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May 7, 2024 VIA ELECTRONIC FILING

Caroline Thomas Jacobs, Director
Office of Energy Infrastructure Safety
California Natural Resources Agency
715 P Street, 20th Floor
Sacramento, CA 95814

**RE: MUSSEY GRADE ROAD ALLIANCE COMMENTS ON THE 2025 UPDATE OF THE WILDFIRE MITIGATION PLANS OF PG&E, SCE, AND SDG&E**

Dear Director Thomas Jacobs:

The Mussey Grade Road Alliance (MGRA or Alliance) files these comments pursuant to the Revised 2025 Wildfire Mitigation Plan Update Schedule[1] provided by the Office of Energy Infrastructure Safety (OEIS or Energy Safety) which authorizes public comment on the Large Utility Wildfire Mitigation Plans (WMPs) by May 7, 2024.

The Mussey Grade Road Alliance is pleased to be able to continue to participate and provide substantive feedback on this update to the Large IOU Wildfire Mitigation Plans. MGRA notes that largely the IOUs have followed OEIS guidance and provided a greatly reduced volume of information dealing with only the changes since last year.

For any reader curious as to how the Mussey Grade Road Alliance, a grass-roots citizen-based organization located in Ramona, California has become involved in reviewing and improving utility power line fire safety in California over the last 17 years we would refer them to our last full description in the 2020 Wildfire Mitigation Plans.[2]

[1] 2023-2025-WMPs; Office of Energy Infrastructure Safety; 2025 Wildfire Mitigation Plan Update Schedule; p. 2; TN13736_20240222T151200_2025_WMP_Update_Letter_and_Schedule.pdf. (2025 Updated Schedule)
[2] MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2020 WILDFIRE MITIGATION PLANS OF SDG&E, PG&E, SCE; April 7, 2020; pp. 1-3. (MGRA 2020 WMP Comments)

The Alliance comments are authored by the Alliance expert, Joseph W. Mitchell, Ph.D.[3] Many of the topics he raised in the previous years – wind and wildfire risk, power shutoff and shortcomings in utility modeling tools – remain active topics of discussion within both Energy Safety and CPUC frameworks. Dr. Mitchell presents additional data and information this year as warranted by the updates.

Many of the issues that MGRA has been raising over the last few years regarding the validity of utility risk calculations, and the massive shift on the part of the utilities to choose undergrounding as their primary mitigation and pull back on other mitigations, continue to be a concern. Where Energy Safety addressed these in its 2023-2025 WMP reviews, MGRA will provide further comment regarding utility actions with regard to the Update, where the situation remains static or unresolved MGRA will refer back to its previous filings.

The most important point raised by MGRA in this year's comments will be the confirmation of its data analysis from Southern California Edison's (SCE) now well-established covered conductor program, showing that covered conductor is substantially – a factor of 2 – more effective at suppressing wildfire ignitions than anticipated by all IOU Subject Matter Experts (SMEs). This will lead to starkly different conclusions in some cases about what the proper mitigation mix should be for utilities.

Energy Safety has in the past shown that it is committed to obtaining a wildfire-safe California at a cost that Californians can afford. We ask that Energy Safety hold to its commitment through the coming years and to stick to the values it has so far served so well.

[3] M-bar Technologies and Consulting, LLC; http://www.mbartek.com; Email: jwmitchell@mbartek.com. Dr. Mitchell is also the Secretary of the Mussey Grade Road Alliance.

Respectfully submitted this 7th day of May, 2024,

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On behalf of the Mussey Grade Road Alliance.

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**WILDFIRE MITIGATION PLAN COMMENTS ON BEHALF OF THE MUSSEY GRADE ROAD ALLIANCE**

The Mussey Grade Road Alliances' (MGRA or Alliance) Wildfire Mitigation Plan comments are authored by MGRA's expert witness Joseph W. Mitchell, Ph.D.[4]

## 1. INTRODUCTION AND SUMMARY

The Mussey Grade Road Alliance provides comment on the 2025 Wildfire Mitigation Plan Updates (WMPs) for Pacific Gas and Electric Company (PG&E),[5] Southern California Edison (SCE),[6] and San Diego Gas and Electric Company (SDG&E).[7] For the sake of comparison between utilities, all comments are provided in one document that for the most part uses the structure laid out in the templates approved in the 2023-2025 Wildfire Mitigation Plan Technical Guidelines.[8]

The changes announced in these updates range from modest to extensive, and MGRA will provide comment in cases where these changes touch upon issues that MGRA has raised in the past. MGRA will also comment on utility responses to OIES Areas for continued improvement (ACIs) when it finds that the utility response is insufficient, incorrect or unclear.

The most impactful change since last year's WMP analysis, in MGRA's opinion, is that the data supporting the effectiveness of covered conductor as a wildfire mitigation has now improved to the point where it calls into question utility undergrounding plans and practices that have been developing over the last few years. Specifically, MGRA will present SCE's covered conductor field data and demonstrate that while reductions in outages and wires down are generally consistent with Subject Matter Expert (SME) expectations, frequency of wildfire ignitions is running at

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[4] M-bar Technologies and Consulting, LLC; http://www.mbartek.com; Email: jwmitchell@mbartek.com. Dr. Mitchell is also Secretary of the Mussey Grade Road Alliance.
[5] 2023-2025-WMPs; 2025 WILDFIRE MITIGATION PLAN UPDATE; San Diego Gas & Electric April 2, 2024; TN13851_20240404T124950_SDGE_2025_Wildfire_Mitigation_Plan_Update. (SDG&E Update).
[6] 2023-2025-WMPs; 2025 WILDFIRE MITIGATION PLAN UPDATE; Southern California Edison; April 2, 2024; TN13819_20240402T155947_20240402_SCE_2025_WMPUpdate_R0. (SCE Update)
[7] 2023-2025-WMPs; 2025 Wildfire Mitigation Plan Update; March 27, 2023; TN13803_20240402T112956_PGE's_2025_Wildfire_Mitigation_Plan_Update. (PG&E Update)
[8] 2023-2025-WMPs; Office of Energy Infrastructure Safety; 2023-2025 WILDFIRE MITIGATION PLAN TECHNICAL GUIDELINES; December 6, 2022; TN11745_20221207T142120_20232025_WMP_Technical_Guidelines.pdf. (OEIS Templates)

approximately half of utility predictions. MGRA has raised this observation in its comments on last year's WMPs,[9] and substantially expanded on it in its testimony in SCE's GRC rate case.[10]

At the same time, utility appeals for extensive undergrounding programs have at least begun to bear fruit at the CPUC. PG&E Rate Case Decision D.23-11-069 reduced PG&E primary undergrounding request by $1.7 billion, but still left approximately 2/3 of PG&E's planned hardening to undergrounding.[11] Looming in the shadows still is the specter of SB 884, which (almost) promises additional funding for undergrounding – assuming it can meet the minimum requirements to show undergrounding is cost-effective.

If there is a clear cost/benefit advantage to covered conductor, particularly in combination with other technologies, if there is a time to mandate a stop to "default-to-undergrounding" algorithms, this would appear to be it. Clear and unambiguous guidance on the proper place for undergrounding is needed from Energy Safety before SB-884 proceedings commence and before SCE's General Rate Case resolves early next year. In particular, there is no more room for Energy Safety to show tolerance to utilities that violate or have ignored the ACIs issued in the 2023-2025 in the areas of demonstrating undergrounding's cost effectiveness when compared to covered conductor and combined advanced technologies.

Another issue that MGRA raises in these yearly reviews is the general uncertainty and inaccuracy of the mechanisms, inputs, and assumptions of the utility risk models. For the most part, the utilities have kept their core calculation methodologies mainly intact and made improvements to some of the inputs. MGRA will not repeat its comments from previous years but will note that many of these models have fundamental flaws that inject a great deal of uncertainty to their results. One outlier this year is PG&E, which has introduced its WDRM v4 model, which leads to a fairly dramatic change to the risk buy-down curve (despite protestations during its GRC proceeding that

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[9] WMPs 2023-2025; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2023-2025 WILDFIRE MITIGATION PLANS OF PG&E, SCE, AND SDG&E; May 26, 2023; pp. 89-91. (MGRA 2023-2025 WMP Comments)

[10] A.22-05-010; DIRECT TESTIMONY OF THE MUSSEY GRADE ROAD ALLIANCE; SOUTHERN CALIFORNIA EDISON COMPANY 2025 GENERAL RATE CASE; February 29, 2023; pp. 67-69.
https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2305010/7075/526147058.pdf

[11] D.23-11-069; pp. 273, 825-826.

such a change would be unlikely) and calls into question once again its undergrounding approach. This, and its implications will be discussed.

### 1.1. Organization

The Mussey Grade Road Alliance provides comment on the 2025 WMP Updates of PG&E, SCE and SDG&E. For the sake of comparison between utilities, all comments are provided in one document that for the most part uses the structure laid out in the templates approved for WMP Updates Guidelines.[12] However, an introductory section has been added as Chapter 1, and a section on related activities at the CPUC as Chapter 2. Subsequent chapters will follow the numbering sequence in the guidelines, so that chapter numbering is OEIS numbering + 2.

MGRA is including utility data request responses as Appendix A of these comments. Even when we are not fully able to explore every issue that these cover in the comments, we hope that Energy Safety will review these responses from the utilities as well in order to inform its own evaluation.

MGRA Workpapers can be found at:
https://github.com/jwmitchell/Workpapers/tree/main/WMP25

### 1.2. Comparison with 2023-2025 WMPs

MGRA made a number of recommendations as part of its comments on the 2023-2025 WMPs.[13] Some of these were acted upon by WSD and later OEIS, either in its review of the WMP or in its comments on the utility quarterly report. Other recommendations may have been in one way or other implemented by utility actions. Some of MGRA's recommendations were not addressed but remain valid concerns. Some of MGRA's 2023-2025 recommendations are summarized below:

[12] 2023-2025-WMPs; Office of Energy Infrastructure; 2025 WILDFIRE MITIGATION PLAN UPDATE GUIDELINES; January 2024.
[13] 2023-2025-WMPs; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2023-2025 WILDFIRE MITIGATION PLANS OF PG&E, SCE, AND SDG&E; May 26, 2023.

| Recommendation | OEIS Action | Utility Action | Status |
|---|---|---|---|
| Utilities should evaluate cost effectiveness of alternatives to undergrounding, particularly advanced technologies in combination with covered conductor. | SDGE-23-06, SDGE-23-09, PG&E-23-07, RN-PG&E-23-05 | SDG&E examines only SGF. SDG&E is descoping FCP and EFD. PG&E examines a number of mitigation combinations. | Undergrounding is default mitigation for PG&E, SCE and SDG&E. PG&E could improve mitigation comparisons. |
| MGRA put a third party review of SDG&E risk modeling into the record and incorporated recommendations | SDGE-23-07. | SDG&E is implementing third party recommendations. | Still active. |
| MGRA had raised the issue that SCE and SDG&E risk models are biased because they do not include areas were PSPS is active in event history. | SCE-23-22. | SCE is not planning to incorporate PSPS Damage modeling. SCE's IWMS prioritizes mitigation for high wind areas. | SCE refusal to incorporate OEIS recommendation, may bypass with alternative model. |
| Utility risk models do not adequately represent correlation between ignition and spread due to extreme wind drivers. | None | PG&E adopts v4 model, SDG&E adds wind correction for risk, SCE uses high winds for Severe classification. SDG&E collaborates with SDSC. | Still active. Utility models still do not show wind as a significant predictive variable, but utilities have adopted workarounds to incorporate wind effects. |
| Technosylva fire spread model does not model larger fires and does not account for suppression effects. | None | PG&E WDRM v4 uses 24 wildfire consequence modeling. | Still active. PG&E adopts WDRM v4. SCE IWMS model prioritizes all areas with potentially large wildfire spread. |
| PG&E was behind SCE and SDG&E in development and deployment of EFD and AFD | RN-PG&E-23-01 | PG&E reporting deployments of EFD and AFD | Still active. |
| PG&E did not fully analyze EPSS and justify safety impacts. | PG&E-23-26 | PG&E now reporting EPSS data to OEIS. | Still active. EPSS criteria need to be more carefully examined. |

**Table 1 -** MGRA recommendations made as part of the 2023-2025 WMP review, Energy Safety and utility action on these topics, and current status.

### 1.3. Significant Findings in the 2025 WMP Updates and Recommendations

A number of significant issues were identified in the 2025 WMP Updates and will be addressed at length in the remainder of these comments. To summarize the most important of these issues identified in the MGRA review:

- Data from SCE's covered conductor deployment indicates that the measured ignition rate is reduced by 85% over bare wire, a factor of two more than that expected by SCE experts.
- If a higher efficiency is used for covered conductor and it is paired with all complimentary advanced technologies, it will shift the balance of mitigation choice in favor of covered conductor even if long-term advantages for undergrounding are incorporated.
- SCE is planning to ramp down its covered conductor program, replacing it with targeted undergrounding (TUG). MGRA has proposed in SCE's GRC an alternative scenario in which SCE can continue its covered conductor program to mitigate its entire HFRA, saving $1 billion by scaling back TUG, and achieving the same risk reduction as its current proposal.
- Advanced technologies that can be used to compliment covered conductor: REFCL, EFD, FCP, DCD, EPSS, Fast trip, are being deployed slowly or not at all for circuits for which utilities have long-term undergrounding plans. These need to be accelerated and expanded.
- SDG&E calculates an accelerated degradation rate for efficiency loss of covered conductor, which MGRA shows is erroneous.
- PG&E's WDRM v4 will likely lead to an expanded request for undergrounding due to its "flattening" of the buy-down curve.
- Examination of completed undergrounding projects and those planned through 2025 show that undergrounding is an extremely cost-inefficient way to protect customers from PSPS outages. As a hypothetical comparison, it would be less costly (often far less costly) to purchase $60,000 off-grid solutions for all residents served by many circuits (most circuits in the case of PG&E) than it is to underground these circuits.

Therefore, cost of preventing a PSPS-minute of customer outage should be used as a comparative metric when choosing mitigations.

- Recent utility data on advanced technologies such as downed conductor, ESD and Fast Circuit do not reveal cases in which these technologies failed to perform their function.

## 2. RELATED ACTIVITY AT THE PUBLIC UTILITIES COMMISSION

### 2.1. A.21-06-021 – PG&E's General Rate Case

*2023-4 Developments* – The Commission issued Decision 23-11-069 granting PG&E a portion of its revenue request. This decision did not grant PG&E its full request for undergrounding, but instead adopted a "hybrid proposal" that included the use of more covered conductor:

"*MGRA suggests that the Commission significantly scale back PG&E's proposal to a "pilot program" until PG&E can demonstrate cost efficiencies, which are speculative as the highest fire threat areas are often in the most challenging terrain. Here, this Decision approves a portion of PG&E's undergrounding proposal, and provides PG&E an opportunity to demonstrate its capabilities to achieve its forecasted decreasing unit costs, to achieve sufficient risk reduction, and to complete its undergrounding work on the timeline forecast in this GRC*."[14]

This "scaling back" consisted of converting approximately 1/3 of PG&E's requested undergrounding program and expanding its covered conductor program to fill the gap. This was in the direction that MGRA, TURN, Cal Advocates had been urging, but not at the same level intervenors requested. PG&E's approved undergrounding program is still substantial.

Another reason that the Commission gave for reducing the amount of undergrounding in PG&E's application is that: "*The Commission finds that new emerging technologies, such as REFCL, may in the near future enable PG&E to reduce the risk of wildfire caused by its overhead assets at a significantly lower costs than undergrounding. Because new technologies are emerging that may be highly effective at reducing ignition risks and much less costly, these developments weigh against authorizing a $5.9 billion forecast to support an ambitious plan to underground*

[14] D.23-11-069; p. 264.

*2,000 miles when emerging technology may soon present a more attractive alternative for ratepayers in terms of safety and costs*."[15]

The Commission also set mandatory targets for risk reduction for PG&E: "*PG&E shall demonstrate its progress to achieve total risk reduction amount over the GRC cycle of at least 18% of the 2023 baseline risk amount…*

*The baseline methodology must explain which models are utilized to calculate baseline risk (i.e., total wildfire risk in the HFTD) and forecasted risk reduction for each year. It shall explain how WDRM v2 is utilized to calculate baseline risk and forecasted risk reduction for projects to be completed in 2023 and how WDRM v3, and any other future version, is utilized to calculate baseline risk and forecasted risk reduction for projects to be completed in 2024 and beyond*."[16]

*Overlap* – PG&E has needed to adjust its hardening targets laid out in the 2023-2025 WMP to correspond to the requirements from the Commission. More concerningly, the massive change in wildfire risk estimation and buy-down rate that PG&E will introduce with v4 and its much shallower buy-down curve (PG&E WMP Update; p. 12) very much puts into question whether PG&E will be able to meet the target of 18% risk reduction mandated by the Commission.

*Comment* – The potential impacts of v4 on PG&E's future hardening program will be discussed in the risk chapter. In order to achieve any targeted risk buy down, either the undergrounding program will need to be increased, or shifted to CC+advanced technologies to adapt to the new risk model without massive cost increases. Fortunately the latter might be possible because of findings indicating that CC is far more effective in reducing wildfire ignitions than PG&E or other utilities currently maintain.

### 2.1.1. A.22-05-015/6 – SDG&E General Rate Case

The SDG&E rate case is as of this writing still pending before the Commission. Evidence and argument made in that case were similar to that made in the PG&E rate case and in our previous WMP reviews.

[15] Id.; p. 294.
[16] Id.; p. 282.

### 2.1.2. A.23-05-010 – SCE General Rate Case

SCE's GRC proceeding enters its evidentiary hearing phase in May. Extensive MGRA testimony was provided late in February of this year.[17] The preparation of this testimony and extensive data request responses on the part of SCE allowed a deeper and more extensive analysis of SCE's MARS risk model and its IWMS consequence-only prioritization model than had been conducted in the past, and led to surprising results.

The most important result is that as more field data has been collected the anomalously low wildfire ignition rate seen in SCE's covered conductor circuits has become statistically significant, and indicates that covered conductor may be ***twice*** as effective at preventing wildfire ignitions as predicted by the IOU Subject Matter Experts. MGRA has raised this point in its previous WMP comments as the statistical anomaly began to appear,[18] but so far this has not prompted significant interest at the CPUC or OEIS. MGRA has awaited feedback or refutation from SCE itself. However, in SCE's Rebuttal Testimony issued this week, no SCE witness rebutted or even addressed MGRA's analysis showing that SCE's covered conductor program is much more effective at mitigating wildfire risk than anticipated,[19] even without additional technological help from REFCL, Fast Trip, EDS, or downed conductor protection.

This is in fact one of the most important pieces of analysis or evidence that MGRA has brought to the CPUC or OEIS in the past decade, and it is important that regulators take note of it. This is particularly urgent because SCE plans to ramp down its highly successful covered conductor program over the next year and replace it with its "Targeted Undergrounding" (TUG) program.[20] However, additional analysis that MGRA performed using SCE's own estimated MARS circuit segment risk showed that if SCE were to instead use some of the money that it had planned for

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[17] A.23-05-010; DIRECT TESTIMONY OF THE MUSSEY GRADE ROAD ALLIANCE SOUTHERN CALIFORNIA EDISON COMPANY 2025 GENERAL RATE CASE; Joseph W. Mitchell, Ph.D.; February 29, 2024. (MGRA SCE GRC Testimony)
https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2305010/7075/526147058.pdf
[18] MGRA 2023-2025 WMP Comments; p. 23, 88-90.
[19] A.23-05-10; SCE-15 Vol. 05 Pt. 2; 2025 General Rate Case Rebuttal Testimony Wildfire Management - Grid Hardening; R. Fugere; April 15, 2024.
[20] MGRA SCE GRC Testimony; pp. 59-61. SCE Update; p. 30; SCE Table 2-32.

TUG and divert it into an extended CC deployment, it could potentially mitigate its entire HFRA by the end of 2028, providing greater risk reduction than its planned TUG program could in that same period.

These analyses will be briefly presented in the appropriate section of these comments. Workpapers containing MGRA's analysis used in its SCE GRC testimony can be found here:

https://github.com/jwmitchell/Workpapers/tree/main/SCEGRC25

*Overlap:* SCE's proposed GRC application is consistent with its 2025 WMP Update and therefore analysis applied to the GRC application is relevant to the update. Furthermore, the implications of SCE's approach to wildfire mitigation and MGRA's finding that its covered conductor program is anomalously effective has general applicability to all other IOUs, which are all in the process of balancing undergrounding and overhead hardening in their wildfire mitigation programs.

## 3. UPDATES TO RISK MODELS

There have been several updates to the utility risk models that bear particular scrutiny. As we left off in the 2023-2035 WMPs, all three major utilities had switched to a "undergrounding first" approach that either added in a decision tree component that switched most choices to undergrounding,[21] or they simply ignored risk scores and developed new criteria for undergrounding.[22] PG&E is coming out with a substantially modified risk model that implies that either future risk reduction will need to be curtailed or, alternatively, that PG&E's already jaw-dropping investment in undergrounding will need to be increased. SCE on the other hand, has merely put its theoretical bipolar model into operation, and its results are very interesting, in fact fascinating if one accounts for the anomalous reduction in wildfire ignition for covered conductor circuits.

[21] MGRA 2023-2025 WMP Comments; p. 21.
[22] Id; p. 69.

### 3.1. General Issues Remaining with Utility Risk Models

While the utilities continue yearly to make important incremental improvements to their risk models, there are certain areas of significant need of improvement that are not addressed and have led to long term uncertainties and biases in the models.

MGRA has put forward a number of criticisms of current utility risk models in past WMP reviews, and a number of these apply to all or most of the major IOUs. Some of these issues have been addressed or are being addressed, but some persist. It is not possible to discuss the utility risk models without mentioning these issues, but MGRA will refer to past work to provide data and evidentiary support.

#### 3.1.1. Coupling of probability and consequence

By adopting the MAVF framework, utilities have been applying a simplistic model in which the risk for a given event is equal to the product of the probability and consequence of the event. In fact, however, probability and consequence are not independent for some risk drivers. Extreme fire weather can cause outages due to wind, either from equipment failure or from vegetation or contact with other objects. If these outages cause ignition, the consequence can potentially be large because of the increased rate of fire spread under high wind conditions. The net result of this bias is that risk in areas prone to extreme fire weather will be suppressed compared to other areas, and that the overall risk of catastrophic wildfire (in lieu or PSPS) is larger overall than utility risk estimates indicate.[23]

This problem is exacerbated by the naïve use of machine learning models that look at annual aggregations of weather attributes, whereas the weather events that trigger catastrophic utility wildfires tend to occur at very specific points in time. Despite criticisms by external reviewers such as E3, these remain the standard risk models of PG&E and SCE.[24]

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[23] WMPs-2022; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2022 WILDFIRE MITIGATION PLANS OF PG&E, SCE, AND SDG&E; April 11, 2022; pp. 21-24 (MGRA 2022 WMP Comments);
[24] WMPs-2023-2025; MGRA WMP Comments; pp. 30-33.

### 3.1.2. Premature curtailment of wildfire simulations

By restricting fire spread to eight hours, which often is exceeded in catastrophic wildfire, wildfire consequences are less than they would be in the most catastrophic fires. This leads to 1) predicted losses that are less than real losses and 2) predicted risk is underestimated in areas further from the ignition point.[25] It should be noted that PG&E's v4 model now uses 24 hour fire spreads, and that these have drastically changed the model's output.[26]

### 3.1.3. PSPS "Blindness"

Since machine learning models learn from previous data, if that data is biased in some way then the subsequent model predictions will be likewise biased.[27] PSPS began to be rolled out to all major utilities in 2018-2019 (for SDG&E 2014). Any machine learning model that uses utility data from areas subject to PSPS will not be observing the outages and ignitions that would normally occur in these areas if the power were on. Predictions, therefore, will greatly underestimate the potential for ignition in areas where PSPS is regularly used. PG&E and SDG&E have or are in the process of using PSPS damage survey results as a proxy for this damage. SCE holds firm, but appears to have implemented a workaround in its IWMS model, as will be discussed later.

### 3.1.4. Wildfire smoke health effects

SDG&E was the only utility that attempted to do a correction for smoke effects and their impact on public health (incorrectly). Discussions in the Wildfire Risk Working Group did not help, and while all stakeholders acknowledge the importance of wildfire smoke health effects – it likely is the largest cause of health impacts and premature deaths from wildfire – the technical problem is difficult enough that there is widespread desire to defer this issue and to slough it off onto another agency if possible.[28] Accordingly, none of the 2025 IOU WMP updates refers to wildfire smoke at all.

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[25] Id; pp. 44-47.
[26] PG&E Update; p. 12.
[27] 2021-WMPs; MGRA Comments; pp. 37-39.
[28] WMPs-2023-2025; MGRA WMP Comments; p. 125.

### 3.1.5. Suppression

Wildfire suppression often determines whether a utility wildfire ignition will become a large damaging wildfire or one that does minimal damage. It is notoriously hard to calculate effectively. MGRA made some suggestions in the 2023 WMP cycle but these were not taken up.[29] PG&E is currently trying to implement a fire suppression component in its risk model.[30] Suppression has two separate effects on consequences: 1) if the wildfire doesn't survive the "initial attack" phase of suppression consequences will be minimized, and 2) for long-term fires perimeter control by fire agencies may make prediction of consequences more problematic.

## 3.2. Southern California Edison

While Southern California Edison has not appreciably changed its risk model presented in the 2023-2025 WMP, it has fully applied it in its 2025 GRC Application, allowing intervenors a much deeper look into the mechanisms of SCE's tools and decision making mechanisms.

SCE now has essentially two independent tools for two different purposes. The first, its MARS tool, is a standard CPUC-compliant risks model with probability and consequence components. MARS is essentially used wherever a risk or a risk-spend efficiency needs to be calculated, and it has been used extensively to inform the priority of mitigation for SCE's covered conductor Program. IWMS is a consequence only tool that is used as a classification criteria. Segments designated as "Severe Risk Area" in IWMS are given high priority for undergrounding.

According to SCE's plan, as it ramps down its Covered Conductor program over the next year and ramps up its TUG program, the wildfire mitigation framework utilized for its work will shift from MARS to IWMS. It would be a mistake to call IWMS a "risk framework" because there is no probability element involved in IWMS. SCE's IWMS Framework is shown in Figure SCE 6-03 on page 62 of its 2025 WMP update.

[29] Id.; pp. 36 – 39.
[30] PG&E Update; p. 10.

### 3.2.1. SCE's IWMS Framework

There are a number of issues with the IWMS model:

- IWMS is not compliant with the Risk-Based Decision-Making Framework because it does not have a probability component or the ability to derive RSEs or cost/benefit.
- IWMS classifications, specifically the selection of threshold criteria and final review, are based on SME judgement, and thus are prone to irreproducibility and personal bias.
- The IWMS identification classes use different measures for ranking, and therefore cannot be compared with each other in a quantitative manner in order to rank risk.
- IWMS and MARS cannot be directly compared since they are entirely different approaches to assessing priority and mitigations.
- SCE makes an artificial link between preferred mitigation and the IWMS model, declaring TUG preferred mitigation for Severe Risk Areas. This is not an inherent characteristic of IWMS classifications themselves, but rather an arbitrary choice on the part of SCE.

There are also some benefits of the SCE IWMS framework. As noted in the previous section, there are a number of biases and errors in the IOU risk models, particularly MARS. Some of the IWMS criteria compensate for MARS bias issues, as shown below:

| MARS Bias | Net Effect | Geographic | IWMS Category | Comment |
|---|---|---|---|---|
| PSPS removes outages/ignitions | Underweight risk | Underweight high wind areas | High Wind Locations | Compensates for bias by mitigating all HW areas |
| 8 hour wildfire simulation limit | Underweight risk | Overweight areas close to ignition. Underweight distant population centers. | High Consequence | Compensates for bias by mitigating all catastrophic fire spread potential |
| Failure to incorporate correlation between ignition and wind | Mixed | Areas with wind-related drivers underweighted, other areas overweighted. | High Wind Locations | Compensates for bias by mitigating areas with more wind-related drivers. |

| | | | | |
|---|---|---|---|---|
| Wildfire smoke health effects not included | Underweight risk | Complex. Greater near wildfire but significant elsewhere. | High Consequence | Will reduce bias, since generally smoke impacts correlate with wildfire size |
| PSPS risk underestimated | Underweight risk | Underweight high PSPS risk areas. | High Wind Location | Bias will be reduced by reducing overall number and scope of PSPS events through mitigation. |

**Table 2** - Effect of IWMS mitigations on known biases in the MARS risk model.[31]

One reason that IWMS mitigations can have a significant effect is that the fraction of unhardened conductor in SCE's system has been significantly reduced over their multi-year covered conductor program. This makes a "brute force" approach more effective because prioritization is no longer as important as it was when the hardening initiative was beginning and the time frame was longer.

### 3.2.2. SCE's Covered Conductor Program

SCE began deploying covered conductor in its HFRA in 2019, and by the end of 2023 over half of the conductor mileage in its HFRA was covered, as shown in the table below:

| | 2019 | 2020 | 2021 | 2022 | 2023* |
|---|---|---|---|---|---|
| Bare Wire (BW) Miles | 9,263 | 8,466 | 7,040 | 5,684 | 4,484 |
| CC installed miles | 372 | 1,354 | 2,857 | 4,269 | 5,469 |
| Total | 9,635 | 9,820 | 9,897 | 9,953 | 9,953 |
| BW Weight of mi/yr | 0.2651 | 0.2423 | 0.2015 | 0.1627 | 0.1283 |
| CC Weight of mi/yr | 0.0260 | 0.0945 | 0.1995 | 0.2981 | 0.3819 |
| | | | | | |
| *2023 covered conductor miles of 1200 are approximate | | | | | |

**Table 3** - Deployment of SCE covered conductor between 2019 and 2023. Weight shows the relative amount of covered conductor deployed in any given year.[32]

[31] MGRA SCE GRC Testimony; p. 47.
[32] MGRA SCE GRC Testimony Workpapers; DR-MGRA-SCE-002-Q2 (Excel)

### 3.2.3. Predicted effectiveness of SCE's covered conductor program

SCE's estimates of covered conductor effectiveness are based on its SME estimates and laboratory work done in house and by third-party contractors and as part of the "Joint IOU Covered Conductor Working Group". Estimated effectiveness varies by the risk driver, between 60% and 90% depending on the driver, with an overall weighted effectiveness of 72%.[33]

### 3.2.4. Predicted historical effectiveness of SCE's wildfire mitigation program

Within the scope of its GRC, SCE was asked to estimate the risk reduction it had achieved between 2017 and the end of 2023 using its most current risk models. SCE provided this data to MGRA,[34] which is summarized in Figure 1, below.

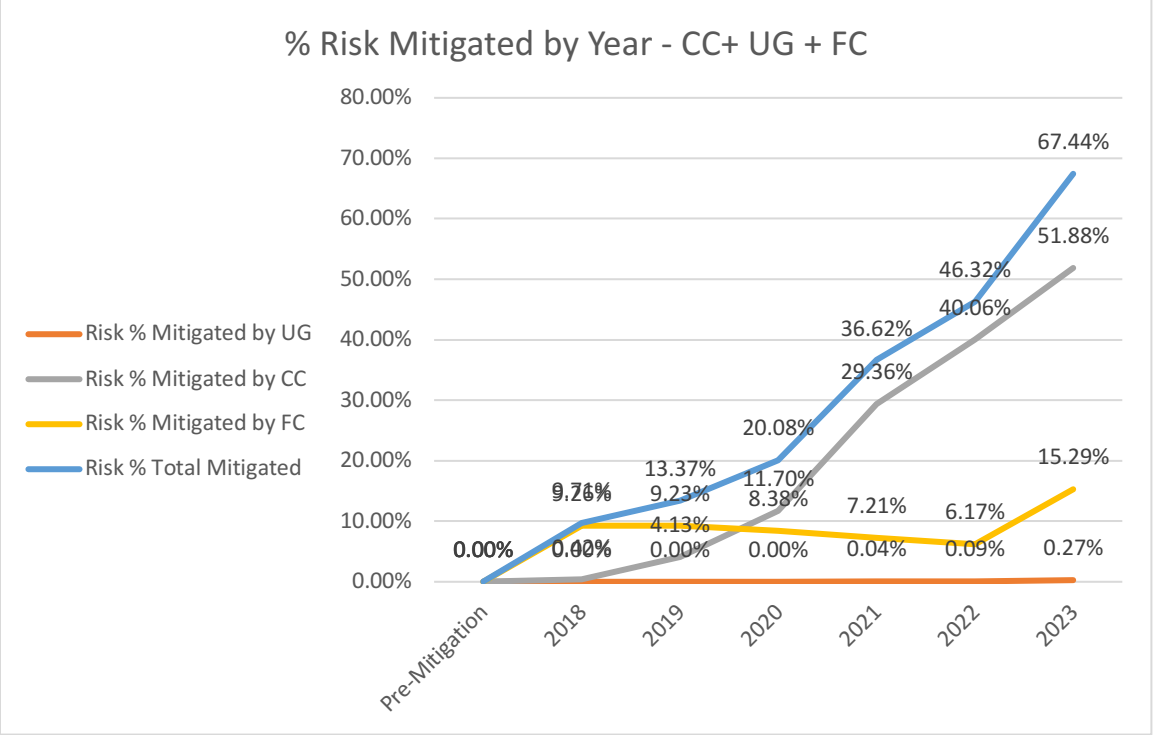


**Figure 1 -** SCE MARS estimated risk reductions from 2017 to 2023 broken down into covered conductor, undergrounding, fast curve, and total.

[33] SCE GRC Testimony; SCE-04 Vol. 05 Pt. 2A; p. 41.
[34] MGRA SCE GRC Testimony; pp. 55-58, cites:
DR Response MGRA-SCE-002-Q2;
Workpaper 2-2_MGRA-SCE-002_Q2-BuyDown-jwm.xlsx.
This can be found in MGRA's workpapers:
https://github.com/jwmitchell/Workpapers/tree/main/SCEGRC25

As can be seen, the vast majority of risk mitigation has been achieved through SCE's covered conductor program, with its Fast Curve also providing significant wildfire risk reduction. As will be shown in the next section, however, even SCE's estimate of 72% mitigation may be a substantial underestimate.

Nevertheless, SCE sees a slowdown in its rate of mitigation in the upcoming years, as it shows in its Figure 7-1, a corrected version of which is shown below:[35]

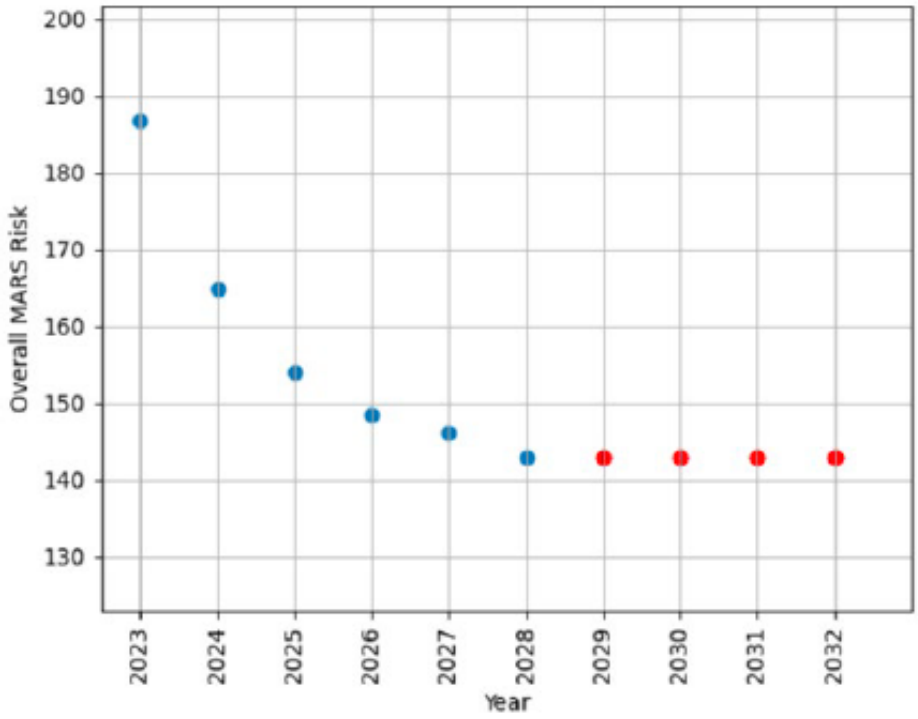


**Figure 2 -** SCE's corrected Figure 7-1, showing its predicted residual risk based on its current mitigation plans and its MARS risk model.

According to SCE's estimates work done between 2023 and 2028 will reduce risk only 23.5% below its 2023 baseline value of 187. It should be pointed out that this relatively modest reduction will be driven by some of the most expensive mitigation that SCE has performed to date.

In fact, SCE's estimate is overly pessimistic for several reasons:

- SCE's deployment of REFCL, while slowed as it faces technical challenges, will contribute to further risk reduction in CC mitigated areas and will continue out past the 2028 deadline.

[35] DR Response MGRA-SCE-WMP25_DataRequest4-Q3.

- SCE has significantly underestimated the effectiveness of covered conductor as a wildfire mitigation, as shown in the following section.
- SCE plans to invest heavily in undergrounding and at the same time ramp down its highly successful covered conductor program. In its SCE GRC testimony MGRA shows that alternative strategies taken by SCE could reduce more risk at a lower cost. This is described in Section 4.3.

### 3.2.5. Measured effectiveness of SCE's covered conductor program

With so much covered conductor deployed for several years in the SCE service area, it is possible to draw conclusions regarding its effectiveness in reducing outages, wire downs, and ignitions.

SCE's estimates are approximately equal to its observed reduction in outages on fully covered conductor segments, as reported in the Joint Covered Conductor Report, in which it demonstrated that fully covered circuits reduce 69% of the faults.[36]

Examination of wires down also shows a reduction in fully covered conductor segments in that are somewhat smaller than SME estimates:

| | 2019 | 2020 | 2021 | 2022 | 2023 | | Total or Wtd Avg |
|---|---|---|---|---|---|---|---|
| Bare Wire Downs | 218 | 166 | 162 | 121 | 189 | | 856 |
| Covered Conductor Wire Downs | 2 | 2 | 19 | 29 | 76 | | 128 |
| BW Wire Downs / mile-yr | 0.023534 | 0.019608 | 0.023011 | 0.021288 | 0.04215 | | 0.024501 |
| CC Wire Downs / mile-yr | 0.005376 | 0.001477 | 0.00665 | 0.006793 | 0.013897 | | 0.008938 |
| BW / CC | 4.377416 | 13.27451 | 3.460182 | 3.133715 | 3.033127 | | 2.741268 |
| Reduction % | 77.2% | 92.5% | 71.1% | 68.1% | 67.0% | | 63.5% |
| Expected CC Wires Down | 8.754831 | 26.54902 | 65.74347 | 90.87773 | 230.5176 | | 422.4427 |

**Table 4 -** Wires down for bare wire and covered conductor circuits for the period 2019 to 2023.[37]

[36] SDG&E 2022 WMP; CC Appendix: 2022 WMP Update Progress Report Effectiveness of Covered Conductor; p. 25 (p. 590/699).
[37] Workpapers WMP25; Workpapers 2-1.a-f_MGRA-SCE-002_Q2-CCUG-WD-Ign-jwm.xlsx, Tab WireDowns.

