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November 2, 2026 VIA ELECTRONIC FILING

Tony Marino, Deputy Director
Office of Energy Infrastructure Safety
715 P Street, 20th Floor
Sacramento, CA 95814

RE: MUSSEY GRADE ROAD ALLIANCE COMMENTS ON THE 2026 PG&E ELECTRICAL UNDERGROUNDING PLAN

Dear Deputy Director Marino,

The Mussey Grade Road Alliance (MGRA) files these comments pursuant to the Office of Energy Infrastructure Safety Office 10-Year Electrical Undergrounding Plan Guidelines[1] and the Comment Schedule and Workshop Announcement,[2] which authorizes public comment on PG&E's 202610-year Electrical Undergrounding Plane (EUP)[3] by November 2, 2026.

MGRA has been involved at the CPUC on power line wildfire issues since 2007,[4] including those involving the PG&E service area. While not residents of the PG&E service area, we have taken a key interest in PG&E's wildfire activities because as the largest electrical utility in California PG&E wields a great deal of regulatory influence. MGRA has analyzed and commented on all PG&E Wildfire Mitigation Plans (WMPs) and was a party in PG&E's most recent rate cases.

[1] Docket 2023-UPs; Office of Energy Infrastructure Safety; 10-YEAR ELECTRICAL UNDERGROUNDING PLAN GUIDELINES; February 20, 2025.(Guidelines)
[2] Docket EUP-PGE; PG&E's 10-Year Electrical Undergrounding Plan, Comment Schedule, and Virtual Public Workshop; October 1, 2026. (Schedule)
[3] Docket EUP-PGE; PG&E 10-Year (2028-2037) Electrical Undergrounding Plan; September 30, 2026.
[4] A full history up to 2020 is provided in:
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)
https://energysafety.ca.gov/wp-content/uploads/docs/misc/wmp/public-comments/mussey-grade-comments-2020-wmp.pdf

Since PG&E first announced its intention to underground 10,000 miles of conductor in 2021, MGRA has been skeptical of the cost-effectiveness of and motivation for this mitigation program.[5] After the passage of Senate Bill 884 (SB 884) that allows utilities to submit 10-year undergrounding plans, MGRA participated in the development of guidelines for both OEIS and the CPUC in an attempt to ensure that the undergrounding plans received adequate review. Together, the OEIS and CPUC requirements are exhaustive and rigorous, resulting in a PG&E filing of 1,200 pages including workpapers. However, the requirements of SB 884 call for an accelerated review process, necessitating an extremely short (1 month) deadline set by Energy Safety for stakeholder review and comment.

This would be an impossible task were it not for the fact that the risk models used in PG&E's EUP filing are the same that were used in the 2026-2028 WMP cycle and in PG&E's 2026-2 GRC, both of which MGRA extensively reviewed. This work will be cited in the current comments. MGRA's conclusion in the GRC proceeding regarding PG&E's risk model can "*MGRA maintains that the WDRM v4, despite its improvements, has been compromised by the magnitude of error in its suppression model and is therefore not fit for use*."[6] The conclusion that MGRA reached has remained valid and directly impacts our recommendation for PG&E's first EUP submission: It should be rejected until key errors in its risk models have been addressed.

The errors in the PG&E WDRMv4 affect the overall magnitude of the risk, and therefore how many circuits meet the threshold for inclusion in the program, but it also affects risk ranking, thus scrambling the geographic location of risk. PG&E has been long aware of MGRA's criticisms and has contrarily stuck by the use its WDRM v4 model even when elements have been shown to be provably wrong. The Commission may shortly rule on its opinion on the validity of PG&E's

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[5] CPUC A.21-06-021; MUSSEY GRADE ROAD ALLIANCE PROTEST OF PACIFIC GAS AND ELECTRIC COMPANY 2023 GENERAL RATE CASE APPLICATION; August 5, 2021; p. 3. Cites: PG&E Will Bury 10,000 Miles of Power Lines So They Don't Spark Wildfires; Associated Press; July 21, 2021. (NPR)
https://www.npr.org/2021/07/21/1019058925/utility-bury-power-lines-wildfires-california
PG&E Aims to Curb Wildfire Risk by Burying Many Power Lines; Ivan Penn; New York Times; July 21, 2021. (NY Times)
https://www.nytimes.com/2021/07/21/business/energy-environment/pge-underground-powerlineswildfires.html

[6] CPUC A.25-05-009; MUSSEY GRADE ROAD ALLIANCE OPENING BRIEF ON PACIFIC GAS AND ELECTRIC COMPANY'S 2027 GENERAL RATE CASE; p. 67. (MGRA 2027 PG&E GRC Brief)
https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M610/K110/610110841.PDF

models and MGRA's assertions in its 2027-2030 GRC application. Regardless, OEIS will need to conduct its own assessment and will reach its own conclusion.

A mistake now will have $17 billion and 10-year impacts, and may underestimate risk in key areas of the PG&E territory, leaving residents at long-term risk. The more quickly that the errors in PG&E's assumptions and models can be resolved the quicker that PG&E can submit a revised plan. Also, if after such delay and effort Energy Safety is hesitant to issue full rejection, MGRA also offers heuristic methods for re-ranking and prioritization of circuits in order to most rapidly reduce the residual risk of catastrophic wildfire.

MGRA again thanks Energy Safety staff for the consideration and time they will put into understanding this work and hope it provides them a sound basis for their decision in this phase of the PG&E Electrical Undergrounding Plan.

Respectfully submitted this 2nd day of November, 2026,

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1. INTRODUCTION AND SUMMARY

Since it initiated its undergrounding plans in 2021, PG&E plans to have completed 1,900 miles of underground distribution lines by the start date of its EUP.[7] With the submission of its 10-year undergrounding plan under the auspices of SB 884, PG&E plans to expand this by another 5,000 miles, at a cost of $16.6 billion in escalated capital expenditures.[8] This is a significant fraction of its original vision of 10,000 miles of undergrounded line.[9] MGRA takes no issue with the many claimed benefits of undergrounding with regard to wildfire risk reduction, operational requirements and potential improvements in reliability. It is the most complete mitigation in the utility portfolio, but in many if not most cases its expense far exceeds its value in these other areas. Evaluation is complicated by the fact that utilities in California are incentivized to build capital projects, retaining approximately 10% of the cost as profit, creating a conflict of interest that potentially colors utility revenue requests and the choices they make during technical analyses. At the same time that PG&E is requesting its underground funding, electric rates are skyrocketing not only due to remediation for past fires but because of the rapid expansion of the California grid to support clean energy projects and now data centers. This created an affordability crisis that led Governor Gavin Newsom in 2024 to issue an Executive Order stating: "*The Office of Energy Infrastructure Safety is directed, and the California Public Utilities Commission is requested, to consult with each other on adjustments to utility wildfire safety oversight processes, procedures, and practices that would yield administrative efficiencies and focus utility investments and activities on cost-effective wildfire mitigation measures that reduce wildfire ignition risk while managing costs to electric ratepayers*."[10]

The joint analysis by OEIS and CPUC of PG&E EUP application will provide significant insight into the cost-effectiveness and reasonability of PG&E's Plan. A fundamental assumption made in adopting a 10-year plan is that it rests on the best tools and data available at the time of its submission, and that its results can be trusted to provide decision-makers with the information necessary to approve, disapprove, or modify the Plan. It is precisely in this area – deep analysis of PG&E's risk modeling – that MGRA has been active since the first WMPs were submitted in 2019. And it is based on its comprehensive analysis that MGRA concludes that PG&E's 2026 EUP should be rejected until it has undergone substantial revision. The basis for the MGRA recommendation

[7] EUP; p. 22.
[8] EUP; p. 3; fn.3.
[9] Footnote 5.
[10] State of California; Executive Department; Executive Order N-5-24.

arises from several disparate issues with PG&E's risk models and general approach to risk. Briefly summarizing, these are:

- The extent of the PG&E EUP implicitly requires the assumption of risk scaling, an assumption that OEIS explicitly excludes from its analysis.
- PG&E continues to underestimate the mitigation effectiveness of covered conductor.
- PG&E's ignition model does not adequately model the effect of high winds on ignition and therefore will not prioritize the locations particularly subject to high intermittent gusts.
- PG&E has added a faulty suppression model that increases overall risk by 30% while redistributing risk away from high wind areas.

The combined effect of these shortcomings were sufficient for MGRA to recommend against the use of WDRM v4 in PG&E's GRC proceeding.[11] In fact, PG&E's GRC undergrounding proposals only covered the years 2027 and potential bridge funding into 2028.[12] PG&E's SB 884 EUP, however, extends all the way from 2028 to 2037. It is essential that it be based on sound analysis and data with the amount of ratepayer funds that will be requested for these projects, which is over and above the amount that will be requested in the GRCs for wildfire prevention.

