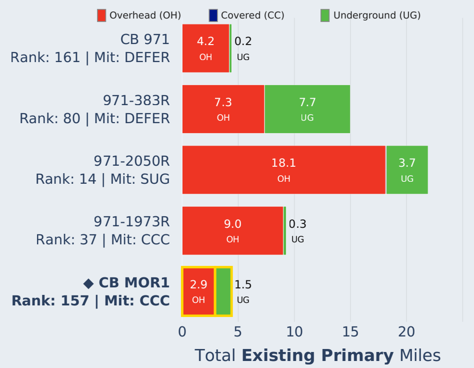
CB MOR1 Lifecycle Nominal Cost Over 55 Years



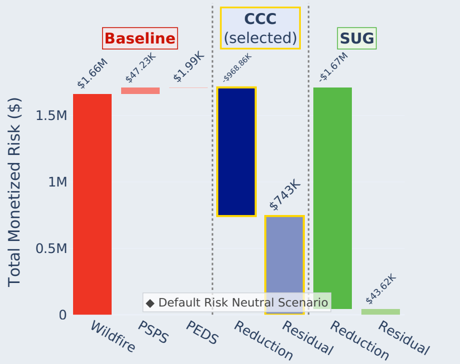
CB MOR1 Cost-Effectiveness - Mitigation Selection Scenarios



CB MOR1 Upstream Hardened Miles



CB MOR1 Risk Breakdown



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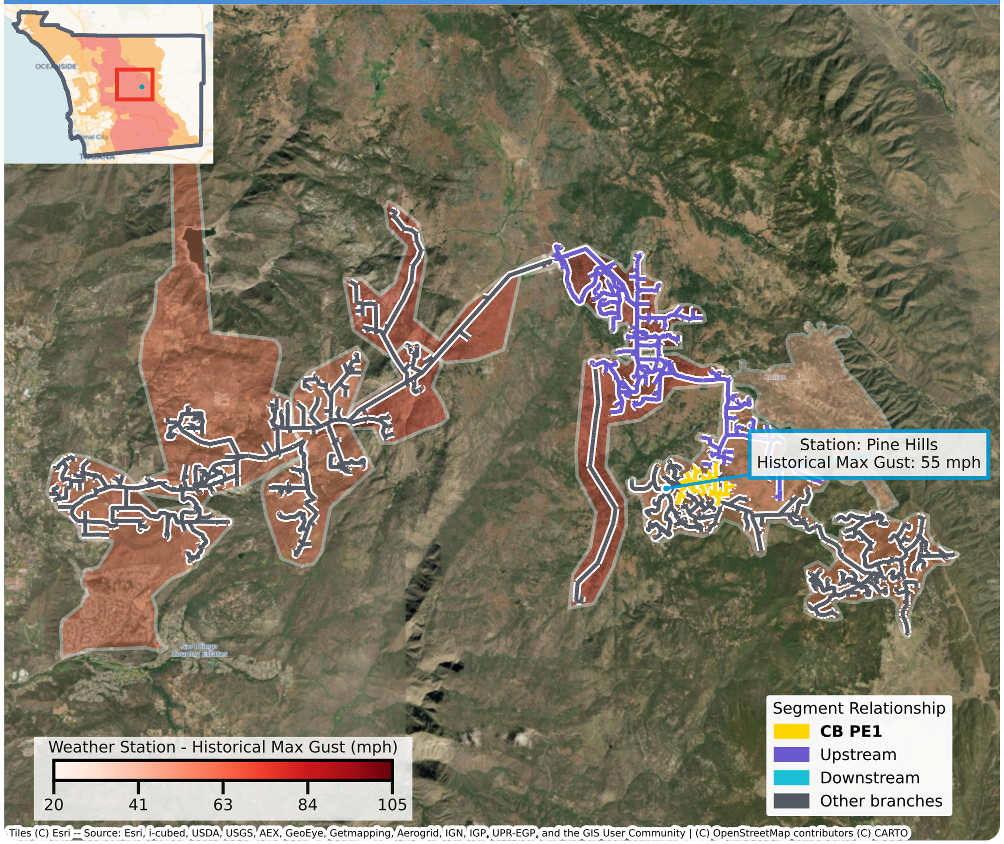
CB PE1 | Rank: 32 | Mitigation: SUG

Downstream Customers		With AFN Flag	HFTD Tier	Community
116 Total				
Residential	Non-Residential		3	CRITICAL FACILITIES
103	13	8		

Scenario analysis indicated that **SUG** was the preferred option. SDG&E performed a preliminary desktop engineering review, refining the UG trench length estimate and verifying the feasibility of the underground conversion. The results of the engineering review were used to validate the scenario analysis. Additionally, the presence of **Max wind gusts greater than approximately 50 mph** was a key factor in choosing **SUG**. Furthermore, **Bundling** with other segments (222-1523R, 222-2085) supported the selection of **SUG**.