Examination of the ignition rates as covered conductor has been deployed, however gives surprising results:

| | 2019 | 2020 | 2021 | 2022 | 2023 | | Total or Wtd Avg |
|---|---|---|---|---|---|---|---|
| Bare Wire Reportable Ignitions | 37 | 49 | 46 | 36 | 15 | | 183 |
| Covered Conductor Reportable Ignitions | 0 | 1 | 2 | 5 | 3 | | 11 |
| BW Ignitions / mile-yr | 0.003994 | 0.005788 | 0.006534 | 0.006334 | 0.003345 | | 0.005238 |
| CC Ignitions / mile-yr | 0 | 0.000739 | 0.0007 | 0.001171 | 0.000549 | | 0.000768 |
| BW / CC | | 7.836759 | 9.333949 | 5.4076 | 6.09835 | | 6.8194 |
| Reduction % | | 87.2% | 89.3% | 81.5% | 83.6% | | 85.3% |
| Expected CC ignitions | 1.485912 | 7.836759 | 18.6679 | 27.038 | 18.29505 | | 73.32362 |

**Table 5 -** Reportable ignitions on bare wire and covered conductor circuits for the period 2019 to 2023.[38]

There is a relative reduction in ignitions of 85% between covered conductor versus bare wire in the SCE field data. This is roughly a factor of 2 more than SCE SME predictions (0.85^2.0 = 0.72). In fact, given the observed number of events it is possible to put a 95% confidence level at 75.3% reduction, thus excluding the hypothesis that the observed number of ignitions is the result of a statistical fluctuation consistent with SCE's 72% prediction.[39]

### 3.2.6. Implications of lower than expected ignition rates for covered conductor

While covered conductor appears to provide outage and wire down rate reductions that are roughly consistent with estimates from SMEs from SCE, PG&E and SDG&E, the actual reportable ignition rates seem to be benefiting from some other factor that is not as yet understood and are reduced by a factor of 2 below expectations.

**<u>This is a big deal.</u>**

The entire theory on which the interim and long term hardening plans that all three major utilities have been based is that covered conductor, while providing modest improvement in ignition rates, cannot provide nearly the protection that undergrounding of circuits can, even if other

[38] Id; Tab Ignitions.
[39] There were 11 ignitions observed on covered conductor segments, with 73.3 predicted based on the bare wire ignition rate. Assuming Poisson statistics, the single-tail 95% confidence interval was calculated using the Excel formula CHISQ.INV.RT(0.05,2*(D15+1))/2, where D15=11. This gives an upper limit of 18.2 events, and 18.2/73.3 = 75.3%. See:
Workpapers WMP25: MGRA Workpaper 2-1.a-f_MGRA-SCE-002_Q2-CCUG-WD-Ign-jwm.xlsx, Tab 'CL Stats'.

enhancing technologies such as REFCL, Downed Conductor Protection, Electronic Fauld Detection (EFD), and Fast Curve/EPSS are taken into account. Additionally, the fact that these very technologies are also available to apply in conjunction with covered conducting and will provide even greater reductions in ignition risk requires that regulators closely scrutinize claims for their undergrounding mandates.

**Recommendations:**

- Energy Safety should order a re-evaluation of covered conductor wildfire ignition mitigation efficiency that is based on SCE field data.
- Energy Safety should require revised covered conductor wildfire mitigation efficiencies be used in mitigation choices.

### 3.3. PG&E Models

#### 3.3.1. WDRM v4

PG&E is moving to its v4 wildfire model which it will implement starting in 2026. PG&E has made a number of improvements in this model, including increasing the Technosylva simulation times to 24 hours. As MGRA predicted, this change 1) increased the overall predicted wildfire risk, and 2) moving the area at risk further out from the point of ignition and reducing the "urbanization" of risk MGRA has been warning about over the past few WMP cycles.[40]

One consequence of this change is that risk is more uniformly spread over the service area, as shown in PG&E's figure B.1.1-3:

[40] 2022-WMPs; MGRA 2022 WMP Comments; pp. 42-47.

**FIGURE PG&E-B.1.1-3:**
**RISK BUYDOWN CURVE COMPARISON BETWEEN WDRM V3 AND V4**

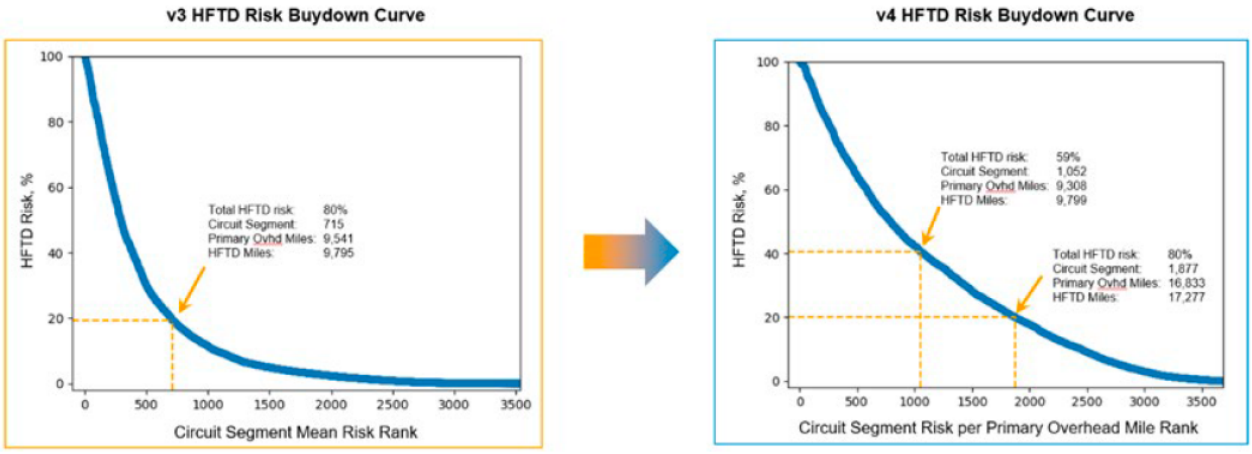


**Figure 3 -** PG&E Figure B.1.1-3 - Risk buydown curve with WDRM v4 versus WDRM v3. The differences are mainly due to the wildfire propagation times extending the area of damage outward from the ignition point.[41]

Previously, PG&E had been promising that future updates would lead to relatively modest changes. An exchange from the evidentiary hearings in PG&E's last GRC made this clear:

"*Q [J. Mitchell, MGRA] So theoretically, five years down the line, we have version four or five, and you look back at what you prioritized for your initial tranche of undergrounding back in 2023, 2024, is it possible that we'll, say, "Oh, we didn't really prioritize the highest risk. Here's what we really need to prioritize now," is it possible that you will find out that those -- your risk priorities have changed, based on better information?*

*A [P. McGregor, PG&E] It is possible that we will see change. However, I don't think the magnitude of the change will be the same. We made some sizable updates moving from version one to version ten* [sic, two]*, predominately the change in the fire propagation modeling tool. And then from version two to version three we made substantial changes including an updated fuels layer including a different consequence algorithm and also reflecting a number of updates we made to our system geometry through GIS. So we see change. I would expect it to be less change, but I would always expect change as we improve*."[42]

The implication from the risk buy-down curves that PG&E shows above is that in its prior projections, PG&E estimated it could eliminate 80% of its risk by mitigating 10,000 miles of its

[41] PG&E Update; p. 12.
[42] A.21-06-021; Evidentiary Hearings; August 22, 2022; pp. 1754-1755.

overhead line. It now estimates that this first 10,000 of mitigation will eliminate only 59% of its risk, and that in order to achieve the same level of mitigation originally promised PG&E would need to mitigate 17,000 miles of overhead line.

The expense of mitigating 10,000 miles of overhead line is already extreme, and in Decision 23-11-069, the Commission already decided that PG&E should begin to rely more on covered conductor. Given PG&E's new wildfire risk assessment, regulators will have several choices:

- Tolerate nearly double the risk that PG&E originally estimated
- Tolerate 70% more cost than PG&E originally estimated, or
- Switch to a more cost-effective method for reducing risk.

PG&E estimates that the effectiveness of covered conductor is only 66.4%,[43] substantially lower than the estimate used by SCE which has much more extensive covered conductor experience, and 2.5 times less effective than what SCE sees in its field data.[44] Use other technologies in conjunction with covered conductor, such as REFCL, EPSS, and Falling Conductor Detection would achieve levels of protection approaching undergrounding at much lower cost.

## 4. UPDATES TO TARGETS, OBJECTIVES, AND EXPENDITURES

### 4.1. SDG&E

This section discusses general issues with regard to utility risk model methodology.

#### 4.1.1. Reduction in expenditures for Advanced Protection

With Covered Conductor + Advanced Protection being a viable alternative for undergrounding, particularly when mitigation efficiency for covered conductor based on SCE field data may be significantly higher than that estimated by IOU SMEs, it is ludicrous for a utility to reduce the scope of its work in this area. Yet, this is what SDG&E has announced it is doing in its

[43] PG&E Update; p. 55.
[44] ln(.664)/ln(.85) = 2.5

20205 WMP Updated. It claims that projected expenditures will be decreased by 59%, "due to future projects having a smaller scope".[45]

It is important to note that while SDG&E is increasing the scope of its covered conductor projects by 40%, these added miles of protection could lack the additional safeguards that compensate for the known vulnerabilities in covered conductor, which Advance Protection technologies provide.

Accompanying SDG&E's de-emphasizing of its Advanced Protection technologies, it is also deferring work on its LTE technology, with its deadline shifting from the end of 2025 out to the year 2033.[46] The LTE network is critical to SDG&E's advanced technologies, particularly falling conductor, and once again seems to bolster the impression that SDG&E is "all in" on undergrounding and is cutting back on other more cost-effective technologies.

**Recommendations:**

- Energy Safety should recommend that advanced technology deployments that have promise to be effective maintain be expanded along with covered conductor deployments, along with all necessary enabling technologies.
- Energy Safety should strongly oppose "default to underground" strategies because of their high costs, long implementation times, and unknown long term efficacies compared to covered conductor and advanced technologies.

### 4.2. Assessment of Economic Soundness of Current and Approaching Undergrounding Projects

All of the major utilities have now begun to implement undergrounding plans and generally ramping up even larger efforts to execute over the next few years. We therefore for the first time have visibility into their granular activities at the project level, how the utilities are choosing between undergrounding and covered conductor, and how many customers are being affected by potentially more reliable service.

[45] SDG&E Update; p. 24.
[46] Id; p. 15.

Having received a couple of odd rumors regarding extensive undergrounding projects with very limited impact, I decided to leverage existing data requests from Cal Advocates on current hardening projects and gather customer and PSPS data as well. Utilities were asked to provide number of customers affected per hardened segment and number of PSPS minutes per circuit since 2019. The goal of the study is ascertain how efficiently from an economic standpoint the underground hardening is being applied and chosen. From a risk reduction standpoint undergrounding is indisputably the most effective risk reduction mechanism, but covered conductor in conjunction with other technologies approach that effectiveness. One additional claimed advantage of undergrounding is that it reduces PSPS (assuming that every circuit supplying the customer is undergrounded), whereas the leeway for reducing PSPS extent, frequency, and duration using higher covered conductor thresholds is more limited. Therefore the primary potential advantage for a customer served by undergrounded circuits is reliability, and one of the metrics that should be examined on a per project basis is the cost of those reliability improvements.

In the extreme case, with a long-path undergrounding project serving a very small number of customers, the price per customer (paid by the ratepayer) could potentially be extreme. We could potentially ask the hypothetical question of whether it would be better for the ratepayers to pay those customers to build standalone solar systems with backup, and then either remove the utility circuit entirely or replace it with a lower-cost covered conductor circuit in conjunction with aggressive PSPS and EPSS/Fast Curve thresholds.

This section will show that these concerns are borne out, particularly for PG&E, for which the cost of undergrounding projects often exceeds, sometimes substantially, the hypothetical cost to provide customers their own standalone generation systems. Additionally, the cost per minute of PSPS reduction varies widely and for some circuits provides a poor justification for an undergrounding decision.

As part of this analysis data from 2023 – actual implemented undergrounding, is presented along with projected undergrounding plans up to 2025. The utility data and analysis of it may be found in MGRA's WMP 2025 workpapers on Github.[47]

[47] https://github.com/jwmitchell/Workpapers/tree/main/WMP25 , files:
SDGE Response MGRA-SDGE-2025WMP-03_Q3_TUGCustomers2023-jwm.xlsx,

SDG&E's data will be presented first because it is the smallest company with a relatively small scope of operations.

### 4.2.1. Methodology

The utilities used a variety of formats and conventions to capture the requested data and the analysis below attempts to render them in a similar manner. First, only undergrounding projects are selected. Pivot tables are used to group these projects in the most logical manner, for instance using circuit segment (SDG&E, PG&E) or circuit. Individual circuit segment lengths are summed. The number of customers and PSPS minutes generally apply to circuits as a whole, so only the maximum value was used. Actual cost was used for 2023 data, as it was available, whereas for projected future costs the length of the circuit was multiplied by a cost of $3 million per mile. A cost per customer was then calculated. An alternative estimate was made under the counterfactual that when the cost per customer exceeded $60k that an off-grid solar installation with backup would be installed instead. Circuits for which this would be economically attractive are marked with 'Y', and an alternative cost calculated for these customers. For PSPS, total number of customer minutes experience was calculated along with the cost per PSPS minute the undergrounding solution cost for that circuit.

### 4.2.2. SDG&E – 2023 Undergrounding Projects

The data for SDG&E's 2023 undergrounding projects is shown in Table 6 below.

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SDGE Response MGRA-SDGE-2025WMP-03_Q2_Revised 4.19.24-TUGCustomers-jwm.xlsx
WMP-Discovery2023-2025_DR_MGRA_010-Q001Atch01-UGCustomers-2023-jwm.xlsx
MGRA-SCE-WMP25_DataRequest Q2_TUG_projects_2025-jwm.xlxs
MGRA-SCE-WMP25_DataRequest4 Q1_TUG_projects_2023-Customers-jwm.xlsx

| Circuit Segment | Length | Cost | Customers | PSPS Minutes | Cost/Customer | Off Grid $60k | OG Costs | Customer minutes | PSPS cost per customer minute |
|---|---|---|---|---|---|---|---|---|---|
| 221-1230F | 2.46 | $ 15,249,570 | 1651 | 23206 | 9237 | | $ 15,249,570 | 38313106 | $ 0.40 |
| 221-37AE | 1.2 | $ 2,839,054 | 915 | 23206 | 3103 | | $ 2,839,054 | 21233490 | $ 0.13 |
| 221-43 | 0.15 | $ 507,964 | | 23206 | #DIV/0! | | $ 507,964 | 0 | |
| 222-1364R | 8.8 | $ 11,025,560 | 438 | 111792 | 25173 | | $ 11,025,560 | 48964896 | $ 0.23 |
| 222-1370R | 1.26 | $ 1,717,946 | 411 | 37264 | 4180 | | $ 1,717,946 | 15315504 | $ 0.11 |
| 222-1401R | 5.53 | $ 10,586,923 | 260 | 111792 | 40719 | | $ 10,586,923 | 29065920 | $ 0.36 |
| 222-1441R | 1 | $ 1,860,248 | 53 | 37264 | 35099 | | $ 1,860,248 | 1974992 | $ 0.94 |
| 222-1503 | 1.34 | $ 2,472,651 | 287 | 37264 | 8616 | | $ 2,472,651 | 10694768 | $ 0.23 |
| 222-1523R | 2.65 | $ 4,936,067 | 488 | 37264 | 10115 | | $ 4,936,067 | 18184832 | $ 0.27 |
| 222-2013R | 3.72 | $ 8,706,724 | 245 | 74528 | 35538 | | $ 8,706,724 | 18259360 | $ 0.48 |
| 358-585R | 1.58 | $ 7,206,937 | 360 | 21784 | 20019 | | $ 7,206,937 | 7842240 | $ 0.92 |
| 445-17R | 4.47 | $ 6,145,456 | 57 | 56352 | 107815 | Y | $ 3,420,000 | 3212064 | $ 1.91 |
| 445-19R | 1.77 | $ 2,220,529 | 89 | 28176 | 24950 | | $ 2,220,529 | 2507664 | $ 0.89 |
| 445-39R | 6.07 | $ 3,886,515 | 865 | 28176 | 4493 | | $ 3,886,515 | 24372240 | $ 0.16 |
| 445-897R | 1.33 | $ 2,247,977 | 356 | 28176 | 6315 | | $ 2,247,977 | 10030656 | $ 0.22 |
| 972-8 | 3.48 | $ 11,244,515 | 2749 | 4112 | 4090 | | $ 11,244,515 | 11303888 | $ 0.99 |
| CB 73 | 1.92 | $ 4,076,097 | 756 | 14052 | 5392 | | $ 4,076,097 | 10623312 | $ 0.38 |
| CB OK1 | 9.19 | $ 21,415,118 | 62 | 26626 | 345405 | Y | $ 3,720,000 | 1650812 | $ 12.97 |
| **Grand Total** | 57.92 | $ 118,345,850 | 10042 | | 11785 | | $ 97,925,277 | 273549744 | $ 0.43 |

**Table 6 -** SDG&E undergrounding projects in 2023 by circuit segment. Includes miles undergrounded, cost, number of customers, and PSPS minutes since 2019. Calculated values include comparison with off-grid solution valued at $60k per customer, and cost per customer minute of avoided PSPS.

Total cost for the projects shown in the table was $118 million, with undergrounding affecting 10,042 customers, for an average cost of $11,785 per customer. In the case of two circuits, 445-17R and CB OK1, a counterfactual off-grid solution costing $60k per customer would have been less expensive. CB OK1, in particular, cost $345k per customer for undergrounding. The cost of avoiding a customer-minute of PSPS averaged $0.43, while the costs for 445-17R and CB OK1 were $1.91 and $12.97, respectively. A hypothetical off-grid solution for these customers could have achieved up to 17% in savings.

### 4.2.3. SDG&E 2024-2025 Undergrounding Projects

The projections for SDG&E's 2023 undergrounding projects is shown in Table 6 below.

| Circuit Segment | Length (mi) | Cost | Customers | PSPS Circuit Minutes | Cost/Customer | Off Grid $60k | OG Costs | Customer minutes | PSPS Cost per customer minute |
|---|---|---|---|---|---|---|---|---|---|
| 210-172R | 0.5 | $ 1,500,000 | 213 | 3338 | $ 7,042 | | $ 1,500,000 | 710994 | $ 2.11 |
| 210-9R | 6.3 | $ 18,900,000 | 190 | 3338 | $ 99,474 | Y | $ 11,400,000 | 634220 | $ 29.80 |
| 217-983R | 7 | $ 21,000,000 | 78 | 13132 | $ 269,231 | Y | $ 4,680,000 | 1024296 | $ 20.50 |
| 220-288R | 2.04 | $ 6,120,000 | 261 | 20222 | $ 23,448 | | $ 6,120,000 | 5277942 | $ 1.16 |
| 220-298R | 10.72 | $ 32,160,000 | 132 | 20222 | $ 243,636 | Y | $ 7,920,000 | 2669304 | $ 12.05 |
| 221-37AE | 5 | $ 15,000,000 | 915 | 23206 | $ 16,393 | | $ 15,000,000 | 21233490 | $ 0.71 |
| 222-1364R | 3.8 | $ 11,400,000 | 438 | 37264 | $ 26,027 | | $ 11,400,000 | 16321632 | $ 0.70 |
| 222-1401R | 1.73 | $ 5,190,000 | 260 | 37264 | $ 19,962 | | $ 5,190,000 | 9688640 | $ 0.54 |
| 222-1503, 222-2013R | 3.18 | $ 9,540,000 | 287 | 37264 | $ 33,240 | | $ 9,540,000 | 10694768 | $ 0.89 |
| 222-2013R | 4.18 | $ 12,540,000 | 245 | 37264 | $ 51,184 | | $ 12,540,000 | 9129680 | $ 1.37 |
| 441-23R | 6.12 | $ 18,360,000 | 75 | 23270 | $ 244,800 | Y | $ 4,500,000 | 1745250 | $ 10.52 |
| 442-729 | 6.2 | $ 18,600,000 | 1137 | 13500 | $ 16,359 | | $ 18,600,000 | 15349500 | $ 1.21 |
| 445-1311R | 4.12 | $ 12,360,000 | 179 | 28176 | $ 69,050 | Y | $ 10,740,000 | 5043504 | $ 2.45 |
| Grand Total | 60.89 | $ 182,670,000 | 4410 | 37264 | $ 41,422 | | $ 119,130,000 | 99523220 | $ 1.84 |

**Table 7 -** SDG&E undergrounding projects planned for 2024-2025 by circuit segment. Includes miles undergrounded, cost (at $3M/mile), number of customers, and PSPS minutes since 2019. Calculated values include comparison with off-grid solution valued at $60k per customer, and cost per customer minute of avoided PSPS.

Total cost for the projects shown in the table is projected to be $182 million assuming a $3 million per mile cost, with undergrounding affecting 4,410 customers, for an average cost of $41,422 per customer. For a total of five of the thirteen circuits shown, a counterfactual off-grid solution costing $60k per customer would have been less expensive than the undergrounding option. Three of the circuits listed show a cost of over $240k per customer for undergrounding. The cost of avoiding a customer-minute of PSPS averaged $1.84, with a maximum cost of $29.80 for circuit segment 210-9R. An off-grid solution for customers on circuits exceeding $60k/customer in cost could have achieved up to 35% in savings.

### 4.2.4. PG&E 2023 Undergrounding Projects

Data provided for PG&E's undergrounding projects is aggregated in the table below:

| Circuit Segment | Cost | Customers | PSPS Customer average | Cost/Customer | Off Grid $60k | OG Costs | Customer Minutes | PSPS Cost per customer minute |
|---|---|---|---|---|---|---|---|---|
| ANDERSON 11031600 | $ 2,101,528 | 111 | 13456 | $ 18,932.69 | | $ 2,101,528 | 1493567 | $ 1.41 |
| ANDERSON 1103226050 | $ 7,447,121 | 276 | 8508 | $ 26,982.32 | | $ 7,447,121 | 2348277 | $ 3.17 |
| AUBERRY 1101CB | $ 593,131 | 334 | 2635 | $ 1,775.84 | | $ 593,131 | 880090 | $ 0.67 |
| AUBERRY 1101R2578 | $ 1,896,867 | 582 | 3565 | $ 3,259.22 | | $ 1,896,867 | 2074733 | $ 0.91 |
| AUBERRY 1101R2839 | $ 524,787 | 132 | 2732 | $ 3,975.66 | | $ 524,787 | 360624 | $ 1.46 |
| BANGOR 1101CB | $ 4,870,167 | 186 | 16499 | $ 26,183.69 | | $ 4,870,167 | 3068778 | $ 1.59 |
| BIG BASIN 110110720 | $ 1,163,173 | 176 | 4841 | $ 6,608.94 | | $ 1,163,173 | 852016 | $ 1.37 |
| BIG BASIN 110212758 | $ 1,057,358 | 223 | 7889 | $ 4,741.52 | | $ 1,057,358 | 1759247 | $ 0.60 |
| BIG BASIN 11022253 | $ 805,688 | 9 | 7480 | $ 89,520.94 | Y | $ 540,000 | 67319 | $ 11.97 |
| BIG BASIN 110296986 | $ 419,237 | 78 | 8104 | $ 5,374.83 | | $ 419,237 | 632105 | $ 0.66 |
| BIG BEND 11021972 | $ 258,265 | 5 | 0 | $ 51,653.00 | | $ 258,265 | 0 | #DIV/0! |
| BIG MEADOWS 21012248 | $ 83,335,065 | 8 | 2589 | $ 10,416,883.09 | Y | $ 480,000 | 20712 | $ 4,023.52 |
| BIG MEADOWS 21012260 | $ 13,411,203 | 272 | 2589 | $ 49,305.89 | | $ 13,411,203 | 704208 | $ 19.04 |
| BIG MEADOWS 21012476 | $ 895,688 | 155 | 2589 | $ 5,778.64 | | $ 895,688 | 401295 | $ 2.23 |
| BIG MEADOWS 21012586 | $ 417,604 | 107 | 2589 | $ 3,902.84 | | $ 417,604 | 277023 | $ 1.51 |
| BRUNSWICK 110651486 | $ 815,265 | 1050 | 17127 | $ 776.44 | | $ 815,265 | 17983859 | $ 0.05 |
| BUCKS CREEK 1101CB | $ 12,313,307 | 0 | 27491 | #DIV/0! | Y | $ 12,313,307 | 0 | #DIV/0! |
| CAMP EVERS 210311046 | $ - | 345 | 5385 | $ - | | $ - | 1857761 | $ - |
| CLARK ROAD 11022070 | $ 14,900,303 | 6 | 0 | $ 2,483,383.85 | Y | $ 360,000 | 0 | #DIV/0! |
| CLARK ROAD 11022094 | $ 4,846,377 | 0 | 0 | #DIV/0! | Y | $ 4,846,377 | 0 | #DIV/0! |
| CLARK ROAD 110247006 | $ 5,364,045 | 94 | 26585 | $ 57,064.31 | | $ 5,364,045 | 2499033 | $ 2.15 |
| CLARK ROAD 110281296 | $ 24,041,703 | 82 | 22772 | $ 293,191.50 | Y | $ 4,920,000 | 1867301 | $ 12.88 |
| CLARK ROAD 1102CB | $ 1,181,711 | 12 | 12022 | $ 98,475.95 | Y | $ 720,000 | 144258 | $ 8.19 |
| CLAYTON 221296224 | $ 5,265,205 | 100 | 9179 | $ 52,652.05 | | $ 5,265,205 | 917859 | $ 5.74 |
| CLAYTON 2215184604 | $ 5,648,897 | 1593 | 2621 | $ 3,546.07 | | $ 5,648,897 | 4175253 | $ 1.35 |
| CORNING 110253184 | $ 29,507,021 | 78 | 18108 | $ 378,295.14 | Y | $ 4,680,000 | 1412426 | $ 20.89 |
| CORNING 1102915324 | $ 10,861,034 | 0 | 15331 | #DIV/0! | Y | $ 10,861,034 | 0 | #DIV/0! |
| COTTONWOOD 1102544790 | $ 13,176,500 | 40 | 8839 | $ 329,412.49 | Y | $ 2,400,000 | 353578 | $ 37.27 |
| COTTONWOOD 11029026 | $ 44,435,901 | 285 | 10682 | $ 155,915.44 | Y | $ 17,100,000 | 3044380 | $ 14.60 |
| CURTIS 1701CB | $ 1,744,828 | 629 | 5713 | $ 2,773.97 | | $ 1,744,828 | 3593254 | $ 0.49 |
| DESCHUTES 11041370 | $ 850,127 | 398 | 11889 | $ 2,136.00 | Y | $ 23,880,000 | 4731689 | $ 0.18 |
| DUNBAR 1101416 | $ 3,465,358 | 21 | 0 | $ 165,017.06 | Y | $ 1,260,000 | 0 | #DIV/0! |
| EL DORADO PH 210119752 | $ 27,302,812 | 1034 | 18427 | $ 26,405.04 | | $ 27,302,812 | 19053733 | $ 1.43 |
| ELK CREEK 11012002 | $ 35,670,657 | 30 | 9097 | $ 1,189,021.90 | Y | $ 1,800,000 | 272903 | $ 130.71 |
| ELK CREEK 110193504 | $ 1,487,314 | 8 | 7741 | $ 185,914.27 | Y | $ 480,000 | 61928 | $ 24.02 |
| FLINT 1101958726 | $ 363,968 | 85 | 4070 | $ 4,281.98 | | $ 363,968 | 345941 | $ 1.05 |
| HALF MOON BAY 110369412 | $ 11,924,793 | 92 | 6661 | $ 129,617.32 | Y | $ 5,520,000 | 612776 | $ 19.46 |
| HORSESHOE 110150140 | $ 7,959,958 | 466 | 6765 | $ 17,081.46 | Y | $ 27,960,000 | 3152500 | $ 2.52 |
| JAMESON 110265516 | $ 5,879,012 | 496 | 13971 | $ 11,852.85 | | $ 5,879,012 | 6929751 | $ 0.85 |
| JAMESON 1105371694 | $ 831,077 | 52 | 9037 | $ 15,982.25 | | $ 831,077 | 469934 | $ 1.77 |
| JAMESON 1105466348 | $ 27,055,402 | 244 | 14150 | $ 110,882.79 | Y | $ 14,640,000 | 3452621 | $ 7.84 |
| JAMESON 1105913400 | $ 4,887,396 | 1 | 4822 | $ 4,887,396.42 | Y | $ 60,000 | 4822 | $ 1,013.56 |
| JAMESON 11059472 | $ 3,327,094 | 131 | 12738 | $ 25,397.67 | | $ 3,327,094 | 1668742 | $ 1.99 |
| JESSUP 11021550 | $ 48,025,655 | 218 | 14346 | $ 220,301.17 | Y | $ 13,080,000 | 3127503 | $ 15.36 |
| JESSUP 1103348657 | $ 5,741,235 | 18 | 0 | $ 318,957.52 | Y | $ 1,080,000 | 0 | #DIV/0! |
| KANAKA 1101CB | $ 349,549 | 108 | 17519 | $ 3,236.57 | | $ 349,549 | 1892029 | $ 0.18 |
| | | | | | | | | |
| KIRKER 2104442850 | $ 5,081,696 | 7 | 4103 | $ 725,956.58 | Y | $ 420,000 | 28721 | $ 176.93 |
| LINCOLN 11042070 | $ 9,306,484 | 276 | 8538 | $ 33,719.14 | | $ 9,306,484 | 2356400 | $ 3.95 |
| LINCOLN 1104275986 | $ 8,964,395 | 0 | 4010 | #DIV/0! | Y | $ 8,964,395 | 0 | #DIV/0! |
| LINCOLN 1104685276 | $ 1,214,553 | 194 | 9410 | $ 6,260.58 | | $ 1,214,553 | 1825540 | $ 0.67 |
| LINCOLN 1104997576 | $ 2,309,629 | 105 | 10543 | $ 21,996.46 | | $ 2,309,629 | 1107015 | $ 2.09 |
| MARIPOSA 210110170 | $ 1,487,209 | 197 | 6850 | $ 7,549.28 | | $ 1,487,209 | 1349450 | $ 1.10 |
| MARIPOSA 210110240 | $ 14,964,583 | 280 | 0 | $ 53,444.94 | | $ 14,964,583 | 0 | #DIV/0! |
| MARIPOSA 210135244 | $ 6,566,057 | 107 | 0 | $ 61,365.02 | Y | $ 6,420,000 | 0 | #DIV/0! |
| MARIPOSA 21019400 | $ 35,713,436 | 770 | 7941 | $ 46,381.09 | | $ 35,713,436 | 6114672 | $ 5.84 |
| MARIPOSA 2102440236 | $ 1,978,000 | 495 | 0 | $ 3,995.96 | | $ 1,978,000 | 0 | #DIV/0! |
| MARTELL 1101CB | $ 4,141,996 | 891 | 5124 | $ 4,648.70 | | $ 4,141,996 | 4565484 | $ 0.91 |
| MIDDLETOWN 110148212 | $ 9,311,785 | 129 | 24632 | $ 72,184.38 | Y | $ 7,740,000 | 3177496 | $ 2.93 |
| MIDDLETOWN 1101548 | $ 19,173,153 | 366 | 20560 | $ 52,385.66 | | $ 19,173,153 | 7525110 | $ 2.55 |
| MIDDLETOWN 1103830 | $ 16,072,265 | 105 | 16173 | $ 153,069.19 | Y | $ 6,300,000 | 1698134 | $ 9.46 |
| MOUNTAIN QUARRIES 21011350 | $ 7,312,539 | 248 | 13881 | $ 29,486.05 | | $ 7,312,539 | 3442581 | $ 2.12 |
| MOUNTAIN QUARRIES 2101CB | $ 11,194,782 | 290 | 0 | $ 38,602.70 | | $ 11,194,782 | 0 | #DIV/0! |
| OAKHURST 110110090 | $ - | 614 | 3740 | $ - | | $ - | 2296515 | $ - |
| OREGON TRAIL 110249144 | $ - | 264 | 8962 | $ - | | $ - | 2365872 | $ - |
| OREGON TRAIL 110335002 | $ 2,654,395 | 786 | 14395 | $ 3,377.09 | | $ - | 11314470 | $ 0.23 |
| PANORAMA 1101CB | $ 2,886,497 | 502 | 9282 | $ 5,749.99 | | $ 2,886,497 | 4659528 | $ 0.62 |

| Circuit Segment | Cost | Customers | PSPS Customer average | Cost/Customer | Off Grid $60k | OG Costs | Customer Minutes | PSPS Cost per customer minute |
|---|---|---|---|---|---|---|---|---|
| PARADISE 11032486 | $ 6,770,925 | 288 | 23710 | $ 23,510.16 | | $ 6,770,925 | 6828485 | $ 0.99 |
| PARADISE 11032534 | $ 17,637,129 | 134 | 21209 | $ 131,620.36 | Y | $ 8,040,000 | 2842006 | $ 6.21 |
| Paradise 110343008 | $ 7,617,950 | 247 | 24224 | $ 30,841.90 | | $ 7,617,950 | 5983306 | $ 1.27 |
| Paradise 110353544 | $ 3,536,817 | 78 | 23528 | $ 45,343.81 | | $ 3,536,817 | 1835159 | $ 1.93 |
| PARADISE 1103CB | $ 25,049,227 | 324 | 23565 | $ 77,312.43 | Y | $ 19,440,000 | 7635180 | $ 3.28 |
| PARADISE 11042034 | $ 10,175,764 | 99 | 25030 | $ 102,785.50 | Y | $ 5,940,000 | 2477952 | $ 4.11 |
| PARADISE 11042206 | $ 17,439,157 | 682 | 24828 | $ 25,570.61 | | $ 17,439,157 | 16932817 | $ 1.03 |
| PARADISE 110439216 | $ 7,538,359 | 214 | 23845 | $ 35,225.98 | | $ 7,538,359 | 5102894 | $ 1.48 |
| PARADISE 1104409622 | $ 3,334,644 | 213 | 0 | $ 15,655.61 | | $ 3,334,644 | 0 | #DIV/0! |
| PARADISE 110443008 | $ 154,660 | 206 | 0 | $ 750.78 | | $ 154,660 | 0 | #DIV/0! |
| PARADISE 1104457900 | $ 8,515,185 | 320 | 24566 | $ 26,609.95 | | $ 8,515,185 | 7861097 | $ 1.08 |
| PARADISE 1104920400 | $ 3,942,454 | 70 | 24647 | $ 56,320.78 | | $ 3,942,454 | 1725290 | $ 2.29 |
| PARADISE 1104954322 | $ 12,388,829 | 139 | 24926 | $ 89,128.26 | Y | $ 8,340,000 | 3464729 | $ 3.58 |
| PARADISE 1104961990 | $ 401,296 | 191 | 24601 | $ 2,101.03 | | $ 401,296 | 4698770 | $ 0.09 |
| Paradise 1104CB | $ 19,797,044 | 72 | 23147 | $ 274,958.94 | Y | $ 4,320,000 | 1666607 | $ 11.88 |
| Paradise 1105121988 | $ 17,105,457 | 131 | 24191 | $ 130,576.01 | Y | $ 7,860,000 | 3169021 | $ 5.40 |
| PARADISE 11052214 | $ 7,151,646 | 382 | 23842 | $ 18,721.59 | | $ 7,151,646 | 9107644 | $ 0.79 |
| Paradise 1105829194 | $ 7,407,304 | 365 | 24181 | $ 20,293.98 | | $ 7,407,304 | 8826069 | $ 0.84 |
| Paradise 1105878870 | $ 8,010,464 | 113 | 23908 | $ 70,889.06 | Y | $ 6,780,000 | 2701595 | $ 2.97 |
| PARADISE 110599226 | $ 10,201,037 | 194 | 23868 | $ 52,582.66 | | $ 10,201,037 | 4630392 | $ 2.20 |
| PARADISE 1105CB | $ 23,767,311 | 66 | 22034 | $ 360,110.77 | Y | $ 3,960,000 | 1454244 | $ 16.34 |
| PARADISE 110636042 | $ 14,251,363 | 277 | 22118 | $ 51,448.96 | | $ 14,251,363 | 6126736 | $ 2.33 |
| Paradise 1106CB | $ 6,129,375 | 59 | 20954 | $ 103,887.71 | Y | $ 3,540,000 | 1236286 | $ 4.96 |
| PINE GROVE 11021222 | $ 3,480,283 | 675 | 11699 | $ 5,155.98 | | $ 3,480,283 | 7896943 | $ 0.44 |
| PLACERVILLE 21067522 | $ 6,215,931 | 1021 | 18631 | $ 6,088.08 | | $ 6,215,931 | 19022524 | $ 0.33 |
| POTTER VALLEY P H 11051904 | $ 3,056,956 | 341 | 12897 | $ 8,964.68 | | $ 3,056,956 | 4397948 | $ 0.70 |
| POTTER VALLEY P H 110537476 | $ 2,330,373 | 104 | 9406 | $ 22,407.43 | | $ 2,330,373 | 978224 | $ 2.38 |
| POTTER VALLEY P H 110576498 | $ 371,210 | 30 | 10926 | $ 12,373.67 | | $ 371,210 | 327780 | $ 1.13 |
| REDBUD 1101708166 | $ 7,011,837 | 87 | 12000 | $ 80,595.83 | Y | $ 5,220,000 | 1044000 | $ 6.72 |
| REDBUD 1101754544 | $ 5,015,380 | 27 | 13471 | $ 185,754.81 | Y | $ 1,620,000 | 363717 | $ 13.79 |
| SHINGLE SPRINGS 210935598 | $ 18,693,868 | 139 | 8248 | $ 134,488.26 | Y | $ 8,340,000 | 1146538 | $ 16.30 |
| SILVERADO 2105247660 | $ - | 44 | 16916 | $ - | | $ - | 744304 | $ - |
| SPANISH CREEK 4401CB | $ 24,206,284 | 1 | 2676 | $ 24,206,283.55 | Y | $ 60,000 | 2676 | $ 9,045.70 |
| STANISLAUS 1701CB | $ 14,569,144 | 359 | 9434 | $ 40,582.57 | | $ 14,569,144 | 3386635 | $ 4.30 |
| STANISLAUS 17021804 | $ 4,913,370 | 603 | 12821 | $ 8,148.21 | | $ 4,913,370 | 7731015 | $ 0.64 |
| STANISLAUS 17021850 | $ - | 1054 | 12742 | $ - | | $ - | 13430195 | $ - |
| STANISLAUS 17021888 | $ 21,726,512 | 656 | 13246 | $ 33,119.68 | | $ 21,726,512 | 8689149 | $ 2.50 |
| STANISLAUS 1702CB | $ 7,969,732 | 71 | 12315 | $ 112,249.74 | Y | $ 4,260,000 | 874389 | $ 9.11 |
| TIDEWATER 210614072 | $ 6,942,032 | 57 | 2352 | $ 121,790.03 | Y | $ 3,420,000 | 134064 | $ 51.78 |
| UPPER LAKE 11011276 | $ 20,481,684 | 166 | 12528 | $ 123,383.64 | Y | $ 9,960,000 | 2079648 | $ 9.85 |
| VACAVILLE 11046542 | $ 12,615,198 | 779 | 12291 | $ 16,194.09 | | $ 12,615,198 | 9574499 | $ 1.32 |
| VACAVILLE 110838316 | $ 28,640,123 | 88 | 15586 | $ 325,455.95 | Y | $ 5,280,000 | 1371568 | $ 20.88 |
| VACAVILLE 11088762 | $ 11,604,581 | 152 | 14989 | $ 76,345.93 | Y | $ 9,120,000 | 2278355 | $ 5.09 |
| VACAVILLE 111113652 | $ 12,818,263 | 74 | 10039 | $ 173,219.76 | Y | $ 4,440,000 | 742918 | $ 17.25 |
| VACAVILLE 1111CB | $ 7,560,347 | 691 | 9354 | $ 10,941.17 | | $ 7,560,347 | 6463934 | $ 1.17 |
| VOLTA 11011596 | $ 2,734,947 | 136 | 27302 | $ 20,109.91 | | $ 2,734,947 | 3713072 | $ 0.74 |
| VOLTA 110153118 | $ 1,199,472 | 24 | 24429 | $ 49,977.99 | | $ 1,199,472 | 586296 | $ 2.05 |
| VOLTA 110185234 | $ - | 368 | 27624 | $ - | | $ - | 10165632 | $ - |
| VOLTA 1101CB | $ 3,522,900 | 52 | 21619 | $ 67,748.09 | Y | $ 3,120,000 | 1124208 | $ 3.13 |
| WILDWOOD 11011454 | $ 524,910 | 14 | 9875 | $ 37,493.55 | | $ 524,910 | 138251 | $ 3.80 |
| WILLOW CREEK 11032936 | $ 40,285,515 | 257 | 4627 | $ 156,752.98 | Y | $ 15,420,000 | 1189139 | $ 33.88 |
| WOODSIDE 11018974 | $ 3,988,400 | 298 | 10213 | $ 13,383.89 | | $ 3,988,400 | 3043469 | $ 1.31 |
| WYANDOTTE 11031941 | $ 383,368 | 0 | 0 | #DIV/0! | Y | $ 383,368 | 0 | #DIV/0! |
| WYANDOTTE 11031976 | $ 1,286,266 | 35 | 0 | $ 36,750.45 | | $ 1,286,266 | 0 | #DIV/0! |
| WYANDOTTE 1110980944 | $ 26,612,530 | 1108 | 9463 | $ 24,018.53 | | $ 26,612,530 | 10485446 | $ 2.54 |
| **Grand Total** | $ 1,179,263,645 | 31399 | | $ 42,689.82 | | $ 734,192,860 | 381825629 | $ 3.09 |

**Table 8 -** PG&E undergrounding projects executed through 2023 by circuit segment. Includes miles undergrounded, cost, number of customers, and PSPS minutes since 2019. Calculated values include comparison with off-grid solution valued at $60k, and cost per customer minute of avoided PSPS.