By miscalculating risk scores, PG&E's model can not only mis-identify the appropriate mitigation for a circuit segment in a particular location, it can also set an inappropriate risk ranking that will result in lower risk circuit segments being mitigated prior to higher risk circuit segments. For that reason, denial of the application and a requirement to fix the risk model prior to resubmission would be appropriate. However, it is acknowledged that SB 884 was signed into law in September 2022 and is yet to be implemented, and that there is a governmental and regulatory expectation that expedited utility infrastructure undergrounding should be enabled by the OEIS and CPUC. If Energy Safety determines model inaccuracies are not sufficient grounds for rejection of the application and further delay, it may be possible to compensate for some of the biases introduced by the models by giving higher weighting to circuit segments in extreme wind areas, since ignition under extreme wind conditions is the cause of nearly all catastrophic utility wildfires, particularly those with a large number of fatalities and the greatest amount of property damage.

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[11] Footnote 6.
[12] CPUC; A.25-05-009; PG&E Ex-04 Testimony v.1; pp. 7-24 to 7-28. (PG&E GRC Ex-04) https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2505009/9120/604617993.pdf

Finally, after the issuance of PG&E's EUP, the CPUC issued a Proposed Decision[13] in the A.26-02-005 (SPD-37) proceeding that puts forward the requirements for the CPUC phase of utility EUP applications. This Decision, if it stands as is, makes several determinations with regard to what constitutes an acceptable EUP application. Most importantly, it finds that:

- Until the Commission and stakeholders can determine an appropriate risk scaling function that would apply to all utilities, IOUs are directed to use risk neutral scaling in their EUP applications.[14]
- For the purposes of calculating Benefit Cost Ratios (BCRs) the IOUs are directed to use "Method 3" or the Disaggregated Formulation suggested by the CPUC Safety Policy Division.[15]

PG&E's EUP is not compliant with either of these requirements and as such cannot proceed to the CPUC phase of evaluation. It should immediately be rejected in order for PG&E to be allowed to try to remedy these issues.

1.1. Workpapers

MGRA workpapers created as part of its EUP analysis can be found in:

https://github.com/jwmitchell/Workpapers/tree/main/PGEEUP26

2. RISK SCALING, BENEFIT COST RATIO, AND PRIORITIZATION

When developing its Guidelines, Energy Safety required that utility risk calculations for Overall Utility Risk, Ignition Risk, and Outage Program Risk be "*unweighted and unscaled*".[16] This is fortunate because not only are there are profound flaws in PG&E's risk scaling model, the effect of risk scaling on PG&E's risk calculation is substantial.

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[13] A.26-02-005; PROPOSED DECISION OF COMMISSIONER JOHN REYNOLDS; DECISION ADOPTING ADDITIONAL RULES FOR THE SENATE BILL 884 EXPEDITED UTILITY DISTRIBUTION INFRASTRUCTURE UNDERGROUNDING PROGRAM; October 16, 2026. (SPD-37 PD)
[14] Id.; p. 18.
[15] Id.; p. 143.
[16] Guidelines; p. 31.

2.1. Program Benefit Cost Ratio

PG&E's Table 1-2 demonstrates the difference between scaled and unscaled risk estimates:

TABLE 1-2:
EUP RISK REDUCTION: UNSCALED MITIGATED BASELINE COMPARED TO SCALED AND UNMITIGATED RISK BASELINE
(BILLIONS OF DOLLARS)

Line No.	Risk Type	Unscaled and Mitigated Risk Reduction	Scaled and Unmitigated Risk Reduction
1	Total Wildfire and Outage Program Risk	$15.1	$117.4
2	Wildfire	$4.5	$104.9
3	EPSS	$6.3	$6.3
4	PSPS	$4.3	$6.2

Table 1 - PG&E Table 1-2 showing the amount of risk reduction over the 55 year lifetime of assets. Mitigated Risk takes into account the effects of PSPS and EPSS.

The table shows the effect of both risk scaling and also EPSS and PSPS mitigation. While these are combined in the above table, PG&E's estimate for catastrophic risk scaling is a factor of 7.5.[17] These different estimates lead to dramatically different implications for risk prioritization. For Scaled and Unmitigated Risk, which is PG&E's preferred calculation method that it intends to use in its submission to the CPUC, wildfire risk is the predominant risk and is worth over $100 billion dollars. This justifies a considerable undergrounding program. However, without risk scaling, PSPS and EPSS risk make up 2/3 of residual risk after mitigation. If this method is used for selection and ranking of undergrounding projects it would 1) justify a smaller program and 2) justify a program that emphasized reduction of reliability risks over wildfire risk.

With a projected cost of $16.6 billion[18] the overall program BCR would be 0.9 and including only wildfire risk would be 0.27 using the Unscaled Mitigated risk from Table 1-2. This implies that the majority of projects being considered for the EUP plan individually have an unscaled mitigated BCR of less than 1.0. In other words, the cost of undergrounding is greater than the benefits in projected benefits of risk reduction for most circuits unless scaling is used. PG&E's BCR presented

[17] MGRA GRC Testimony; p. 25.
[18] Footnote 8.

in its analysis is based on the assumption of risk scaling.[19] Thus, PG&E's EUP plan hinges on the implicit assumptions that 1) its risk scaling is reasonable, and 2) PSPS and EPSS are not mitigations that should be considered. Neither of these assumptions is correct.

2.2. PG&E Risk Scaling

While MGRA 2026-2028 WMP Comments addressed the issue of PG&E risk scaling,[20] it addressed these much more extensively in MGRA's testimony and briefing on PG&E's GRC, in which risk scaling became one of the most contentious issues in the proceeding. Thirty pages of MGRA's GRC Testimony were dedicated to this topic,[21] thirty pages of its Brief,[22] and ten pages of its Reply Brief.[23] To briefly summarize the issues with risk scaling as discussed in MGRA's GRC filings:

- Risk scaling is a question of "values", what a subject thinks risk aversion is worth, and is therefore an subjective rather than objective measure. Questions of "worth", or costs, are outside of the scope of OEIS authority.[24]
- PG&E claims to cite numerous authorities supporting its risk aversion position, but in fact none of these are relevant its specific situation.[25]
- PG&E's use of CAT bonds as a proxy is not valid in that it is based on a proprietary third-party vendor model which does not represent PG&E's risk calculations.[26]
- There is no universally accepted consensus on risk aversion to catastrophic risks is appropriate or on methodology to calculate risk aversion.[27]
- PG&E's methodology already incorporates tail risk so there is no justification for applying a multiplier of 7.5 to catastrophic risks.[28]

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[19] EUP; p. 397; Table 9-3 MODEL LANDSCAPE VARIABLES TABLE.
[20] MGRA WMP Comments; pp. 12-17
[21] MGRA GRC Testimony; pp. 13-45.
[22] MGRA GRC Brief; pp. 13-46.
[23] CPUC; A.25-05-009; MUSSEY GRADE ROAD ALLIANCE REPLY BRIEF CONCERNING PACIFIC GAS AND ELECTRIC COMPANY'S 2027 GENERAL RATE CASE; pp. 4-14. https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M612/K426/612426450.PDF
[24] MGRA GRC Brief; p. 14, 20, 24
[25] Id.; pp. 22-24.
[26] Id.; pp. 34-42.
[27] Id.; p. 31.
[28] Id.; pp. 27-28.

- CPUC's Safety Policy Division's positive evaluation of PG&E's scaling methodology was based upon the faulty assumption that ratepayers would be mitigating risk by purchasing catastrophe bonds through PG&E.[29]
- Risk neutral scaling does not lead to deferred capital investment because BCRs are calculated using the full 55 year lifecycle costs.[30]

If Energy Safety reviews the CPUC record regarding risk aversion, it will see that PG&E conducts a shell game with its definition of "risk aversion", which it gives one of three meanings depending on the context:

- The fact that people don't like catastrophic risks,
- A convex risk scaling function, i.e. people are willing to pay more to avoid a risk than the long term monetized value of the risk. For example, any risk against which one voluntary insures shows a risk-averse attitude,
- PG&E's risk aversion and corresponding risk scaling function.

PG&E regularly switches from one definition to the other, sometimes within the same argument to suit its purpose.

If PG&E's proposed attitude and risk scaling function is seen as an insurance premium that a customer would pay to avoid a risk, a factor of 7.5 over the 55 year life of the mitigation, the annual premium would be:

premium = 7,500% / 55 years = 13.6% of value per year[31]

This an extreme value. Homeowners in wildfire areas pay 1-2% of value per year to insure their homes.

However, cost reasonability is not an OEIS mandate. And Energy Safety requires PG&E to provide unscaled risk values in some limited contexts. However, it is important to emphasize just how ubiquitous risk scaling is in the BCR values used in the EUP. PG&E states that: "*The BCRs calculated in the EUP and supporting workpapers use Scaled Wildfire Risk post-PSPS and post-*

[29] Id.; pp. 39-42.
[30] Id. pp. 33-34.
[31] Id. p. 43.