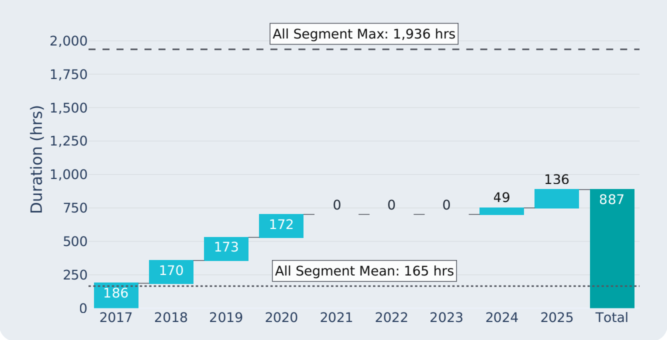
Circuit 222 Map



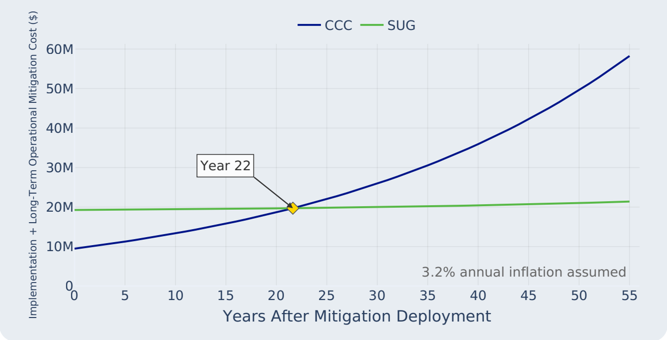
Tiles (C) Esri -- Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community | (C) OpenStreetMap contributors (C) CARTO

Risk Rank Comparison

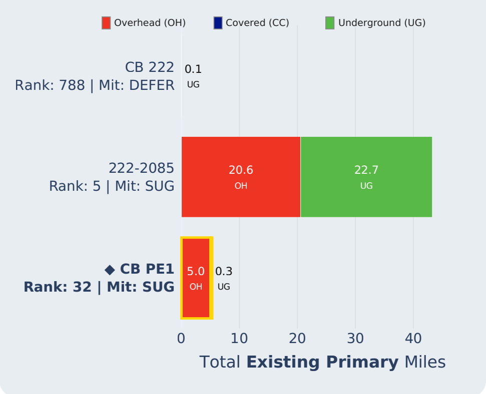
CB PE1 PSPS Event Duration (hrs)



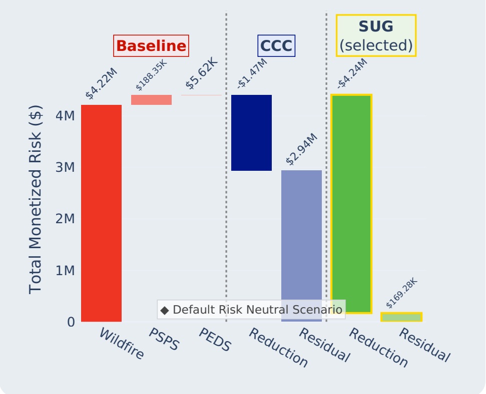
CB PE1 Lifecycle Nominal Cost Over 55 Years



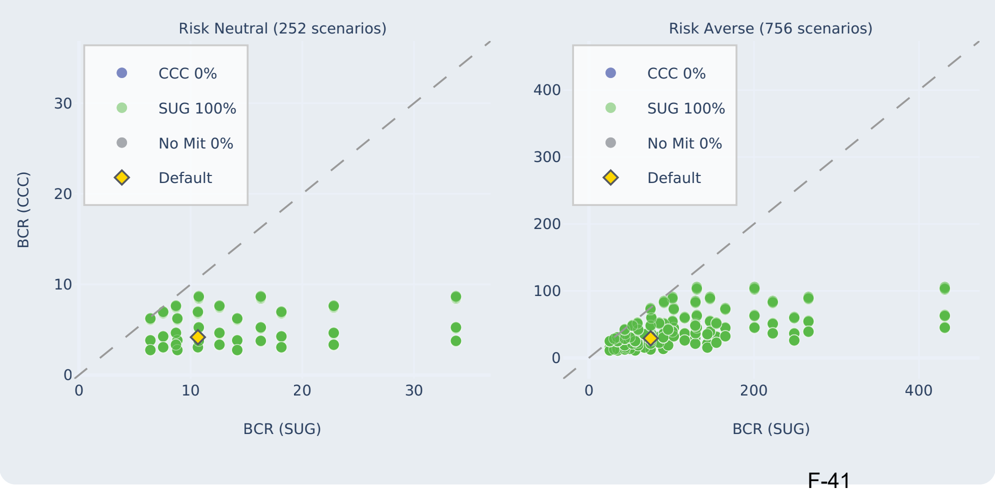
CB PE1 Upstream Hardened Miles



CB PE1 Risk Breakdown



CB PE1 Cost-Effectiveness - Mitigation Selection Scenarios



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