PG&E has by far the most extensive and expensive undergrounding program, with a total cost of $1.18 billion for projects completed so far. Many of the circuit segments with undergrounding – 48 out of 120, exceeded the $60k threshold that would provide a reasonable off-grid solution. Several circuit segments exceeded $1 million in undergrounding costs per customer serviced, including those on circuits Spanish Creek, Jameson, Elk Creek, Clark Road, and Big Meadows. The average cost of avoiding a customer PSPS minute is $3.09, with a wide variation.

An off-grid solution providing service to customers on circuits costing more than $60k per customer would cost $734 million, a cost savings of 38%.

### 4.2.5. 2024-2025 PG&E Undergrounding Projects

Projected costs and data for PG&E's planned 2024-2025 undergrounding projects are given in the table below:

| Circuit Segment | UG Miles | Cost (@ $3M/mi) | Customers | PSPS Customer Average | Cost/customer | Off Grid $60k | OG Costs | Customer minutes | PSPS reduction cost $/min |
|---|---|---|---|---|---|---|---|---|---|
| ALLEGHANY 1101VR816 | 2.270075758 | $6,810,227 | 74 | 20231 | $ 92,030 | Y | 4,440,000 | 1,497,094 | $ 4.55 |
| ALLEGHANY 1102CB | 34.355 | $103,065,000 | 152 | 23000 | $ 678,059 | Y | 9,120,000 | 3,496,000 | $ 29.48 |
| ANTLER 11011384 | 14.698 | $44,094,000 | 386 | 9417 | $ 114,233 | Y | 23,160,000 | 3,634,962 | $ 12.13 |
| ANTLER 11011520 | 8.916 | $26,748,000 | 117 | 10486 | $ 228,615 | Y | 7,020,000 | 1,226,862 | $ 21.80 |
| ANTLER 11011612 | 3.529924242 | $10,589,773 | 77 | 10749 | $ 137,530 | Y | 4,620,000 | 827,673 | $ 12.79 |
| ANTLER 1101CB | 0.939962121 | $2,819,886 | 33 | 9248 | $ 85,451 | Y | 1,980,000 | 305,184 | $ 9.24 |
| APPLE HILL 1104CB | 5.39 | $16,170,000 | 212 | 11561 | $ 76,274 | Y | 12,720,000 | 2,450,937 | $ 6.60 |
| APPLE HILL 21026552 | 16.69 | $50,070,000 | 197 | 16956 | $ 254,162 | Y | 11,820,000 | 3,340,332 | $ 14.99 |
| APPLE HILL 21027502 | 32.22136364 | $96,664,091 | 376 | 17848 | $ 257,085 | Y | 22,560,000 | 6,710,844 | $ 14.40 |
| APPLE HILL 210289934 | 1.489962121 | $4,469,886 | 68 | 18534 | $ 65,734 | Y | 4,080,000 | 1,260,312 | $ 3.55 |
| AUBERRY 1101R2578 | 0.537310606 | $1,611,932 | 582 | 3565 | $ 2,770 |  | 1,611,932 | 2,074,733 | $ 0.78 |
| BEAR VALLEY 210576694 | 0.360037879 | $1,080,114 | 32 | 5209 | $ 33,754 |  | 1,080,114 | 166,688 | $ 6.48 |
| BEAR VALLEY 21059570 | 2.339962121 | $7,019,886 | 40 | 2868 | $ 175,497 | Y | 2,400,000 | 114,720 | $ 61.19 |
| BELL 11082202 | 12.95018939 | $38,850,568 | 509 | 8102 | $ 76,327 | Y | 30,540,000 | 4,123,923 | $ 9.42 |
| BIG BASIN 11025066 | 7.125378788 | $21,376,136 | 94 | 8253 | $ 227,406 | Y | 5,640,000 | 775,778 | $ 27.55 |
| BIG MEADOWS 21012260 | 0.478030303 | $1,434,091 | 272 | 2589 | $ 5,272 |  | 1,434,091 | 704,208 | $ 2.04 |
| BIG MEADOWS 21012476 | 1.1 | $3,300,000 | 155 | 2589 | $ 21,290 |  | 3,300,000 | 401,295 | $ 8.22 |
| BONNIE NOOK 1101CB | 24.15596212 | $72,467,886 | 349 | 17155 | $ 207,644 | Y | 20,940,000 | 5,986,957 | $ 12.10 |
| BUCKS CREEK 1101CB | 2.404545455 | $7,213,636 | 0 | 27491 | #DIV/0! | Y | 7,213,636 | 0 | #DIV/0! |
| BUCKS CREEK 1102CB | 30.99412879 | $92,982,386 | 48 | 20899 | $ 1,937,133 | Y | 2,880,000 | 1,003,139 | $ 92.69 |
| BUCKS CREEK 1103CB | 0.598484848 | $1,795,455 | 16 | 25315 | $ 112,216 | Y | 960,000 | 405,040 | $ 4.43 |
| CALISTOGA 110143924 | 5.639962121 | $16,919,886 | 397 | 25564 | $ 42,619 |  | 16,919,886 | 10,149,074 | $ 1.67 |
| CLARK ROAD 11022094 | 2.964204545 | $8,892,614 | 0 | 25929 | #DIV/0! | Y | 8,892,614 | 0 | #DIV/0! |
| CLARK ROAD 110247006 | 5.113636364 | $15,340,909 | 94 | 26585 | $ 163,201 | Y | 5,640,000 | 2,499,033 | $ 6.14 |
| CLARK ROAD 1102CB | 0.890909091 | $2,672,727 | 12 | 12022 | $ 222,727 | Y | 720,000 | 144,258 | $ 18.53 |
| CLAYTON 2212614950 | 0.65 | $1,950,000 | 48 | 2593 | $ 40,625 |  | 1,950,000 | 124,464 | $ 15.67 |
| CLAYTON 2212681608 | 8.439962121 | $25,319,886 | 271 | 6577 | $ 93,431 | Y | 16,260,000 | 1,782,237 | $ 14.21 |
| CLAYTON 221296224 | 5.271969697 | $15,815,909 | 100 | 9179 | $ 158,159 | Y | 6,000,000 | 917,859 | $ 17.23 |
| COLUMBIA HILL 110190730 | 2.470075758 | $7,410,227 | 252 | 23148 | $ 29,406 |  | 7,410,227 | 5,833,365 | $ 1.27 |
| CORNING 110253184 | 8.298106061 | $24,894,318 | 78 | 18108 | $ 319,158 | Y | 4,680,000 | 1,412,426 | $ 17.63 |
| CORNING 1102915324 | 0.093181818 | $279,545 | 0 | 15331 | #DIV/0! | Y | 279,545 | 0 | #DIV/0! |
| COTTONWOOD 1102544790 | 7.303219697 | $21,909,659 | 40 | 8839 | $ 547,741 | Y | 2,400,000 | 353,578 | $ 61.97 |
| COTTONWOOD 11029026 | 0.037689394 | $113,068 | 285 | 10682 | $ 397 |  | 113,068 | 3,044,380 | $ 0.04 |
| CRESCENT MILLS 21012056 | 0.820075758 | $2,460,227 | 115 | 2690 | $ 21,393 |  | 2,460,227 | 309,350 | $ 7.95 |
| CURTIS 1701CB | 2.986363636 | $8,959,091 | 629 | 5713 | $ 14,243 |  | 8,959,091 | 3,593,254 | $ 2.49 |
| CURTIS 170356972 | 0.7 | $2,100,000 | 77 | 6627 | $ 27,273 |  | 2,100,000 | 510,279 | $ 4.12 |
| CURTIS 17039240 | 12.63996212 | $37,919,886 | 838 | 7905 | $ 45,250 |  | 37,919,886 | 6,624,715 | $ 5.72 |
| DIAMOND SPRINGS 1402 | 1.329924242 | $3,989,773 | 0 | 0 | #DIV/0! | Y | 3,989,773 | 0 | #DIV/0! |
| DRUM 1101CB | 0.3 | $900,000 | 3 | 17367 | $ 300,000 | Y | 180,000 | 52,101 | $ 17.27 |
| DUNBAR 1101416 | 1.101325758 | $3,303,977 | 21 | 22653 | $ 157,332 | Y | 1,260,000 | 475,715 | $ 6.95 |
| DUNBAR 1101CB | 2.327272727 | $6,981,818 | 60 | 11271 | $ 116,364 | Y | 3,600,000 | 676,260 | $ 10.32 |
| DUNBAR 1103534 | 1.381818182 | $4,145,455 | 161 | 23029 | $ 25,748 |  | 4,145,455 | 3,707,748 | $ 1.12 |
| ECHO SUMMIT 1101481660 | 0.219886364 | $659,659 | 4 | 3206 | $ 164,915 | Y | 240,000 | 12,824 | $ 51.44 |
| EL CERRITO G 1105BR160 | 1.73125 | $5,193,750 | 1708 | 4972 | $ 3,041 |  | 5,193,750 | 8,491,865 | $ 0.61 |
| EL DORADO PH 2101CB | 6.2 | $18,600,000 | 88 | 13882 | $ 211,364 | Y | 5,280,000 | 1,221,631 | $ 15.23 |
| ELECTRA 11017104 | 15.8 | $47,400,000 | 367 | 11097 | $ 129,155 | Y | 22,020,000 | 4,072,428 | $ 11.64 |
| ELECTRA 1101L1697 | 5.660037879 | $16,980,114 | 246 | 11136 | $ 69,025 | Y | 14,760,000 | 2,739,394 | $ 6.20 |
| ELK CREEK 11012002 | 0.810227273 | $2,430,682 | 30 | 9097 | $ 81,023 | Y | 1,800,000 | 272,903 | $ 8.91 |
| ELK CREEK 11012032 | 0.489962121 | $1,469,886 | 44 | 12794 | $ 33,407 |  | 1,469,886 | 562,918 | $ 2.61 |
| FLINT 1101750 | 4.835984848 | $14,507,955 | 188 | 4791 | $ 77,170 | Y | 11,280,000 | 900,633 | $ 16.11 |
| FORESTHILL 110137238 | 1.928030303 | $5,784,091 | 95 | 14887 | $ 60,885 | Y | 5,700,000 | 1,414,261 | $ 4.09 |
| FORESTHILL 110150486 | 17.86837121 | $53,605,114 | 914 | 14288 | $ 58,649 |  | 53,605,114 | 13,059,463 | $ 4.10 |
| FORESTHILL 11022106 | 28.09015152 | $84,270,455 | 427 | 14747 | $ 197,355 | Y | 25,620,000 | 6,297,169 | $ 13.38 |
| FROGTOWN 1702CB | 0.534469697 | $1,603,409 | 423 | 3964 | $ 3,791 |  | 1,603,409 | 1,676,683 | $ 0.96 |
| GANSNER 11012424 | 3.414962121 | $10,244,886 | 201 | 2744 | $ 50,970 |  | 10,244,886 | 551,544 | $ 18.57 |
| GIRVAN 11029012 | 0.170075758 | $510,227 | 240 | 10891 | $ 2,126 |  | 510,227 | 2,613,875 | $ 0.20 |
| GRAYS FLAT 0401CB | 1.4 | $4,200,000 | 115 | 2633 | $ 36,522 |  | 4,200,000 | 302,795 | $ 13.87 |
| HALF MOON BAY 11036012 | 0.858143939 | $2,574,432 | 162 | 7870 | $ 15,892 |  | 2,574,432 | 1,274,940 | $ 2.02 |
| HARTLEY 1101698 | 0.297727273 | $893,182 | 71 | 11947 | $ 12,580 |  | 893,182 | 848,237 | $ 1.05 |
| HIGHLANDS 1102628 | 6.352462121 | $19,057,386 | 21 | 17248 | $ 907,495 | Y | 1,260,000 | 362,208 | $ 52.61 |
| INDIAN FLAT 1104CB | 16.03977273 | $48,119,318 | 718 | 2967 | $ 67,019 | Y | 43,080,000 | 2,130,507 | $ 22.59 |

| Circuit Segment | UG Miles | Cost (@ $3M/mi) | Customers | PSPS Customer Average | Cost/customer | Off Grid $60k | OG Costs | Customer minutes | PSPS reduction cost $/min |
|---|---|---|---|---|---|---|---|---|---|
| JAMESON 110265516 | 11.29185606 | $33,875,568 | 496 | 13971 | $ 68,298 | Y | 29,760,000 | 6,929,751 | $ 4.89 |
| JAMESON 1105466348 | 4.002840909 | $12,008,523 | 244 | 14150 | $ 49,215 | | 12,008,523 | 3,452,621 | $ 3.48 |
| JESSUP 11021550 | 0.304166667 | $912,500 | 218 | 14346 | $ 4,186 | | 912,500 | 3,127,503 | $ 0.29 |
| KANAKA 1101CB | 2.065530303 | $6,196,591 | 108 | 17519 | $ 57,376 | | 6,196,591 | 1,892,029 | $ 3.28 |
| KESWICK 11011586 | 5.661174242 | $16,983,523 | 24 | 14562 | $ 707,647 | Y | 1,440,000 | 349,488 | $ 48.60 |
| KESWICK 11011588 | 0.129924242 | $389,773 | 29 | 14647 | $ 13,440 | | 389,773 | 424,763 | $ 0.92 |
| KESWICK 11011590 | 0.270075758 | $810,227 | 51 | 14264 | $ 15,887 | | 810,227 | 727,464 | $ 1.11 |
| KESWICK 110148480 | 0.220075758 | $660,227 | 134 | 12303 | $ 4,927 | | 660,227 | 1,648,602 | $ 0.40 |
| KESWICK 11019712 | 1.398863636 | $4,196,591 | 270 | 13323 | $ 15,543 | | 4,196,591 | 3,597,210 | $ 1.17 |
| KONOCTI 11022293 | 0.189962121 | $569,886 | 64 | 12811 | $ 8,904 | | 569,886 | 819,904 | $ 0.70 |
| LINCOLN 1104685276 | 2.258901515 | $6,776,705 | 194 | 9410 | $ 34,931 | | 6,776,705 | 1,825,540 | $ 3.71 |
| MARIPOSA 210110170 | 0.450757576 | $1,352,273 | 197 | 6850 | $ 6,864 | | 1,352,273 | 1,349,450 | $ 1.00 |
| MARIPOSA 210110240 | 18.62992424 | $55,889,773 | 280 | 0 | $ 199,606 | Y | 16,800,000 | 0 | #DIV/0! |
| MARIPOSA 210135244 | 2.676325758 | $8,028,977 | 107 | 0 | $ 75,037 | Y | 6,420,000 | 0 | #DIV/0! |
| MARIPOSA 21019400 | 7.334659091 | $22,003,977 | 770 | 7941 | $ 28,577 | | 22,003,977 | 6,114,672 | $ 3.60 |
| MARIPOSA 2102440236 | 0.132575758 | $397,727 | 593 | 0 | $ 671 | | 397,727 | 0 | #DIV/0! |
| MIDDLETOWN 11011314 | 1.05 | $3,150,000 | 39 | 16729 | $ 80,769 | Y | 2,340,000 | 652,444 | $ 4.83 |
| MIDDLETOWN 1101171414 | 2.429924242 | $7,289,773 | 21 | 17704 | $ 347,132 | Y | 1,260,000 | 371,783 | $ 19.61 |
| Middletown 1101433160 | 1.389962121 | $4,169,886 | 18 | 18991 | $ 231,660 | Y | 1,080,000 | 341,838 | $ 12.20 |
| MIDDLETOWN 110148212 | 3.589962121 | $10,769,886 | 61 | 13042 | $ 176,556 | Y | 3,660,000 | 795,562 | $ 13.54 |
| MIDDLETOWN 1101548 | 12.78844697 | $38,365,341 | 129 | 24632 | $ 297,406 | Y | 7,740,000 | 3,177,496 | $ 12.07 |
| MIDDLETOWN 1102302610 | 1.588825758 | $4,766,477 | 366 | 20560 | $ 13,023 | | 4,766,477 | 7,525,110 | $ 0.63 |
| MIWUK 170236888 | 0.010037879 | $30,114 | 4 | 7776 | $ 7,528 | | 30,114 | 31,104 | $ 0.97 |
| MOLINO 110266006 | 1.513825758 | $4,541,477 | 172 | 7866 | $ 26,404 | | 4,541,477 | 1,352,977 | $ 3.36 |
| MOUNTAIN QUARRIES 21011350 | 1.578977273 | $4,736,932 | 248 | 13881 | $ 19,101 | | 4,736,932 | 3,442,581 | $ 1.38 |
| MOUNTAIN QUARRIES 2101CB | 0.580113636 | $1,740,341 | 290 | 9905 | $ 6,001 | | 1,740,341 | 2,872,450 | $ 0.61 |
| NARROWS 2102CB | 3.84 | $11,520,000 | 28 | 9133 | $ 411,429 | Y | 1,680,000 | 255,734 | $ 45.05 |
| NORTH BRANCH 1101CB | 0.343371212 | $1,030,114 | 100 | 2356 | $ 10,301 | | 1,030,114 | 235,600 | $ 4.37 |
| NOTRE DAME 11042028 | 12.875 | $38,625,000 | 130 | 20324 | $ 297,115 | Y | 7,800,000 | 2,642,169 | $ 14.62 |
| OAKHURST 110310140 | 5.520075758 | $16,560,227 | 527 | 4053 | $ 31,424 | | 16,560,227 | 2,135,715 | $ 7.75 |
| OREGON TRAIL 11021584 | 5.760037879 | $17,280,114 | 244 | 9475 | $ 70,820 | Y | 14,640,000 | 2,311,840 | $ 7.47 |
| OREGON TRAIL 110335002 | 16.37462121 | $49,123,864 | 786 | 14395 | $ 62,499 | Y | 47,160,000 | 11,314,470 | $ 4.34 |
| ORO FINO 110276008 | 20.65022727 | $61,950,682 | 364 | 26878 | $ 170,194 | Y | 21,840,000 | 9,783,592 | $ 6.33 |
| ORO FINO 1102CB | 3.137007576 | $9,411,023 | 22 | 23452 | $ 427,774 | Y | 1,320,000 | 515,945 | $ 18.24 |
| | | | | | | | | | |
| PARADISE 11042034 | 2.335416667 | $7,006,250 | 99 | 25030 | $ 70,770 | Y | 5,940,000 | 2,477,952 | $ 2.83 |
| Paradise 11042206 | 4.074431818 | $12,223,295 | 682 | 24828 | $ 17,923 | | 12,223,295 | 16,932,817 | $ 0.72 |
| PARADISE 11042488 | 0.077462121 | $232,386 | 56 | 23895 | $ 4,150 | | 232,386 | 1,338,140 | $ 0.17 |
| PARADISE 110439216 | 3.901136364 | $11,703,409 | 214 | 23845 | $ 54,689 | | 11,703,409 | 5,102,894 | $ 2.29 |
| PARADISE 1104409622 | 10.42859848 | $31,285,795 | 213 | 23698 | $ 146,882 | Y | 12,780,000 | 5,047,717 | $ 6.20 |
| PARADISE 110443008 | 2.532575758 | $7,597,727 | 206 | 24222 | $ 36,882 | | 7,597,727 | 4,989,797 | $ 1.52 |
| PARADISE 110453544 | 0.531060606 | $1,593,182 | 46 | 23552 | $ 34,634 | | 1,593,182 | 1,083,382 | $ 1.47 |
| PARADISE 1104920400 | 3.791856061 | $11,375,568 | 70 | 24647 | $ 162,508 | Y | 4,200,000 | 1,725,290 | $ 6.59 |
| PARADISE 1105121988 | 7.627462121 | $22,882,386 | 131 | 24191 | $ 174,675 | Y | 7,860,000 | 3,169,021 | $ 7.22 |
| PARADISE 11052214 | 5.39280303 | $16,178,409 | 382 | 23842 | $ 42,352 | | 16,178,409 | 9,107,644 | $ 1.78 |
| PARADISE 1105829194 | 11.20075758 | $33,602,273 | 365 | 24181 | $ 92,061 | Y | 21,900,000 | 8,826,069 | $ 3.81 |
| PARADISE 1105878870 | 1.321780303 | $3,965,341 | 113 | 23908 | $ 35,092 | | 3,965,341 | 2,701,595 | $ 1.47 |
| PARADISE 1105CB | 3.005871212 | $9,017,614 | 66 | 22034 | $ 136,631 | Y | 3,960,000 | 1,454,244 | $ 6.20 |
| PARADISE 11061212 | 0.709469697 | $2,128,409 | 279 | 21845 | $ 7,629 | | 2,128,409 | 6,094,755 | $ 0.35 |
| PARADISE 110636042 | 12.06439394 | $36,193,182 | 277 | 22118 | $ 130,661 | Y | 16,620,000 | 6,126,736 | $ 5.91 |
| Paradise 1106CB | 0.376515152 | $1,129,545 | 59 | 20954 | $ 19,145 | | 1,129,545 | 1,236,286 | $ 0.91 |
| PIKE CITY 11011720 | 7.52 | $22,560,000 | 28 | 21849 | $ 805,714 | Y | 1,680,000 | 611,772 | $ 36.88 |
| PIKE CITY 1101CB | 28.49015152 | $85,470,455 | 229 | 21355 | $ 373,233 | Y | 13,740,000 | 4,890,295 | $ 17.48 |
| PINE GROVE 11013166 | 2.456 | $7,368,000 | 246 | 12037 | $ 29,951 | | 7,368,000 | 2,961,092 | $ 2.49 |
| PINE GROVE 1101CB | 6.63 | $19,890,000 | 235 | 6690 | $ 84,638 | Y | 14,100,000 | 1,572,052 | $ 12.65 |
| PINE GROVE 110213438 | 5.753030303 | $17,259,091 | 284 | 17308 | $ 60,771 | Y | 17,040,000 | 4,915,472 | $ 3.51 |
| PIT NO 3 2101CB | 5.767045455 | $17,301,136 | 0 | 0 | #DIV/0! | Y | 17,301,136 | 0 | #DIV/0! |
| PIT NO 5 1101CB | 0.929924242 | $2,789,773 | 5 | 9339 | $ 557,955 | Y | 300,000 | 46,695 | $ 59.74 |
| PLACERVILLE 111219712 | 5.829924242 | $17,489,773 | 470 | 12258 | $ 37,212 | | 17,489,773 | 5,761,076 | $ 3.04 |
| PLACERVILLE 21061104 | 1.030681818 | $3,092,045 | 636 | 20200 | $ 4,862 | | 3,092,045 | 12,847,447 | $ 0.24 |
| PLACERVILLE 210611132 | 66.12592424 | $198,377,773 | 432 | 17099 | $ 459,208 | Y | 25,920,000 | 7,386,730 | $ 26.86 |
| PLACERVILLE 2106935216 | 32.94969697 | $98,849,091 | 231 | 16314 | $ 427,918 | Y | 13,860,000 | 3,768,534 | $ 26.23 |
| POINT MORETTI 110112122 | 1.111931818 | $3,335,795 | 54 | 3591 | $ 61,774 | Y | 3,240,000 | 193,887 | $ 17.20 |
| POTTER VALLEY P H 11051904 | 2.216666667 | $6,650,000 | 341 | 12897 | $ 19,501 | | 6,650,000 | 4,397,948 | $ 1.51 |
| REDBUD 1101323962 | 20.63731061 | $61,911,932 | 479 | 17046 | $ 129,252 | Y | 28,740,000 | 8,164,888 | $ 7.58 |
| REDBUD 1101454 | 10.62443182 | $31,873,295 | 33 | 13489 | $ 965,857 | Y | 1,980,000 | 445,137 | $ 71.60 |
| REDBUD 1101708166 | 5.383143939 | $16,149,432 | 87 | 12000 | $ 185,626 | Y | 5,220,000 | 1,044,000 | $ 15.47 |
| SHADY GLEN 11012768 | 3.110037879 | $9,330,114 | 172 | 10203 | $ 54,245 | | 9,330,114 | 1,754,842 | $ 5.32 |
| SHADY GLEN 110132726 | 10.66003788 | $31,980,114 | 250 | 10446 | $ 127,920 | Y | 15,000,000 | 2,611,502 | $ 12.25 |
| SHADY GLEN 11022232 | 27.02992424 | $81,089,773 | 337 | 17518 | $ 240,622 | Y | 20,220,000 | 5,903,659 | $ 13.74 |
| SHADY GLEN 110248894 | 10.16003788 | $30,480,114 | 193 | 17659 | $ 157,928 | Y | 11,580,000 | 3,408,133 | $ 8.94 |

| Circuit Segment | UG Miles | Cost (@ $3M/mi) | Customers | PSPS Customer Average | Cost/customer | Off Grid $60k | OG Costs | Customer minutes | PSPS reduction cost $/min |
|---|---|---|---|---|---|---|---|---|---|
| SILVERADO 2104515946 | 18.32416667 | $54,972,500 | 368 | 20426 | $ 149,382 | Y | 22,080,000 | 7,516,857 | $ 7.31 |
| SILVERADO 2104632 | 25.417 | $76,251,000 | 242 | 24546 | $ 315,087 | Y | 14,520,000 | 5,940,054 | $ 12.84 |
| SILVERADO 2104646776 | 2.235 | $6,705,000 | 254 | 17975 | $ 26,398 | | 6,705,000 | 4,565,736 | $ 1.47 |
| SILVERADO 2104708 | 3.579924242 | $10,739,773 | 133 | 15304 | $ 80,750 | Y | 7,980,000 | 2,035,446 | $ 5.28 |
| SILVERADO 210478268 | 16.618 | $49,854,000 | 311 | 21107 | $ 160,302 | Y | 18,660,000 | 6,564,222 | $ 7.59 |
| SILVERADO 2105 167360 & 990552 | 1.870075758 | $5,610,227 | 160 | 15873 | $ 35,064 | | 5,610,227 | 2,539,680 | $ 2.21 |
| SILVERADO 2105167360 | 8.039962121 | $24,119,886 | 109 | 13588 | $ 221,283 | Y | 6,540,000 | 1,481,092 | $ 16.29 |
| SILVERADO 2105658898 | 15.90840152 | $47,725,205 | 587 | 14088 | $ 81,304 | Y | 35,220,000 | 8,269,656 | $ 5.77 |
| STANISLAUS 17011812 | 25.99280303 | $77,978,409 | 359 | 9434 | $ 217,210 | Y | 21,540,000 | 3,386,635 | $ 23.03 |
| STANISLAUS 170237278 | 7.5 | $22,500,000 | 438 | 13222 | $ 51,370 | | 22,500,000 | 5,791,236 | $ 3.89 |
| STANISLAUS 17026028 | 9.28 | $27,840,000 | 495 | 12884 | $ 56,242 | | 27,840,000 | 6,377,642 | $ 4.37 |
| STANISLAUS 1702CB | 2.754734848 | $8,264,205 | 71 | 12315 | $ 116,397 | Y | 4,260,000 | 874,389 | $ 9.45 |
| SYCAMORE CREEK 11112268 | 27.78965909 | $83,368,977 | 274 | 18769 | $ 304,266 | Y | 16,440,000 | 5,142,706 | $ 16.21 |
| TEJON 11022455 | 8.989393939 | $26,968,182 | 263 | 10530 | $ 102,541 | Y | 15,780,000 | 2,769,390 | $ 9.74 |
| TEJON 11023751 | 9.564015152 | $28,692,045 | 45 | 11321 | $ 637,601 | Y | 2,700,000 | 509,463 | $ 56.32 |
| TEJON 1102732836 | 11.83512121 | $35,505,364 | 278 | 10574 | $ 127,717 | Y | 16,680,000 | 2,939,527 | $ 12.08 |
| TIGER CREEK 0201CB | 4.42 | $13,260,000 | 11 | 14262 | $ 1,205,455 | Y | 660,000 | 156,882 | $ 84.52 |
| UPPER LAKE 11011276 | 1.0625 | $3,187,500 | 166 | 12528 | $ 19,202 | | 3,187,500 | 2,079,648 | $ 1.53 |
| VACAVILLE 11046542 | 2.073295455 | $6,219,886 | 779 | 12291 | $ 7,984 | | 6,219,886 | 9,574,499 | $ 0.65 |
| VACAVILLE 110838316 | 1.359280303 | $4,077,841 | 88 | 15586 | $ 46,339 | | 4,077,841 | 1,371,568 | $ 2.97 |
| VACAVILLE 110847860 | 0.445075758 | $1,335,227 | 1118 | 9575 | $ 1,194 | | 1,335,227 | 10,705,206 | $ 0.12 |
| VACAVILLE 11088762 | 5.853409091 | $17,560,227 | 152 | 14989 | $ 115,528 | Y | 9,120,000 | 2,278,355 | $ 7.71 |
| VACAVILLE 111113652 | 1.541477273 | $4,624,432 | 74 | 10039 | $ 62,492 | Y | 4,440,000 | 742,918 | $ 6.22 |
| VACAVILLE 1111CB | 6.158901515 | $18,476,705 | 691 | 9354 | $ 26,739 | | 18,476,705 | 6,463,934 | $ 2.86 |
| WEST POINT 11014706 | 15.307 | $45,921,000 | 331 | 16845 | $ 138,734 | Y | 19,860,000 | 5,575,695 | $ 8.24 |
| WEST POINT 1101CB | 5.259848485 | $15,779,545 | 4 | 16000 | $ 3,944,886 | Y | 240,000 | 64,000 | $ 246.56 |
| WEST POINT 11021341 | 10.42954545 | $31,288,636 | 85 | 18954 | $ 368,102 | Y | 5,100,000 | 1,611,090 | $ 19.42 |
| WEST POINT 11024788 | 3.260037879 | $9,780,114 | 592 | 18954 | $ 16,520 | | 9,780,114 | 11,220,614 | $ 0.87 |
| WEST POINT 110277204 | 2.639962121 | $7,919,886 | 49 | 19982 | $ 161,630 | Y | 2,940,000 | 979,118 | $ 8.09 |
| WILDWOOD 110198896 | 4.810037879 | $14,430,114 | 19 | 6327 | $ 759,480 | Y | 1,140,000 | 120,206 | $ 120.04 |
| WOODSIDE 11018974 | 1.190151515 | $3,570,455 | 298 | 10213 | $ 11,981 | | 3,570,455 | 3,043,469 | $ 1.17 |
| WYANDOTTE 1110980944 | 5.290909091 | $15,872,727 | 1108 | 9463 | $ 14,326 | | 15,872,727 | 10,485,446 | $ 1.51 |
| **Grand Total** | 1131.904947 | $3,395,714,841 | 38640 | | $ 87,881 | Y | 1,497,973,568 | 497,482,620 | $6.83 |

**Table 9 -** PG&E undergrounding projects planned through 2025 by circuit segment. Includes miles undergrounded, cost (at $3M/mile), number of customers, and average PSPS minutes since 2019. Calculated values include comparison with off-grid solution valued at $60k, and cost per customer minute of avoided PSPS.

PG&E's planned undergrounding projects are more expensive per customer minute of PSPS avoided than those projects that have already been implemented. PG&E's projected undergrounding costs are $3.4 billion. Most of the circuit segments planned for undergrounding – 98 out of 163, exceeded the $60k per customer threshold that would provide a off-grid solution. Several circuit segments exceeded $1 million in undergrounding costs per customer serviced. A hypothetical off-grid solution with a $60k per customer threshold would cost $1.5 billion, a savings of 56% over PG&E's projected costs.

### 4.2.6. SCE Undergrounding Projects

While SCE provided data for its undergrounding projects as well, the format of the data is different, with many circuit segments serving many customers, and it is not known whether this is due to how SCE interprets the request or whether it is due to a different topology of the SCE system. In any case, it is only possible to aggregate unique blocks of customers at the circuit level, and with the substantial number of customers at this level the amount spent on undergrounding per project is quite small compared to the extrema seen in the finer grained SDG&E and PG&E data.

### 4.2.7. Discussion of WMP Undergrounding Project Costs

The purpose of undergrounding is primarily as a wildfire mitigation and secondarily as a means to reduce dependency on PSPS and improve customer reliability. As a wildfire mitigation, the principal consideration is the risk presented by the utility infrastructure itself in the landscape it traverses, and the number of customers served by that infrastructure is irrelevant. While undergrounding is the most effective wildfire mitigation, it is not the most cost effective. Covered conductor in combination with other technologies is capable of providing protection from wildfire ignition that rivals undergrounding at a much lower cost. Some of these complimentary mitigations include PSPS, EPSS, and Fast Curve circuit breaker settings that have impacts on reliability. This is used as an argument for choosing undergrounding over other options, since for fully undergrounded circuits PSPS and other reliability risks can be eliminated.

Energy Safety has a dual mandate to eliminate both wildfire and PSPS risks. Nevertheless, Energy Safety has also issued numerous directives to utilities requiring them to demonstrate the risk spend efficiency and cost-effectiveness of the mitigations chosen. This same information has helped guide the CPUC as it determines whether and how to approve utility revenue requests. So while Energy Safety does not directly involve itself in cost issues it has supported the CPUC's goal of making the utility wildfire mitigation programs cost-efficient.

Now that undergrounding programs are underway, data is available regarding cost per circuit segment. Each of these circuit segments serves a certain number of customers, so the metric of how much mitigation costs per customer served can be calculated. While this is not directly relevant to wildfire risk reduction it can be directly related to reliability and PSPS risk. To the extent the utilities are using PSPS reduction as an argument for selecting undergrounding over other mitigation options, determining how much it costs to protect the reliability of each customer is germane and should be used as another metric to gauge whether utilities are making reasonable choices.

In order to clarify this issue, this analysis asked the hypothetical question of how much it would cost to pay customers to get off the grid so that their circuit segment could be removed. It is understood that this is not a practical solution in most cases – solar is not practical in all locations, customers may not want the added responsibility of maintaining their own power infrastructure, and

it would require new regulatory measures to implement. Nevertheless, this analysis serves as a benchmark of whether undergrounding is "worthwhile" in order to service customers at remote locations, or whether it is actually a burden on ratepayers. The metric of cost per customer-minute of potentially avoided PSPS is a complementary metric that should weigh in to the question of whether PSPS avoidance serves as support for the choice of undergrounding.

The data shows that for many circuit segments, particularly in the vast PG&E service area, the cost of undergrounding exceeds, often greatly exceeds, what it would cost to install stand-alone power systems for all customers served by that segment. In the case of PG&E's 2024-2025 projects, the overall cost for undergrounding is over double what the cost would be in the hypothetical situation where off-grid solutions were built for each customer on high cost-per-customer circuits. While that may not be a feasible solution, it does beg the question of whether it is appropriate to choose the most expensive mitigation solution for those circuit segments unless it can be demonstrated that alternatives to undergrounding cannot provide adequate wildfire risk reduction for high cost-per-customer circuit segments.