EPSS, consistent with Table 9-3 (Model Risk Landscape Variables)."[32] Of the variables used in the PG&E data tables only ignition_consequence, baseline_cumulative_risk, project_as_scoped_risk, and screen_3_alt_cumulative risk use unscaled values. The remainder (XXX_total_risk_reduction, XXX_cost_benefit_ratio) for project as scoped and screen 2 and 3 is based on PG&E scaled risk values. It turns out that the magnitude of PG&E's proposed undergrounding program is based for the most part on the assumption of risk scaling.

At the CPUC a Proposed decision was issued in A.26-02-005, the proceeding to consider rules regarding the CPUC phase of the EUP.[33] Thee question of risk scaling with regard to EUPs was litigated in this proceeding and the SPD-37 PD finds that utilities must use risk neutral scaling in their BCRs once the EUP applications go to the CPUC. The PD states that: "*Moreover, we note that the RDF requires risk-neutral values precisely because the Commission has not yet adopted a common risk scaling function and unscaled BCRs provide the only consistent basis for evaluating project selection*."[34] And the PD concludes: "*the Commission finds that unless and until the Commission explicitly adopts an alternative risk scaling function in the recently opened RDF proceeding (R.26-04-016) or another future proceeding (such as an individual utility's most recent general rate case), the single approach to be used in connection with any EUP will be unscaled (i.e., risk-neutral) risk values*."[35]

PG&E filed a Motion to Amend in proceeding A.26-02-005, arguing that the PD would have grave implications for the EUP currently under consideration by Energy Safety. According to PG&E, if requirements regarding neutral risk scaling and SPD's BCR calculation methodology are adopted, it would: "*Reduce EUP-eligible miles from approximately 11,000 to less than 1,300.*"[36] PG&E's Motion was denied on October 30, 2026. If the SPD-37 PD is adopted unchanged, it will result in an incompatibility between the EUP submitted to Energy Safety and an EUP that the CPUC will accept as being in the ratepayer interest. However, as a participant in A.26-02-005,

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[32] DRR EUP-PhI_DR_MGRA_004-Q001.
[33] Id; p. 42.
[34] SPD-37 PD; p. 41.
[35] Id; p. 42.
[36] CPUD A.26-02-005; "MOTION OF PACIFIC GAS AND ELECTRIC COMPANY (U 39-E) TO AMEND THE PROCEDURAL SCHEDULE TO ALLOW COMMENTS ON THE CUMULATIVE IMPACTS OF THE OCTOBER 16, 2026 PROPOSED DECISION ON PACIFIC GAS AND ELECTRIC COMPANY'S 10-YEAR ELECTRICAL UNDERGROUNDING PLAN (EUP) AND FUTURE EUPS; October 27, 2026; p. 6.
https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M626/K495/626495218.PDF

ratepayer cost was not the primary consideration but rather the validity of PG&E's methods. MGRA filings at OEIS and the CPUC have shown that utility risk scaling functions in general and PG&E's in particular are beset with improper assumptions and are not valid. Additionally, in Section 5.3 MGRA discusses the BCR methodology and the absurdity of negative BCRs. The conclusions in the CPUC's Proposed Decision are technically sound, and Energy Safety should reach similar conclusions when evaluating PG&E's EUP. If so, this will result in a rejection of the current EUP, and so Energy Safety should provide explicit guidance to PG&E so that a resubmitted EUP will be technically and procedurally valid.

Recommendations:

- Energy Safety should reject the current plan and should require that PG&E provide a plan in which proposed projects have an unscaled mitigated BCR > 1, or can be justified by overriding considerations (tree fall-in, ingress/egress, extreme wind).
- Energy Safety should require any BCR that it uses for evaluation of PG&E's EUP application to be presented using unscaled benefits.

2.3. EPSS and PSPS Risk Mitigation

PG&E's decision to use "unmitigated" risk for its EUP decision-making – risk without EPSS or PSPS mitigation – makes no sense regardless of their argument that PSPS and EPSS are not permanent mitigations. EPSS and PSPS are currently in use, and they are extremely effective mitigations. PG&E claims that the 67% mitigation effectiveness for overhead hardening with covered conductor (which MGRA filings have shown to be an underestimate) increases to 79% effectiveness in conjunction with EPSS and Downed Conductor Detection (DCD).[37] In its 2026-2028 WMP filing, PG&E claimed that when PSPS is included that the wildfire risk is reduced by 97%.[38]

PG&E argues that these mitigations should be ignored because the need for EPSS and PSPS will be reduced by undergrounding, and that "*using PSPS and EPSS as a permanent baseline assumption effectively assumes that those outage programs will remain in place indefinitely.*" therefore it presents "*an alternative analysis using a scaled, unmitigated baseline that excludes the*

[37] EUP; p. 171.
[38] PG&E 2026-2028 WMP; TABLE PG&E-6.1.3-1; p. 126.

impacts of PSPS and EPSS."[39] There doesn't appear to be a logical thread connecting these concepts. In fact, the "unmitigated baseline" used by PG&E reduces the relative importance EPSS/PSPS as a factor determining undergrounding prioritization.

PGE was asked to provide a "Scaled and Mitigated" risk reduction estimate. This represents acknowledgement of the value of EPSS and PSPS in terms of risk reduction but still using PG&E's risk scaling function.

Line No.	Risk Type	Unscaled and Mitigated Risk Reduction	Scaled and Unmitigated Risk Reduction	Scaled and Mitigated Risk Reduction
1	Total Wildfire and Outage Program Risk	$15.1	$117.4	$30.3
2	Wildfire	$4.5	$104.9	$17.8
3	EPSS	$6.3	$6.3	$6.3
4	PSPS	$4.3	$6.2	$6.2

Table 2 - Total risk reduction estimated by PG&E from implementation of its EUP. This is identical to Table 1 but contains a column for "Scaled and Unmitigated" Risk Reduction, which is risk reduction according to PG&E's scaling function but accounting for the existing benefits of PSPS and EPSS.[40]

Even using PG&E's scaling function, the overall BCR for wildfire mitigation in PG&E's EUP is 1.8, meaning that many circuit segments may be achieving a BCR of less than 1.0.

2.4. Prioritization of Wildfire and PSPS Risk Mitigation

SB 884 states that the EUP may only be approved if "*if the large electrical corporation has shown that the plan will substantially increase electrical reliability by reducing the use of public safety power shut off, enhanced powerline safety settings, de-energization events, and any other outage programs, and substantially reduce the risk of wildfire*."[41] Using unscaled risk that includes EPSS and PSPS mitigations, 2/3 of current residual risk arises from PSPS and EPSS risk as determined by PG&E's ICE 2.0[42] based risk model. Nevertheless, PG&E's prioritization appears to be based on wildfire risk reduction and not PSPS risk reduction.

[39] EUP; p. 14.
[40] Data Request Response (DRR) EUP-PhI_DR_MGRA_003-Q001.
[41] Pub. Util. Code, § 8388.5(d)(2).
[42] EUP; p. 267.

Using PG&E's Table 2-12, the Target/Timeline Table, it is possible to determine relative prioritization of wildfire and PSPS risk reduction, as shown in the figure below:

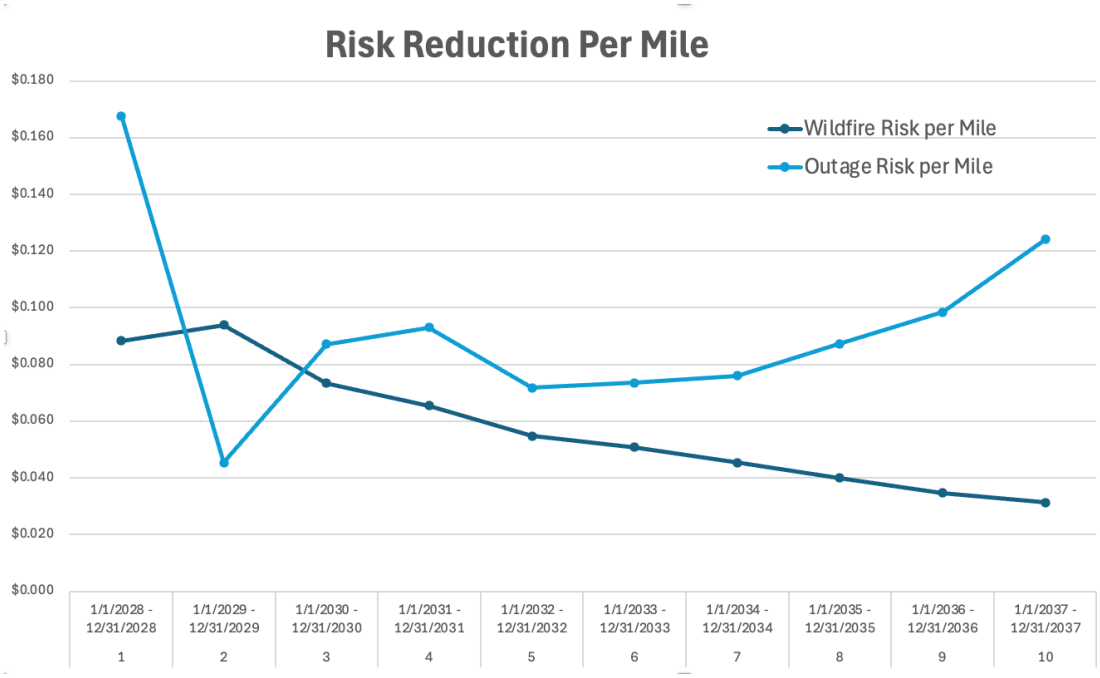


Figure 1 - Risk reduction per mile as a function of plan year. Data is derived from Table 2-12/WP002,[43] and shows the mitigated risk reduction for both wildfire and outages divided by the number of miles planned for the specified year.

Data for the figure was derived from Workpaper WP002, used for Table 2-12. The unscaled mitigated risk for both wildfire and outages was divided by the number of underground miles deployed in that year. The Wildfire Risk per Mile reduction shows a clear downward trend, which demonstrates that PG&E is prioritizing the circuit segments with the highest wildfire risk, addressing them earlier in the 10-year plan. The outage risk, on the other hand, shows a slight increase. There are two possible effects in play. First, as more circuit segments are undergrounded, the number of unmitigated upstream segments will be reduced thus increasing the relative effectiveness in mitigation per mile. Second, there is no evidence that outage risk is receiving equivalent priority to wildfire risk. Of particular concern is the significant drop in outage risk reduction between Year 1 and Year 2.

[43] MGRA Workpaper TN18762_20261012T163858_PGE_WP002_20260930_EUP_Target_Timeline_Table_R0xlsx-jwm.xlsx

3. PG&E RISK MODEL WDRM V4

PG&E continues to use its Wildfire Distribution Risk Model Version 4 as the basis of its EUP. This model has already been analyzed by MGRA in both its 2026-2028 WMP Comments[44] and in its 2027 PG&E General Rate Case testimony.

3.1. Ignition Model Underestimates Wind Effects

3.1.1. Limitations of Machine Learning (ML) models

MGRA review of PG&E's machine learning (ML) based ignition model as presented in its 2026-2028 WMP and prior filings has shown that PG&E underestimates the effect of wind-related ignitions because these models use aggregations of weather data[45] that are seasonally averaged.[46] As PG&E states in the documentation on its algorithms: "*Some covariates, such as weather and other time-based variables, require derivation, as the data should represent the conditions under which known events have occurred. To support multi-year event datasets, the derivation typically requires statistical extracts of multi-year sequences of weather data. Typical derivations for time-based data such as wind speed and fuel moisture include average values, percentile values, counts of days beyond threshold limits, etc.*"

These "statistical extracts" throw away the temporal data, diluting the effects of short-term extreme fire weather, which can cause outages due to wind, either from equipment failure or from vegetation or contact with other objects. The principal of Data Science and Machine Learning is that modern ML algorithms can extract maximum information from a data set better than other forms of analysis. However, this is not true if data is thrown away prior to feeding it into the model, and this is exactly what "statistical extracts" and aggregation do.

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[44] 2026-2028-Base-WMPs; MGRA 2026-2028 Base WMP P&GE Comments. (MGRA WMP Comments. If other MGRA WMP comments are cites these will be referred to by date).
https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=58534&docket=2026-2028-Base-WMPs&shareable=true

[45] MGRA WMP Comments; p. 18. Cites:
Supplemental Info: RaDA Modeling Algorithms and Methodologies; Version 1; Documentation; 03/12/2025.

[46] EUP; p. 275.

Analysis of PG&E's ML sub-models show that wind-related features contribute relatively little to the ignition risk.[47] Previous WMP Comments have clearly shown that outages increase exponentially as a function of wind speed,[48] confirming the earlier results of Mitchell 2013, which shows a 1000X increase in outage rates when wind speeds increase from 20 mph to 70 mph.[49] This relationship was understood by PG&E prior to the adoption of its ML model. The figure below shows a graph from data provided by PG&E during its 2022 WMP review cycle, showing calculated ignition probabilities during the October 2019 winds storm.

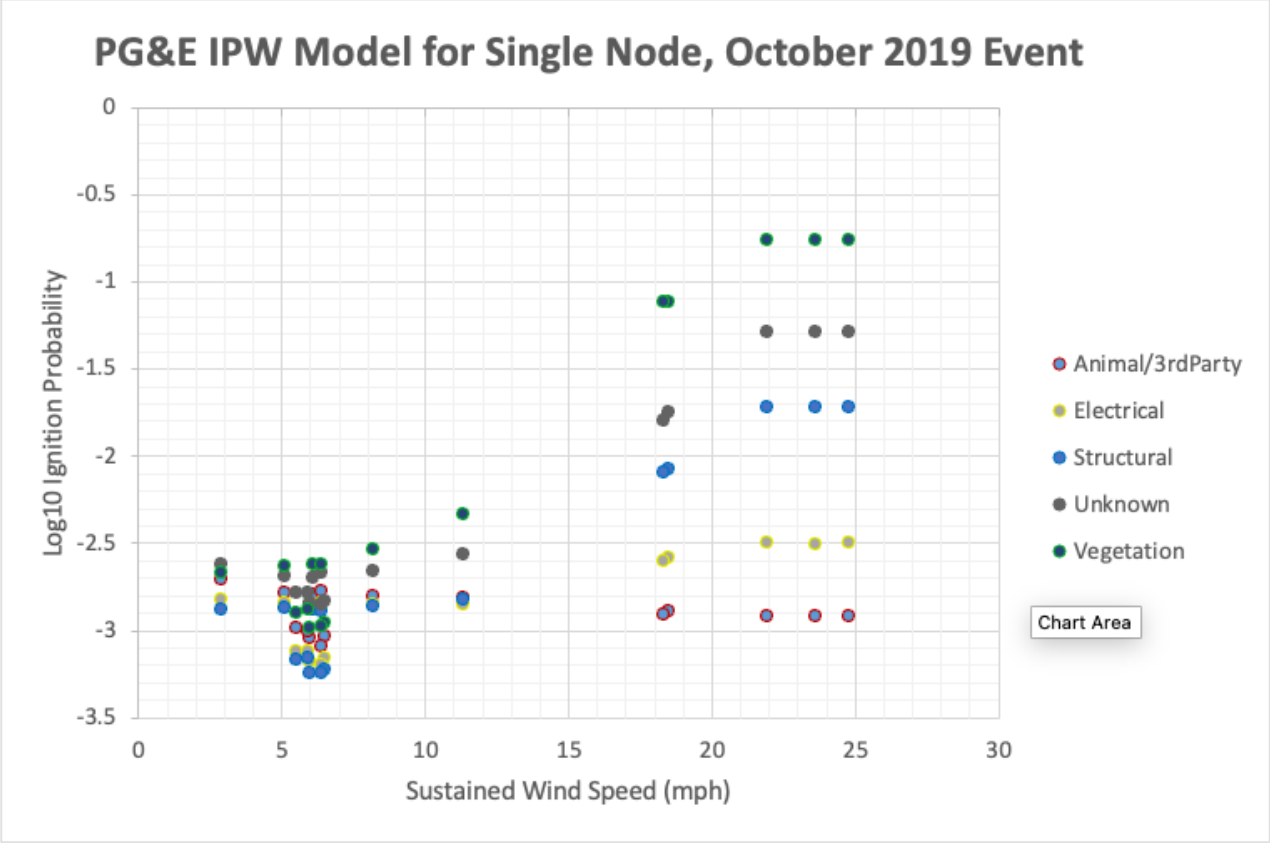


Figure 2 - PG&E's previous outage model, showing calculated ignition risk based on wind speed, as plotted in MGRA's 2022 WMP Comments.[50]

In PG&E's previous model, vegetation ignitions show a 100 fold increase as the wind speed increases from 6 to 20 mph, whereas in the current ML-based model vegetation ignitions do not

[47] Id.; pp. 19-20. Table 4.
[48] 2022-WMPs; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2022 WILDFIRE MITIGATION PLANS OF PG&E, SCE, AND SDG&E; April 21, 2021; pp. 31-38. https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52263&docket=2022-WMPs&shareable=true
[49] Mitchell, J.W., 2013. Power line failures and catastrophic wildfires under extreme weather conditions. Engineering Failure Analysis, Special issue on ICEFA V- Part 1 35, 726–735. (Based on SDG&E outage and wind data). https://doi.org/10.1016/j.engfailanal.2013.07.006
[50] Op. Cite; p. 38.

seem to have wind as a determinative feature at all. Wind-initiated ignitions have been responsible for the most destructive and deadly wildfire ignitions (Rice, Cherokee, Adobe, Nuns, LaPorte, Norrbomm, Partrick, Lobo, Pocket, Zogg).[51] This clearly demonstrates that annualized weather data is incapable of identifying transient wind risk. 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 the estimated risk in areas prone to extreme fire weather will be lower than it would otherwise be if the full ignition risk was incorporated.