Likewise, the cost to avoid a customer PSPS minute varies from less than $1 for some circuits to in excess of $20 for other circuits. Circuit segments with excessive cost to reduce PSPS for customers should not be given preference for undergrounding. It can be seen that this value varies greatly from circuit to circuit, and provides a means of identifying circuits for which PSPS avoidance makes little economic sense. For such circuits, covered conductor should be deployed in combination with other complimentary mitigations, which might include aggressive EPSS and PSPS thresholds. Impacts to reliability could potentially be offset with grants or rebates to customers implementing off-grid or backup solutions at a considerably lower cost than undergrounding.

**Recommendations:**

- Energy Safety should use the cost per customer served and cost per PSPS minute avoided to identify circuits segments that require additional justification for the choice of undergrounding over other mitigations. In these cases, mitigations could include covered conductor in combination with other mitigations which might involve more aggressive EPSS or PSPS thresholds.

- Energy Safety should note in its findings that in the cases of many circuit segments the cost of undergrounding greatly exceeds what it would cost to build off-grid solutions for all customers served by the circuit. This should be referred to the CPUC for potential actions such as grants or rebates for customers seeking off-grid solutions or backup on high-cost circuits, or other potential actions encouraging off-grid solutions in these areas.
- Energy Safety should require further data from SCE allowing its undergrounding cost per customer to be directly compared with PG&E and SDG&E.

### 4.3. SCE Portfolio Optimization

As mentioned in Section 2.1.2, MGRA has been a party to SCE's general rate case and entered testimony which is soon going into the evidentiary hearing phase.[48] Part of the MGRA analysis was to vary the assumptions SCE made in its rate case regarding covered conductor efficiency, the balance between undergrounding and covered conductor, the choice of circuits for the undergrounding program, and use of advanced mitigation technologies such as REFCL. Performing this analysis was facilitated by the tool which SCE provided which analyzed circuit segment risk.[49] This analysis is relevant to the current expenditures and planning due to the fact that SCE plans to ramp down its covered conductor program and replace it with targeted undergrounding within the next year. The MGRA analysis shows the impact of this decision compared to alternative options.

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[48] A.23-05-010; DIRECT TESTIMONY OF THE MUSSEY GRADE ROAD ALLIANCE SOUTHERN CALIFORNIA EDISON COMPANY 2025 GENERAL RATE CASE; Joseph W. Mitchell, Ph.D.; February 29, 2024. (MGRA SCE GRC Testimony)
https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2305010/7075/526147058.pdf

[49] Id.; pp. 89-97.
The primary source is based on Workpaper SCE-04 Vol. 05 Pt.1, Excel Spreadsheet, which has been delivered in response to a number of intervenor data responses (TURN-SCE-007, TURN-SCE-036). The version used in the following scenario analysis is MGRA-SCE-005-Q2. MGRA has created a number of derivative Excel file Worksheets for the following scenario analysis:
MGRA-SCE-005_Q2 - UG-CC-REFCL-Master-jwm.xlsx
MGRA-SCE-005_Q2 - UG-CC-REFCL-UG3-jwm.xlsx
MGRA-SCE-005_Q2 - UG-CC-REFCL-UG3UH-jwm.xlsx
Workpaper MGRA-SCE-005_Q2-Totals.xlsx
These can be found in MGRA's workpapers:
https://github.com/jwmitchell/Workpapers/tree/main/SCEGRC25

The MGRA analysis is a general exploration of different assumptions and scenarios, and is not a funding proposal, and additionally contains a number of assumptions and approximations. For a full list of the limitations and caveats of the analysis please refer to the MGRA testimony.

Results of the analysis are shown in Figure 4. The circles indicate different scenarios, with the x axis showing overall hardening cost and the y axis showing estimated risk reduction using SCE's calculation tool. The diameter of the circles is proportional to the scenario RSE. SCE's base model is shown in magenta, while MGRA scenarios are shown in blue.

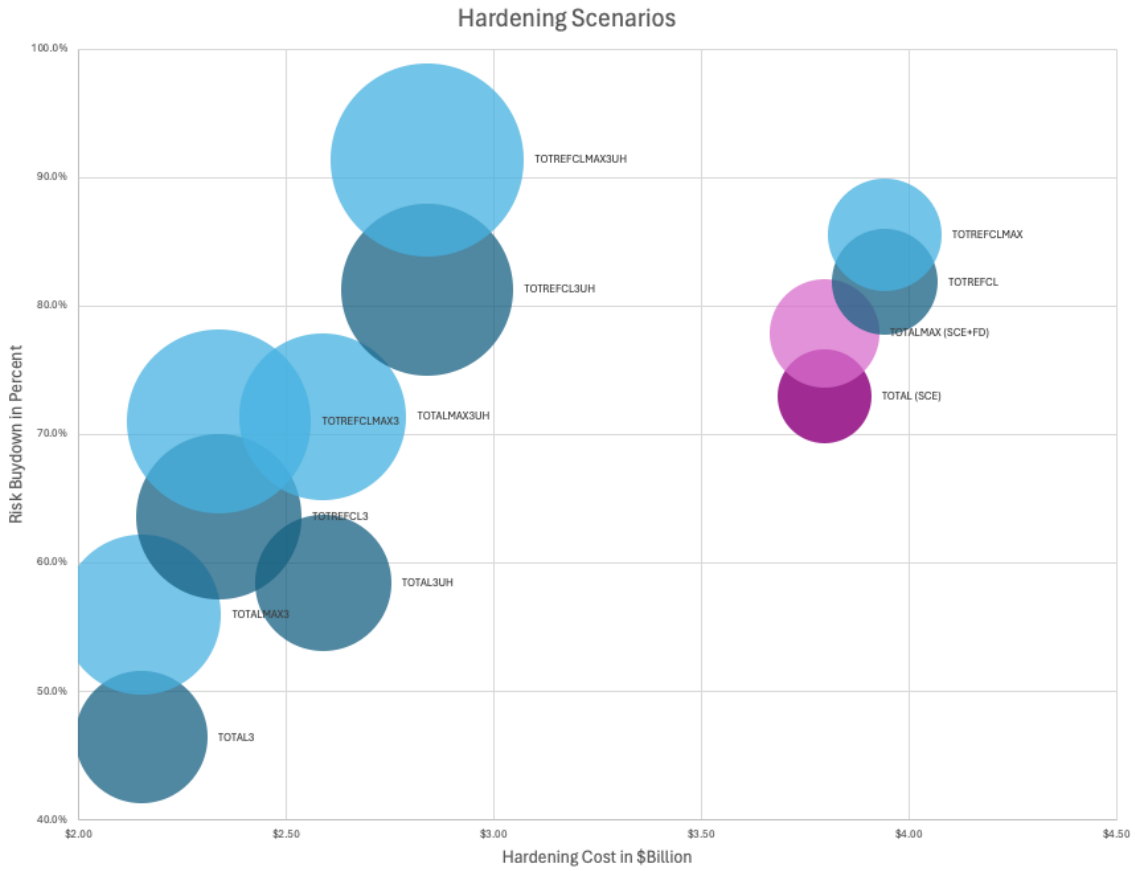


**Figure 4 -** A comparison of the MGRA hardening scenarios based on SCE tools, inputs and data. The X axis shows overall scenario cost. The y axis shows risk buydown in percent. Scenarios are labelled by text, with nomenclature described above. The diameter of the the circle is proportional to RSE. Light shaded circles use "MAX" assumptions that WCCP risk mitigation is 85% rather than 72% based on SCE field data and on the potential for additional technology mitigations. SCE's original scenario is indicated by the magenta circles.

Assumptions for each scenario are listed in the table below:

| Scenario | CC eff. 85% | REFCL | 1/3 TUG | Full Hardening |
|---|---|---|---|---|
| TOTAL (SCE) | | | | |
| TOTALMAX | X | | | |
| TOTREFCL | | X | | |
| TOTREFCLMAX | X | X | | |
| TOTAL3 | | | X | |
| TOTALMAX3 | X | | X | |
| TOTAL3UH | | | X | X |
| TOTALMAX3UH | X | | X | X |
| TOTREFCL3 | | X | X | |
| TOTREFCLMAX3 | X | X | X | |
| TOTREFLC3UH | | X | | X |
| TOTREFCLMAX3UH | X | X | X | X |

**Table 10 -** MGRA hardening scenarios from MGRA GRC testimony. Description below.

Assumption criteria are:

**CC eff. 85% -** Covered conductor mitigation efficiency is 85% based on MGRA analysis of SCE field data. Unchecked uses SCE assumption of 72% efficiency.

**REFCL -** Assumes SCE's CC+REFCL scenario which SCE states improves wildfire mitigation efficiency by 50%.

**1/3 TUG –** Reduces the scope of SCE's TUG program by 2/3, based on a random selection of circuit segments. Circuit segments removed were assumed to be hardened with covered conductor. Choice of 1/3 is arbitrary, but allows for substantial cost savings and still allows SCE to mitigate the most extreme risk areas with undergrounding.

**Full Hardening -** SCE's plan through its GRC period leaves a substantial fraction of its HFRA unhardened. Full hardening assumes that SCE's covered conductor program continues throughout the period until its entire HFRA is hardened.

The conclusions that can be reached from this analysis are that it is possible for SCE to achieve greater risk reduction by 2028 by scaling back its targeted undergrounding program and using the money saved to continue its covered conductor program and complete the hardening of its HFRA. In discovery provided to MGRA, SCE has estimated that as of the end of 2023 it had reduced its wildfire risk by 67% since it began its program in 2017.[50]

This conclusion should be generally applicable to the other major IOUs as well.

**Recommendations:**

- Energy Safety should recommend that SCE's successful covered conductor program be continued until wildfire risk is minimized in its HFRA.
- Energy Safety should find that SCE's covered conductor program has been extremely effective

## 5. AREAS FOR CONTINUED IMPROVEMENT

### 5.1. PG&E

#### 5.1.1. ACI-PG&E-23-05 - PG&E's combinations of mitigations lack obvious ideal combinations

While PG&E technically complies with the requirement that it examine combinations of mitigations, it leaves out the most obvious and obfuscates the most likely to be of greatest use. Additionally, PG&E continues to use 64% as its covered conductor effectiveness while even SCE uses 72%, and MGRA's analysis of SCE's field data shows to be 85%. We show PG&E's table ACE-PG&E-2300503 below.

[50] MGRA SCE GRC Testimony; p. 57, cites:
DR Response MGRA-SCE-002-Q2;
Workpaper 2-2_MGRA-SCE-002_Q2-BuyDown-jwm.xlsx
(https://github.com/jwmitchell/Workpapers/tree/main/SCEGRC25)

**TABLE ACI-PG&E-23-05-3:**
**IGNITION MITIGATION EFFECTIVENESS: REPRESENTATIVE BLENDED AVERAGE VALUES**

| Scenario | Blended Average Effectiveness[a] |
|---|---|
| Alt. 1 – Baseline | 0% |
| Alt. 2 – Underground Primary | 97.7% |
| Alt. 3 – Underground All | 99.2% |
| Alt. 4 – Covered conductor (CC) Overhead with EPSS | 78.2% |
| Alt. 5 – Bare Conductor Rebuild with EPSS and downed conductor detection | 60.9% |
| Alt. 6 – Line Removal w/ Remote Grid | 97.7% |
| Alt. 7 – EPSS including downed conductor detection (DCD)/Partial Voltage (with bare conductor) | 60.4% |
| Alt. 8 – EPSS and PSPS (with bare conductor) | 91.3% |
| Alt. 9 – Rapid Earth Fault Current Limiter (REFCL), CC Overhead, EPSS and DCD | 65.0% |
| Covered Conductor Rebuild – New | 66.4%(b) |

Assumptions:

- Analysis assumes no Overhead degradation for life of the asset;
- EPSS and DCD are only active when conditions are greater than R1;
- Ground sensitivity on 4 wire systems for high impedance faults similar to DCD mitigation; and
- Mitigation effectiveness for other Environmental caused outages: None for Overhead and All for Underground.

(a) These are averages based on review of 8 years of outage history between 2015 and 2022. This historical review differs from the methodology used to calculate the annual effectiveness reported by PG&E for any given year.

All of these effectiveness values represent a blended average effectiveness at the circuit segment level with the exception of "Alt. 9 – REFCL, CC Overhead, EPSS and DCD" which is a substation effectiveness score. Not all substations are capable of having REFCL applied, and it cannot be isolated to a circuit segment only.

The approach to calculating outage risk considered the following outage types, however they were deemed not applicable and therefore excluded:

No improvement for existing Underground Type outages; and

All company-initiated outages, Community Wildfire Safety Program and PSPS outages fire forest/grass outages – potential wildfire cause outage/force out.

(b) The mitigation effectiveness value for CC used in the WBCA (66.4%) is similar to the value arrived at as part of the joint California IOUs CC effectiveness study for 2022 (64%). See PG&E's 2023-2025 WMP, Revision 1, April 26, 2023, page 900.

**Table 11 -** PG&E's claimed ignition mitigation effectiveness table using blended averages.[51]

First, there is clearly no mitigation that approaches the effectiveness of covered conductor on its own. However, PG&E shows covered conductor only in Alternatives, 4, 9, and "Covered Conductor Rebuild". Finally, the "ultimate" combination, listed as alternative 9, with REFCL, EPSS, DCD, in combination with Covered Conductor rates as only 65% effective, whereas it estimates that covered conductor alone has a 66.4% efficiency. PG&E's explanation is that this is a "substation effectiveness score", since it claims that not all substations are REFCL-capable. This does still not make sense, and in a response to an MGRA data request PG&E explained:

"*The reported blended average effectiveness for Alt 9 was based on a study focused on*

[51] PG&E Update; p. 55.

*a specific subset of circuits where REFCL could be utilized. This same Alt 9 analysis cannot be performed assuming all circuits are REFCL enabled. The REFCL analysis was applied to substations that met the following requirements:*

- *Single voltage 3 wire 12 kV substation;*
- *Minimum of 20 OH miles in HFTD;*
- *Less than 50% of circuit UG; and*
- *Less than 20% of circuit past autobanks.*

*The effectiveness of the other mitigation types (CC Overhead, EPSS, DCD) on the Alt 9 population is less in comparison to that of the full population in the Alt 4 study. Therefore, the overall blended average effectiveness of Alt 9 is lower than Alt 4*."[52]

PG&E does not put forward a very convincing argument in this case, which is essentially that the circuits connected to substations that might be REFCL capable have much higher risk and are much less affected by mitigation. REFCL on its own is estimated to have a 50% efficiency even stated by SCE, and sources in Australia see much higher efficiencies.[53] Covered conductor, in addition, is estimated by PG&E to have 66% effectiveness alone, and DCD specifically compensates for the CC vulnerability most likely to lead to catastrophic wildfire – tree fall in. On top of that, EPSS has been shown to be extremely effective in reducing ignitions – initial results of 80% were reported by PG&E.[54] While some of the protective effects of these multiple layers of protection may be redundant, some in fact are complimentary, such as DCD and covered conductor. Another example is REFCL, which is not effective at mitigating multi-phase faults,[55] will be protected from most multi-phase faults by covered conductor. PG&E's claim that there is a set of infrastructure that presents such low mitigation effectiveness even with multiple layers of protection strains credulity, and OEIS should investigate further.

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[52] DR Response MGRA_009-Q009.
[53] Marxen, T., 2019. How do Victoria's REFCLs deliver more fire-risk reduction than simple theory and experience elsewhere say they should? | LinkedIn [WWW Document]. URL https://www.linkedin.com/pulse/how-do-victorias-refcls-deliver-more-fire-risk-than-simple-marxsen%3FtrackingId=YoM4zpCp9cG1uYmCn5Lkcg%253D%253D/?trackingId=YoM4zpCp9cG1uYmCn5Lkcg%3D%3D (accessed 5.16.23). Also,
PG&E Data Request Response WMP-Discovery2023_DR_CalAdvocates_011-Q008g.
REFCL Functional Performance Review; Report for Energy Safe Victoria; PSC Reference: JA8648-0-0 REFCL Functional Performance Report. (Downloaded 2/24/2024).
https://www.esv.vic.gov.au/sites/default/files/2022-12/REFCL-Functional-Performance-Review.pdf
[54] PG&E 2022 WMP; p. 738.
[55] SDG&E 2025 WMP; p. 94.

In summary, PG&E's response to ACI-PG&E-23-05 is insufficient and appears to be at face implausible. Energy Safety should not approve PG&E's WMP until these flaws are remedied and methodologies fully explained.

**Recommendations:**

- PG&E should add to its alternatives:
  - CC + DCD + EPSS for all blended history
  - CC + DCD + EPSS + REFCL for all of its service area, incorporating only feasible REFCL implementations
  - CC + DCD + EPSS with CC efficiency given at 85% as consistent with SCE field data.

### 5.1.2. ACI PG&E-23-07 – Deployment of New Technologies

*Description:*
*PG&E is behind its peers when it comes to the deployment of new technologies and has not provided active plans to meet the same levels of implementation.*

PG&E's response to this ACI does little to assure the reader that has studied its deployments that it takes new technologies seriously, or at least seriously enough that they would allow them to compete with their extensive undergrounding program. An example is their framing of their REFCL activity at the Calistoga REFCL pilot:

"*An important outcome of the Calistoga REFCL pilot will be to validate these estimates along with the implementation cost and additional complexity of operations on the PG&E system.*

*To address the fundamental assumption of this ACI, we also believe that our deployment of REFCL technology is comparable or better than that of our peers. It is our understanding that only one other utility in California has deployed a similar REFCL system*."[56]

PG&E began to plan its REFCL implementation in 2019, and implement it in 2020,[57] making it the temporary leader in exploring this new technology. A number of technical mishaps and supply chain problems followed, and then with the 2021 announcement that PG&E would be

[56] PG&E Update; p. 69.
[57] PG&E 2020 WMP; p. 5-17.

undergrounding 10,000 miles of its line REFCL took the sidelight and SCE soon surpassed it in implementation and theory.

In 2023 and 2024, EFD was implemented on 392 miles of circuit, and DFA will be deployed across approximately 3000 miles between 2023 and 2025. These are fairly small segments compared with those PG&E plans to underground.

PG&E has come up with yet another reason to deploy REFCL:

*a) No, PG&E has not estimated the incremental wildfire risk reduction (in dollars) attributed to widescale deployment of REFCL.*

*b) This study has not been conducted because REFCL cannot be deployed widescale on PG&E's electric assets. REFCL can only be applied to substations that meet the following minimum requirements:*

- *Single voltage 3-wire 12 kV substation;*
- *At least 20 overhead miles in HFTD;*
- *Less than 50% of circuit underground;*
- *Less than 20% of circuit past autobanks; and*
- *Sufficient physical space to deploy equipment.*[58]

Note, that under these limitations, PG&E can "immunize" a circuit from REFCL valuation by doing a partial deployment of undergrounding on that circuit, thus either reducing the overhead miles in the HFTD to less than 20 miles or increasing its undergrounding to over 50% of the circuit.

These numbers underscore an important point: PG&E deploys advanced technologies, but refrains from deploying them wherever there is the possibility of undergrounding instead. For example it told MGRA that:

"*PG&E has avoided selecting circuits/circuit segments with known undergrounding schedules for Early Fault Detection (EFD) deployment*."[59]

What this means, of course, is that while residents wait, perhaps many years, for PG&E to underground their circuits they will be denied the safety measures that the advanced technologies offer. So PG&E's slow-walking advanced technologies does not appear to be due to any lack of

[58] DR Response CalPA_Set WMP-44_Q8
[59] DR Response MGRA_009-Q013.

capabilities, but rather a deliberate decision to hold out to deploy as much underground hardening as possible.

**Recommendations:**

- PG&E should be required to implement advanced technologies that can benefit residents if the delay in its undergrounding program for a given segment is more than two years.
- PG&E should supply OEIS with undergrounding project plans indicating projects that will either 1) increase the amount of undergrounding on the circuit to over 50% or 2) reduce the overhead line to less than 20 miles. Energy Safety should then order a REFCL/CC++ evaluation for that circuit in comparison to the undergrounding project.
- PG&E should be required quantitative justification that "*REFCL cannot be deployed widescale on PG&E's electric assets*" clearly identifying which circuits it does and does not consider REFCL candidates and why. This should be a condition of approval.

### 5.1.3. ACI PG&E-23-08 – Covered Conductor Inspection and Maintenance

PG&E participated in the Joint IOU Covered Conductor Working Group, and reported results on UV weather testing.[60] PG&E reported that "*Tested materials showed significant degradation in mechanical properties after UV exposure*." SCE, on the other hand, concluded that its contractor "*Exponent concluded that while UV exposure may accelerate CC sheath aging by causing embrittlement and/or cracking, UV inhibitors are commonly used to prolong polymer lifetime (Hendrix 2010, Ariffin 2012)*" and that "*more investigation is not recommended*". SDG&E also concluded that "*Tests determined that the tensile strength of the CCs did not change as a function of exposure to UV and temperature*."

**Recommendation:**

- Energy Safety should require PG&E to clarify whether it is using UV inhibitors to prolong the life of its covered conductor and prevent embrittlement. PG&E should be made to clarify whether its covered conductor meets the same standards as that used by

[60] DR Response WMP-Discovery2023-2025_DR_MGRA_009-Q012, file WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch02.pdf

SCE and SDG&E. If not it should be required to come up with a remediation plan to move forward with more resilient covered conductor.

### 5.1.4. ACI PG&E-23-25 – Fire Potential Index and Ignition Probability Weather Enhancements

It appears that PG&E's new Ignition Given Outage Probability Weather model (IOPW), may be subject to "PSPS bias". According to PG&E "*The model is trained on every unplanned overhead outage, whether a reportable ignition was observed or not, from 2015 to 2022. Fuel, weather, and topography information is passed through to the model for each outage and ignition*."[61] Areas that are subject to extreme fire weather will have frequent PSPS, and during PSPS events no outages can happen. Therefore data sets from these areas will be missing data from these periods, and models trained on this data will underestimate the outage probability of what are the most hazardous areas. This could lead to decisions leaving more hazardous areas energized while areas less subject to PSPS typically are de-energized.

**Recommendations:**

- PG&E should be required to explain how its IOPW model avoids or corrects for "PSPS-bias".

### 5.1.5. ACI PG&E-23-26 – Evaluation and Reporting of Safety Impacts Relating to EPSS

PG&E's EPSS approach is likely to need to far more inappropriate disconnections than necessary: "*Biannually, PG&E evaluates options for EPSS enablement criteria. As wildfire risk begins to elevate in late spring or early summer, PG&E will evaluate meteorological forecasts, fuel models, observed conditions within the service area, and operating postures of State and Federal fire agency partners to validate that wildfire risk is escalating, warranting a transition into established 'peak season' enablement criteria*."[62]

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[61]

[62] PG&E Update; p. 133.

PG&E claims that "*EPSS is enabled and disabled based on forecasted weather conditions. EPSS settings are enabled or disabled based on criteria approved by our Wildfire Risk Governance Steering Committee. This criteria is based on 2km-by-2km model outputs from our Fire Potential Index (FPI) model. PG&E's FPI model*." MGRA's 2023 WMP comments noted a number of cases where circuits were being deactivated in areas of low winds, low temperatures, and low humidity.[63] MGRA had planned to perform a more extensive analysis of EPSS data for this WMP Update in order to gauge the efficiency of the EPSS decision-making, however it was effectively blocked by PG&E's over-application of confidentiality to classify fields such as time, date, location and cause as confidential. While some progress has been made in discussions with PG&E there remains insufficient time in this WMP update review period to perform the analysis. It is therefore incumbent on Energy Safety to do so, or to require that PG&E perform such analysis itself.

**Recommendations:**

- For all EPSS and Fast Curve outage events, Energy Safety should require reporting of data from the weather station nearest the outage, relating the wind gust speed, relative humidity, temperature, and vegetation moisture if available. Fire Potential Index score at the location should also be provided.
- Outage GIS data should be required to report whether the following were active on the circuit: EPSS/Fast Curve circuit protection; downed, fallen or open conductor detection.
- Wire down GIS data should be required to report whether the following were active on the circuit: downed, fallen or open conductor detection
- Ignition GIS data should be required to report whether the following were active on the circuit: EPSS/Fast Curve circuit protection; downed, fallen or open conductor detection.
- Energy Safety should find that these data elements are not confidential.

## 5.2. SCE

### 5.2.1. SCE-23-02. Calculating Risk Scores Using Maximum Consequence Values

In SCE's response to Energy Safety's ACI regarding its risk modeling practices, SCE is sharply defiant of Energy Safety's directive to provide probabilistic risk scores. And provides

[63] MGRA 2023 WMP Comments; pp. 111-115.

considerable exposition explaining its position, both in its WMP Update[64] and in its data request responses to intervenors[65] MGRA has addressed SCE's points extensively in proceeding R.20-07-013, and also in MGRA's Testimony in the SCE GRC proceeding.[66] Regarding the RDF Proceeding R.20-07-013, the Commission has in the last week issued a proposed decision that all utilities, including SCE, must calculate risk in a manner that includes probabilities and not just consequences.[67] This is only a proposed decision at this point, and it should be anticipated that SCE will strongly oppose some of its findings.

Nevertheless, here is a brief interpretation of SCE's position and actions, and MGRA's opinion of it.

SCE relied on its MARS risk calculation program for the last few years as it implemented its audacious covered conductor scheme, which has now covered over half of its HFTD. As MGRA has stated elsewhere in this document and in previous WMP filings, SCE's MARS calculation has a number of key biases, weaknesses and flaws which bias risk models in certain ways. One of these was SCE's adoption of an 8 hour limit for Technosylva fire modeling times, whereas in real life catastrophic wildfires often do considerable damage after 8 hours. This biases fire sizes to the low side and artificially suppresses risk in areas far away from the ignition point.

Other IOUs, when calculating their "global" risk modeled these size distributions and were not limited to an 8 hour physical simulation, but rather adopted a truncated power law distribution (recommended by MGRA) that is been found by scientists and engineers to provide a reasonable physically based fit to wildfire size distributions and losses. SCE, instead, simply used the MARS-calculated value, leading MGRA to be concerned that it was inadequately managing tail risk. The advantage of truncated power laws is that "the catastrophic is typical" – in other words the "average" value of the loss is driven by the most extreme events, which nullifies SCE's argument regarding "expected" values versus maximum consequence.[68]

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[64] pp. 35-43.
[65] For example: 02_CalAdvocates-SCE-2025WMP-05 Q.02.
[66] MGRA GRC Testimony; pp. 14-24, 41-54.
https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2305010/7075/526147058.pdf
[67] PROPOSED DECISION OF COMMISSIONER JOHN REYNOLDS; April 26, 2024; PHASE 3 DECISION
https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=530252715
[68] SCE Update; p. 36.

SCE's example of the Afternoon Fire in Lahaina as "extreme" event[69] does not support its position, but instead highlights a more important point that contingency/scenario planning is vital in a world where climate change effects are yearly getting stronger, and in which our ability to predict exact outcomes is limited. Lahaina needed nothing more than an effective PSPS plan to be saved, and with the alarming meteorological data indicating unprecedented weather, such a plan should have been implemented. Unprecedented conditions warrant unprecedented actions. With PSPS classed as an "evil" in its own right, with an OEIS directive to eliminate or severely reduce it, California has missed a chance to evangelize this low cost, moderate risk measure to prevent an almost inevitable catastrophe when unprecedented extreme fire weather meets unprepared utility infrastructure.

Along with the introduction of its TUG undergrounding program, SCE also introduced its IWMS prioritization tool. Unique among utility models, IWMS is not a probability measure at all because it contains no probability component, but is instead a collection of threat categories, that if met, warrant mitigation (in SCE's view, mostly TUG). IWMS should be (or should have been) integrated into MARS in order to provide risk-based decision-making. Instead, SCE has taken the empirical approach of bypassing, rather than fixing, the weaknesses of MARS by mitigating all circuits that might be underrepresented for risk in MARS if they meet certain criteria. In Table 2, I show that this approach can actually help to fix MARS biases, though of course I differ strongly with SCE on whether TUG is the appropriate primary mitigation for the IWMS categorized circuits.

One interesting example is the approach to very large wildfires. SCE has identified all circuits which still have significant growth potential after 8 hours of Technosylva simulation and has listed them all to be mitigated before 2028, effectively "cutting off the tail" of the tail risk distribution. So while it is possible for a full calculation to be done for these circuits including the correct distribution, this may be potentially moot within the next few years, since wildfire risk will be effectively mitigated or at least de minimis. In fact, MGRA has in the SCE GRC rate case made the proposal that SCE continue its covered conductor program rather than shut it down next year. If it does so, its entire HFTD will have been mitigated with either covered conductor or undergrounding by 2028, and SCE would be the first IOU to achieve this milestone. While there

[69] Id.

may still be some need for calculating residual wildfire and PSPS risk it may be drastically different in character and smaller within the next few years.

### 5.2.2. SCE-23-09 - Time dependence of Hardening in Severe Risk Areas

Energy Safety's requirement was that "*For facilities in its SRA that have not undergone covered conductor installation, SCE does not perform adequate analysis of alternative mitigation plans and instead is often prioritizing undergrounding over other mitigations.*

*Required Progress Item #1: Demonstrate adequate risk reduction for any areas planned for undergrounding via interim mitigation strategies, accounting for all ignition risk drivers*."[70]

In response, SCE decided to track net benefits of a CC/REFCL++ installation versus undergrounding over a 45 year time span, the effective life of the covered conductor mitigation. It took into account that TUG could be deployed up to two years before undergrounding, which conveys a short-term advantage. It also assumed delays in the deployment of REFCL, which is reasonable in light of the difficulties that have been encountered by the technology so far. SCE displays this in its figure ACI SCE-23-09b:

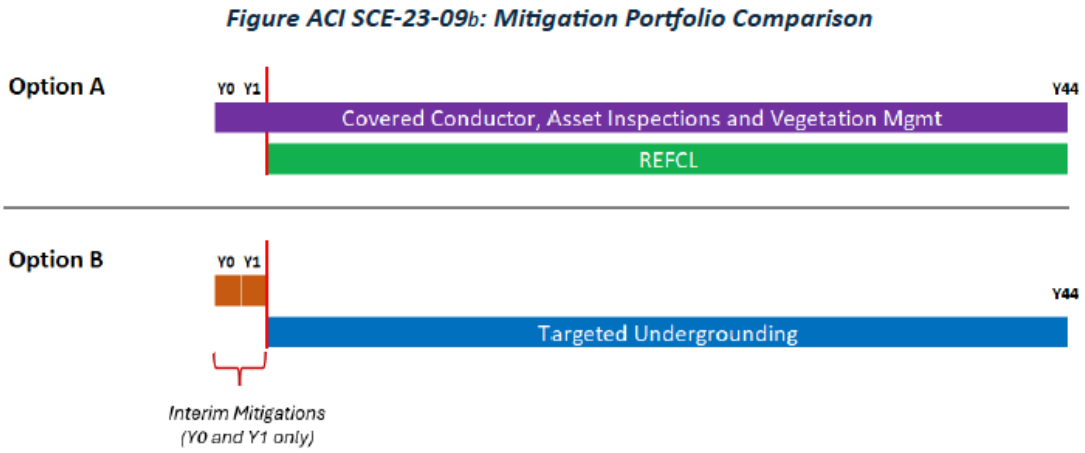


**Figure 5 -** Figure ACI SCE-23-09b, incorporating the effective lifetimes of covered conductor.

SCE's analysis concludes that 1) TUG has a higher risk reduction in 90% of SRA sites, 2) Net Present Value Risk reduction of Option A and B are 1.4 and 1.6, respectively.

[70] SCE Update; p. 60.

However, SCE's analysis did not take into account the fact that SCE's field data imply a current wildfire ignition reduction efficiency of 85% versus the 72% used in the SCE analysis. Using SCE's analysis spreadsheet as a starting point, MGRA constructed its own analysis using an imputed wildfire reduction efficiency for covered conductor of 85%, but in all other aspects identical to the SCE analysis.[71] This was done by approximating an increase in efficiency of 85/72 in risk reduction. However the mechanism by which this added efficiency is being achieved is not yet understood and it could be possible that it is redundant with protections that would be put in place by REFCL (or conversely that the imputed additional wildfire mitigation efficiency is complementary with REFCL and would therefore provide an even higher level of protection than the 85/72 ratio).

Under these assumptions Option A and Option B perform equivalently. Risk reduction for the two analyses are shown in the tables below.

**Assuming 72% CC efficiency**

| | |
|---|---|
| Sum of Circuits with TUG Risk Reduction > CC/REFCL++ Risk Reduction | 301 |
| Total Number of Circuits | 326 |
| % of Circuits with TUG Risk Reduction > CC/REFCL++ Risk Reduction | 92% |

**Assuming 85% CC efficiency**

| | |
|---|---|
| Sum of Circuits with TUG Risk Reduction > CCCor/REFCL++ Risk Reduction | 155 |
| Total Number of Circuits | 326 |
| % of Circuits with TUG Risk Reduction > CCorrected/REFCL++ Risk Reduction | 48% |

**Table 12 -** Fraction of circuits with higher time-weighted risk reduction assuming 72% CC wildfire mitigation efficiency and 85% CC wildfire mitigation efficiency.

The Net Present Value weighted risk reduction are also roughly equivalent with the assumption of higher CC effectiveness. As the options are not mutually exclusive, it is also possible to choose an "optimized" portfolio that uses the best risk reduction solution for each circuit.

[71] See Workpaper TN13825_20240402T162110_2025_WMP_Update_ACI_SCE2309_Item_2_45yRisk2-jwm.

| Option | CC Efficiency | NPV Risk Reduction |
|---|---|---|
| TUG | 72% | 1.60 |
| CC/REFCL++ | 72% | 1.36 |
| CC/REFCL++ | 85% | 1.58 |
| Optimized TUG/REFCL++ | 85% | 1.65 |

**Table 13 -** NPV risk reduction for different assumptions regarding covered conductor wildfire ignition mitigation efficiency and optimization of strategy for circuit.

While the SCE analysis takes the lead time to implement undergrounding into account, as well as other extraneous costs, such as vegetation management, EPSS, which are positive steps, there are a number of factors that are still omitted from the analysis:

- The analysis does not account for the effect of EFD sensors and their potential for significantly reducing incipient faults that could start wildfires
- Open Circuit Detection is not taken into account, which eliminates a major pathway by which a covered conductor protected circuit can be damaged in such a manner to start a catastrophic wildfire.
- The reason that SCE field data is showing an anomalously low number of wildfire ignitions needs to be understood.
- Lifetime analysis should also take into account the impact of future wildfires on circuits (both UG and CC with fire protected poles), particularly since wildfire frequency and intensity is expected to increase with climate change.

**Recommendations:**

- Time-dependent risk analysis should take into account all mitigations including EFD and DOCD, in addition to factors such as vegetation management, inspections, trip settings, and should account for potential future wildfire impact on circuits.

#### 5.2.2.1. ACI-PG&E-23-05-1 – Cumulative Risk over Time

PG&E makes a similar point in its Update, showing time dependence of underground and overhead hardened line:

**FIGURE ACI-PG&E 23-05-1:**
**CUMULATIVE RISK REDUCTION FOR UNDERGROUNDING AND OVERHEAD HARDENING OVER ASSET LIFETIME**

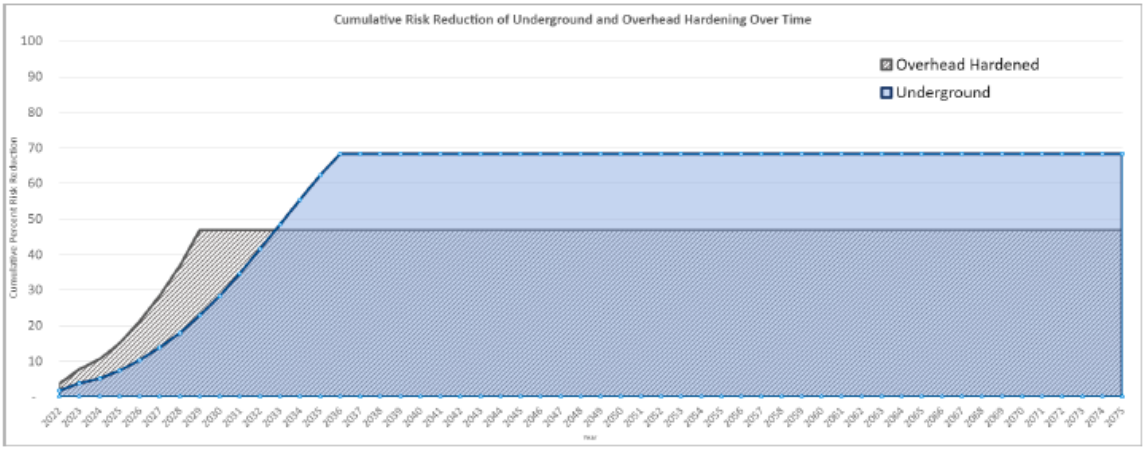


**Figure 6 -** PG&E chart of cumulative risk reduction for undergrounding and overhead hardening over the asset lifetime.

PG&E's approach suffers from the same shortcomings that the SCE analysis does, specifically that the risk elimination from overhead hardening is much larger than anticipated due to CC efficiency overestimation and lack of incorporating Advanced Technologies such as REFCL, EFD, FCP, etc.

### 5.2.3. SCE-23-19. Early Fault Detection Implementation
### SCE-23-15. Continued Monitoring of Fast Curve Settings Impact

In addition to Energy Safety's request that utilities gather outage data regarding EFD and Fast Curve settings, it is also important that they monitor the effectiveness of these technologies in preventing ignitions. In particular it is important to monitor the ignition rates (and causes) for circuits with these technologies enabled in order to compare them directly to circuits that do not have these technologies enabled.

While MGRA did not have the ability to do this with the data provided, SCE did provide ignition information that could be correlated with the presence or absence of these technologies.[72] One of the issues with the analysis is that if ignitions are not listed associated with a particular

[72] DR Response MGRA-SCE-WMP23-DataRequest2-Q3.
Workpaper: MGRA_SCE_WMP23_DR_Ignitions-jwm.xlsx

technique then that could mean 1) the technique is not in wide usage or 2) the technique is widely used but is very effective (or both, these are not mutually exclusive). We suggest that OEIS collect data going forward to allow these two hypotheses to be discriminated.

MGRA analyzed ignition data for years 2022 and 2023 provided through the data request and compared it to the GIS data provided quarterly to Energy Safety. The sample contained a total of 219 ignitions over this period. Of these, 193 had none of the protective measures in place and 26 ignitions did.