A panel sponsored by E3 consultants, who reviewed PG&E's model, reached a similar conclusion: "*To capture the effect of extreme wind on both wildfire ignition risk and consequences, some TAC members strongly recommend a new methodology that incorporates a temporal element to capture the linkage between probability of ignition and consequence during extreme wind periods.*"[52] Even PG&E's latest version of its consequence model documentation recognizes that future model improvements need to "*Account for temporal alignment between probability of ignition and consequence*".[53]

3.1.2. PSPS "Blindness"

There is a significant bias in utility risk models due to the fact that power is shut off in high risk areas during the most dangerous weather conditions, thus eliminating all outage and ignition data. MGRA has repeatedly raised the issue of "PSPS blindness" in WMPs and in the General Rate Case proceedings. PG&E in fact began to incorporate PSPS damage and hazard reports into its risk model. As MGRA states in its brief in that GRC:

"In comments on PG&E's RAMP, MGRA warned that risk from areas subject to PSPS was being miscalculated because *'the fact that areas are de-energized implies that ignition and outage data are not collected from these areas, which by virtue of the fact that they are the areas chosen for emergency de-energization, are the areas with the highest risk of ignition of catastrophic fire. Left unchecked, this 'hole' in the dataset creates a bias artificially inflating the risk in areas outside of PSPS zones and decreasing relative risk in the far more dangerous PSPS zones.'*

[51] PG&E 2026-2028 WMP v.1, pp. 35-37.
[52] MGRA WMP Comments; pp. 20-21. Cites:
E3 Review of PG&E's Wildfire Risk Model Version 4; July 2024. (E3 Review)
[53] EUP; WP025; WILDFIRE CONSEQUENCE MODEL VERSION 4 (WFC V4) DOCUMENTATION; p. 1011.

PG&E developed corrective coding that *"allows PG&E to forecast ~100 million virtual fires daily across the PG&E territory in forecast mode, simulate fires on demand as they start, simulate hypothetical fires based on PSPS damage and hazard reports, as well as simulate fires in past weather scenarios'."*[54]

PG&E confirmed that it continues to use this methodology in risk calculations based on WDRM v4:

"*In WDRM v4, PSPS damages and hazards are included as a type of failure in the failure probability models and use an assumed ignition rate in the ignition probability model…*

It calculates avoided ignitions by multiplying the number of hazards and damages identified during post-PSPS patrols by an outage-to-ignition rate derived from historical ignition and outage data associated with vegetation- and equipment-caused events during Red Flag Warning (RFW) conditions in High Fire Threat Districts (HFTDs). "[55]

While this feature address PSPS blindness in WDRM v4, PG&E does not use damage events in its Project Variable Modifier (PVM) analysis or in its risk analysis. PG&E's PVM is based on a subject matter expert of 2,700 failure modes, and these do not include PSPS damage reports, only outage and ignition data, according to a data request response by PG&E.[56] The response also states that: "*Damage associated with high winds is incorporated into the mitigation effectiveness analysis when it results in a documented failure event captured in the historical outage dataset and attributed to a recorded cause or supplemental cause. As such, many wind-related failures are reflected in the effectiveness calculations through outage events that occurred under normal operating conditions.*"[57] This compromises the value of the PVM, because the failure modes associated with catastrophic wildfire do not occur during "normal operating conditions", but rather under extreme weather conditions, when certain risk drivers are greatly amplified.

Recommendations:

- Require PG&E to include PSPS damage reports and associated failure modes in its PVM analysis.

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[54] A.21-06-021; MUSSEY GRADE ROAD ALLIANCE OPENING BRIEF ON PACIFIC GAS AND ELECTRIC COMPANY'S 2023 GENERAL RATE CASE; November 4, 2022; p. 22.
[55] DRR EUP-PhI_DR_MGRA_003-Q002.
[56] DRR EUP-PhI_DR_MGRA_002-Q003.
[57] Id.

3.1.3. The Next Catastrophe – PSPS Failure

Utility mitigation actions have been effective in the reduction of long term wildfire risk. Most importantly, the implementation of a PSPS program in conjunction with EPSS/DCD has drastically limited the number and destructive potential of utility wildfires. As disruptive and dangerous as PSPS events are themselves, they are relied upon under conditions where the initiation of catastrophic wildfire is highly likely. For example, in the aftermath of the 2019 PSPS events the CPUC Safety Enforcement Division contracted with Technosylva to run simulations of wildfire spread using damage discovered in patrols after PSPS events as the potential ignition source of a wildfire in the contrafactual that the line had been energized. While these studies were never validated, and from what we know now may have been underestimates, the results are sobering.

For the October 9-12, 2019 PSPS event, wildfires ignited at points where PG&E equipment was damaged might have impacted 18,800 buildings and burned approximately 275,000 acres.[58] For the October 26-29, 2019 PSPS event, ignition events resulting from all damage points could have potentially impacted 250,000 buildings and burned 3,000,000 acres, assuming that every ignition resulted in a wildfire and that there was no suppression.[59]

While these events in some ways represent "worst-case" scenarios (every damage point results in ignition, no suppression, 24 hour wildfire propagation), it is clear that the use of PSPS during the 2019 weather events, regardless of how faulty the methods, prevented catastrophic wildfire damage in the PG&E area. The only major event during this period was the Kincaid fire, which resulted from an energized transmission line.

PSPS is 100% effective for mitigating wildfire on the circuits where it is applied. Dead lines start no fires. However, PG&E does not list PSPS effectiveness at 100% and there are reasons for

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[58] CPUC; SED; 2019 PSPS Event –Wildfire Analysis Report; Event Date: October 9 - 12, 2019 IOU: Pacific Gas & Electric; Prepared by Technosylva, Inc.; p. 25. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/safety-and-enforcement-division/documents/technosylva-report-on-pge-psps-eventoct-912-2019.pdf

[59] CPUC; SED; 2019 PSPS Event –Wildfire Analysis Report; Event Date: October 26 – 29, 2019 IOU: Pacific Gas & Electric; Prepared by Technosylva, Inc.; p. 26. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/safety-and-enforcement-division/documents/technosylva-report-on-pge-psps-eventoct-2629-2019.pdf

this. Applying PSPS correctly to an area is a craft executed in the context of a complex and non-linear weather system. Things can go wrong, among them:

- Some equipment may have hidden faults causing it to fail below GO 95 wind speeds.
- Trees may have hidden weakness causing them to fail at lower wind speeds.
- Weather predictions as far as extent and timing of wind may be inaccurate.
- Winds at ground level couple strongly to terrain and other effects and may be much higher or lower than a mesoscale model can predict.[60]

One such failure has already occurred – the Zogg fire, which led to four fatalities and occurred when PSPS was in effect on nearby circuits. This fire led to federal court intervention and PG&E's development of tree overstrike criteria for PSPS.[61]

If we take the standpoint of the real tail-risk faced by the system, one must try to imagine the aftermath of the next catastrophic utility wildfire and its causes, the shortcomings of the WDRM model become clear. WDRM is good at identifying garden variety wildfires and predicting their trajectories. Among catastrophic wildfires, the Dixie and Butte wildfires fall into this category, with a tree contacting a conductor under conditions conducive to a fuel-driven vegetation fire. These can become large, but usually in remote areas without much urban density. WDRM would suggest other drivers should be expected for our catastrophic wildfires as well: transformers, squirrels, vehicle collisions – all of which provide ignition sources and none of which to date have been responsible for a catastrophic wildfire in California. While PG&E's Bow Tie model assigns a higher consequence to events occurring during Red Flag Warnings,[62] of which high winds are a component. Use of PSPS Damage events in WDRM likelihood models is helpful, but this does not capture all potential transient ignition causes that would occur under high wind conditions but are not recorded because power is off.

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[60] Coen, J.L., Schroeder, W., Conway, S., Tarnay, L., 2020. Computational modeling of extreme wildland fire events: A synthesis of scientific understanding with applications to forecasting, land management, and firefighter safety. Journal of Computational Science 45, 101152. https://doi.org/10.1016/j.jocs.2020.101152

[61] CPUC Undocketed: From: MGRA To: Leslie Palmer, Director Safety and Enforcement Division; Ref: MGRA Comments Regarding the PG&E Overstrike Proposal and Workshop; April 27, 2021. Workpapers: MGRA - PGE Overstrike Comments.pdf

[62] EUP; p. 1049; WP027.

It is possible that a non-wind related fault randomly occurs during one of these fire wind events. It is more likely, however, that the next catastrophe will be like those that have come before. Extreme winds cause damage to utility infrastructure or trees near utility infrastructure and cause a spark that ignites a wildfire under the worst possible conditions. PSPS should be, and is, mitigating this risk. The tail risk that is most likely to cause the next major catastrophe is a PSPS failure of some kind: to early, too late, in the wrong place. While EPSS/DCD provides considerable extra protection during these periods, there is an approximately a 40% it fails to prevent the ignition.

If the contention that PSPS failure during extreme wind conditions is the primary tail risk is correct then undergrounding in areas subject to that risk is a mitigation that should be considered. However, due to the flaws in the WDRM v4 ignition model, and its suppression model as will be shown in Section 3.2, it is not at all clear how this risk is distributed geographically or where hardening should be prioritized.

Rejection of the application on this basis alone would be appropriate. However, it could take years for PG&E to improve its model to include temporal effects in its ML models, because there is currently no straightforward path to doing this. There are, however, modifications that could be made to PG&E analysis and prioritization that would help to compensate for the biases its ignition model introduces.

3.1.4. Compensating for shortcomings in PG&E's ignition model

Introducing two additional measures would go a long way to compensate for the current ignition driver and geographical bias. One of these would be to create an 'extreme wind' criterion, and the other would be to prioritize based on PSPS reliability risk. This would be in addition to PG&E's current fall-in tree risk and ingress/egress criteria. Currently, PG&E's methodology uses two metrics to identify circuit segment candidates for undergrounding other than BCR: high tree-strike risk and for ingress/egress concerns where facilities traverse constrained roadways or evacuation routes:[63]

[63] EUP; p. 131.

"*Undergrounding is the most appropriate mitigation where local conditions (i.e., presence of fall-in tree risk, ingress, and egress needs, and previous PSPS impacts) require a more effective mitigation for wildfire, reliability, and/or public safety risks than overhead hardening*."[64]

If appropriately applied these can be reasonable criteria for undergrounding. Tree fall-in is one scenario in which covered conductor circuits can be severely damaged enough to cause wildfire. While Downed Conductor Detection (DCD) provides significant mitigation against this risk driver, there is still residual risk of ignition, and tree fall-in is a wind-related failure (though again PG&E's ML ignition model finds wind to be only a tiny contributor to fall-in risk[65]).

Likewise, protecting communities from lines blocking evacuation routes is a critical yet hard to quantify safety concern. It is important to understand that PG&E's so-called "egress" sub-model in its WDRM v4 consequence model does not identify egress-related risk issues but rather identifies areas with a higher proportion of AFN customers.[66] As noted in MGRA WMP Comments, this is not a bad thing, but it doesn't identify where ingress/egress issues that could potentially trap residents during a wildfire are present. PG&E's criteria for classifying a circuit segment as 'egress risk' identifies where "*overhead facilities traverse constrained roadways or evacuation routes*"[67] through a "*detailed analysis of local conditions at the street level*". This is a valid approach to identifying egress risk and it is not easily quantifiable in a risk model. MGRA filings at the CPUC and OEIS have long supported undergrounding in such cases.

It is recommended that Energy Safety allow PG&E to adopt to addition risk identification criteria to compensate for the significant flaws in its WDRM v4 risk model. If PG&E's risk scaling is not accepted as legitimate, then the number of miles suitable for undergrounding may be significantly reduced. In this case, adopting these additional criteria would help address residual tail risk due to inadvertent exposure of vulnerable energized infrastructure to extreme winds.

3.1.4.1. Extreme Wind Category

In addition to these special Screen 3 factors, Energy Safety should require a third: **Extreme Wind**. Likewise, PG&E should adopt such a criterion in its mitigation decision tree. If circuits are

[64] Id.; p. 132.
[65] MGRA WMP Comments; p. 18.
[66] MGRA 2026-2028 WMP Comments; pp. 43-46.
[67] EUP; p. 131.

exposed to extreme winds on a regular (or irregular) basis, both infrastructure and nearby vegetation are under stressed conditions. Additionally, if for some reason high winds occur in these areas and infrastructure is not undergrounded and if PSPS is not triggered for some reason, then the relative risk of catastrophic wildfire is very high. MGRA has asked PG&E to provide the peak wind speeds measured by its mesonet, including the number of 10-minute measurements above certain thresholds per year. These are shown in Table 3.

Gust Threshold > 0.1 Hour/Year (mph)	Stations Over Threshold	Fraction Over Threshold	Stations Over Threshold (HFTD)	Fraction Over Threshold (HFTD)
All stations >=0	1648		1218	
50	592	36%	461	38%
55	371	23%	303	25%
60	239	15%	199	16%
65	142	9%	120	10%
70	89	5%	77	6%

Table 3 - Number of PG&E weather stations registering wind gusts over threshold for 0.1 hour per year.[68]

The frequency of ignition, even with the inclusion of PSPS damage events in the risk events analyzed, does not fully capture the steepness of the outage rate increase with wind. Additionally, as will be shown in the subsequent section, PG&E's WDRM v4 effectively randomizes risk across the geography such that high wind areas will be relatively de-prioritized. Addition of an Extreme Risk category to the special Screen 3 factors would compensate for this shortcoming and reduce the potential for the PSPS-failure tail risk case.

The question of where to set this threshold should be analyzed by Energy Safety. IOUs invoke PSPS due to "extreme winds" but often set this value between 50 and 55 mph. The CPUC has interpreted its GO 95 wind loading requirements to correspond to "known local conditions" which can exceed 56 mph, which was the utility interpretation of the GO 95 standard prior to 2014.[69] However, with the full deployment of utility weather station mesonets, known local conditions are much better specified. Correspondingly, all covered conductor circuits will be constructed to withstand very high wind loading. The CPUC recognized in the cited decision that

[68] DRR EUP-PhI_DR_MGRA_002-Q001Supp01 and
Workpapers: EUP-PhI_DR_MGRA_002-Q001Supp01Atch01-jwm.xlsx
[69] CPUC D.14-12-089; p. 5.

vegetation contact was the most likely hazard during high winds that could not be mitigated by higher engineering standards. Covered conductor addresses much of the vegetation contact risk, but tree and heavy branch fall-in remain as potential hazards. PG&E has already created a branch in its decision tree for tree fall-in, however, so an "extreme wind" category would be designed to reduce wind-related risk outside of areas with high tree fall-in hazard. With the fall-in category already addressed, this allows a higher wind speed to be chosen for assignment of an "Extreme Wind" designation. A threshold of 70 mph is suggested. While only 6% of PG&E weather stations average over 10 minutes per year under these conditions, it will be seen that a larger proportion of PG&E circuit segments in the HFTD are within a few miles of these stations.

A data request linking EUP Plan specified circuit segments to their proximate weather stations was issued by MGRA.[70] This has allowed a sensitivity analysis to be performed linking the circuit segments and weather station wind gust exceedance calculations.[71] This calculation examines wind gust exceedance data for all PG&E weather stations within 3 miles of the circuit segment. The 3 mile value was chosen to allow local extreme local wind gust values to be captured under the premise that extreme winds can be highly localized.[72] However, it also a very conservative estimate because the flagging of a circuit segment as "extreme wind" will occur even if there is only one station out of many in an exposed position. Two variables were used to explore the sensitivity: wind gust speed threshold, set to 60, 65, or 70 mph, and number of hours per year above threshold. There were 11,483 circuit segments listed in PG&E's input file, with total length of 80,632 miles. The circuit segments marked as eligible totaled 28,078 miles in length, roughly 3X the 10,000 miles PG&E has claimed are eligible. Input was not received until the week before the deadline, and analysis performed immediately before the deadline, so there has been no time to resolve the discrepancy. This will be resolved in a subsequent data request and calculation results will be

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[70] DRR EUP-PhI_DR_MGRA_002-Q002, and
Workpapers EUP-PhI_DR_MGRA_002-Q002Supp01Atch01.xlsx

[71] Analysis was performed using files in previous footnote and
PGE_Initial_2026_09_30_Complete_Wind0.jwm.xlsx
Copies of all these files can be found in the WindThresholdAnalysis folder of MGRA Workpapers:
https://github.com/jwmitchell/Workpapers/tree/main/PGEEUP26/WindThresholdAnalysis
Analysis was performed with Python script pge_segment_wind_threshold_jwm_gpt.py generated by Chat GPT-6.1 Sol Light. Script was assembled step-wise, script outputs were reviewed as shown in chat log extreme_wind_chat_log.pdf. Variants for each combination of wind speed and yearly hours above threshold produced excel spread sheets identical to the "Complete_Wind0" input except for the addition of two columns, one for wind speed above threshold (Y/N) and one measuring peak wind gust for any circuit within 3 miles of the circuit segment. Debug log files were generated for each run showing 40 typical circuits.

[72] Fn. 60; Coen et. al.

updated. Nevertheless, calculated results are still presented because they demonstrate how an Extreme Wind classification would affect circuits listed in PG&E's plan Results are shown in the table below:

Threshold (mph)	Yearly Hours Over Threshold	Circuits Over Threshold	Length Over Threshold	Plan Length Over Threshold
60	0.1	2887	22806	14429
	0.2	2281	17898	10931
	0.5	1715	13404	8803
	1.0	1285	9680	6525
65	0.1	1809	14044	9140
	0.2	1543	11924	7966
	0.5	1090	8182	5616
	1.0	665	5145	3461
70	0.1	1238	8830	6071
	0.2	899	7112	5001
	0.5	498	3825	2778
	1.0	383	3012	2328

Table 4 - Circuits meeting annual wind gust peak over threshold criteria for PG&E's circuits in its supplied datasets. These add up to more than stated in its EUP so this issue will be resolved later. However, this table serves to show how raising the wind speed threshold and requiring longer periods over threshold both significantly reduce the number of circuits potentially exposed to high winds (weather station over threshold within three miles). This is intended to help PG&E and Energy Safety establish a reasonable Extreme Wind criterion for undergrounding. Description of the analysis is provided in Workpapers described in Footnote 71.