**REFCL:** No ignitions were observed, probably to the limited deployment of REFCL.

**EFD:** Only 3 ignitions occurred on EFD-activated circuits. Two of these resulted in CPUC-reportable ignitions. These are shown in the table below and in the workpaper.

| Event ID | Date/Time | CIRCUIT_NAME | REFCL_ACTIVE | EFD_ACTIVE | FC_ACTIVE | PSPS_ACTIVE | Reported | Cause | Size | Outage | Voltage | Detection | Max Gust | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6031 | 2022-10-24 21:07:00 | RED MOUNTAIN | N | Y | N | N | Y | splice/clampconnector | .26-9.99 | NA | 16 kv | Staff | 18.3 | 293SE |
| 6665 | 2023-07-16 01:03:00 | CLARINET | N | Y | Y | N | Y | wire-to-wire | <.25 ac | 129184852 | 16 kV | FA | | |
| 6902 | 2023-09-27 10:33:00 | MUTUAL | N | Y | Y | N | N | | | | | | | |

**Table 14 -** SCE ignitions 2022-2023 with EFD-activated circuits. Details of reported ignitions are provided, including highest wind gust speed within 3 miles of the circuit 1/2 hour prior to ignition.

The Mutual ignition was not reportable, possibly because Fast Curve settings were active and the fire self-extinguished. The Clarinet ignition was due to wire-to-wire contact, for which covered conductor is a full mitigation. It is interesting that the EFD did not detect deterioration for the Red Mountain circuit prior to failure, which does not seem wind induced. Falling conductor protection or Fast Curve may likely have prevented ignition on that circuit. Hence, no significant wildfire occurred between 2022 and 2023 which had EFD enabled that could not have been prevented by other standard mitigations (CC, FC, OCD).

**Fast Curve:** 24 ignitions occurred with fast curve settings enabled between 2022 and 2023. Of these, only 11 had to be reported to the CPUC, meaning that the others did not meet the criteria of a “wildfire”. Hence, these may be possibly self-extinguished.

| Event ID | Date/Time | CIRCUIT_NAM | REFCL_ACTIVE | EFD_ACTIVE | FC_ACTIVE | PSPS_ACTIVE | Reported | Cause | Size | Outage | Voltage | Detection | Max Gust | Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5491 | 2022-05-18 18:30:00 | PINTO | N | N | Y | N | N | | | | | | | |
| 5579 | 2022-06-16 12:38:00 | PRONGHORN | N | N | Y | N | N | | | | | | | |
| 5594 | 2022-06-18 00:03:00 | VICASA | N | N | Y | N | N | | | | | | | |
| 5631 | 2022-06-21 14:04:00 | PLACID | N | N | Y | N | N | | | | | | | |
| 5620 | 2022-06-29 08:57:00 | SERRA | N | N | Y | N | N | | | | | | | |
| 5648 | 2022-07-10 22:33:00 | BRENNAN | N | N | Y | N | N | | | | | | | |
| 5706 | 2022-07-29 19:45:00 | THACHER | N | N | Y | N | N | | | | | | | |
| 5739 | 2022-08-04 19:44:00 | MINT CANYON | N | N | Y | N | N | | | | | | | |
| 5834 | 2022-09-06 19:23:00 | KINSEY | N | N | Y | N | N | | | | | | | |
| 5975 | 2022-10-02 15:27:00 | TRUMP | N | N | Y | N | Y | Conductor/Human Error | <.25 | 127714318 | 16kv | FA | | |
| 6570 | 2023-06-09 22:32:00 | SAN NICHOLA | N | N | Y | N | N | | | | | | | |
| 6620 | 2023-07-03 21:12:00 | HARNAGE | N | N | Y | N | N | | | | | | | |
| 6695 | 2023-07-14 19:04:00 | ROCKHILL | N | N | Y | N | N | | | | | | | |
| 6665 | 2023-07-16 01:03:00 | CLARINET | N | Y | Y | N | Y | wire-to-wire | <.25 ac | 129184852 | 16 kV | FA | | |
| 6663 | 2023-07-20 12:27:00 | WARDELL | N | N | Y | N | Y | vehicle | 0.26-9.99 | | 12 kv | FA | | |
| 6674 | 2023-07-23 09:51:00 | NAPA | N | N | Y | N | Y | balloon | 0.26-9.99 | 129217433 | 12 kv | FA | | |
| 6718 | 2023-08-07 10:51:00 | WHIP | N | N | Y | N | Y | vehicle | <3m | | 12 kv | FA | | |
| 6753 | 2023-08-15 16:56:00 | GALAHAD | N | N | Y | N | Y | insulator/bushing/corrosion | <.25 ac | 129328592 | 16 kv | FA | 15.1 | 404SE |
| 6902 | 2023-09-27 10:33:00 | MUTUAL | N | Y | Y | N | N | | | | | | | |
| 6932 | 2023-10-09 20:57:00 | SHETLAND | N | N | Y | N | Y | connector | 0.26-9.99 | 129637889 | 12 kv | FA | 3.1 | SE933 |
| 6943 | 2023-10-11 14:00:00 | TEST | N | N | Y | N | Y | connector | <0.25 | 129649112 | 16 kv | FA | 12.1 | 608SE |
| 6965 | 2023-10-26 16:44:00 | CONINE | N | N | Y | N | Y | pothead | 0.26-9.99 | 129739482 | 12 kv | PD | 12.6 | SE264 |
| 6962 | 2023-10-29 18:39:00 | ENERGY | N | N | Y | Y | Y | conductor | <0.25 | 129753216 | 16 kv | FA | 35 | 642SE |
| 6966 | 2023-10-30 03:58:00 | FERRARA | N | N | Y | Y | Y | vegetation, quercus, weather | 0.26-9.99 | 129754250 | 12 kv | FA | 32.9 | SE106 |

**Table 15 -** SCE ignitions 2022-2023 with FC-activated circuits. Details of reported ignitions are provided, including for some ignitions highest wind gust speed within 3 miles of the circuit one half hour prior to ignition.

Of these ignitions: Clarinet was wire-to-wire, and also had EFD enabled, but would have been mitigated by covered conductor. Three fires were due to human error and to vehicle collisions, which while generally hard to mitigate occur only randomly in terms of high fire risk weather. A balloon and a wire-to-wire ignition were also observed, both of which are effectively mitigated by covered conductor. Four connector and bushing failures were observed, for which EFD and/or falling conductor protection would likely have been effective. A fire due to a pothead failure may have also been detected by EFD. An oak failure under Red Flag warning conditions may have been mitigated with open conductor protection. Vegetation management was overridden in this particular case due to a conservation restriction. This conductor was bare wire, and a fall in caused the conductors to slap together and at least one conductor to break.[73] Ignition was almost inevitable under the instant conditions, whereas probability would have been reduced with covered conductor in conjunction with open circuit detection.

[73] DR Response MGRA-SCE-WMP25-DataRequest6-Q1.

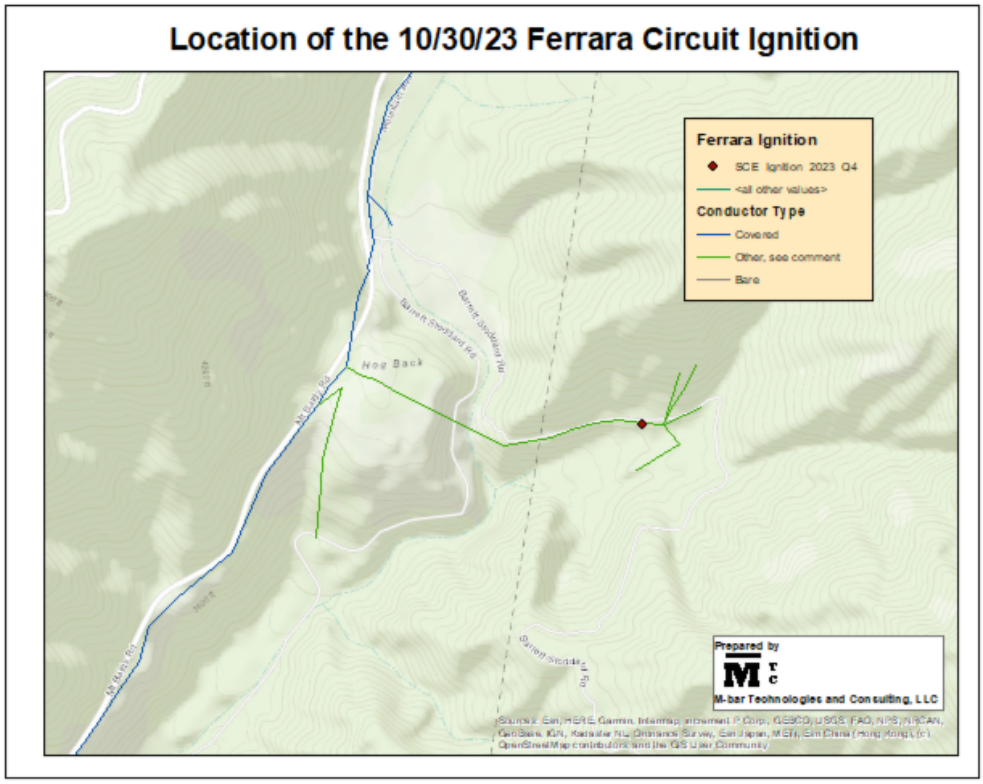


**Figure 7 -** The 10/30/2023 ignition on the Ferrara circuit was caused by an oak under a conservation restriction during a RFW event. The segment impacted by the oak fall-in was bare wire.

Additionally, PSPS was active in the SCE service area during this time, and had it been applied to this area the ignition would not have occurred. The maximum wind gust measured within 4 miles of the ignition point within ½ hour of the oak fall-in was 32.9 mph, below PSPS thresholds.

In general, two years passed without a reportable ignition in the SCE service area that would not have been potentially mitigated by the combination of covered conductor, EFD, open conductor protection and/or REFCL. This underlines the importance of expanded advanced technology programs including REFCL.

#### 5.2.3.1. SDGE-23-10: Early Fault Detection Implementation
#### SDGE-23-11: Changes to Scope of Falling Conductor

MGRA has performed a similar analysis for SCE's 2022-2023 ignition data and is presenting it in the same section for comparison. This was obtained in a data request from SDG&E.[74] SDG&E lists 21 ignitions in this period.

Two observations are immediately apparent from SDG&E's data. First, there were no ignitions occurring when PSPS was activated. Mostly this was due to the weather and lack of PSPS conditions. More noteworthy is that SDG&E did not have FCP active on any of the circuits that had ignitions. It is unknown whether SDG&E avoided ignitions because of this technology or whether it has failed to implement it widely enough to make a difference.

Of the two circuits on which EFD was activated, one had a fire due to a vehicle, and the other due to an animal, neither of which would be expected to have been anticipated by EFD. Of the listed ignitions, six were due to animal contact and three to balloon contact, both of which are effectively mitigated by covered conductor. Two ignitions were caused by vegetation contact, also very well mitigated by covered conductor except in the case of tree fall-in, in which case FCP could be effective. Four cases of ignition caused by conductor/splice failure could also have been addressed by FCP had it been active. In all of the ignitions listed by SDG&E, all may have been plausibly prevented by a combination of covered conductor, falling conductor protection, EFD, and possibly sensitive fault settings. According to IOU SME analysis, vehicle collisions are the most challenging to mitigate, but they are rare and uncorrelated with potentially dangerous fire weather.

#### 5.2.3.2. ACI PG&E-23-14 – Effectiveness Analysis for EPSS Including Implementation of DCD

In this ACI, Energy Safety requested that PG&E an evaluation of DCD including:

*"• Evaluation of effectiveness based on EPSS outage causes in relation to avoided ignitions.*

*• Number of outages and outage frequency that occurs on circuits with DCD implemented.*

[74] DR Response MGRA-SDGE-2025WMP-02_Question 12,
Workpaper SDGE Response MGRA-SDGE-2025WMP-02_Question 9,12,13-AT-Ignitions-JWM.xlsx

*• PG&E's methodology for determining effectiveness for DCD, including ignitions that have occurred when each is implemented.*

*• Measures to alleviate any associated reliability and safety impacts PG&E has observed since implementation of DCD."*[75]

PG&E responded that : "*During 2023, two ignitions occurred where DCD was enabled. However, DCD settings mitigated at least 17 events that likely would have resulted in an ignition had DCD not been enabled. These 17 events are a subset of the overall 332 DCD outages where fault types such as wire on ground or vegetation into line were observed which could have led to an ignition*."[76]

MGRA tried to obtain and validate this data but was only partially successful due to PG&E's assertion that certain key attributes of outages, ignitions, and wires down were sensitive (such as times, exact cause, dates) and redacted these from data provided to MGRA. MGRA notes that there were 11, not 2 DCD related ignitions reported in data it received, though only 4 of these were reported in the HFTD. These were cross-referenced with PG&E wire down data, and only one of these four occurred in an area which had a wire down in 2023 (dates were not provided), though the geographic match is not certain. MGRA is requesting more data from PG&E regarding this issue but it may not be received prior to filing deadline. MGRA requests that Energy Safety follow up on this data and ascertain whether any PG&E DCD ignitions represent failures of the DCD to mitigate ignitions from downed conductors.

Nevertheless, it is encouraging that PG&E has expanded its DCD protection to 17,000 circuit miles in 2023,[77] and that this is has been effective in preventing ignitions. Naively using PG&E's numbers, this protection was effective in 17 out of 19 instances, or approximately 90%. Energy Safety at this point should ascertain what the effectiveness is for its combination with other mitigations, particularly covered conductor, but also EFD (which might detect incipient splice degradation), and potentially REFCL (if these technologies are compatible).

[75] PG&E Update; p. 88.
[76] Id, p. 89.
[77] Id.

**Recommendations:**

- Utilities should add columns to their ignition data indicating which mitigations were active.
- Utilities should be required to collect data indicating that a mitigation was effective in preventing a risk event from becoming a wildfire. Examples include vegetation found to be in contact with covered lines, wires down with FCP/Fast Circuit/REFCL, etc. This will not be an inclusive record because many "near miss" events will be undetectable (i.e. wire slap, etc.)
- Energy Safety should require that utilities expand their Advanced Technologies program and keep projects in scope unless a circuit is due for imminent undergrounding (within two years).
- PG&E should be specifically required to provide more information regarding ignitions and averted ignitions under DCD, as well as false triggers resulting in customer outages.

## 5.3. SDG&E

### 5.3.1. SDGE-23-02: Calculating Risk Scores Using Maximum

SDG&E is currently reviewing its process for risk calculation. For its next version of WiNGS-Planning, SDG&E is looking at incorporating elements of its WiNGS-Ops model as one option, the other implementing probability distributions using the existing annual FireCast model output.[78] MGRA has long maintained that the dependence of catastrophic utility wildfire on extreme wind events has been ignored in IOU planning models, since these models have historically averaged over annual histories, which washes out contributions from areas where catastrophic fire winds are most likely to occur. SDG&E added a "hack" to help correct this bias in its last version of its planning model,[79] which is helpful, but SDG&E's WiNGS-Ops model uses actual real-time weather information to estimate risk areas and therefore lacks the bias found in planning models. (In fact, all utility operational models use real time weather information that accurately represents high-risk wind areas.) Incorporation of WiNGS-Ops elements would be helpful in eliminating wind bias.

[78] SDG&E Update; p. 43.
[79] MGRA 2023 WMP Comments; p. 43.

**Recommendations:**

- SDG&E should favor incorporating elements of its WiNGS-Ops model into WiNGS-Planning if it is feasible to do so in order, among other things, to accurately represent areas where dangerous fire winds are likely to occur.

### 5.3.2. SDGE-23-06: Demonstration of Proper Decision Making for Selection of Undergrounding Projects

SDG&E notes that its current wildfire mitigation strategy is heavily reliant on PSPS and situational awareness.[80] Nevertheless, they claim that with hardening done to date they have been able to achieve 98% risk reduction.[81] To eliminate the residual 2% risk and reduce PSPS reliance, SDG&E proposes deploying 1,500 miles of strategic undergrounding and 370 miles of covered conductor by 2032.[82] At $3 million per mile, SDG&E's elimination program cost for this portion of its mitigation program will be $4.5 billion, working out to an average of $1,500 per customer for SDG&E's 3 million customers, all to eliminate residual 2% risk. SDG&E also wishes to reduce PSPS risk, which is important, but as shown in Sections 4.2.2 and 4.2.3, a considerable portion of the cost of eliminating PSPS risk via undergrounding comes from circuits where there are relatively few customers per mile of circuit. This should weigh heavily against the choice of undergrounding over covered conductor for these circuits.

The impact of undergrounding on reduction of PSPS risk is also quite slow, since all circuit segments must be undergrounded before benefits are seen. This is aptly demonstrated by SDG&E's Figure 8,[83] which shows projected PSPS impact reduction with and without undergrounding:

[80] SDG&E Update; p. 54.
[81] Id.; p. 55.
[82] Op. Cite.
[83] Id; p. 59.

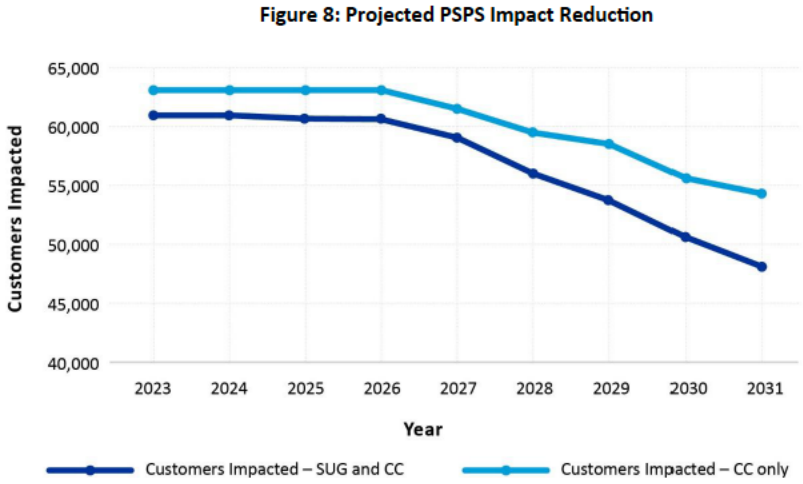


**Figure 8 -** SDG&E's Figure 8, showing comparative PSPS impact reduction with and without undergrounding.

Note that SDG&E's graph's y axis shows a relatively narrow range of customers impacted. In fact, the difference in PSPS impact due to SDG&E's planned undergrounding program would provide only a 18% improvement over covered conductor alone by 2031.[84] Hence, reduction of PSPS impacts provides a weak support for a very expensive undergrounding program.

SDG&E also uses an absurdly low value for the effectiveness of covered conductor: 64%.[85] SCE, with a similar service area and vastly more experience with covered conductor claims 72%, and MGRA's analysis of SCE's field data reveals the number is actually closer to 85%. Using a higher value for covered conductor mitigation efficiency would cause SDG&E's WiNGS-Planning decision tree to choose significantly more covered conductor. SDG&E's RSE undergrounding threshold used in its decision tree is set by requiring a global risk reduction target.[86] If covered conductor provides higher risk reduction this would push the undergrounding RSE threshold higher, effectively including more covered conductor in SDG&E's optimized solution.

SDG&E recognizes that modifications to its covered conductor efficiency may be warranted:

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[84] Differential of the two curves: (54k – 48k) / 54k = 18%
[85] Id.
[86] A.22-05-015/6; DIRECT TESTIMONY OF THE MUSSEY GRADE ROAD ALLIANCE SAN DIEGO GAS AND ELECTRIC COMPANY 2024 GENERAL RATE CASE - ERRATA 2; Dated: March 27, 2023; Revised; June 8, 2023; pp. 46-51. (MGRA SDG&E GRC Testimony) https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2205015/6221/511023310.pdf

"*a)SDG&E is already considering the adoption of an alternative efficacy percentage for covered conductor. Prior to accepting an alternative efficacy percentage, efficacy studies for covered conductor with and without mixed mitigations must undergo review and approval by subject matter experts across various internal teams. Combined mitigation study results are expected this year. In turn, SDG&E expects to make a decision on updating covered conductor efficacy based on these results. The general consensus is that the updated covered conductor efficacy score will be implemented in the WiNGS Planning model by the end of 2024 or early 2025. SDG&E currently expects that these new efficacy studies will be incorporated into SDG&E's 2026-2028 WMP.*

*b) Efficacy changes in the WiNGS model are heavily scrutinized as they must be supported by data from trusted studies. Furthermore, changing efficacy rates may have a direct impact on the mitigation selection process and strategy. Prior to adoption of new efficacy rates, SDG&E must have complete confidence in the study results to avoid mitigation pivots, which can be costly in terms of wasted design costs and delayed deployment of grid hardening mitigations.*"[87]

It must be pointed out that the cost of mitigation pivot changes is dwarfed by the change in the mitigation itself if undergrounding is being over-prescribed, which it undoubtedly is if the covered conductor risk mitigation efficiency is as underestimated as it would appear to be.

Finally, Energy Safety has mandated that SDG&E: "*Demonstrate adequate risk reduction for any areas planned for undergrounding via interim mitigation strategies, accounting for all ignition risk drivers*."[88] The only mitigation strategies SDG&E discusses are PSPS and circuit settings, and these present risks as well as mitigations. SDG&E should instead be discussing its deployment of advanced technologies, such as Downed Conductor Detection and EFD, but instead seems to be sidelining these programs.[89]

In conclusion, SDG&E is not making adequate efforts to show that its choice of undergrounding is reasonable, and the WMP should not be approved until this is remedied.

[87] DR Response CalPA-4.6
[88] Op. Cite; p. 53.
[89] Section 4.1.1

**Recommendations:**

- SDG&E should use a higher and more reasonable value for covered conductor mitigation efficiency.
- If new SDG&E estimates show major changes in mitigation choices, these should, so far as it is practical, be integrated into short-term planning.
- SDG&E should deploy advanced technology on circuits that will not be undergrounded within the next two years.
- SDG&E should be discouraged from choosing undergrounding to eliminate PSPS risk for circuits which would have an inordinately high cost per customer minute PSPS.

### 5.3.3. SDGE-23-08: Continuation of Grid Hardening Joint Studies

#### 5.3.3.1. SDG&E's predicted rate of covered conductor efficiency degradation over time is erroneous

SDG&E states that:

"*While a covered conductor will replace aging equipment in the short term, the covered conductor itself will age and degrade, reducing the effectiveness of the original installation over time. To address this issue, previous studies on the effectiveness of traditional (bare conductor) hardening were used to estimate the effectiveness of covered conductors on equipment failure risk drivers over time. As shown in Figure 12, traditional hardening had an estimated effectiveness of approximately 65% in year one, but that effectiveness steadily decreased over time and is now calculated as 32% effective*."[90]

SDG&E uses its observations regarding hardening to assert that they expect a *"decrease in covered conductor efficacy from 78% in year one to 65% in year 10*."[91] SDG&E shows this dependency in its Figure 12:

[90] SDG&E Update; p. 90.
[91] Id.

**Figure 12: Hardening Efficacy Over Time**

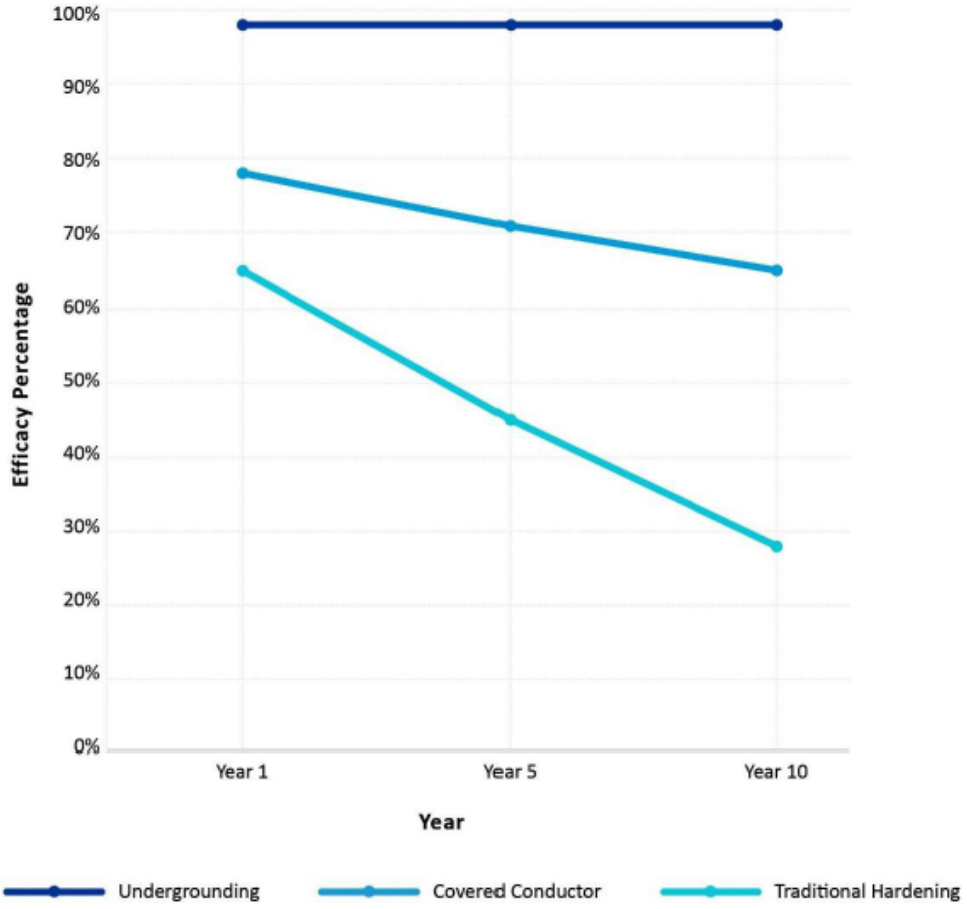


**Figure 9 -** SDG&E Figure 12, purporting to show the decrease in hardening efficiency over time for coveredd conductor and for traditional hardening. MGRA analysis shows that this graph is in error.

MGRA was able to obtain the data that SDG&E used to derive its estimates and SDG&E's calculations.[92] As MGRA shows in its modified spreadsheets (SDGE Response MGRA-SDGE-2025WMP-04_Q2.1-2022-jwm.xlsx), it appears that the root of SDG&E's result is mathematical and statistical error.

[92] DR Response MGRA-SDGE-2025WMP-04-Q2,
MGRA Workpapers:
SDGE Response MGRA-SDGE-2025WMP-04_Q2.1.xlsx
SDGE Response MGRA-SDGE-2025WMP-04_Q2.2.xlsx
SDGE Response MGRA-SDGE-2025WMP-04_Q2.1-2022-jwm.xlsx

SDG&E's Q2.1 spreadsheet contains an analysis of outage rates before and after hardening in 2022, while SDG&E's Q2.2 spreadsheet contains an analysis of outage rates before and after hardening in 2019. In the 2019 study, SDG&E shows that the fault rate for hardened lines is 44.5% lower than for unhardened (Q2.2, Tab Summary, Line 401). In the 2020 study, SDG&E shows that the ratio of fault rates for hardened lines is only 27.5% lower than for unhardened lines. SDG&E attributes this difference to degradation occurring that occurs after hardening.

SDG&E's approach is erroneous. As can be seen from their data, the 2019 study is based on 396 hardening projects whereas the 2022 study is based on 733 projects, so the sample being studied is entirely different. More important, though, is SDG&E's determination of the rates of outage per 100 miles for unhardened and unhardened lines in both samples. These give:

| Year | Unhardened Outage Rate | Hardened Outage Rate | Reduction |
|---|---|---|---|
| 2019 | 9.23 | 5.12 | 44.5% |
| 2022 | 4.90 | 3.55 | 27.5% |

**Table 16 -** SDG&E outage rates for hardened and unhardened circuits per year per 100 miles in 2019 and in 2022.[93]

It is immediately apparent that **both** the hardened and unhardened outage rates were reduced substantially between 2019 and 2022, with the reduction being somewhat more pronounced for unhardened lines. A major lowering of outage rates is not consistent with the hypothesis of line degradation, which should see outage rates increase on both hardened and unhardened circuits. A number of known SDG&E activities could account for the overall lower outage rates, including:

- PSPS – will reduce the number of outages during high wind events, which would ordinarily cause a higher number of outages.
- Vegetation management – SDG&E's enhanced tree trimming program substantially reduced tree-related outages.

But why would the unhardened outage rate be reduced *more* than the hardened rate? Most likely this is due to "survivor bias". It is likely that "bad" circuits with high outage rates are

[93] Id.

prioritized for hardening by SDG&E. Once a circuit is hardened, it is removed from the pool of "unhardened" circuits, and its outage history is set to zero, and it is added to the pool of "hardened" circuits. Over time, this will reduce the overall rate of outages for unhardened lines.

The best way to determine degradation over time is to look at the circuit behavior over time and see if outage rates increase. SDG&E's data sets go back almost ten years making such a study possible. Using SDG&E's data, an analysis was performed in which faults per year per circuit were summed up over all hardened circuits and binned for the year since the circuit was hardened. This was performed independently for the 2019 and 2022 data sets. The results are below:

2019 DATA:

| Year post-hardening | Circuits | Sum of faults/year | Avg faults/yr-circuit |
|---|---|---|---|
| 0 | 60 | 0.0000 | 0.0000 |
| 1 | 58 | 2.5982 | 0.0448 |
| 2 | 53 | 3.9424 | 0.0744 |
| 3 | 59 | 2.4562 | 0.0416 |
| 4 | 86 | 5.4959 | 0.0639 |
| 5 | 46 | 0.9665 | 0.0210 |
| 6 | 26 | 0.7789 | 0.0300 |
| 7 | 5 | 0.1304 | 0.0261 |
| 8 | 1 | 0.0000 | 0.0000 |

2022 DATA:

| Year post-hardening | Circuits | Sum of faults/year | Avg faults/yr-circuit |
|---|---|---|---|
| 0 | 10 | 0.00000000 | 0 |
| 1 | 57 | 0.80573951 | 0.014135781 |
| 2 | 43 | 0.81821045 | 0.01902815 |
| 3 | 50 | 1.58228440 | 0.031645688 |
| 4 | 54 | 3.36767542 | 0.06236436 |
| 5 | 45 | 2.87462699 | 0.0638806 |
| 6 | 50 | 4.59985158 | 0.091997032 |
| 7 | 56 | 2.99551559 | 0.05349135 |
| 8 | 15 | 0.97724196 | 0.065149464 |

| | | | |
|---|---|---|---|
| 9 | 13 | 1.27211826 | 0.097855251 |
| 10 | 1 | | |

**Table 17 -** Calculation of outage rate per circuit as a function of the age of the circuit segment. The number of circuits of a particular age are counted, and the sum of all outages for circuits of that age is obtained. These are divided to obtain the mean. This is a mean per circuit rather than a mean per mile, as shown in the previous examples.[94]

The result shown in the table gives no convincing evidence regarding increase of outage rate with unit time. Relatively high rates are seen in years 2 and 4 in the 2019 data, and 4-9 in the 2022 data. However years 5-7 in the 2019 data give quite low outage rates, making it impossible to characterize the effect of aging on outage rates, mostly due to low statistics and also likely due to systematic changes in the system characteristics as SDG&E undertakes its mitigation process.

#### 5.3.3.2. Outages are not equivalent to wildfire ignitions

It has been well-established that the rates of outages and wires down in covered conductor and compared with bare conductor by multiple IOUs square pretty well with rates predicted with the IOU SMEs.[95] However, as demonstrated in Section 3.2.5 that ignition rates for covered conductor are roughly have the rate predicted by SMEs. Hence, even if the outage rate increases over time as the line degrades (and for which SDG&E has provided no convincing evidence), it is not clear whether the ignition rate would increase at the same rate as the outages. Making this sort of a prediction will require that the IOUs understand the mechanism of the anomaly that suppresses ignition in covered conductor and how that particular immunity will change with time.

#### 5.3.3.3. Combined mitigations are particularly effective for wind-related outage drivers

The great majority of historical catastrophic California utility wildfires have been under "fire weather" conditions during which the probability of certain failure modes increases dramatically, the Dixie and Butte fires being the only notable exceptions.

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[94] Id., SDGE Response MGRA-SDGE-2025WMP-04_Q2.1-2022-jwm.xlsx
Tabs Summary 2019 and Summary 2022.
[95] SDG&E 2022 WMP; Attachment H: Joint IOU Response to Action Statement-Covered Conductor; p. 25-26, (p. 561/699). See Figure 8: SCE Faults on HFRA Circuits.

SDG&E has now estimated the combined efficiency for a number of feasible mitigations: covered conductor, FCP, and EFD.[96] Examining the combined mitigations CC+FCP+EFD, SDG&E finds the following wildfire reduction efficiencies for drivers that are wind-enhanced:

| **Wind-Related Risk Event Driver** | **Wildfire Ignition Reduction Efficiency** |
|---|---|
| Connection device | 96% |
| Wire-to-wire | 100% |
| Vegetation contact | 98% |
| Crossarm damage or failure | 77% |
| Conductor damage or failure | 100% |
| Insulator or bushing damage or failure | 94% |
| Other – Contact | 50% |
| Pole damage or failure | 34% |
| Anchor/guy damage or failure | 30% |
| Unknown | 70% |

**Table 18 -** SDG&E wind-related drivers and SDG&E's estimate of combined mitigation effectiveness.

For a number of wind-related drivers that have been the cause of most catastrophic utility wildfires, SDG&E's estimates that it can reduce the risk to numbers rivaling undergrounding. It predicts less efficiency when dealing with potential catastrophic damage to poles and infrastructure: cross-arm failure, pole failure, and anchor/guy damage. Two points:

1) Currently these are, as far as we know, SME estimates and have not actually been measured in the SDG&E service area because of SDG&E's meager use of covered conductor to date.
2) Catastrophic damage of the type more likely to overwhelm mitigation measures is most likely to occur under conditions of very high winds. Under conditions where such damage is remotely possible, PSPS can also be used as an option. Higher thresholds can be considered, however, in situations where flying debris is less likely to be an issue due to covered conductor resilience.

[96] SDG&E Update; pp. 92-93.

SDG&E calculates the combined efficiency of CC+EFD+FCP at 77%, which is based on the inordinately low value of 64% for covered conductor alone (SCE field data suggests this should be closer to 85%).

**Recommendations:**

- Energy Safety must discard SDG&E's predictions of circuit degradation over time and eliminate all conclusions that SDG&E or other utilities draw from this study or any that are similar.
- When comparing alternative mitigations with undergrounding for mitigation planning, SDG&E should choose an option of combined mitigations (CC+EFD+FCP), plus higher threshold PSPS. SDG&E should also use a value for covered conductor effectiveness that corresponds to SCE field data.
- Energy Safety should task the utilities with developing a science-based model to determine the rate at which ignition mitigation reduced by covered conductor is reduced over time.

## 6. CONCLUSION

While the 2025 WMP Updates may be modest compared to the 2023-2025 WMP issuances, there is much happening at the utilities as the plans are being either implemented or their details finalized. This time period coincides with the CPUC GRC cycle, with PG&E's decided and SDG&E's and SCE's pending, and a considerable amount of spending on mitigation is underway. Primarily, for PG&E and SDG&E, this spending is on undergrounding while SCE is preparing to ramp down its highly successful covered conductor program in order to replace it with its targeted undergrounding program. Consequently, a considerable amount of information relevant to the 2025 WMP updates can be found in these external proceedings, and I have included it and cited it as appropriate.

The most important development is that Southern California Edison is nearing the end game of wildfire mitigation, having hardened most of its HFRA with covered conductor, and on track to finish much of the rest of it with TUG if its application is successful. However, MGRA has shown that SCE's field data indicates a much higher wildfire mitigation effectiveness for covered

conductor – 85% than any of the utilities including SCE have anticipated. This means that not only has SCE reduced its wildfire risk considerably more than it had predicted, it is also possible that if it were to divert 2/3 of its TUG spending to the continuation of its covered conductor program it could have its entire HFRA mitigated by 2028, at a cost of $1 billion less than what it is currently requesting. MGRA is making the case for this in the SCE rate case.

Meanwhile SDG&E and PG&E plow forward with undergrounding programs, at considerable expense. These are hard to justify cost-wise in comparison with covered conductor and advanced complimentary technologies, but in these updates the utilities have tried to include an estimate for conductor aging. While aging will likely have an effect in the long term on covered conductor effectiveness, SDG&E presents calculations that are extreme – and erroneous. Another justification used for undergrounding is that it reduces PSPS. However, data presented by SDG&E shows how slow this process may be, since in order to completely eliminate PSPS all upstream segments must be undergrounded. Additionally, MGRA uses data from undergrounding projects that have been recently completed and that are planned through 2025 to demonstrate the cost inefficiency of protecting customers from PSPS through undergrounding. For many circuit segments, it would be more cost effective (were it possible) to buy $60,000 off-grid solutions for every customer on the circuit than it has been or will be to underground that circuit. In the case of PG&E, this is true of most circuits, and a hypothetical "off-grid" solution could cost less than half of what PG&E is planning to spend on undergrounding through 2025. While such an idea might not currently be practicable, the cost for reducing a PSPS-minute per customer should be a consideration when determining which circuits to underground and which to mitigate with covered conductor.

Regarding risk models, PG&E's WDRM v4 had little technical information provided and was not analyzed in detail by MGRA, aside to note that it appears to have a greatly "flattened" risk buy-down curve – a prediction MGRA made regarding the hazards of using an 8 hour limit for Technosylva fire spread models. This implies greater risk over a greater area, and likely will lead to additional PG&E requests for undergrounding beyond its 10,000 mile plan. SCE is in open defiance of CPUC and OEIS rules regarding risk analysis as it shifts to its consequence-only IWMS model, which ignores the standard definition of risk as probability X consequence. The Commission appears poised to bring SCE to heel with its latest proposed decision in the RDF proceeding. However, with SCE so close to the finish line with its mitigation projects, this may be a moot point

except to capture the residual risk for an HFRA almost fully mitigated by undergrounding, covered conductor, and advanced technologies.

Of particular concern currently is that PG&E and SDG&E in particular are slow-walking their covered conductor deployment and deployment of advanced technologies, particularly in areas which may be undergrounded down the line. This leaves WUI residents at unnecessary risk for a longer period of time as PG&E and SDG&E implement undergrounding, a slow process for reasons both technical and financial. In its 2023 WMP Comments, MGRA explained why it is likely that the extreme costs of undergrounding passed onto customers have had devastating and deadly impacts on some of the poorest and most vulnerable customers.[97] Energy Safety should require a re-evaluation of the covered conductor / undergrounding balance using the higher covered conductor wildfire risk reduction efficiency suggested by MGRA's analysis of SCE's now extensive field data and also ensure that covered conductor analyses are accurately and fully paired with advanced technologies such as REFCL, downed conductor detection, high impedance and fast trip settings, EPSS, Electronic Fault Detection, the choice of appropriate mitigation strategy may shift substantially away from undergrounding toward covered conductor and technology solutions.