While overall normalization needs to be adjusted, the relative effects of raising the wind threshold criteria in terms of wind gust speed and hours per year over threshold appear to be robust, with similar fractional reduction seen in the length of all circuits affected and the length of circuits considered to be candidates for the EUP plan. In all cases, increasing the time required over threshold from 0.1 hour to 1.0 hours reduces both the number of candidate circuits and the length of those circuits by a factor of 2-3X. Likewise, raising the threshold from 60 mph to 70 mph reduces the number of candidate circuits and their length by a factor of 2-3X, except for the 1.0 hour case for the number of circuits, which is closer to a factor of 4. Nevertheless, even choosing a 70 mph, 0.1 hr threshold, 28% of planned circuits have an "extreme wind" weather station within 3 miles.

To reiterate why an "Extreme Wind" UG category should be considered:

- The Machine Learning algorithms underweight wind in order of importance due to risk, yet historical catastrophic wildfires almost all been wind driven.
- Even the inclusion of Post-PSPS damage events in the training set does not seem to fully capture wind risk enough to make wind a primary driver.
- The PG&E Suppression model (Section 3.2) is not valid and smears risk across the landscape, reducing the value of risk scores and rankings.
- As argued in Section 3.1.3, the most likely tail-risk catastrophic wildfire is through a mis-application of PSPS that inadvertently exposes infrastructure to high winds during fire weather.

Nevertheless, a number of caveats should be kept in mind:

- The three mile radius is extremely conservative and picks the worst measurements within 27 square miles. The chance that the swath of this landscape that the circuit passes through experience winds approaching the exceedance level are statistically small. Furthermore, these could be ruled out by physical examination by a meteorologist if the local topography around the circuit simply would support higher winds. The advantage of the three mile radius is that it is unlikely to miss the potential for extreme local conditions.
- Not all circuit segments exceeding wind threshold will have appreciable risk. There should be a special risk reduction / BCR threshold for these circuits. Unscaled BCRs in these cases may be less than 1.0, but this under-ranking may be due to the inability of WDRM v4 to correctly quantify extreme wind risk. If an "Extreme Wind" category is adopted it should still require a minimum total risk reduction and BCR threshold.
- The algorithm as described will have a tendency to select long circuits, which pass by more weather stations, and therefore have a higher probability of being near an "Extreme Wind" weather station. This could be easily remedied by only approving portions of the circuit segment traversing potential extreme wind areas for undergrounding, thus making these hybrid projects.
- "Extreme Wind" categorization would be especially important in areas with high tree strike risk or egress risk (real egress risk – the risk of infrastructure blocking ingress or egress of evacuees or emergency responders).

- Conversely, “Extreme Wind” designation would indicate against the raising of PSPS thresholds in those areas, as discussed in Section 4.1.4.
- This analysis was prepared at the very last minute, with PG&E’s data available the week before the deadline and the final analysis only being performed during the final weekend before the deadline. To increase transparency, therefore, all artifacts of the analysis: chat logs, log files, inputs and outputs, and the python script itself have been loaded into the M-bar Technologies and Consulting, LLC GitHub site along with other workpapers.
- MGRA will continue this analysis and upload revisions to its Workpapers.

Caveats notwithstanding, a threshold should be chosen based on the engineering characteristics of the hardened CC infrastructure. Heavy vegetation contact, such as tree fall-in, remains a danger even at lower speeds, but PG&E already has a tree fall-in hazard designation and decision point. MGRA therefore tentatively suggests an Extreme Wind classification for circuits with proximate weather stations showing 70 mph gusts for at least 0.1 hours per year. Lower values should be within the design limits of hardened overhead infrastructure without appeal to safety factors. Energy Safety should allow PG&E to include such a designation in a subsequent application or revision notice, however it should be Energy Safety that sets the thresholds, since IOUs in the past have been overly expansive at what they consider “extreme wind”.

3.1.4.2. PSPS risk reduction

Another related and complementary suggestion is to re-prioritize circuit segments to address PSPS reliability risk with greater weight. As can be seen in Figure 1 and PG&E Table 2-12, PG&E’s prioritization emphasizes buy-down of wildfire risk. With both the Commission and OEIS recommending that the utilities emphasis unscaled risk in their EUP application, reliability risks as calculated by the ICE model currently exceed wildfire risk (Table 1). However, while PG&E’s spending on residual wildfire risk clearly emphasizes the circuits with highest wildfire risk early in the 10-year project, more aggressive buy-down of PSPS risk does not occur until the last two or three years of the timeline. This trend should be reversed. Not only does this provide greater overall risk buy-down earlier in the cycle (and therefor higher yearly BCR), by reducing the need for PSPS it also reduces the potential for PSPS-failure tail risk.

At some level, Extreme Wind designation and reliability buy-down will be addressing the same circuits and accomplishing the same thing. However, they are complimentary. Extreme Wind designation provides direct warning that a circuit segment is at risk of igniting catastrophic wildfire if PSPS is not carefully applied to that circuit because extreme winds may occur along it. However, wind patterns are non-linear, and it may be that the closest weather station does not accurately represent the wind exposure of a circuit. The fact, though, that it is in an area where high winds are possible and PSPS is necessary adds further weight to its selection in addition to reliability benefits to be gained.

Recommendations:

- Require and allow an "Extreme Wind" designation to be used to prioritize selection of circuit segments for undergrounding.
- Require PG&E to shift the emphasis from wildfire risk buy-down to PSPS risk buy-down in its Target/Timeline.

3.2. PG&E's Suppression Model Distorts and Amplifies Consequences

In WDRM v4 PG&E added a "suppression" submodel to its consequence model. MGRA 2026-2028 WMP Comments[73] reviewed this submodel in detail and found a number of critical errors in it. For one, it makes the scientifically dubious assumption that the exact terrain at the point of ignition can have a tenfold impact on the number of structures destroyed tens of miles away. In fact, MGRA found an error in its Figure 10[74] regarding house loss fraction, which PG&E admitted was erroneous and supplied corrected data. However, PG&E continues to use the same figure based on the same erroneous data in its updated consequence model documentation (now Figure 11)[75], which it explains it did not correct because: "*Updating or revising specific examples was outside the scope of this document update*"[76]

Energy Safety also found room for concern in its review of PG&E model, concluding in its Decision that the additional factors PG&E included in its consequence model do not "*The factors include proxies to incorporate ingress and egress, and suppression into the model. These factors have a large impact on wildfire consequence. However, PG&E does not demonstrate that: (1) the*

[73] MGRA WMP Comments; pp. 33-43.
[74] Shown as Figure 8 in MGRA WMP Comments; p. 37.
[75] EUP; WP025; p. 997.
[76] DRR EUP-PhI_DR_MGRA_001-Q002.

proxies for these factors are appropriate, (2) these factors improve its consequence risk model's accuracy, (3) PG&E is appropriately weighing these new factors, and (4) PG&E has properly validated these new additions. Overall, PG&E has not demonstrated that these additions lead to an accurate understanding of risk on its system."[77]

In the MGRA review of PG&E's GRC, further analysis of PG&E's suppression model was performed, including more rigorous statistical analysis.[78] These results reified MGRA's and OEIS's concerns with this model. As MGRA pointed out in its WMP comments, the PG&E Suppression model on average multiplies overall risk by about 30%, by spreading risk over a larger area.

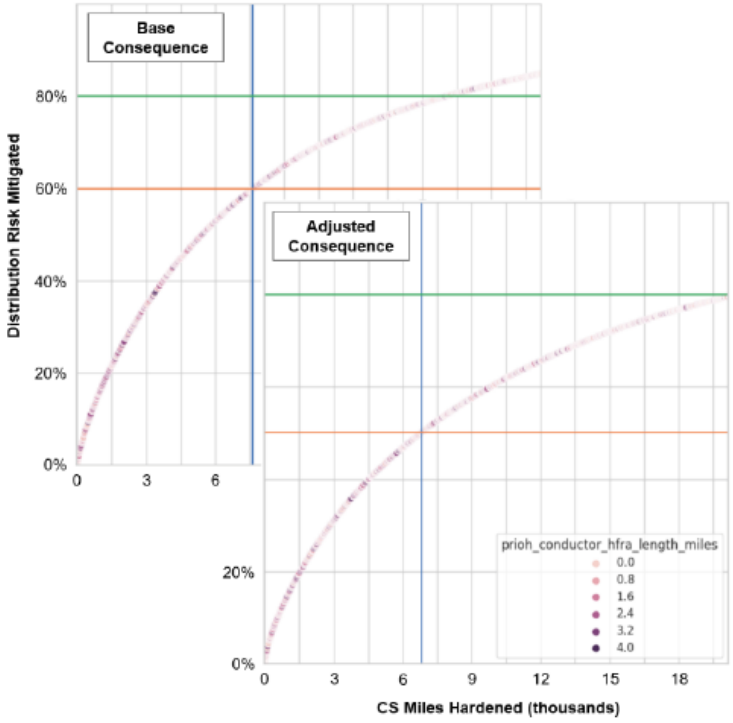


Figure 21 - System Hardening Risk Buydown

Figure 3 - PG&E risk buy down curve taking into account the weighting that would be applied due to its suppression model and egress model. Suppression model is expected to dominate the curve, since it greatly expands risk into remote areas.[79]

[77] 2026-2028-Base-WMPs; OFFICE OF ENERGY INFRASTRUCTURE SAFETY; DECISION; PACIFIC GAS AND ELECTRIC COMPANY 2026-2028 BASE WILDFIRE MITIGATION PLAN; February 5, 2026; pp. 10-11. (OEIS PG&E WMP Decision)
[78] MGRA GRC Testimony; pp. 66-88.
[79] EUP; WP025; p. 1010.