Respectfully submitted this 7th day of May, 2024,

By: __*/S/*____***Joseph W. Mitchell, Ph.D.***_____

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on behalf of the Mussey Grade Road Alliance

[97] MGRA 2023 WMP Comments; pp. 79-81.

## 7. SUMMARY OF RECOMMENDATIONS

**Recommendations:**

- Energy Safety should order a re-evaluation of covered conductor wildfire ignition mitigation efficiency that is based on SCE field data.
- Energy Safety should require revised covered conductor wildfire mitigation efficiencies be used in mitigation choices.
- Energy Safety should recommend that advanced technology deployments that have promise to be effective maintain be expanded along with covered conductor deployments, along with all necessary enabling technologies.
- Energy Safety should strongly oppose "default to underground" strategies because of their high costs, long implementation times, and unknown long term efficacies compared to covered conductor and advanced technologies.
- Energy Safety should use the cost per customer served and cost per PSPS minute avoided to identify circuits segments that require additional justification for the choice of undergrounding over other mitigations. In these cases, mitigations could include covered conductor in combination with other mitigations which might involve more aggressive EPSS or PSPS thresholds.
- Energy Safety should note in its findings that in the cases of many circuit segments the cost of undergrounding greatly exceeds what it would cost to build off-grid solutions for all customers served by the circuit. This should be referred to the CPUC for potential actions such as grants or rebates for customers seeking off-grid solutions or backup on high-cost circuits, or other potential actions encouraging off-grid solutions in these areas.
- Energy Safety should require further data from SCE allowing its undergrounding cost per customer to be directly compared with PG&E and SDG&E.
    - CC + DCD + EPSS for all blended history
    - CC + DCD + EPSS + REFCL for all of its service area, incorporating only feasible REFCL implementations
    - CC + DCD + EPSS with CC efficiency given at 85% as consistent with SCE field data.

- PG&E should be required to implement advanced technologies that can benefit residents if the delay in its undergrounding program for a given segment is more than two years.
- PG&E should supply OEIS with undergrounding project plans indicating projects that will either 1) increase the amount of undergrounding on the circuit to over 50% or 2) reduce the overhead line to less than 20 miles. Energy Safety should then order a REFCL/CC++ evaluation for that circuit in comparison to the undergrounding project.
- PG&E should be required quantitative justification that "*REFCL cannot be deployed widescale on PG&E's electric assets*" clearly identifying which circuits it does and does not consider REFCL candidates and why. This should be a condition of approval
- Energy Safety should require PG&E to clarify whether it is using UV inhibitors to prolong the life of its covered conductor and prevent embrittlement. PG&E should be made to clarify whether its covered conductor meets the same standards as that used by SCE and SDG&E. If not it should be required to come up with a remediation plan to move forward with more resilient covered conductor.
- PG&E should be required to explain how its IOPW model avoids or corrects for "PSPS-bias".
- For all EPSS and Fast Curve outage events, Energy Safety should require reporting of data from the weather station nearest the outage, relating the wind gust speed, relative humidity, temperature, and vegetation moisture if available. Fire Potential Index score at the location should also be provided.
- Outage GIS data should be required to report whether the following were active on the circuit: EPSS/Fast Curve circuit protection; downed, fallen or open conductor detection.
- Wire down GIS data should be required to report whether the following were active on the circuit: downed, fallen or open conductor detection
- Ignition GIS data should be required to report whether the following were active on the circuit: EPSS/Fast Curve circuit protection; downed, fallen or open conductor detection. Energy Safety should find that these data elements are not confidential
- Time-dependent risk analysis should take into account all mitigations including EFD and DCD, in addition to factors such as vegetation management, inspections, trip settings, and should account for potential future wildfire impact on circuits.
- Utilities should add columns to their ignition data indicating which mitigations were active.

- Utilities should be required to collect data indicating that a mitigation was effective in preventing a risk event from becoming a wildfire. Examples include vegetation found to be in contact with covered lines, wires down with FCP/Fast Circuit/REFCL, etc. This will not be an inclusive record because many "near miss" events will be undetectable (i.e. wire slap, etc.)
- Energy Safety should require that utilities expand their Advanced Technologies program and keep projects in scope unless a circuit is due for imminent undergrounding (within two years).
- PG&E should be specifically required to provide more information regarding ignitions and averted ignitions under DCD, as well as false triggers resulting in customer outages.
- SDG&E should favor incorporating elements of its WiNGS-Ops model into WiNGS-Planning if it is feasible to do so in order, among other things, to accurately represent areas where dangerous fire winds are likely to occur.
- SDG&E should use a higher and more reasonable value for covered conductor mitigation efficiency.
- If new SDG&E estimates show major changes in mitigation choices, these should, so far as it is practical, be integrated into short-term planning.
- SDG&E should deploy advanced technology on circuits that will not be undergrounded within the next two years.
- SDG&E should be discouraged from choosing undergrounding to eliminate PSPS risk for circuits which would have an inordinately high cost per customer minute PSPS.
- Energy Safety must discard SDG&E's predictions of circuit degradation over time and eliminate all conclusions that SDG&E or other utilities draw from this study or any that are similar.
- When comparing alternative mitigations with undergrounding for mitigation planning, SDG&E should choose an option of combined mitigations (CC+EFD+FCP), plus higher threshold PSPS. SDG&E should also use a value for covered conductor effectiveness that corresponds to SCE field data.
- Energy Safety should task the utilities with developing a science-based model to determine the rate at which ignition mitigation reduced by covered conductor is reduced over time.

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# APPENDIX A - MGRA DATA REQUESTS

**A-1 - PG&E Data Requests**

**PG&E – MGRA – Data Request Response 1**

# 2025 Wildfire Mitigation Plans
# PG&E
# MGRA Data Request No. 1
# March 21, 2024

***GIS Data:***

***Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.***

***Please remove any confidential attributes that may have been added to the requested records.***

MGRA-1-1 Please provide for Asset Point data for Camera, Fuse, Support Structure, and Weather Station.

MGRA-1-2 Provide Asset Line data for Transmission Line (as permitted as non-confidential), Primary Distribution Line, and Secondary Distribution Line.

MGRA-1-3 Provide PSPS Event data. Include Event Log, Event Line, Event Polygon data. Please exclude customer meter data. Provide all PSPS Event Asset Damage data including photos.

MGRA-1-4 Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

MGRA-1-5 Under Initiatives, please provide Grid Hardening data, including Hardening Log, Hardening Point, and Hardening Line data. Inspection data is not requested at this time.

MGRA-1-6 Under Other Required Data, please provide Red Flag Warning Day polygon data.

MGRA-1-7 Please provide a layer indicating calculated circuit-level risk using the methodology presented in the WMP.

a. If independent probability and consequence layers exist, please provide these independently as well.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_008-Q001 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_008-Q001 | | |
| Request Date: | March 21, 2024 | Requester DR No.: | MGRA-PGE-WMP23_DataRequest1 |
| Date Sent: | April 5, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

*GIS Data:*

*Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.*

*Please remove any confidential attributes that may have been added to the requested records.*

**QUESTION 001**

Please provide for Asset Point data for Camera, Fuse, Support Structure, and Weather Station.

**GENERAL STATEMENT REGARDING RESPONSES TO QUESTIONS 1 THROUGH 6**

In response to questions 1 through 6 of this set of data requests, PG&E is providing non-confidential data from the 2023 Office of Energy Infrastructure and Safety (Energy Safety) Geographic Information System (GIS) Data Standard submission, as instructed by the requesting party. Due to the high volume of records in our submission (approximately 13.5 million records each quarter), individual record review for confidential data is neither feasible nor practical. The feature classes and related tables included in the submission are not static and change each quarter. Additionally, the interconnected aspect of feature class data and the geospatial representation of the data creates complexities in identifying the confidentiality of individual records and introduces additional risk for error. PG&E is applying confidentiality designations at the feature class and field level, dependent on the subject data, to help mitigate against the risk of mislabeling individual records. Batch analysis was used to identify non-confidential records. PG&E respectfully requests that MGRA use this data for internal purposes only and restrict access to a need-to-know basis.

**ANSWER 001**

In response to this request, PG&E is providing Camera and Weather Station data, as delivered in the 2023 Energy Safety GIS Data Standard Submissions. PG&E is also providing non-confidential data from the Support Structure feature class. As requested,

PG&E is not providing data for the Fuse feature class as this data is confidential critical energy infrastructure information (CEII).

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_008-Q001Atch01.zip*," for the data provided in response to this data request.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_008-Q002 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_008-Q002 | | |
| Request Date: | March 21, 2024 | Requester DR No.: | MGRA-PGE-WMP23_DataRequest1 |
| Date Sent: | April 5, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

*GIS Data:*

*Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.*

*Please remove any confidential attributes that may have been added to the requested records.*

**QUESTION 002**

Provide Asset Line data for Transmission Line (as permitted as non-confidential), Primary Distribution Line, and Secondary Distribution Line.

**ANSWER 002**

In response to this request, PG&E is providing non-confidential data for the Primary and Secondary Distribution Line Feature Classes, as delivered in the 2023 Energy Safety GIS Data Standard Submissions. As requested, PG&E is not providing the Transmission Line feature class because it is confidential CEII.

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_008-Q001Atch01.zip*," for the data provided in response to this data request.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_008-Q003 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_008-Q003 | | |
| Request Date: | March 21, 2024 | Requester DR No.: | MGRA-PGE-WMP23_DataRequest1 |
| Date Sent: | April 5, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

*GIS Data:*

*Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.*

*Please remove any confidential attributes that may have been added to the requested records.*

**QUESTION 003**

Provide PSPS Event data. Include Event Log, Event Line, Event Polygon data. Please exclude customer meter data. Provide all PSPS Event Asset Damage data including photos.

**ANSWER 003**

In response to this request, PG&E is unable to provide Public Safety Power Shutoff (PSPS) Event data for the Quarter (Q)1, Q2, and Q3 2023 submissions as no PSPS Events took place those quarters. Two PSPS events occurred during the third quarter in 2023. As requested, our non-confidential data is included in this response.

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_008-Q001Atch01.zip*," for the data provided in response to this data request.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_008-Q004 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_008-Q004 | | |
| Request Date: | March 21, 2024 | Requester DR No.: | MGRA-PGE-WMP23_DataRequest1 |
| Date Sent: | April 5, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

*GIS Data:*

*Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.*

*Please remove any confidential attributes that may have been added to the requested records.*

**QUESTION 004**

Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

**ANSWER 004**

In response to this request, PG&E is providing non-confidential data for the Wire Down, Ignition, Unplanned Outage, and Risk Event Asset Log feature classes, as delivered in the 2023 Energy Safety GIS Data Standard Submissions. Energy Safety changed its schema for version 3.1 of the Data Standard and combined all Outage feature classes into a single feature class.

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_008-Q001Atch01.zip*," for the data provided in response to this data request.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_008-Q005 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_008-Q005 | | |
| Request Date: | March 21, 2024 | Requester DR No.: | MGRA-PGE-WMP23_DataRequest1 |
| Date Sent: | April 5, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

*GIS Data:*

*Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.*

*Please remove any confidential attributes that may have been added to the requested records.*

**QUESTION 005**

Under Initiatives, please provide Grid Hardening data, including Hardening Log, Hardening Point, and Hardening Line data. Inspection data is not requested at this time.

**ANSWER 005**

In response to this request, PG&E is providing non-confidential data for the Grid Hardening Point and Grid Hardening Line feature classes, as delivered in the 2023 Energy Safety GIS Data Standard Submissions. Energy Safety changed its schema for version 3.1 of the Data Standard which removed the Grid Hardening Log feature class.

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_008-Q001Atch01.zip*," for the data provided in response to this data request.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_008-Q006 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_008-Q006 | | |
| Request Date: | March 21, 2024 | Requester DR No.: | MGRA-PGE-WMP23_DataRequest1 |
| Date Sent: | April 5, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

*GIS Data:*

*Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.*

*Please remove any confidential attributes that may have been added to the requested records.*

**QUESTION 006**

Under Other Required Data, please provide Red Flag Warning Day polygon data.

**ANSWER 006**

In response to this request, PG&E is providing non-confidential data for the Red Flag Warning Day polygon data for Q2-Q4 2023 feature class as delivered in the 2023 Energy Safety GIS Data Standard Submissions. PG&E is unable to provide the Red Flag Warning Day polygon data for the Q1 2023 submission as there were no Red Flag Warning days to report.

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_008-Q001Atch01.zip*," for the data provided in response to this data request.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_008-Q007 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_008-Q007 | | |
| Request Date: | March 21, 2024 | Requester DR No.: | MGRA-PGE-WMP23_DataRequest1 |
| Date Sent: | April 5, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

*GIS Data:*

*Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.*

*Please remove any confidential attributes that may have been added to the requested records.*

**QUESTION 007**

Please provide a layer indicating calculated circuit-level risk using the methodology presented in the WMP.

a. If independent probability and consequence layers exist, please provide these independently as well

**ANSWER 007**

The requested circuit segment-level risk model results that correspond with this request for 2023 Q1-Q4 data are the Wildfire Distribution Risk Model (WDRM) v3 results that were provided previously in *WMP-Discovery2023_DR_MGRA_001-Q001* and submitted to the Mussey Grade Road Alliance on April 7, 2023.

In PG&E's 2025 WMP Update, the next iteration of the Wildfire Risk model (WDRM v4) is outlined.[1] At this time the model has recently been internally approved for use in developing future workplans. WDRM v4 influenced workplans will be first introduced in the 2026 WMP.

[1] PG&E 2025 WMP Update (Apr. 2, 2024) at 6-12.

**PG&E – MGRA – Data Request Response 2**

# 2025 Wildfire Mitigation Plans
# PG&E
# MGRA Data Request No. 2
# April 8, 2024

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**Table PG&E-B.1.1-2 Event Probability Model Predictive Performance**

MGRA-2-1 In the table, predictive ability for drivers of ignitions from Primary Conductor (Other, Wire Down) fare relatively poorly compared to regular attributes. Explain why this is so.

MGRA-2-2 Please provide information available on the introduction of "an assessment of dry wind conditions for predicting areas of high consequence".

MGRA-2-3 Will this "dry wind" consequence assessment also be couple to driver weather days also characterized by high winds?

MGRA-2-4 Will the "dry wind" weather days be associated with a probability driver also correlated with "dry wind" weather days and if howso.

**PS-07: Reduce PSPS Impacts to Customers (Section 9.1.5)**

MGRA-2-5 For the 22k to 13k reduction in customers exposed to PSPS events, how much of the reduction is due to 1) undergrounding 2) Motorized Switch Operations (MSOs), and 3) other factors.

MGRA-2-6 Explain how MSO reduces PSPS incidence.

MGRA-2-7 Does MSO also allow for EPSS to be enabled as a function of weather conditions?

MGRA-2-8 If not, is EPSS enabled based on weather conditions and if so how?

**Table ACI-PG&E-23-05-3: Ignition mitigation effectiveness**

MGRA-2-9 For Alt 4 – Covered conductor + EPSS, effectiveness is rated at 78.2%. Alt 9 includes CC + EPSS, but also REFCL and DCD and shows an effectiveness of 65%. How is it possible that adding additional mitigations reduces the effectiveness? If this calculation is in error please provide a corrected value. Perform this as a circuit analysis, not a substation analysis, assuming all circuits are REFCL enabled.

MGRA-2-10 Please provide the above table ACI-PG&E-23-05-3 under the assumption that Covered Conductor wildfire ignition reduction effectiveness is 85.0%, not 66.4%.

**p. 57 - Non-Underground Mitigations**

MGRA-2-11 "*This consideration of location-specific benefits and risks is consistent with the prior decision-tree approach we used to select projects and mitigations for completion in 2023 to 2025*." In what ways does the new calculation differ from the previous decision-tree based analysis and in what ways does it differ?

**Table ACE PG&E-23-06-01**

**TABLE ACI PG&E-23-06-1:**
**SUMMARY OF COMPLETED WORKSHOPS**

| Workshop Title | Date |
|---|---|
| Kickoff and Corrosion Testing | May 3, 2023 |
| Aging Susceptibility | June 12, 2023 |
| New Technologies | July 17, 2023 |
| Maintenance and Inspections | July 24, 2023 |
| Effectiveness Testing | August 7, 2023 |
| New Technologies – EFD | September 20, 2023 |
| New Technologies | November 8, 2023 |

MGRA-2-12 Please provide the slides presented at these workshops, redacted for any confidential material.

**Early Fault Detection/Distribution Fault Anticipation**

MGRA-2-13 Are EFD circuits being deployed on circuits that are being scoped for undergrounding?

MGRA-2-14 What would be the final year that a circuit will be undergrounded that might potentially be implemented with an EFD?

MGRA-2-15 Please provide a list of reportable ignitions for the last two years including the following additional attributes:

**a.** rating system at the time of the ignition (R0, R1, R2, etc)

**b.** whether circuit was implemented with active DCD

**c.** whether circuit was implemented with active EPSS

**d.** whether PSPS was activated anywhere on the system.

MGRA-2-16 Please provide a list of outages for the last two years including the following additional attributes:

**a.** rating system at the time of the outage (R0, R1, R2, etc)

**b.** whether circuit was implemented with active DCD

**c.** whether circuit was implemented with active EPSS

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q001 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q001 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## Table PG&E-B.1.1-2 Event Probability Model Predictive Performance

### QUESTION 001

In the table, predictive ability for drivers of ignitions from Primary Conductor (Other, Wire Down) fare relatively poorly compared to regular attributes. Explain why this is so.

### ANSWER 001

This is a topic of current study. The wire-down model addresses primary wire-down ignitions due to equipment failures and not vegetation related failures. Current investigations are focused on the fact that most failure events occur in coastal areas and ignitions do not follow the same pattern. Work is ongoing to improve the model's ability to represent this spatial pattern.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q002 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q002 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## Table PG&E-B.1.1-2 Event Probability Model Predictive Performance

### QUESTION 002

Please provide information available on the introduction of “an assessment of dry wind conditions for predicting areas of high consequence”.

### ANSWER 002

As indicated on page 10 of the 2025 PG&E WMP Update, one of the key updates to the v4 Wildfire Consequence (WFC) model is the addition of an analog for Red Flag conditions. Red Flag conditions are correlated with fire outcomes. However, due to inconsistencies with the way Red Flag conditions are forecast and reported, a proxy for Red Flag conditions has been developed that is consistent across the territory. The WFC model uses one of the definitions for Red Flag conditions found in Northern California and estimates the so-called “dry wind” conditions from PG&E historic meteorology data.

Dry wind conditions enter as a partition in the baseline consequence model, similar to the way the risk bowtie uses Red Flag warnings. Like Red Flag warnings, dry wind remains correlated with severe fire outcomes. However, the additional explanatory power of dry wind over the predicted destructive condition has proven to be more modest.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q003 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q003 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## Table PG&E-B.1.1-2 Event Probability Model Predictive Performance

### QUESTION 003

Will this “dry wind” consequence assessment also be couple to driver weather days also characterized by high winds?

### ANSWER 003

PG&E interprets this question to be requesting whether the dry wind definition corresponds to days with drier weather and higher winds. In this case, yes, the dry wind definition is based on relative humidity being lower than a threshold and the wind speed being higher than a threshold. In this way, it does serve to identify dry and windy days.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q004 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q004 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## Table PG&E-B.1.1-2 Event Probability Model Predictive Performance

### QUESTION 004

Will the “dry wind” weather days be associated with a probability driver also correlated with “dry wind” weather days and if how so.

### ANSWER 004

PG&E interprets this question to ask whether the dry wind days data, used in the development of Wildfire Consequence, is directly used in the development of the probability of ignition sub models. If so, the response is: no, but the same source meteorological wind and humidity observations used in the development of the dry wind days in the wildfire consequence model are used in the development of the probability of ignition sub-models.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q005 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q005 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## PS-07: Reduce PSPS Impacts to Customers (Section 9.1.5)

### QUESTION 005

For the 22k to 13k reduction in customers exposed to PSPS events, how much of the reduction is due to 1) undergrounding 2) Motorized Switch Operations (MSOs), and 3) other factors.

### ANSWER 005

All of the reduction from 22k to 13k is attributed to undergrounding. As mentioned in section B.2.1.1.3 of the 2025 WMP, the number of undergrounding miles for 2025 was adjusted from 550 miles to 330 miles, therefore the reduction in customer events mitigated corresponds proportionally to the decrease in undergrounding miles completed. No customer events mitigated from Motorized Switch Operations (MSO) replacements are expected in 2025 as the program is expected to be completed in 2024.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q006 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q006 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## PS-07: Reduce PSPS Impacts to Customers (Section 9.1.5)

### QUESTION 006

Explain how MSO reduces PSPS incidence.

### ANSWER 006

For clarification, Motorized Switch Operator (MSO) devices do not reduce "PSPS incidence," but rather the scope of customer impact during a PSPS event.

While MSO devices were intended to serve as a sectionalizing device, PG&E identified MSO devices as an ignition risk when operated while energized due to the chance of arc flashes. As a result, MSO devices are not operated while energized, but must first be de-energized before they can be operated.

If an MSO device is selected for a PSPS event, the next upstream non-MSO device must first be used to temporarily de-energize the MSO device, so that the MSO device can be operated while de-energized. The non-MSO device is closed to energize up to the now-open MSO device.

This procedure eliminates the ignition risk from the MSO device but results in a short duration PSPS outage for the customers located between the MSO device and the upstream device. If the MSO device is replaced with a non-MSO device such as reclosers, subsurface equipment, and other vacuum switch equipment approved for current usage, these short duration outage customers will no longer experience any outage during the PSPS event because the replacement devices can be opened directly without needing to utilize an upstream device.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q007 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q007 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## PS-07: Reduce PSPS Impacts to Customers (Section 9.1.5)

### QUESTION 007

Does MSO also allow for EPSS to be enabled as a function of weather conditions?

### ANSWER 007

Motor Switch Operator (MSO) devices are not capable of fault protection and therefore are not part of EPSS. As part of the MSO initiative in the WMP, these units are being replaced with either a line recloser, an automated switch, or a manual switch. If the line recloser option is selected, those replaced devices will have EPSS capability and be enabled during EPSS weather conditions.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q008 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q008 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## PS-07: Reduce PSPS Impacts to Customers (Section 9.1.5)

### QUESTION 008

If not, is EPSS enabled based on weather conditions and if so how?

### ANSWER 008

Yes, EPSS is enabled and disabled based on forecasted weather conditions. EPSS settings are enabled or disabled based on criteria approved by our Wildfire Risk Governance Steering Committee. This criteria is based on 2km-by-2km model outputs from our Fire Potential Index (FPI) model. PG&E's FPI model is trained to identify localized wildfire risk based on a variety of key risk indicators derived from fire science as well as lessons learned from previous catastrophic wildfires.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q009 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q009 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## Table ACI-PG&E-23-05-3: Ignition mitigation effectiveness

### QUESTION 009

For Alt 4 – Covered conductor + EPSS, effectiveness is rated at 78.2%. Alt 9 includes CC + EPSS, but also REFCL and DCD and shows an effectiveness of 65%. How is it possible that adding additional mitigations reduces the effectiveness? If this calculation is in error please provide a corrected value. Perform this as a circuit analysis, not a substation analysis, assuming all circuits are REFCL enabled.

### ANSWER 009

The reported blended average effectiveness for Alt 9 was based on a study focused on a specific subset of circuits where REFCL could be utilized. This same Alt 9 analysis cannot be performed assuming all circuits are REFCL enabled. The REFCL analysis was applied to substations that met the following requirements:

- Single voltage 3 wire 12 kV substation;
- Minimum of 20 OH miles in HFTD;
- Less than 50% of circuit UG; and
- Less than 20% of circuit past autobanks.

The effectiveness of the other mitigation types (CC Overhead, EPSS, DCD) on the Alt 9 population is less in comparison to that of the full population in the Alt 4 study. Therefore, the overall blended average effectiveness of Alt 9 is lower than Alt 4.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q010 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q010 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## Table ACI-PG&E-23-05-3: Ignition mitigation effectiveness

### QUESTION 010

Please provide the above table ACI-PG&E-23-05-3 under the assumption that Covered Conductor wildfire ignition reduction effectiveness is 85.0%, not 66.4%.

### ANSWER 010

This is not feasible to provide based on the methodology of PG&E's study. Mitigation effectiveness cannot be predetermined (i.e. 85% overall wildfire ignition reduction effectiveness is not an input). Rather, the average effectiveness value of 66.4% is the result of assessing the aggregated mitigation effectiveness against more the 2,000 modes of failure, each with an effectiveness ranging from 0% to 100%.

Much of the benefits of covered conductor overlap the benefits of the operational mitigations, such as EPSS. Because of that, we chose a more granular analysis of outage causes to assign effectiveness to differentiate the multiple combined mitigations so as not to "double count" benefits.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_009-Q012 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_009-Q012 | | |
| Request Date: | April 8, 2024 | Requester DR No.: | MGRA Data Request No. 2 |
| Date Sent: | April 11, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## Table ACE PG&E-23-06-01

**TABLE ACI PG&E-23-06-1:**
**SUMMARY OF COMPLETED WORKSHOPS**

| Workshop Title | Date |
|---|---|
| Kickoff and Corrosion Testing | May 3, 2023 |
| Aging Susceptibility | June 12, 2023 |
| New Technologies | July 17, 2023 |
| Maintenance and Inspections | July 24, 2023 |
| Effectiveness Testing | August 7, 2023 |
| New Technologies – EFD | September 20, 2023 |
| New Technologies | November 8, 2023 |

### QUESTION 012

Please provide the slides presented at these workshops, redacted for any confidential material.

### ANSWER 012

Please reference the table below for presentation materials for the workshops identified.

| Workshop Title | Attachment Name |
|---|---|
| Kickoff and Corrosion Testing<br>Date: May 3, 2023 | WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch01.pdf |
| Aging Susceptibility<br>Date: June 12, 2023 | WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch02.pdf |
| New Technologies<br>Date: July 17, 2023 | WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch03.pdf |
| Maintenance and Inspections<br>Date: July 24, 2023 | WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch04.pdf |
| Effectiveness Testing<br>Date: August 7, 2023 | WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch05.pdf |

| Workshop Title | Attachment Name |
|---|---|
| New Technologies – EFD<br>Date: September 20, 2023 | WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch06.pdf |
| New Technologies<br>Date: November 8, 2023 | WMP-Discovery2023-2025_DR_MGRA_009-Q012Atch07.pdf |

**PG&E – MGRA – Data Request Response 3**

# 2025 Wildfire Mitigation Plans
# PG&E
# MGRA Data Request No. 3
# April 12, 2024

***PG&E Hardening Plans 2023-2025***

*Cal Advocates have submitted two data requests to SDG&E, one concerning hardening activities completed in 2023 (CalPA-3.10) and once concerning planned hardening activity in 2025. (CALPA-3.8). This Data Request asks for some of this data and additional fields from SCE, subject to the following caveats:*
*- PG&E may change the type and scope of its hardening during the course of the project due to unanticipated cost or technical factors*
*- PG&E may remove any field which is confidential.*
*- The term "customers" refers to all customers served by or downstream of the circuit segment*

MGRA-3-1 Please provide a spreadsheet listing (as rows) of every undergrounding project completed during the period of January 1, 2023, through December 31, 2023, including non-WMP projects. For each project, please provide the following information (as columns):

a) Project ID number or other identifier
b) Circuit ID
c) ID of each circuit segment that was entirely undergrounded in the project
d) ID of each circuit segment that was partially undergrounded in the project
e) Total overhead circuit-miles removed
f) Total circuit-miles of underground conductor installed
g) Total miles of trenching required
h) Total electric costs of the project (i.e., costs attributed to your electric facilities), including costs for planning, design, permitting, and construction
i) Total number of customers served by the project
j) Total number of minutes of PSPS experienced by the project circuit segments since 2019.

MGRA-3-2 Please provide a spreadsheet listing (as rows) of every planned undergrounding projected to be fully or partially completed by the end of 2025. This includes work currently underway, completed in 2024, or to be performed in 2024.

a) Order number
b) Program
c) Circuit ID number
d) Circuit-segment name or ID number (if the project affects more than one circuit-segment, please identify each one)
e) Relevant wildfire risk score(s) from the wildfire risk model that you are using to estimate distribution risk in your 2025 WMP Update filing
f) The expected or actual start date of the project
g) The expected completion date of the project

h) Length (in circuit miles) of underground conductor to be installed prior to the end of 2025
j) Length (in circuit miles) of overhead conductor to be permanently removed prior to the end 2025 and replaced by underground conductor (note that this may differ slightly from the previous section due to differing overhead and underground routes)
k) Length (in circuit miles) of overhead conductor to be permanently removed in 2025 and not replaced with covered conductor or undergrounded)
l) Total number of customers served by the project
m) Total number of minutes of PSPS experienced by the project circuit segments since 2019.

***Advanced Technologies***

MGRA-3-3 Are DCD algorithms based on prevailing weather conditions? If so, please describe how sensitivity of DCD is adjusted according to weather.

MGRA-3-4 During todays (April 8th) meet and confer, the ADMS technology was mentioned that could allow much faster switching of fast trip configurations. Please describe ADMS and for what mitigations it could be used, and how much it might help to improve the false trip rate.

***Outages and EPSS***

MGRA-3-5 Please provide the 2022 and 2023 EPSS reliability studies referred to on p. 8 and p. 12 of TN13808_20240402T112956_20240402_PGE_2025_WMPUpdate_R0_ACI2315_Atch01.pdf.

MGRA-3-6 As per discussions in the April 8th meet and confer, please provide distribution unplanned outage data for the 2023 calendar year in any format required to remove transmission data or any other confidential information. This can be unrelated to the format required by the Spatial Quarterly Data Report.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_010-Q001 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_010-Q001 | | |
| Request Date: | April 12, 2024 | Requester DR No.: | 3 |
| Date Sent: | April 17, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## PG&E Hardening Plans 2023-2025

*Cal Advocates have submitted two data requests to SDG&E, one concerning hardening activities completed in 2023 (CalPA-3.10) and once concerning planned hardening activity in 2025. (CALPA-3.8). This Data Request asks for some of this data and additional fields from SCE, subject to the following caveats:*
*-PG&E may change the type and scope of its hardening during the course of the project due to unanticipated cost or technical factors*
*-PG&E may remove any field which is confidential.*
*-The term "customers" refers to all customers served by or downstream of the circuit segment*

### QUESTION 001

Please provide a spreadsheet listing (as rows) of every undergrounding project completed during the period of January 1, 2023, through December 31, 2023, including non-WMP projects. For each project, please provide the following information (as columns):

a. Project ID number or other identifier
b. Circuit ID
c. ID of each circuit segment that was entirely undergrounded in the project
d. ID of each circuit segment that was partially undergrounded in the project
e. Total overhead circuit-miles removed
f. Total circuit-miles of underground conductor installed
g. Total miles of trenching required
h. Total electric costs of the project (i.e., costs attributed to your electric facilities), including costs for planning, design, permitting, and construction
i. Total number of customers served by the project
j. Total number of minutes of PSPS experienced by the project circuit segments since 2019.

**ANSWER 001**

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_010-Q001Atch01.xlsx*,*"* worksheet "Q1 a-h", for a list of PG&E's system hardening projects with undergrounding miles—as well as the Community Rebuild undergrounding miles—completed in 2023. Descriptions of the included fields are as follows:

a) In worksheet "Q1 a-h", please see column A (Order).

b) In worksheet "Q1 a-h", please see column B (Circuit ID), also included are the following related fields:

- Column C (Circuit Name);
- Column D (Circuit Protection Zone (CPZ)).

c) Not applicable. To date, no circuit segment (referred to as a CPZ in this response) has been fully undergrounded. When PG&E undergrounds a CPZ, 100% of the pre-existing overhead circuitry is not replaced because one or more of the following reasons may be applicable:

- Hardening applied to a CPZ can be a hybrid of mitigation methods (overhead hardening, undergrounding, line removal).
- There are portions of the CPZ in locations that are infeasible to replace with underground circuitry (e.g. water crossings).
- Hardening a CPZ may be split into multiple sub-projects, each focused on different portions of the CPZ. Various project specific constraints (e.g. permits) lead to multi-year hardening of a whole CPZ.

d) Please see the response to subpart (c). All circuit segments (referred to as a CPZ in this response) identified in this response are considered partially undergrounded; therefore, that field is not included in the attachment.

e) PG&E interprets the request for "Total overhead circuit-miles removed" as the distance of existing overhead infrastructure that was replaced with underground infrastructure in an undergrounding project.

This information is not provided in this response because PG&E currently does not have complete tabular data to provide the total overhead circuit-miles removed relating to the undergrounding project. This information is actively being consolidated and will be available in PG&E's System Hardening Accountability Report in accordance with the requirements of GRC 23-11-069 (OP 20–23).

f) In worksheet "Q1 a-h", please see column T (UG – 2023 Complete). This includes the undergrounding miles completed in 2023.

In worksheet "Q1 a-h", please see column L (Total Planned UG Miles). This includes the sum of all undergrounding miles planned for the project for all years, including 2023 miles completed and pre- and post-2023, where applicable.

Also provided is mileage for our other system hardening methods (overhead hardening and line removal).

g) Trenching length data is not currently captured; therefore, that field is not provided in the attachment.

h) In worksheet “Q1 a-h”, please see column AA (Total Estimated Actual Cost). PG&E interprets “electric costs” as project costs associated with starting and completing an electric undergrounding project; therefore, both incurred and forecasted costs for the project are included.

i) In worksheet “Q1 i-j,” please see column B (Customer Count – April 2024). PG&E does not currently have a complete mapping of customer counts by undergrounding order (job). PG&E is proving the number of customers associated with a CPZ as of April 2024 where undergrounding work has taken place in 2023.

Note, the customers reported by CPZ are not representative of the customers impacted by a specific undergrounding project.

j) In worksheet “Q1 i-j,” please see columns C and D. PSPS minutes are measured at the customer level, but PG&E does not currently have a completed mapping of customers to undergrounding orders (jobs). PG&E is providing two measures associated with total number of minutes of PSPS experienced by the project CPZs since 2019 where undergrounding work has taken place in 2023:

1. The minutes reported in column C (Sum of PSPS Minutes for Average Customer Outage on CPZ) is a total of the average customer outage duration from events in 2019-2023.
2. The minutes reported in column D (Sum of PSPS Minutes for Maximum Event Duration on CPZ) is a total from events in 2019-2023, measuring the duration from the beginning of the first outage start and concluding with the last outage end.

PG&E points out that the minutes reported in column C may be less than the minutes reported in column D for the following reasons:

- Some customers may experience multiple short-duration outages within the same PSPS event, such as microgrid switching. Column C reports the duration as the sum of these multiple outage durations, while column D calculates the time period between the earliest outage start (among these multiple outages) and the last outage end.
- Customers located on the same CPZ may be restored at different times. This results in the average outage duration reported, in column C, being lower than the duration reported in column D (which uses the restoration time of the last customer as the end time).

Note, the PSPS minutes reported by CPZ is not representative of the outages on a specific portion of that CPZ that is in scope of a specific undergrounding project.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_010-Q002 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_010-Q002 | | |
| Request Date: | April 12, 2024 | Requester DR No.: | 3 |
| Date Sent: | April 17, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## PG&E Hardening Plans 2023-2025

*Cal Advocates have submitted two data requests to SDG&E, one concerning hardening activities completed in 2023 (CalPA-3.10) and once concerning planned hardening activity in 2025. (CALPA-3.8). This Data Request asks for some of this data and additional fields from SCE, subject to the following caveats:*
*-PG&E may change the type and scope of its hardening during the course of the project due to unanticipated cost or technical factors*
*-PG&E may remove any field which is confidential.*
*-The term "customers" refers to all customers served by or downstream of the circuit segment*

### QUESTION 002

Please provide a spreadsheet listing (as rows) of every planned undergrounding projected to be fully or partially completed by the end of 2025. This includes work currently underway, completed in 2024, or to be performed in 2024.

a) Order number

b) Program

c) Circuit ID number

d) d.Circuit-segment name or ID number (if the project affects more than one circuit segment, please identify each one)

e) Relevant wildfire risk score(s) from the wildfire risk model that you are using to estimate distribution risk in your 2025 WMP Update filing

f) The expected or actual start date of the project

g) The expected completion date of the project

h) Length (in circuit miles) of underground conductor to be installed prior to the end of 2025

i) [BLANK]

j) Length (in circuit miles) of overhead conductor to be permanently removed prior to the end 2025 and replaced by underground conductor (note that this may differ slightly from the previous section due to differing overhead and underground routes)

k) Length (in circuit miles) of overhead conductor to be permanently removed in 2025 and not replaced with covered conductor or undergrounded)

l) Total number of customers served by the project

m) Total number of minutes of PSPS experienced by the project circuit segments since 2019.

**ANSWER 002**

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_010-Q002Atch01.xlsx"*, worksheet "Q2 a-k" for a list of PG&E's forecasted undergrounding projects for 2024-2026. Please note that the forecasted miles for 2025 and 2026 have been combined in this report as the projects associated with each of these years are still being finalized. A description of the included fields is as follows:

a) In worksheet "Q2 a-k", please see column A (Order).

b) In worksheet "Q2 a-k", please see column B (Category).

c) In worksheet "Q2 a-k", please see column C (Circuit ID) and column D (Circuit Name).

d) In worksheet "Q2 a-k", please see column E (Circuit Protection Zone (CPZ)).

e) In worksheet "Q2 a-k", please see column H (Applicable Risk Score) and column G (Applicable Risk Model).

f) In worksheet "Q2 a-k", please see column I (Est. Construction Start Date). This date represents the estimated date construction will be initiated on the project, recognizing there are additional phases prior to the construction start (e.g., planning, design, estimating, permitting).

g) In worksheet "Q2 a-k", please see column J (Est. Project End Date). The year included represents when the newly installed undergrounded lines are planned for electrification and the project is considered complete. Since the key criteria for reporting miles as complete is not the construction end date, but the fire risk safety audit completion and electric energization, please note that a project can have a construction end dates at the end of year, but may be associated with the following year given they passed the fire risk safety audit in the later year. This dynamic is common within the year as well.

h) In worksheet "Q2 a-k", please see column M (Total Planned UG Miles). The sum of all undergrounding miles planned for the project for 2024-2026. As noted above the, forecasted miles for 2025 and 2026 have been combined in this report.

i) [Noting that this Data Request skipped subpart (i) and, therefore, no response is included.]

j) PG&E interprets the data requested as the distance of existing overhead infrastructure that was replaced with underground infrastructure in an undergrounding project.

   This information is not provided in this response because PG&E currently does not have complete tabular data to provide the total overhead circuit-miles removed relating to the undergrounding project.

k) In worksheet "Q2 a-k", please see column N (Total Planned Removal Miles). This includes the sum of all Line Removal miles planned for the project for 2024-2026.

As noted above, the, forecasted miles for 2025 and 2026 have been combined in this report.

l) In worksheet “Q2 l-m,” please see column B for data, and see the response to MGRA 010-Question 001 subpart i of this data request for an explanation.

m) In worksheet “Q2 l-m,” please see columns C and D for data. Additionally, please see the response to Request No. 1, subpart (j) of this data request for a further explanation.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_010-Q003 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_010-Q003 | | |
| Request Date: | April 12, 2024 | Requester DR No.: | 3 |
| Date Sent: | April 17, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

***Advanced Technologies***

**QUESTION 003**

Are DCD algorithms based on prevailing weather conditions? If so, please describe how sensitivity of DCD is adjusted according to weather.

**ANSWER 003**

The Downed Conductor Detection (DCD) algorithm and corresponding protective function element is directly tied to EPSS enablement criteria. No additional weather or enablement criteria is applied when enabling DCD.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_010-Q004 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_010-Q004 | | |
| Request Date: | April 12, 2024 | Requester DR No.: | 3 |
| Date Sent: | April 17, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## *Advanced Technologies*

### QUESTION 004

During todays (April 8th) meet and confer, the ADMS technology was mentioned that could allow much faster switching of fast trip configurations. Please describe ADMS and for what mitigations it could be used, and how much it might help to improve the false trip rate.

### ANSWER 004

Advanced Distribution Management System (ADMS) is an operating platform where supervisory control and data acquisition (SCADA), the real-time system network model, and other operational applications are used to monitor and control the grid. The EPSS application within ADMS currently being developed will be used to streamline the routine enablement and disablement of EPSS devices as an operational mitigation to current manual practices. The ADMS EPSS application will not directly impact the way EPSS performs as a protective function and therefore will not have an effect on the false trip rate.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_010-Q005 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_010-Q005 | | |
| Request Date: | April 12, 2024 | Requester DR No.: | 3 |
| Date Sent: | April 17, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## *Outages and EPSS*

### QUESTION 005

Please provide the 2022 and 2023 EPSS reliability studies referred to on p. 8 and p.12 of TN13808_20240402T112956_20240402_PGE_2025_WMPUpdate_R0_ACI2315_Atch01.pdf.

### ANSWER 005

For the narrative associated with PG&E's 2022 EPSS Reliability Study, please reference pdf page 1120 at the following link: https://www.pge.com/assets/pge/docs/outages-and-safety/outage-preparedness-and-support/pge-wmp-r4-010824.pdf

Please also reference "*WMP-Discovery2023-2025_DR_MGRA_010-Q005Atch01.xlsx*" for the 2022 EPSS Reliability Study.

For PG&E's 2023 EPSS Reliability Study, please reference the following attachments:

- *WMP-Discovery2023-2025_DR_MGRA_010-Q005Atch02.pdf*
- *WMP-Discovery2023-2025_DR_MGRA_010-Q005Atch03.xlsx*

**2024 WMP Commitment GM-07 (EPSS Reliability Study): Narrative**

This document serves as a narrative companion to the 2023 EPSS Reliability Study – primarily to provide information on the commitment that isn't appropriate for the excel spreadsheet format.

- Resource Constraints (access issues, staffing numbers, etc.):
  - PG&E has not previously identified resource constraints that prevented it from meeting or exceeding established metrics for Customer Average Interruption Duration Index (CAIDI).
  - PG&E has established a plan to ensure appropriate resources are available to support response to EPSS outages to meet both its response metrics and outage duration metrics.
- PG&E must also provide an updated plan of actions being taken based on the analysis performed in its EPSS reliability impact study to reduce reliability and safety impacts of EPSS:
  - PG&E leverages the information included in the attached 2023 EPSS Reliability Study to inform activities meant to improve reliability for customers experiencing outages on circuits protected by EPSS. PG&E is evaluating operational mitigations executed in 2023 in combination with information in the 2022 and 2023 EPSS Reliability Study to review reliability impacts and potential improvement in support of future mitigation work scoping and further reducing outage activity on EPSS enabled zones.
  - In 2024, PG&E will continue to execute targeted vegetation management work, Vegetation Management for Operational Mitigations (VMOM), intended to reduce the impacts of vegetation caused outages due to increased sensitivity resulting from EPSS enabled devices. Additionally, we will continue to execute our Vegetation Extent of Condition patrols and vegetation management work for EPSS enabled vegetation caused outages to: (1) determine if there are additional vegetation risks upstream and downstream of the fault location; and (2) attempt to remove any identified vegetation.
  - In addition to vegetation management work, PG&E will execute animal mitigation work for EPSS enabled animal caused outages. Animal mitigation may include installation of bird retrofitting, critter guard and additional measures depending on asset configuration.
  - PG&E will continue to leverage EPSS reliability information in support of circuit sectionalization efforts and in 2024 plans to begin installation of FuseSaver equipment with the intent to decrease customer impact from outages on EPSS enabled zones. In addition to wildfire risk, PG&E will assess reliability impact of proposed zones to help inform prioritization.
  - The information included in the 2023 EPSS Reliability Study is also used to help improve our customer communication and engagement at the service point identification level including identification of our highest impacted customers and support offerings available. In 2023, the EPSS program experienced a Customer Average Interruption Duration Index (CAIDI) of 193 minutes, or just over 3 hours.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_010-Q006 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_010-Q006 | | |
| Request Date: | April 12, 2024 | Requester DR No.: | 3 |
| Date Sent: | April 17, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

## *Outages and EPSS*

### QUESTION 006

As per discussions in the April 8th meet and confer, please provide distribution unplanned outage data for the 2023 calendar year in any format required to remove transmission data or any other confidential information. This can be unrelated to the format required by the Spatial Quarterly Data Report.

### ANSWER 006

Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_010-Q006Atch01.xlsx*" for the requested information.

**PG&E – MGRA – Data Request Response 4**

# 2025 Wildfire Mitigation Plans
# PG&E
# MGRA Data Request No. 4
# April 16, 2024

***WDRM v4***

*Cal Advocates have submitted a number of data request referring to WDRM v4.*

MGRA-4-1 Please provide non-confidential versions of any responses to Cal Advocates data requests if the responses to Cal Advocates are confidential.

MGRA-4-2 Please provide a non-confidential version of documentation containing a description of WDRM v4, including testing and validation.

MGRA-4-3 If E3 or another consulting group has analyzed WDRM v4, please provide a non-confidential version of its report.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_011-Q003 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_011-Q003 | | |
| Request Date: | April 16, 2024 | Requester DR No.: | 4 |
| Date Sent: | April 19, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

**SUBJECT WDRM v4**

**QUESTION 003**

If E3 or another consulting group has analyzed WDRM v4, please provide a non-confidential version of its report.

**ANSWER 003**

E3 is currently conducting an independent review of the WDRM v4, which is scheduled to be available by the end of Q2 2024.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_011-Q001 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_011-Q001 | | |
| Request Date: | April 16, 2024 | Requester DR No.: | 4 |
| Date Sent: | April 19, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

**SUBJECT WDRM V4**

**QUESTION 001**

Please provide non-confidential versions of any responses to Cal Advocates data requests if the responses to Cal Advocates are confidential.

**ANSWER 001**

PG&E objects to this request on the grounds that it seeks to impose a continuing discovery obligation on PG&E. Continuing discovery obligations are not permitted under California law. *Biles v. Exxon Mobile Corp.*, 124 Cal.App.4th 1315, 1328 (2004); Code Civ. Proc. § 2030.060(g).

Additionally, PG&E objects to this request on the grounds that it is overbroad and unduly burdensome. PG&E receives an enormous volume of data requests in the window of time between submitting its WMP and the deadline to submit public comments. This burden is exacerbated by the default three business day turnaround period for all responses. Imposing this continuous discovery obligation on PG&E during this period is not tenable. Furthermore, any effort to provide the requested information would be further exacerbated because MGRA has refused to sign a confidentiality or non-disclosure agreement, and providing this information would require manually redacting all confidential information from each response.

PG&E notes that the Public Advocates Office is a government agency that has broad statutory authority that exceeds this single regulatory proceeding and allows the Public Advocates Office to obtain information that exceeds what MGRA, as a private organization, would be able to obtain through this proceeding.

Lastly, MGRA may obtain non-confidential versions of PG&E responses to Cal Advocates data requests at the following website: https://www.pge.com/en/outages-and-safety/safety/community-wildfire-safety-program.html#accordion-6b52828ca7-item-a47a0617be.

If you would like to discuss this request and our response, please do not hesitate to reach out as we are happy to meet and confer on this issue.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_011-Q002 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_011-Q002 | | |
| Request Date: | April 16, 2024 | Requester DR No.: | 4 |
| Date Sent: | April 19, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

**SUBJECT WDRM v4**

**QUESTION 002**

Please provide a non-confidential version of documentation containing a description of WDRM v4, including testing and validation.

**ANSWER 002**

PG&E objects to this request on the grounds that it is overbroad and unduly burdensome to provide what can be interpreted as all "documentation containing a description of WDRM v4." Gathering and providing all "documentation containing a description of WDRM v4" could take many weeks of work and require reviewing many thousands of documents. PG&E also objects to this request on the grounds that it is vague and ambiguous as to what is included in all "documentation containing a description of WDRM v4." PG&E further objects to this request insofar as it seeks information protected by the attorney-client privilege and attorney work product privilege. PG&E also objects to the request on the grounds that it exceeds the scope of this regulatory proceeding, as PG&E's 2025 WMP notes that WDRM v4 has not yet been used for any wildfire mitigation work.

Notwithstanding and without waiving these objections, PG&E responds as follows: we anticipate that WDRM v4 model documentation, including a validation report, will be available by the end of Q2 2024.

**PG&E – MGRA – Data Request Response 5**

# 2025 Wildfire Mitigation Plans
# PG&E
# MGRA Data Request No. 5
# April 25, 2024

MGRA-5-1 Please provide an Excel spreadsheet giving the mapping between PG&E weather station IDs and IDs used by Synoptic for the PG&E mesonet if these IDs are different.

**PG&E – MGRA – Data Request Response 6**

**2025 Wildfire Mitigation Plans**
**PG&E**
**MGRA Data Request No. 6**
**April 30, 2024**

MGRA-6-1 The PG&E response supplied to MGRA in WMP-Discovery2023-2025_DR_MGRA_009-Q015Atch01-IngitionsAT was incomplete and non-responsive because:

a. It contained on ID that could be crossed-referenced to PG&E's reported ignition data base.

b. It contained only ignition date, not ignition time, which makes it impossible to distinguish them, since many ignitions often occur on the same day.

The existing response therefore has not been made usable for any potential investigation regarding cause or whether and is of limited utility.

Please provide an updated version containing standard ignition IDs and times.

**PACIFIC GAS AND ELECTRIC COMPANY**
**Wildfire Mitigation Plans Discovery 2023-2025**
**Data Response**

| | | | |
|---|---|---|---|
| PG&E Data Request No.: | MGRA_013-Q001 | | |
| PG&E File Name: | WMP-Discovery2023-2025_DR_MGRA_013-Q001 | | |
| Request Date: | April 30, 2024 | Requester DR No.: | Data Request #6 |
| Date Sent: | May 1, 2024 | Requesting Party: | Mussey Grade Road Alliance |
| PG&E Witness: | | Requester: | Joseph Mitchell |

**QUESTION 001**

The PG&E response supplied to MGRA in WMP-Discovery2023-2025_DR_MGRA_009-Q015Atch01-IngitionsAT was incomplete and non-responsive because:

a. It contained on ID that could be crossed-referenced to PG&E's reported ignition data base.

b. It contained only ignition date, not ignition time, which makes it impossible to distinguish them, since many ignitions often occur on the same day.

The existing response therefore has not been made usable for any potential investigation regarding cause or whether and is of limited utility.

Please provide an updated version containing standard ignition IDs and times.

**ANSWER 001**

PG&E objects to, and disagrees with, the categorization of its responses to the referenced data requests as being "incomplete and non-responsive." PG&E notes that the requesting party could have participated in the meet and confer process—as the parties have done multiple times in the past—if it was unhappy with the responses provided and PG&E would have done its best to accommodate the requesting party.

a. PG&E objects to subpart (a) on the grounds that it is vague, ambiguous, and confusing. PG&E interprets this subpart as requesting clarification regarding the index number that was included in Column A of "*WMP-Discovery2023-2025_DR_MGRA_009-Q015Atch01.xlsx*." Please note, the index number is the unique identifier for the event in PG&E's ignitions database. The index number represents the year the ignition occurred and its unique identification number (ID). For example, Index "20220142" represents a year 2022 ignition with the unique id of 0142.

b. Please see attachment "*WMP-Discovery2023-2025_DR_MGRA_013-Q001Atch01.xlsx*" for an updated spreadsheet which includes the time the ignition was reported in Column "C." Please note, PG&E is unable to confirm the exact start time of an ignition, however, is providing the timestamp for when the first responder reported the incident.

**PG&E – MGRA – Data Request Response 7**

# 2025 Wildfire Mitigation Plans
# PG&E
# MGRA Data Request No. 7
# May 1, 2024

The PG&E response WMP-Discovery2023-2025_DR_MGRA_013-Q001 contained information that has apparent discrepancies with PG&E's WMP 2025 Update:

MGRA-7-1 The excel spreadsheet WMP-Discovery2023-2025_DR_MGRA_013-Q001Atch01.xlsx contains 11 ignitions in which the circuit was activated with DCD, while only four occurred in the HFTD. PG&E's WMP Update says that only two ignitions occurred. Please explain this apparent discrepancy.

MGRA-7-2 Were any of the verified ignitions on DCD-enabled circuits associated with wire-downs? If so provide the wire-down identifier from PG&E's GIS data, since PG&E included no time data in its wire down data set.

MGRA-7-3 Please provide the full cause (as reported to the CPUC) for the ignitions that occurred on the DCD-enabled circuits.

MGRA-7-4 Please provide detailed cause information for the 17 "near miss" events that PG&E claims may have been averted by DCD activation, as well as outage dates and times.

MGRA-7-5 How many "false" DCD signals were received that resulted in outages in 2023? What were the number of customers and customer minutes affected?

## A-2 SCE Data Request Responses

**SCE – MGRA – Data Request Response 1**

# 2025 Wildfire Mitigation Plans
# SCE
# MGRA Data Request No. 1
# March 21, 2024

***GIS Data:***

***Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q4 2023.***

***Please remove any confidential attributes that may have been added to the requested records.***

MGRA-1-1 Please provide for Asset Point data for Camera, Fuse, Support Structure, and Weather Station.

MGRA-1-2 Provide Asset Line data for Transmission Line (as permitted as non-confidential), Primary Distribution Line, and Secondary Distribution Line.

MGRA-1-3 Provide PSPS Event data. Include Event Log, Event Line, Event Polygon data. Please exclude customer meter data. Provide all PSPS Event Asset Damage data including photos.

MGRA-1-4 Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

MGRA-1-5 Under Initiatives, please provide Grid Hardening data, including Hardening Log, Hardening Point, and Hardening Line data. Inspection data is not requested at this time.

MGRA-1-6 Under Other Required Data, please provide Red Flag Warning Day polygon data.

MGRA-1-7 Please provide a layer indicating calculated circuit-level risk using the methodology presented in the WMP.

a. If independent probability and consequence layers exist, please provide these independently as well.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 1**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 3/21/2024**

**Response Date: 4/4/2024**

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**Question 01:**
Please provide for Asset Point data for Camera, Fuse, Support Structure, and Weather Station.

**Response to Question 01:**
Data is organized by quarter. See this response for all non-confidential data requested.

SCE has provided the following requested data layers deemed non-confidential in the zipped geodatabase, SCE_2023_Q4_NonConfidential.gdb:

- SCE_PrimaryDistributionLine_2023_Q4
- SCE_SecondaryDistributionLine_2023_Q4
- SCE_Camera_2023_Q4
- SCE_WeatherStation_2023_Q4
- SCE_GridHardeningPoint_2023_Q4
- SCE_RedFlagWarningDayPolygon_2023_Q4
- SCE_PspsEventDamagePoint_2023_Q4
- SCE_PspsEventLine_2023_Q4
- SCE_PspsEventPolygon_2023_Q4
- SCE_PspsEventConductorDamageDetail_2023_Q4
- SCE_PspsEventDamagePhotoLog_2023_Q4
- SCE_PspsEventLog_2023_Q4
- SCE_PspsEventOtherAssetDamageDetail_2023_Q4
- SCE_PspsEventSupportStructureDamageDetail_2023_Q4
- SCE_Ignition_2023_Q4
- SCE_UnplannedOutage_2023_Q4
- SCE_WireDownEvent_2023_Q4

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET MGRA-SCE-WMP23_DataRequest1**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 3/21/2024**

**Response Date: 4/4/2024**

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**Question 02:**
Provide Asset Line data for Transmission Line (as permitted as non-confidential), Primary Distribution Line, and Secondary Distribution Line.

**Response to Question 02:**
Refer to MGRA-SCE-WMP23_DataRequest1, Question 01.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET MGRA-SCE-WMP23_DataRequest1**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 3/21/2024**

**Response Date: 4/4/2024**

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**Question 03:**
Provide PSPS Event data. Include Event Log, Event Line, Event Polygon data. Please exclude customer meter data. Provide all PSPS Event Asset Damage data including photos.

**Response to Question 03:**
Refer to MGRA-SCE-WMP23_DataRequest1, Question 01.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET MGRA-SCE-WMP23_DataRequest1**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 3/21/2024**

**Response Date: 4/4/2024**

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**Question 04:**
Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

**Response to Question 04:**
Refer to MGRA-SCE-WMP23_DataRequest1, Question 01.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET MGRA-SCE-WMP23_DataRequest1**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 3/21/2024**

**Response Date: 4/4/2024**

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**Question 05:**
Under Initiatives, please provide Grid Hardening data, including Hardening Log, Hardening Point, and Hardening Line data. Inspection data is not requested at this time.

**Response to Question 05:**
Refer to MGRA-SCE-WMP23_DataRequest1, Question 01.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET MGRA-SCE-WMP23_DataRequest1**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 3/21/2024**

**Response Date: 4/4/2024**

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**Question 06:**
Under Other Required Data, please provide Red Flag Warning Day polygon data.

**Response to Question 06:**
Refer to MGRA-SCE-WMP23_DataRequest1, Question 01.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET MGRA-SCE-WMP23_DataRequest1**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 3/21/2024**

**Response Date: 4/4/2024**

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**Question 07:**
Please provide a layer indicating calculated circuit-level risk using the methodology presented in the WMP.
a. If independent probability and consequence layers exist, please provide these independently as well.

**Response to Question 07:**
Refer to MGRA-SCE-WMP23_DataRequest1, Question 01.

**SCE – MGRA – Data Request Response 2**

# 2025 Wildfire Mitigation Plans
# SCE
# MGRA Data Request No. 2
# April 8, 2024

***5.3 Grid Design, Operations, Maintenance***

MGRA-2-1 Please provide non-confidential versions of the slides and/or report presented at the following IOU Joint studies meetings:
*June 2023 - Distribution Fault Anticipation (DFA) - Discuss implementation strategies, practices and effectiveness*
*July 2023 - Early Fault Detection (EFD) - Discuss implementation strategies, practices and effectiveness*
*August 2023 - Rapid Earth Fault Current Limited (REFCL) - Discuss implementation strategies, practices and effectiveness*

**Figure ACI SCE-23-09: Mitigation Portfolio Comparison**

MGRA-2-2 This figure shows a multi-year comparison of mitigations. For details and methodology presented in this figure, reader is referred to a file in http://www.sce.com/safety/wild-fire-mitigation However, it is not clear which document or section contains this data. Please provide all data and calculation underlying the figure referred to above.

MGRA-2-3 Please provide a list of reportable ignitions for the last two years including the following additional attributes:

**a.** whether circuit was implemented with active Fast Curve Settings

**b.** whether circuit was implemented with active REFCL

**c.** whether circuit was implemented with active EFD

**d.** whether PSPS was activated anywhere on the system.

MGRA-2-4 Please provide a list of outages for the last two years including the following additional attributes:

**a.** whether circuit was implemented with active Fast Curve Settings

**b.** whether circuit was implemented with active REFCL

**c.** whether circuit was implemented with active EFD

**SCE Table 2-11: 2025 Target Changes**

MGRA-2-5 Please provide detailed information as to why the REFCL GFN target had to be reduced by 50% in 2024.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 2**

**To: MGRA**
**Prepared by: Genevieve Cross**
**Job Title: Senior Advisor**
**Received Date: 4/8/2024**

**Response Date: 4/10/2024**

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**Question 01:**
Please provide non-confidential versions of the slides and/or report presented at the following IOU Joint studies meetings:
June 2023 - Distribution Fault Anticipation (DFA) - Discuss implementation strategies, practices and effectiveness
July 2023 - Early Fault Detection (EFD) - Discuss implementation strategies, practices and effectiveness
August 2023 - Rapid Earth Fault Current Limited (REFCL) - Discuss implementation strategies, practices and effectiveness

**Response to Question 01:**

Please see attached for the requested presentations:

WMP Joint IOU CC Working Group - New Tech - Workshop - REFCL - 11082023-v2.pdf

WMP Joint IOU CC Working Group - New Tech - Workshop - EFD - 09082023.pdf

WMP Joint IOU CC Working Group - New Tech - Workshop - 7-17 DFA.pdf

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 2**

**To: MGRA**
**Prepared by: John Rankin**
**Job Title: Senior Manager**
**Received Date: 4/8/2024**

**Response Date: 4/10/2024**

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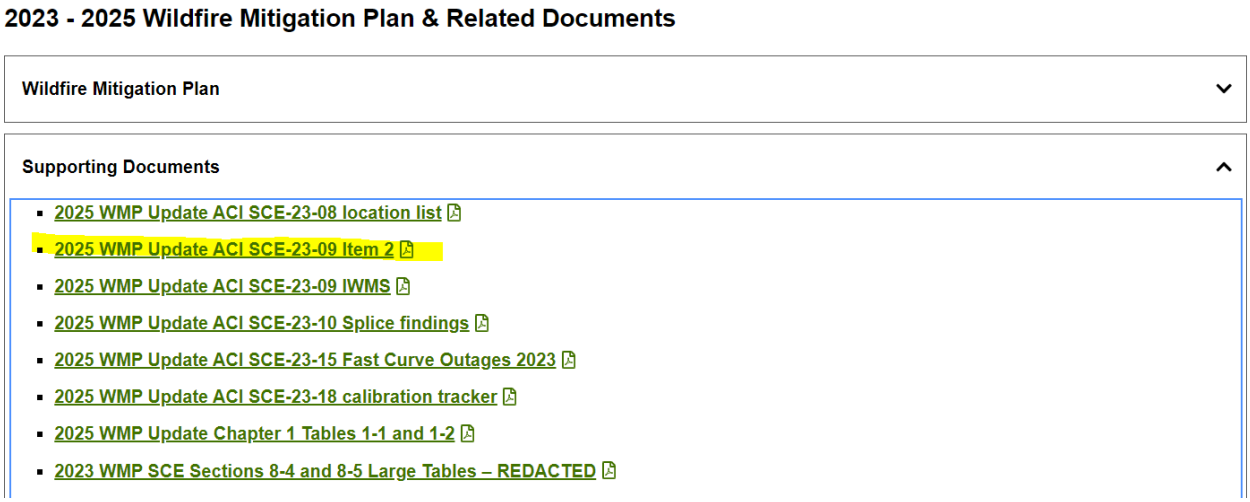
**Question 02:**
This figure shows a multi-year comparison of mitigations. For details and methodology presented in this figure, reader is referred to a file in http://www.sce.com/safety/wild-fire-mitigation However, it is not clear which document or section contains this data. Please provide all data and calculation underlying the figure referred to above.

**Response to Question 02:**

Please see the supporting document titled "2025 WMP Update ACI SCE-23-09 Item 2", which is available at the link reference above on sce.com. SCE also notes that Figure ACI SCE-23-09 is meant to conceptually illustrate the timing considerations for the different mitigations, and does not represent calculated values.

Here is a screenshot for reference:



*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 2**

**To: MGRA**
**Prepared by: Jonathan Brownstein**
**Job Title: Manager**
**Received Date: 4/8/2024**

**Response Date: 4/10/2024**

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**Question 03:**
Please provide a list of reportable ignitions for the last two years including the following additional attributes:
a. whether circuit was implemented with active Fast Curve Settings
b. whether circuit was implemented with active REFCL
c. whether circuit was implemented with active EFD
d. whether PSPS was activated anywhere on the system.

**Response to Question 03:**

Please see the attached Excel sheet and note the following:

For responses to question a, b and c, a "Y" response means that in at least one portion of the circuit, the technology (i.e. Fast Curve, REFCL, or EFD) was installed and enabled. Because REFCL, Fast Curve, and EFD do not necessarily cover or protect an entire circuit, a "Y" response in a column should not be interpreted to mean that the device or protection strategy was active at the specific location of the ignition or outage.

For responses to question d, a "Y" response for the PSPS column means there was a PSPS de-energization in at least one location on SCE's system.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 2**

**To: MGRA**
**Prepared by: Trang L Woo**
**Job Title: Engineer 3**
**Received Date: 4/8/2024**

**Response Date: 4/10/2024**

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**Question 04:**
Please provide a list of outages for the last two years including the following additional attributes:
a. whether circuit was implemented with active Fast Curve Settings
b. whether circuit was implemented with active REFCL
c. whether circuit was implemented with active EFD

**Response to Question 04:**

Please see the attached Excel spreadsheet and note the following:

a "Y" response means that in at least one portion of the circuit, the technology (i.e. Fast Curve, REFCL, or EFD) was installed and enabled. Because REFCL, Fast Curve, and EFD do not necessarily cover or protect an entire circuit, a "Y" response in a column should not be interpreted to mean that the device or protection strategy was active at the specific location of the outage.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 2**

**To: MGRA**
**Prepared by: John Rankin**
**Job Title: Senior Manager**
**Received Date: 4/8/2024**

**Response Date: 4/10/2024**

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**Question 05:**
Please provide detailed information as to why the REFCL GFN target had to be reduced by 50% in 2024.

**Response to Question 05:**

Please see SCE's response to Question #3 of the data request set "CalAdvocates-SCE-2025WMP-04", which SCE responded to on April 10, 2024. In that response, SCE provides detailed information about its proposed reduction to the REFCL target in 2025.

**SCE – MGRA – Data Request Response 3**

# 2025 Wildfire Mitigation Plans
# SCE
# MGRA Data Request No. 3
# April 10, 2024

***GIS Data:***

***Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q3 2023.***

***This data was provided as a data request response in the SCE GRC proceeding A.23-05-010. However, examination of the data shows that the "Outage Date/Time" field contains only date data and no time data. The Q4 data provided in response to MGRA DR1, on the other hand, has correct date/time data. Please reissue the risk event data for 2023 Q1-Q3 with the correct date/time field for Unplanned outages and any other risk data for which time is missing.***

***Please remove any confidential attributes that may have been added to the requested records.***

MGRA-3-1 Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 3**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 4/10/2024**

**Response Date: 4/16/2024**

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**Question 01:**
GIS Data:

Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q3 2023.
This data was provided as a data request response in the SCE GRC proceeding A.23-05-010. However, examination of the data shows that the "Outage Date/Time" field contains only date data and no time data. The Q4 data provided in response to MGRA DR1, on the other hand, has correct date/time data. Please reissue the risk event data for 2023 Q1-Q3 with the correct date/time field for Unplanned outages and any other risk data for which time is missing.

Please remove any confidential attributes that may have been added to the requested records.

MGRA3-1: Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

**Response to Question 01:**
SCE has provided an update to the date/time fields of the following requested data layers deemed non-confidential in the zipped geodatabase, SCE_2023_Q1_NonConfidential.gdb:

- SCE_Ignition_2023_Q1
  - Field(s) Updated: Fire Start Date and Time
- SCE_UnplannedOutage_2023_Q1
  - Field(s) Updated: Outage Start Date and Time, Outage End Date and Time
  - Note: 133 Unplanned Outages were not updated with a time stamp, as they have been further validated and no longer meet SCE's reporting requirements.

SCE has provided an update to the date/time fields of the following requested data layers deemed non-confidential in the zipped geodatabase, SCE_2023_Q2_NonConfidential.gdb:

- SCE_UnplannedOutage_2023_Q2
  - Field(s) Updated: Outage Start Date and Time, Outage End Date and Time
  - Note: 154 Unplanned Outages were not updated with a time stamp, as they have

been further validated and no longer meet SCE's reporting requirements.

SCE has provided an update to the date/time fields of the following requested data layers deemed non-confidential in the zipped geodatabase, SCE_2023_Q3_NonConfidential.gdb:

- SCE_UnplannedOutage_2023_Q3
    - Field(s) Updated: Outage Start Date and Time, Outage End Date and Time
    - Note: 140 Unplanned Outages were not updated with a time stamp, as they have been further validated and no longer meet SCE's reporting requirements.

**SCE – MGRA – Data Request Response 4**

# 2025 Wildfire Mitigation Plans
# SCE
# MGRA Data Request No. 4
# April 12, 2024

***SCE Hardening Plans 2023-2025***

*Cal Advocates have submitted two data requests to SDG&E, one concerning hardening activities completed in 2023 (CalPA-3.10) and once concerning planned hardening activity in 2025. (CALPA-3.8). This Data Request asks for some of this data and additional fields from SCE, subject to the following caveats:*
*- SCE may change the type and scope of its hardening during the course of the project due to unanticipated cost or technical factors*
*- SCE may remove any field which is confidential.*
*- The term "customers" refers to all customers served by or downstream of the circuit segment*

MGRA-4-1 Please provide a spreadsheet listing (as rows) of every undergrounding project completed during the period of January 1, 2023, through December 31, 2023, including non-WMP projects. For each project, please provide the following information (as columns):

a) Project ID number or other identifier
b) Circuit ID
c) ID of each circuit segment that was entirely undergrounded in the project
d) ID of each circuit segment that was partially undergrounded in the project
e) Total overhead circuit-miles removed
f) Total circuit-miles of underground conductor installed
g) Total miles of trenching required
h) Total electric costs of the project (i.e., costs attributed to your electric facilities), including costs for planning, design, permitting, and construction
i) Total number of customers served by the project
j) Total number of minutes of PSPS experienced by the project circuit segments since 2019.

MGRA-4-2 Please provide a spreadsheet listing (as rows) of every planned undergrounding projected to be fully or partially completed by the end of 2025. This includes work currently underway, completed in 2024, or to be performed in 2024.

a) Order number
b) Program
c) Circuit ID number
d) Circuit-segment name or ID number (if the project affects more than one circuit-segment, please identify each one)
e) Relevant wildfire risk score(s) from the wildfire risk model that you are using to estimate distribution risk in your 2025 WMP Update filing
f) The expected or actual start date of the project
g) The expected completion date of the project
h) Length (in circuit miles) of underground conductor to be installed prior to the end of 2025

j) Length (in circuit miles) of overhead conductor to be permanently removed prior to the end 2025 and replaced by underground conductor (note that this may differ slightly from the previous section due to differing overhead and underground routes)
k) Length (in circuit miles) of overhead conductor to be permanently removed in 2025 and not replaced with covered conductor or undergrounded)
l) Total number of customers served by the project
m) Total number of minutes of PSPS experienced by the project circuit segments since 2019.

MGRA-4-3 Regarding ***Redlines to SCE's 2023-2025 Wildfire Mitigation Plan***
The modification to Figure 7-1, Projected Overall HFRA risk shows the residual MARS risk after 2028 increasing from 80 in the 2023-2025 WMP to 150 in the WMP 2025 update. What is the cause of this increase in residual risk?

MGRA-4-4 Regarding **Southern California Edison Company's 2023 Wildfire Mitigation Plan Annual Report on Compliance (ARC) Pursuant to PUC Section 8386.3(c)(1)**
On page 16 in the section "*Re-evaluate existing PSPS windspeed thresholds using engineering-based analysis that considers, among other factors, the effectiveness of covered conductor.*" SCE notes that "*SCE contracted the services of an external vendor to assess the existing PSPS windspeed threshold methodology and to explore a more predictive and data-driven model using asset and equipment failure data to derive the probability of a fault from exposure to wind. The vendor and SCE's subject matter experts concluded that there is an insufficient amount of relevant historical failure data to adequately train an automated model. SCE will evaluate lessons learned from the effort and continue to evaluate alternative windspeed threshold models*."

a. Please provide the document authored by the vendor and any report authored by SCE regarding the third party evaluation of PSPS windspeed thresholds.

b. What data were used for the analysis?

c. Was winter data used for the analysis or was only data occurring during fire season used for the analysis?

d. Was the data used for the analysis inclusive of periods and areas where PSPS was active?

e. Was damage data collected during post-PSPS patrols used as part of the data analysis?

f. Was data prior to 2019 used for the analysis?

MGRA-4-5 Regarding the file provided to MGRA as MGRA_SCE_WMP23_DR_Ignitions in response to MGRA-2-3, please provide a version of this file that:

a. Uses the FIPA ID so that it can be correlated with reportable ignitions

b. Has corrected date/time (the provided data set appears to be using UTC rather than local Pacific time).

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 5 _ D a t a R e q u e s t 4**

**To: MGRA**
**Prepared by: Tram Camba**
**Job Title: Senior Advisor**
**Received Date: 4/12/2024**

**Response Date: 4/17/2024**

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**Question 01:**
Please provide a spreadsheet listing (as rows) of every undergrounding project completed during the period of January 1, 2023, through December 31, 2023, including non-WMP projects. For each project, please provide the following information (as columns):

a) Project ID number or other identifier
b) Circuit ID
c) ID of each circuit segment that was entirely undergrounded in the project
d) ID of each circuit segment that was partially undergrounded in the project
e) Total overhead circuit-miles removed
f) Total circuit-miles of underground conductor installed
g) Total miles of trenching required
h) Total electric costs of the project (i.e., costs attributed to your electric facilities), including costs for planning, design, permitting, and construction
i) Total number of customers served by the project
j) Total number of minutes of PSPS experienced by the project circuit segments since 2019.

**Response to Question 01:**

Per our discussion with MGRA on 4/15/2024, SCE will only provide WMP-related projects, which is in the attached, "MGRA-SCE-WMP25_DataRequest4 Q1_TUG_projects_2023.xlsx".

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 5 _ D a t a R e q u e s t 4**

**To: MGRA**
**Prepared by: Tram Camba**
**Job Title: Senior Advisor**
**Received Date: 4/12/2024**

**Response Date: 4/17/2024**

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**Question 02:**
Please provide a spreadsheet listing (as rows) of every planned undergrounding projected to be fully or partially completed by the end of 2025. This includes work
currently underway, completed in 2024, or to be performed in 2024.

a) Order number
b) Program
c) Circuit ID number
d) Circuit-segment name or ID number (if the project affects more than one circuitsegment, please identify each one)
e) Relevant wildfire risk score(s) from the wildfire risk model that you are using to estimate distribution risk in your 2025 WMP Update filing
f) The expected or actual start date of the project
g) The expected completion date of the project
h) Length (in circuit miles) of underground conductor to be installed prior to the end of 2025j) Length (in circuit miles) of overhead conductor to be permanently removed prior to the end 2025 and replaced by underground conductor (note that this may differ slightly from the previous section due to differing overhead and underground routes)
k) Length (in circuit miles) of overhead conductor to be permanently removed in 2025 and not replaced with covered conductor or undergrounded)
l) Total number of customers served by the project
m) Total number of minutes of PSPS experienced by the project circuit segments since 2019.

**Response to Question 02:**

Per our discussion with MGRA on 4/15/2024, SCE will provide only WMP-related projects in response to this data request. SCE has not included risk scores, as the data would be confidential when provided at this level of granularity, and MGRA's data request directions note that "SCE may remove any field which is confidential."

Please refer to the attached file for the requested information, "MGRA-SCE-WMP25_DataRequest Q2_TUG_projects_2025.xlsx".

Please note the following:

- SCE provides both Project Initiation Form (PIF) and Work Order information in response to part (a).
- Planned construction and start dates could change due to several factors including, for example, construction priority of work, environmental constraints, and resource plans.
- The TUG plan excludes miles still in design for projects expected to be completed in 2025. SCE is working to accelerate designs to ensure a 2025 completion.
- SCE plans and executes work at a more granular structure level. Therefore, segment IDs provided are based on structures planned in the work order. Some segments listed may be connected to a planned structure but are not actually planned for TUG.
- Some TUG work orders do not have structures associated with them and thus segment IDs or wildfire risk values are not available for these work orders.
- Some TUG work orders contain only underground structures in the plan. Wildfire risk values are not available for underground structures.
- Some work orders with no miles may have their miles captured under another associated work order.
- The Total Miles of OH Removed and Replaced by UG is provided at the PIF level, and therefore will be duplicated in the spreadsheet if there is more than one work order associated with the PIF.
- SCE does not track length of overhead conductor permanently removed and not replaced with covered conductor or undergrounding as a result of TUG.
- Other system hardening projects are not organized by circuit mileage as part of work planning and scheduling.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 5 _ D a t a R e q u e s t 4**

**To: MGRA**
**Prepared by: Berta Sandberg**
**Job Title: Senior Advisor**
**Received Date: 4/12/2024**

**Response Date: 4/17/2024**

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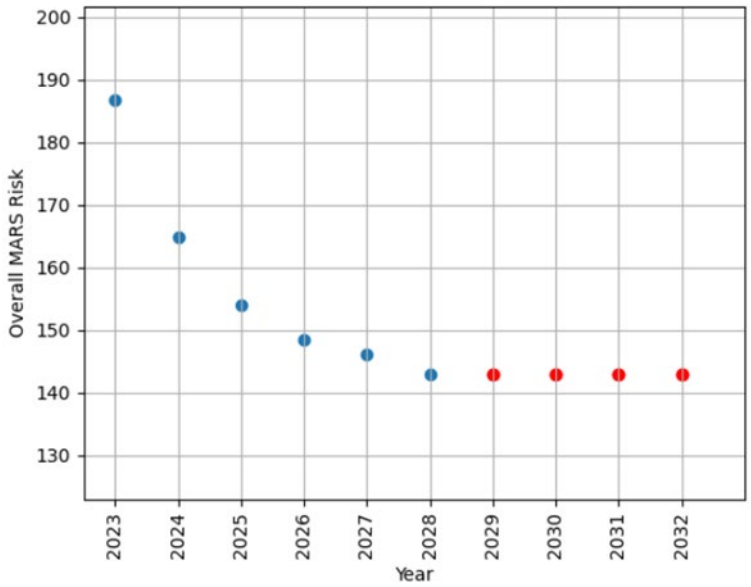
**Question 03:**
Regarding Redlines to SCE's 2023-2025 Wildfire Mitigation Plan
The modification to Figure 7-1, Projected Overall HFRA risk shows the residual MARS risk after 2028 increasing from 80 in the 2023-2025 WMP to 150 in the WMP 2025 update. What is the cause of this increase in residual risk?

**Response to Question 03:**

SCE's updates to its risk models for the WMP 2025 update, which are described in Chapter 1, include changes to both Probability of Ignition (POI) and consequence values (Technosylva WRRM 7.6). Both of these changes increased baseline residual risk. For example, SCE's refresh of fuel maps increased overall consequence values and also filled in previously zero values in Technosylva WRRM 6.0 values.

Additionally, SCE's updated version of Figure 7-1 included certain calculation errors. SCE has corrected this in errata submitted to OEIS on April 16, 2024. For reference, here is the corrected version of Figure 7-1:



*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 5 _ D a t a R e q u e s t 4**

**To: MGRA**
**Prepared by: Martin Barriga**
**Job Title: Senior Advisor**
**Received Date: 4/12/2024**

**Response Date: 4/17/2024**

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**Question 04:**
Regarding Southern California Edison Company's 2023 Wildfire Mitigation Plan Annual Report on Compliance (ARC) Pursuant to PUC Section 8386.3(c)(1)
On page 16 in the section "Re-evaluate existing PSPS windspeed thresholds using engineering-based analysis that considers, among other factors, the effectiveness of covered conductor." SCE notes that "SCE contracted the services of an external vendor to assess the existing PSPS windspeed threshold methodology and to explore a more predictive and data-driven model using asset and equipment failure data to derive the probability of a fault from exposure to wind. The vendor and SCE's subject matter experts concluded that there is an insufficient amount of relevant historical failure data to adequately train an automated model. SCE will evaluate lessons learned from the effort and continue to evaluate alternative windspeed threshold models."

a. Please provide the document authored by the vendor and any report authored by SCE regarding the third party evaluation of PSPS windspeed thresholds.
b. What data were used for the analysis?
c. Was winter data used for the analysis or was only data occurring during fire season used for the analysis?
d. Was the data used for the analysis inclusive of periods and areas where PSPS was active?
e. Was damage data collected during post-PSPS patrols used as part of the data analysis?
f. Was data prior to 2019 used for the analysis?

**Response to Question 04:**

SCE objects to this data request on the grounds that it seeks information relating to SCE's 2023 Annual Report on Compliance, not the 2025 Wildfire Mitigation Plan Update which is the subject of this proceeding. Subject to that objection, please see below.

*a) Please provide the document authored by the vendor and any report authored by SCE regarding the third-party evaluation of PSPS windspeed thresholds.*

Attached please find a comprehensive report to the PSPS risk informed threshold analysis. SCE did not author any additional report on the third-party evaluation of PSPS windspeed thresholds.

*b) What data was used for the analysis?*

The analysis used weather, asset, incident, vegetation, structural, SCADA, circuit and segment, location, and inspection and mitigation data. Descriptions and details of the data sets can be found in the report.

*c) Was winter data used for the analysis or was only data occurring during fire season used for the analysis?*

Yes, winter data was used in the analysis. The data was used for a range of years from the beginning of 2020 to the end of August 2023. Weather data was aggregated by day on the dates and locations of reported incidents.

*d) Was the data used for the analysis inclusive of periods and areas where PSPS was active?*

Yes, all data was used to maximize the available training data.

*e) Was damage data collected during post-PSPS patrols used as part of the data analysis?*

Damage data was collected; however, it was intended for use in back-casting of the model. Back-casting was not completed due to the model performance results. A back-casting plan can be found in the appendix.

*f) Was data prior to 2019 used for the analysis?*

No. The analysis used data from the beginning of 2020 to the end of August 2023.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 5 _ D a t a R e q u e s t 4**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 4/12/2024**

**Response Date: 4/17/2024**

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**Question 05:**
Regarding the file provided to MGRA as MGRA_SCE_WMP23_DR_Ignitions in response to MGRA-2-3, please provide a version of this file that:

a. Uses the FIPA ID so that it can be correlated with reportable ignitions
b. Has corrected date/time (the provided data set appears to be using UTC rather than local Pacific time).

**Response to Question 05:**

a. The Ignition ID is synonymous with the FIPA ID.

b. SCE's outage source systems used to generate Risk Events for the Quarterly Data Report utilizes UTC for date time fields. Therefore, the Risk Event data submitted to OEIS is in UTC and is also consistent with how SCE has provided Risk Event date time in previous MGRA data requests. Changing Risk Event date times would conflict with the data provided to OEIS. To identify Pacific Standard Time subtract 8 hours from UTC. To identify Pacific Daylight Time subtract 7 hours from UTC. There is also a Geoprocessing Tool which will convert time zones: Convert Time Zone.

**SCE – MGRA – Data Request Response 5**

# 2025 Wildfire Mitigation Plans
# SCE
# MGRA Data Request No. 5
# April 25, 2024

MGRA-5-1 Please provide an Excel spreadsheet giving the mapping between SCE weather station IDs and IDs used by Synoptic for the SCE mesonet.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 3 _ D a t a R e q u e s t 5**

**To: MGRA**
**Prepared by: Meghan Booth Aguilar**
**Job Title: Advisor**
**Received Date: 4/25/2024**

**Response Date: 4/30/2024**

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**Question 01:**
Please provide an Excel spreadsheet giving the mapping between SCE weather station IDs and IDs used by Synoptic for the SCE mesonet.

**Response to Question 01:**

Please see the attached Excel spreadsheet containing "Mesowest IDs" for weather station ID and Mesonet ID association for active weather stations as of April 19, 2024.

**SCE – MGRA – Data Request Response 6**

# 2025 Wildfire Mitigation Plans
# SCE
# MGRA Data Request No. 6
# May 1, 2024

MGRA-6-1 Regarding the10/30/2023 ignition with Event ID 6966 on the Ferrara circuit:

a. Was the circuit segment portion that came into contact with the oak tree covered or bare conductor?

b. What was the contact with the conductor: tree fall-in, heavy branch contact, light branch contact?

c. Was the conductor broken?

d. Were multiple phases affected?

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 5 _ D a t a R e q u e s t 6**

**To: MGRA**
**Prepared by: Jonathan Brownstein**
**Job Title: Engineering Manager**
**Received Date: 5/1/2024**

**Response Date: 5/3/2024**

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**Question 01:**
Regarding the10/30/2023 ignition with Event ID 6966 on the Ferrara circuit:
a. Was the circuit segment portion that came into contact with the oak tree covered or bare conductor?
b. What was the contact with the conductor: tree fall-in, heavy branch contact, light branch contact?
c. Was the conductor broken?
d. Were multiple phases affected?

**Response to Question 01:**

*a) Was the circuit segment portion that came into contact with the oak tree covered or bare conductor?*

The circuit segment in contact with the oak tree was bare conductor.

*b) What was the contact with the conductor: tree fall-in, heavy branch contact, light branch contact?*

The contact with the conductor was tree fall-in causing conductor slap.

*c) Was the conductor broken?*

Yes, the conductor was broken.

*d) Were multiple phases affected?*

Yes, there were multiple phases affected.

# 2025 Wildfire Mitigation Plans
# SDG&E
# MGRA Data Request No. 1
# March 21, 2024

***GIS Data:***

***Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.***

***Please remove any confidential attributes that may have been added to the requested records.***

MGRA-1-1 Please provide for Asset Point data for Camera, Fuse, Support Structure, and Weather Station.

MGRA-1-2 Provide Asset Line data for Transmission Line (as permitted as non-confidential), Primary Distribution Line, and Secondary Distribution Line.

MGRA-1-3 Provide PSPS Event data. Include Event Log, Event Line, Event Polygon data. Please exclude customer meter data. Provide all PSPS Event Asset Damage data including photos.

MGRA-1-4 Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

MGRA-1-5 Under Initiatives, please provide Grid Hardening data, including Hardening Log, Hardening Point, and Hardening Line data. Inspection data is not requested at this time.

MGRA-1-6 Under Other Required Data, please provide Red Flag Warning Day polygon data.

MGRA-1-7 Please provide a layer indicating calculated circuit-level risk using the methodology presented in the WMP.

a. If independent probability and consequence layers exist, please provide these independently as well.

*Southern California Edison*
*2025-WMPs – 2025-WMPs*

**DATA REQUEST SET M G R A - S C E - W M P 2 5 _ D a t a R e q u e s t 4**

**To: MGRA**
**Prepared by: Jessica Vibbert**
**Job Title: GIS Advisor**
**Received Date: 4/12/2024**

**Response Date: 4/17/2024**

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**Question 05:**
Regarding the file provided to MGRA as MGRA_SCE_WMP23_DR_Ignitions in response to MGRA-2-3, please provide a version of this file that:

a. Uses the FIPA ID so that it can be correlated with reportable ignitions
b. Has corrected date/time (the provided data set appears to be using UTC rather than local Pacific time).

**Response to Question 05:**

a. The Ignition ID is synonymous with the FIPA ID.

b. SCE's outage source systems used to generate Risk Events for the Quarterly Data Report utilizes UTC for date time fields. Therefore, the Risk Event data submitted to OEIS is in UTC and is also consistent with how SCE has provided Risk Event date time in previous MGRA data requests. Changing Risk Event date times would conflict with the data provided to OEIS. To identify Pacific Standard Time subtract 8 hours from UTC. To identify Pacific Daylight Time subtract 7 hours from UTC. There is also a Geoprocessing Tool which will convert time zones: Convert Time Zone.

**A-3 - SDG&E Data Requests**

**SDG&E – MGRA – Data Request Response 1**

# 2025 Wildfire Mitigation Plans
# SDG&E
# MGRA Data Request No. 1
# March 21, 2024

***GIS Data:***

***Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.***

***Please remove any confidential attributes that may have been added to the requested records.***

MGRA-1-1 Please provide for Asset Point data for Camera, Fuse, Support Structure, and Weather Station.

MGRA-1-2 Provide Asset Line data for Transmission Line (as permitted as non-confidential), Primary Distribution Line, and Secondary Distribution Line.

MGRA-1-3 Provide PSPS Event data. Include Event Log, Event Line, Event Polygon data. Please exclude customer meter data. Provide all PSPS Event Asset Damage data including photos.

MGRA-1-4 Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

MGRA-1-5 Under Initiatives, please provide Grid Hardening data, including Hardening Log, Hardening Point, and Hardening Line data. Inspection data is not requested at this time.

MGRA-1-6 Under Other Required Data, please provide Red Flag Warning Day polygon data.

MGRA-1-7 Please provide a layer indicating calculated circuit-level risk using the methodology presented in the WMP.

a. If independent probability and consequence layers exist, please provide these independently as well.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

## GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an

undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

## II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

GIS Data:
Please provide the GIS data set provided to the Office of Energy Infrastructure Safety for Q1-Q4 2023.

Please remove any confidential attributes that may have been added to the requested records.

**QUESTION 1**

Please provide for Asset Point data for Camera, Fuse, Support Structure, and Weather Station.

**RESPONSE 1**

Attached are the GIS data sets that SDG&E provided to Office of Energy Infrastructure Safety (Energy Safety) for Q1, Q2, Q3, and Q4 2023 per Energy Safety's version 3.1 data schema.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

**QUESTION 2**

Provide Asset Line data for Transmission Line (as permitted as non-confidential), Primary Distribution Line, and Secondary Distribution Line.

**RESPONSE 2**

See SDG&E's response to question 1.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

**QUESTION 3**

Provide PSPS Event data. Include Event Log, Event Line, Event Polygon data. Please exclude customer meter data. Provide all PSPS Event Asset Damage data including photos.

**RESPONSE 3**

See SDG&E's response to question 1.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

**QUESTION 4**

Provide Risk Event Point data, including Wire Down, Ignition, Transmission unplanned outage (as classified non-confidential), Distribution Unplanned Outage data, Distribution Vegetation Caused Unplanned Outage, Risk Event Asset Log.

**RESPONSE 4**

See SDG&E's response to question 1.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

## QUESTION 5

Under Initiatives, please provide Grid Hardening data, including Hardening Log, Hardening Point, and Hardening Line data. Inspection data is not requested at this time.

## RESPONSE 5

See SDG&E's response to question 1.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

## QUESTION 6

Under Other Required Data, please provide Red Flag Warning Day polygon data.

## RESPONSE 6

See SDG&E's response to question 1.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

## QUESTION 7

Please provide a layer indicating calculated circuit-level risk using the methodology presented in the WMP.

a. If independent probability and consequence layers exist, please provide these independently as well.

## RESPONSE 7

See SDG&E's response to question 1.

**MUSSEY GRADE ROAD DATA REQUEST:**
**MGRA-SDGE-2025WMP-01**
**SDG&E RESPONSE**

**Date Received: March 21, 2024**
**Date Submitted: April 4, 2024**

**END OF REQUEST**

**SDG&E – MGRA – Data Request Response 2**

***Undergrounding versus Covered Conductor and Other mitigations***

*In 2024, a combined mitigation study is being conducted by a third-party vendor to understand the benefits and costs associated with increasing covered conductor effectiveness and how a combination of mitigations compares to undergrounding.*

MGRA-2-1 Who is the third party vendor conducting the study?

MGRA-2-2 When did the study commence?

MGRA-2-3 When will a report for the study be complete?

MGRA-2-4 Are there interim versions available?

MGRA-2-5 Please provide the inputs and assumptions that were given to the vendor for the study.

MGRA-2-6 Please provide results when available including any interim results clearly marked as such.

**Table 15: Efficiency of Covered Conductor**

MGRA-2-7 What is the basis for dropping the wildfire mitigation effectiveness of CC for pole damage and anchor/guy failure?

MGRA-2-8 Please provide any calculations, data, or lab test results supporting this conclusion.

**Figure 12: Hardening Efficiency over Time**

MGRA-2-9 Please provide a table of ignitions since the SDG&E hardening program commenced that includes year of hardening of the circuit involved as an attribute.

MGRA-2-10 Provide the data supporting Figure 12. This should consist of ignition rate per year per mile for hardened wire divided into hardening year segments.

MGRA-2-11 Show the methodology for determining the slope of the covered conductor curve compared to the OH hardening curve.

**5.9 SDGE-23-10: Early Fault Detection Implementation**

MGRA-2-12 Please provide a list of reportable ignitions for the last two years including the following additional attributes:

**a.** whether circuit was implemented with active FCP

**b.** whether circuit was implemented with active EFD

**c.** whether PSPS was activated anywhere on the system.

MGRA-2-13 Please provide a list of outages for the last two years including the following additional attributes:

a. whether circuit was implemented with active FCP

b. whether circuit was implemented with active EFD

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

## GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an

undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

## II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**Undergrounding versus Covered Conductor and Other mitigations (related to questions 1 – 6)**

In 2024, a combined mitigation study is being conducted by a third-party vendor to understand the benefits and costs associated with increasing covered conductor effectiveness and how a combination of mitigations compares to undergrounding.

**QUESTION 1**

Who is the third-party vendor conducting the study?

**RESPONSE 1**

SDG&E objects to the request to the extent it is vague and ambiguous. SDG&E assumes the language in the introduction to the question refers to language used in SDG&E's 2025 WMP Update. Subject to and without waiving the foregoing objections, SDG&E responds as follows:

The third-party vendor conducting the study is Aerospace Technical Services.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**QUESTION 2**

When did the study commence?

**RESPONSE 2**

SDG&E objects to the request to the extent it is vague and ambiguous. SDG&E assumes the language in the introduction to the question refers to language used in SDG&E's 2025 WMP Update. Subject to and without waiving the foregoing objections, SDG&E responds as follows:

The study commenced on November 1, 2023.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**QUESTION 3**

When will a report for the study be complete?

**RESPONSE 3**

SDG&E objects to the request to the extent it is vague and ambiguous. SDG&E assumes the language in the introduction to the question refers to language used in SDG&E's 2025 WMP Update. Subject to and without waiving the foregoing objections, SDG&E responds as follows:

SDG&E anticipates a final report by year end 2024.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**QUESTION 4**

Are there interim versions available?

**RESPONSE 4**

SDG&E objects to the request to the extent it is vague and ambiguous. SDG&E assumes the language in the introduction to the question refers to language used in SDG&E's 2025 WMP Update. Further, the term "interim versions" is unclear. Subject to and without waiving the foregoing objections, SDG&E responds as follows:

SDG&E anticipates a final report by year end 2024.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

## QUESTION 5

Please provide the inputs and assumptions that were given to the vendor for the study.

## RESPONSE 5

SDG&E objects to the request to the extent it is vague and ambiguous. SDG&E assumes the language in the introduction to the question refers to language used in SDG&E's 2025 WMP Update. Subject to and without waiving the foregoing objections, SDG&E responds as follows:

Inputs provided to vendor:

- Ignition data
- Outage data
- Meteorology data
- Covered Conductor install dates and location
- Undergrounding asset install dates and location
- Early Faut Detection install dates and location
- Falling Conductor Protection install dates and location

Assumptions provided to vendor:

- To only consider outage data with the following taken into accounted:
    - Risk events
    - Distribution events
    - HFTD location

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**QUESTION 6**

Please provide results when available including any interim results clearly marked as such.

**RESPONSE 6**

SDG&E objects to the request to the extent it is vague and ambiguous, specifically with respect to the term "interim results." SDG&E assumes the language in the introduction to the question refers to language used in SDG&E's 2025 WMP Update. SDG&E further objects to the request to the extent it seeks information that is subject to attorney client privilege, attorney work product, or any other applicable privilege or doctrine. Subject to and without waiving the foregoing objections, SDG&E responds as follows:

SDG&E anticipates a final report by year end 2024.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**Table 15: Efficiency of Covered Conductor**
**(related to questions 7 and 8)**

**QUESTION 7**

What is the basis for dropping the wildfire mitigation effectiveness of CC for pole damage and anchor/guy failure?

**RESPONSE 7**

SDG&E objects to the request to the extent it seeks information already publicly available and described further in SDG&E's Wildfire Mitigation Plan Update. Subject to and without waiving the foregoing, SDG&E responds as follows:

As discussed within ACI SDGE-23-08:

> *The effectiveness of covered conductors against various equipment failure risk drivers was reduced in 2024 for several reasons. First, the estimated effectiveness against equipment failure drivers was originally derived using a year-over-year approach. Effectiveness was defined as the immediate protection gained from performing the covered conductor installation, which would replace aging or damaged equipment with new equipment. However, because these effectiveness numbers are being utilized for long-term investment planning, it is more appropriate to utilize a long-term effectiveness number for risk drivers. While a covered conductor will replace aging equipment in the short term, the covered conductor itself will age and degrade, reducing the effectiveness of the original installation over time. To address this issue, previous studies on the effectiveness of traditional (bare conductor) hardening were used to estimate the effectiveness of covered conductors on equipment failure risk drivers over time. As shown in Figure 12, traditional hardening had an estimated effectiveness of approximately 65% in year one, but that effectiveness steadily decreased over time and is now calculated as 32% effective. In contrast, the effectiveness of undergrounding electric lines (WMP.473) did not change, as the only ignition risk is related to vehicle contact with padmounted equipment, which remains constant over time. Because of the similarities in equipment being replaced in the covered conductor and traditional hardening initiatives, the 10-year recorded effectiveness of 30% for traditional hardening effectiveness against equipment failure risk events was also used to calculate covered conductor effectiveness for the same equipment failure risk drivers, resulting in a decrease in covered conductor efficacy from 78% in year one to 65% in year 10.*[1]

[1] SDG&E 2025 Wildfire Mitigation Plan Update p.90

The risk drivers for pole damage and anchor/guy failure are not directly addressed by the installation of covered conductor. The long-term risk reduction for these drivers was therefore aligned with the 30% recorded effectiveness seen in SDG&E's traditional hardening program.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

## QUESTION 8

Please provide any calculations, data, or lab test results supporting this conclusion.

## RESPONSE 8

SDG&E objects to the request to the extent it seeks information already publicly available and described further in SDG&E's Wildfire Mitigation Plan Update. Subject to and without waiving the foregoing, SDG&E responds as follows:

The 30% equipment failure efficacy was calculated utilizing an average of the recorded effectiveness of SDG&E's traditional hardening program. Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-02_Q8.xlsx."

**Figure 12: Hardening Efficiency over Time**
**(related to questions 9 – 11)**

**QUESTION 9**

Please provide a table of ignitions since the SDG&E hardening program commenced that includes year of hardening of the circuit involved as an attribute.

**RESPONSE 9**

SDG&E objects to the request to the extent it is unduly broad and overly burdensome, as well as vague and ambiguous. SDG&E's response is limited to ignitions on hardened infrastructure in the HFTD. Subject to and without waiving this or any other objections, SDG&E responds as follows:

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-02_Question 9,12,13.xlsx."

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**QUESTION 10**

Provide the data supporting Figure 12. This should consist of ignition rate per year per mile for hardened wire divided into hardening year segments.

**RESPONSE 10**

SDG&E objects to the request to the extent it seeks information that is publicly available in SDG&E's 2025 WMP Update and is vague and unintelligible to the extent the question misstates the information provided in Figure 12. SDG&E further objects to the request that it calls for SDG&E to perform additional studies or analysis that do not exist. Subject to and without waiving the foregoing or any other objections, SDG&E responds as follows:

The data in Figure 12 does not represent the ignition rate per year per mile for hardened wire divided into hardening year segments, as claimed by MGRA. The ignition rate per year per mile was not calculated or incorporated as part of this analysis. Rather, the analysis represented in Figure 12 is sourced from SDG&E's distribution overhead (OH) hardening study, which utilized the pre- and post-mitigation fault rates per 100 miles within in the HFTD for all risk events, incorporating location-specific data.

SDG&E does not have enough data to perform a similar study for covered conductor. The Covered Conductor efficacy values are estimated efficacy values created utilizing subject matter expertise, joint IOU studies, and the OH hardening study results.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

## QUESTION 11

Show the methodology for determining the slope of the covered conductor curve compared to the OH hardening curve.

## RESPONSE 11

SDG&E objects to the request to the extent it seeks information that is publicly available in SDG&E's 2025 WMP Update, and is vague and unintelligible to the extent the question misstates the information provided in Figure 12. SDG&E further objects to the request that it calls for SDG&E to perform additional studies or analysis that do not exist. Subject to and without waiving the foregoing or any other objections, SDG&E responds as follows:

The covered conductor curve was created by utilizing the year one data point of 78% estimated effectiveness reported in SDG&E's 2023 WMP and the year ten data point of 65% estimated effectiveness as reported within the 2025 WMP Update. A straight line was drawn between these two points to create the covered conductor line.

The OH hardening line was created by utilizing SDG&E's recorded effectiveness data for year five and year ten (45% and 28% respectively) and SDG&E's estimated effectiveness for year one of 65%. These points were connected with straight lines.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**5.9 SDGE-23-10: Early Fault Detection Implementation**
**(related to questions 12 and 13)**

**QUESTION 12**

Please provide a list of reportable ignitions for the last two years including the following additional attributes:

a. whether circuit was implemented with active FCP
b. whether circuit was implemented with active EFD
c. whether PSPS was activated anywhere on the system

**RESPONSE 12**

SDG&E objects to the request to the extent it is unduly broad and overly burdensome, as well as vague and ambiguous. SDG&E's response is limited to ignitions in the HFTD. Subject to and without waiving this or any other objections, SDG&E responds as follows:

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-02_Question 9,12,13.xlsx."

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

## QUESTION 13

Please provide a list of outages for the last two years including the following additional attributes:

a. whether circuit was implemented with active FCP
b. whether circuit was implemented with active EFD

## RESPONSE 13

SDG&E objects to the request to the extent it is unduly broad and overly burdensome, vague and ambiguous, and seeks information irrelevant to SDG&E's Wildfire Mitigation Plan or 2025 WMP Update. SDG&E's response is limited to outages in the HFTD. Subject to and without waiving this or any other objections, SDG&E responds as follows:

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-02_Question 9,12,13.xlsx."

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-02**
**SDG&E RESPONSE**

**Date Received: April 8, 2024**
**Date Submitted: April 11, 2024**

**END OF REQUEST**

**SDG&E – MGRA – Data Request Response 3**

# 2025 Wildfire Mitigation Plans
# SDG&E
# MGRA Data Request No. 3
# April 12, 2024

***SDG&E Hardening Plans 2023-2025***

*Cal Advocates have submitted two data requests to SDG&E, one concerning hardening activities completed in 2023 (CalPA-3.10) and once concerning planned hardening activity in 2025. (CALPA-3.8).*

*Please provide a version of the tables provided to Cal Advocates with the following additional information, with the following caveats:*
*- SDG&E may change the type and scope of its hardening during the course of the project due to unanticipated cost or technical factors*
*- SDG&E may remove any field which is confidential.*
*- The term "customers" refers to all customers served by or downstream of the circuit segment.*

MGRA-3-1 Provide an additional table identical to that in CalPA-3.8, but providing the additional separate columns:
a) Number of customers served by each segment listed
b) Total number of minutes of PSPS outage experienced by each circuit/segment since 2017.

MGRA-3-2 Provide an additional table identical to that in CalPA-3.8 and containing the additional fields listed in MGRA-3-1, but for projects expected to be partially completed in 2024.

MGRA-3-3 Provide an additional table identical to that in CalPA-3.10, but providing the additional separate columns:
a) Number of customers served by each segment listed
b) Total number of minutes of PSPS outage experienced by each circuit/segment since 2017.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**

## GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an

undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

## II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**

**SDG&E Hardening Plans 2023-2025**

Cal Advocates have submitted two data requests to SDG&E, one concerning hardening activities completed in 2023 (CalPA-3.10) and once concerning planned hardening activity in 2025. (CALPA-3.8).

Please provide a version of the tables provided to Cal Advocates with the following additional information, with the following caveats:

- SDG&E may change the type and scope of its hardening during the course of the project due to unanticipated cost or technical factors
- SDG&E may remove any field which is confidential.
- The term "customers" refers to all customers served by or downstream of the circuit segment.

**QUESTION 1**

Provide an additional table identical to that in CalPA-3.8, but providing the additional separate columns:

a) Number of customers served by each segment listed
b) Total number of minutes of PSPS outage experienced by each circuit/segment since 2017.

**RESPONSE 1**

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q1.xlsx."

Please note that SDG&E identified one project (0441-DUG-A-SUG) that was not included in its response to CALPA-3.8. SDG&E also corrected certain wildfire risk scores that were incorrect for some projects with multiple circuit segments. SDG&E has provided a revised response to Cal Advocates. The one missing project and updated wildfire risk scores are included in SDG&E's response here.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**

## QUESTION 2

Provide an additional table identical to that in CalPA-3.8 and containing the additional fields listed in MGRA-3-1, but for projects expected to be partially completed in 2024.

## RESPONSE 2

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q2.xlsx." This is a subset of the projects included in SDG&E's response to question 1 above.

Please note that SDG&E identified one project (0441-DUG-A-SUG) that was not included in its response to CALPA-3.8. SDG&E also corrected certain wildfire risk scores that were incorrect for some projects with multiple circuit segments. SDG&E has provided a revised response to Cal Advocates. The one missing project and updated wildfire risk scores are included in SDG&E's response here.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**

**QUESTION 3**

Provide an additional table identical to that in CalPA-3.10, but providing the additional separate columns:

a) Number of customers served by each segment listed
b) Total number of minutes of PSPS outage experienced by each circuit/segment since 2017.

**RESPONSE 3**

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q3.xlsx."

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**

**END OF REQUEST**

**SDG&E – MGRA – Data Request Response 4**

# 2025 Wildfire Mitigation Plans
# SDG&E
# MGRA Data Request No. 4
# April 25, 2024

MGRA-4-1 Please provide an Excel spreadsheet giving the mapping between SDG&E weather station IDs and IDs used by Synoptic for the SDG&E mesonet if these IDs are different.

MGRA-4-2 Regarding MGRA-SDGE-2025WMP-02-Q10, please provide "*SDG&E's distribution overhead (OH) hardening study, which utilized the pre- and post-mitigation fault rates per 100 miles within in the HFTD for all risk events, incorporating location-specific data*."

MGRA-4-3 If the aforementioned study does not directly contain a breakdown of fault rates per year after installation, please provide such a breakdown in addition.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**
**Date Revised Question 1 and 2 Submitted: April 19, 2024**

## GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an

undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

## II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**
**Date Revised Question 1 and 2 Submitted: April 19, 2024**

**SDG&E Hardening Plans 2023-2025**

Cal Advocates have submitted two data requests to SDG&E, one concerning hardening activities completed in 2023 (CalPA-3.10) and once concerning planned hardening activity in 2025. (CALPA-3.8).

Please provide a version of the tables provided to Cal Advocates with the following additional information, with the following caveats:

- SDG&E may change the type and scope of its hardening during the course of the project due to unanticipated cost or technical factors
- SDG&E may remove any field which is confidential.
- The term "customers" refers to all customers served by or downstream of the circuit segment.

**QUESTION 1**

Provide an additional table identical to that in CalPA-3.8, but providing the additional separate columns:

a) Number of customers served by each segment listed
b) Total number of minutes of PSPS outage experienced by each circuit/segment since 2017.

**RESPONSE 1**

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q1.xlsx."

Please note that SDG&E identified one project (0441-DUG-A-SUG) that was not included in its response to CALPA-3.8. SDG&E also corrected certain wildfire risk scores that were incorrect for some projects with multiple circuit segments. SDG&E has provided a revised response to Cal Advocates. The one missing project and updated wildfire risk scores are included in SDG&E's response here.

**REVISED RESPONSE 1**

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q1_Revised 4.19.24.xlsx."

To provide more clarity on the wildfire risk score, column e2) "Wildfire Risk Score" has been added to show the pre-mitigation score compared to the post-mitigation score. The original column e) Wildfire Risk Score originally indicated a post-mitigation score; in an effort to avoid

confusion, the column has been explicitly renamed to “e) Wildfire Risk Score Post-mitigation”. The additional column named “e2) Wildfire Risk Score Pre-mitigation” has been added to the table to allow for understanding of the pre-mitigation wildfire risk score.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**
**Date Revised Question 1 and 2 Submitted: April 19, 2024**

## QUESTION 2

Provide an additional table identical to that in CalPA-3.8 and containing the additional fields listed in MGRA-3-1, but for projects expected to be partially completed in 2024.

## RESPONSE 2

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q2.xlsx." This is a subset of the projects included in SDG&E's response to question 1 above.

Please note that SDG&E identified one project (0441-DUG-A-SUG) that was not included in its response to CALPA-3.8. SDG&E also corrected certain wildfire risk scores that were incorrect for some projects with multiple circuit segments. SDG&E has provided a revised response to Cal Advocates. The one missing project and updated wildfire risk scores are included in SDG&E's response here.

## REVISED RESPONSE 2

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q2_Revised 4.19.24.xlsx."

To provide more clarity on the wildfire risk score, column e2) "Wildfire Risk Score" has been added to show the pre-mitigation score compared to the post-mitigation score. The original column e) Wildfire Risk Score originally indicated a post-mitigation score; in an effort to avoid confusion, the column has been explicitly renamed to "e) Wildfire Risk Score Post-mitigation". The additional column named "e2) Wildfire Risk Score Pre-mitigation" has been added to the table to allow for understanding of the pre-mitigation wildfire risk score.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**
**Date Revised Question 1 and 2 Submitted: April 19, 2024**

## QUESTION 3

Provide an additional table identical to that in CalPA-3.10, but providing the additional separate columns:

a) Number of customers served by each segment listed
b) Total number of minutes of PSPS outage experienced by each circuit/segment since 2017.

## RESPONSE 3

Please see attached spreadsheet titled "SDGE Response MGRA-SDGE-2025WMP-03_Q3.xlsx."

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-03**
**SDG&E RESPONSE**

**Date Received: April 12, 2024**
**Date Submitted: April 17, 2024**
**Date Revised Question 1 and 2 Submitted: April 19, 2024**

**END OF REQUEST**

**SDG&E – MGRA – Data Request Response 4**

# 2025 Wildfire Mitigation Plans
# SDG&E
# MGRA Data Request No. 4
# April 25, 2024

MGRA-4-1 Please provide an Excel spreadsheet giving the mapping between SDG&E weather station IDs and IDs used by Synoptic for the SDG&E mesonet if these IDs are different.

MGRA-4-2 Regarding MGRA-SDGE-2025WMP-02-Q10, please provide "*SDG&E's distribution overhead (OH) hardening study, which utilized the pre- and post-mitigation fault rates per 100 miles within in the HFTD for all risk events, incorporating location-specific data*."

MGRA-4-3 If the aforementioned study does not directly contain a breakdown of fault rates per year after installation, please provide such a breakdown in addition.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-04**
**SDG&E RESPONSE**

**Date Received: April 25, 2024**
**Date Submitted: April 29, 2024**

## GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an

undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

## II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-04**
**SDG&E RESPONSE**

**Date Received: April 25, 2024**
**Date Submitted: April 29, 2024**

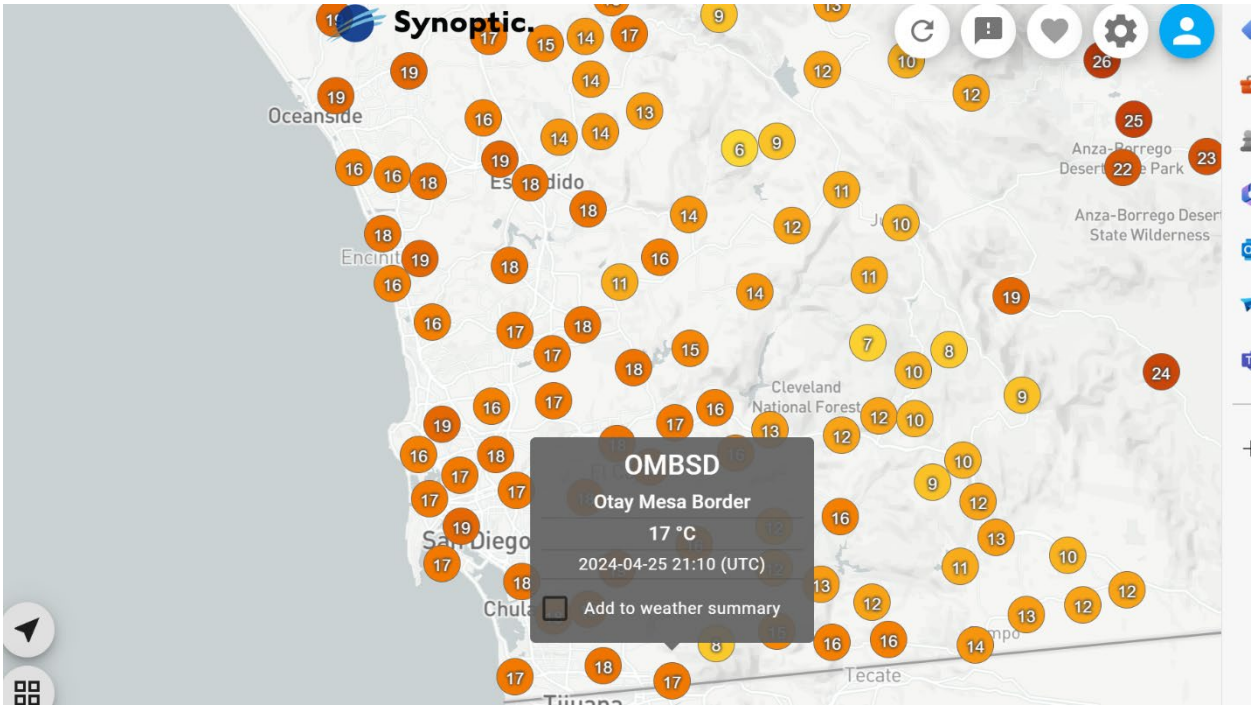
## QUESTION 1

Please provide an Excel spreadsheet giving the mapping between SDG&E weather station IDs and IDs used by Synoptic for the SDG&E mesonet if these IDs are different.

## RESPONSE 1

SDG&E objects to the request to the extent it is overly broad and unduly burdensome, and seeks information in a format already provided to MGRA through alternative means. Subject to and without waiving the foregoing objections, SDG&E responds as follows:

A spreadsheet is not necessary given that the synoptic viewer aggregates all reporting weather stations. The weather stations owned by SDG&E will be three letters followed by SD. For example, Otay Mesa Border is OMBSD, which is an SDG&E weather station as shown in the screenshot below available at https://viewer.synopticdata.com/. The viewer is a paid service provided by Synoptic and as such is password protected. Observations can also be viewed for free at Mesowest at https://mesowest.utah.edu/.



**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-04**
**SDG&E RESPONSE**

**Date Received: April 25, 2024**
**Date Submitted: April 29, 2024**

## QUESTION 2

Regarding MGRA-SDGE-2025WMP-02-Q10, please provide "*SDG&E's distribution overhead (OH) hardening study, which utilized the pre- and post-mitigation fault rates per 100 miles within in the HFTD for all risk events, incorporating location-specific data*."

## RESPONSE 2

SDG&E has attached the following two spreadsheets which include SDG&E's distribution overhead hardening study using two different year ranges.

- "SDGE Response MGRA-SDGE-2025WMP-04_Q2.2.xlsx", which encompasses data spanning from 2013 to 2019, resulting in an efficacy rate of 44.5%, and
- "SDGE Response MGRA-SDGE-2025WMP-04_Q2.1.xlsx", which contains data from 2013 to 2022, yielding an efficacy rate of 27.5%.

These files incorporate raw data, from which SDG&E has derived summarized fault rates and fault rates categorized by the cause of risk events. The study focuses on pre- and post-mitigation fault rates per 100 miles within the High Fire Threat District.

**MUSSEY GRADE ROAD**
**DATA REQUEST: MGRA-SDGE-2025WMP-04**
**SDG&E RESPONSE**

**Date Received: April 25, 2024**
**Date Submitted: April 29, 2024**

**QUESTION 3**

If the aforementioned study does not directly contain a breakdown of fault rates per year after installation, please provide such a breakdown in addition.

**RESPONSE 3**

Not applicable.

**Date Received: April 25, 2024**
**Date Submitted: April 29, 2024**

**END OF REQUEST**