Under specific circumstances, PG&E's prediction of suppression is far greater than 30%, in fact reaching a factor of 20X, as shown in its TDI level adjustments for a hypothetical Dixie fire.

Table 21 - Dixie Fire
Suppression Predictions

TDI Level	Buildings Destroyed
Actual	1311
1	531
2	1311
3	3021
4	6082
5	9985

Table 5 - PG&E's WFC v4 Table 11, showing what they predict to be the number of buildings destroyed if the TDI level was different.[80]

PG&E asserts that the TDI level at the actual ignition point was 2, and the observed number of buildings lost was 1,311. But in a hypothetical fire where the TDI at the ignition point was 5, the number of buildings lost would have been 9,985. The problem is obvious to anyone with a scant knowledge of wildfire: the ignition point in the Dixie fire was tens of miles from many of the homes that were destroyed in the wildfire, as shown in the map below:

[80] EUP; WP025; p. 1014.

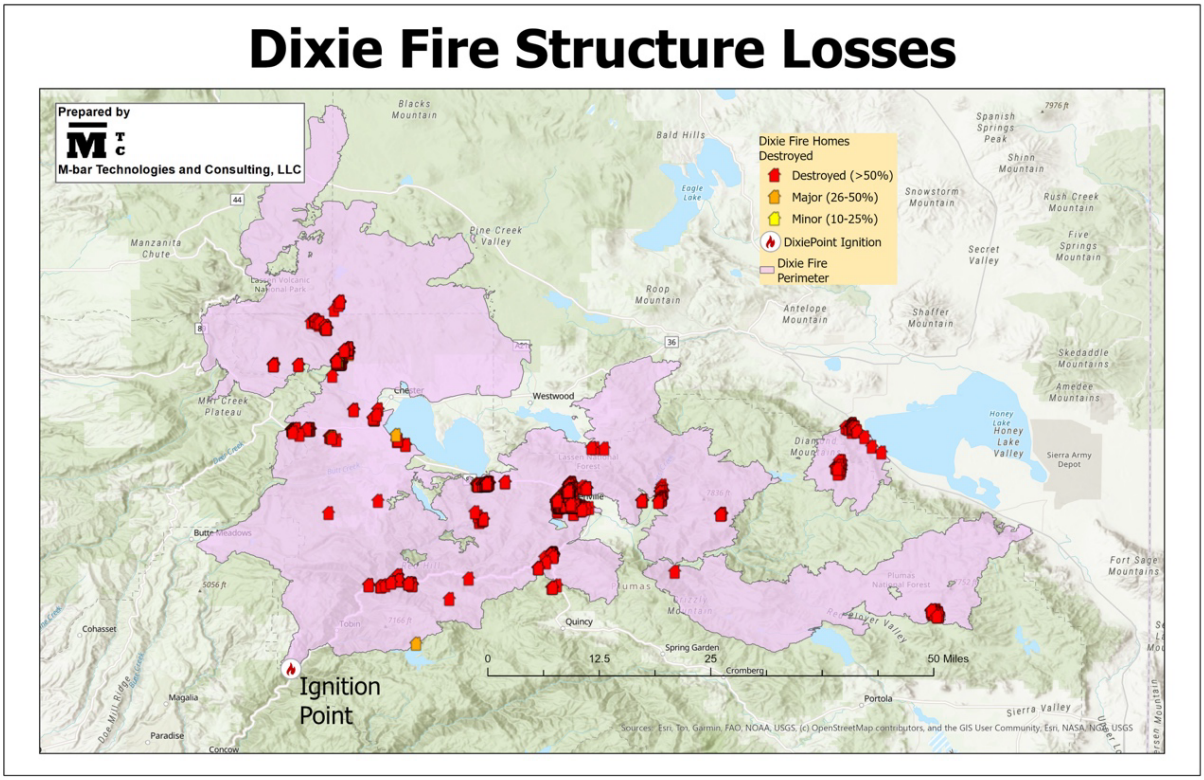


Figure 4 - Map of the Dixie fire structure losses, also showing the point of ignition. The scale shows that the fire extended over 50 miles.[81]

A thought experiment posed in MGRA's GRC testimony demonstrates that PG&E's model is non-sensical from the standpoint of wildfire science, physics, and logic.

"*According to PG&E, the TDI at the point of the Dixie fire origin was 2, which is fairly low. This means that access to that area was not very restrictive, and that firefighter access for suppression might have been possible. Now say that there was a deep ravine ¼ mile from the Dixie fire start point, and that instead of starting in an area with TDI 2, it started in an area with TDI 5. According to (PG&E WFC Table 11), the number of homes destroyed if the fire started in the nearby canyon would be nearly 10,000, versus the 1,300 actually destroyed, a factor of 7.7 larger. Somehow the extra 8,700 lost homes, many miles away from the point of origin, would somehow 'know' that the fire started in the canyon rather than the actual Dixie fire origin, and burn down accordingly.*"

[81] MGRA GRC Testimony; p. 75. Cites:
Structure losses: https://gis.data.cnra.ca.gov/maps/CALFIRE-Forestry::dixie-fire-structure-status-map/explore?location=40.249045%2C-120.926214%2C7
Ignition: https://www.fire.ca.gov/incidents/2021/7/13/dixie-fire/
Fire Perimeter: https://gis.data.cnra.ca.gov/datasets/CALFIRE-Forestry::california-fire-perimeters-all/about

Terrain Difficulty Index, or TDI, is a proprietary variable used by Technosylva to represent the access firefighters have to particular points in the landscape. An academic paper published at the end of 2025, many of the authors of which were Technosylva staff, studied the effect of TDI and suppression efficiency and found a strong relationship.[82] However, the manner in which the authors use the TDI variable is quite different from what PG&E does. PG&E uses TDI only at the point of ignition, whereas the authors define their TDI variable as: "*Average Terrain Difficulty Index at 2 h within the simulated fire perimeter*."[83] Additionally, the authors measure initial attack success rate rather than a building loss fraction, which is a much more highly correlated number.

PG&E's choice of the building loss rate as the variable with which to measure suppression is odd, and results in very low statistical correlation. To measure statistical correlation, PG&E calculates a "total deviance ratio" as shown in the table below:

model	deviance ratio (compared to null model)
Null model	1.000
Wind speed only	0.980
TDI (Terrain Difficulty Index) only	0.814
LFM (Live Fuel Moisture) only	0.970
Full model	0.755

Table 6 - PG&E's calculation of the "total deviance ratio" comparing the fitted model against a simple average (Null model).[84]

PG&E only used three variables to explain its fit, and that the entire fit only explains 24.5% of the observed variation, with the TDI component alone explaining 19% of variability (a point confirmed by the PG&E witness).[85] It is not statistically valid to apply such a large scaling correction when the actual explanatory power of the variables is so small. What if the explanatory value was only 0.1% rather than 19%? Would PG&E still apply the full 20X scaling range between TDI=1 and TDI=5 to the consequence? We must assume they would. PG&E might conceivably re-scale its observed TDI correlation by the statistical importance of the variable, as suggested by

[82] Cardil, A., et. al. 2025. Assessing the suppression difficulty of wildland fires for initial attack response. Int J Wildland Fire 34, WF24160. https://doi.org/10.1071/WF24160 (Cardil 2025)
[83] Id.
[84] MGRA GRC Testimony; p. 71. Cites:
Id.; Appendix B; DRR GRC-2027-PhI_DR_MGRA_003-Q001.
[85] MGRA GRC Brief; p. 58-59.

MGRA to PG&E's witness during cross-examination.[86] For example, instead of 20X, maximum variation would be 40%, and instead of an average 30% increase the increase would be 6%.

PG&E has not made this correction or adjusted its suppression model for the EUP. However it has compared its WDRM v3 and WDRM v4 risk models and found a roughly 20% change in risk per mile, with v4 being 20% lower than v3.[87] This is somewhat counter-intuitive (since the suppression model on the average increases overall risk), but it appears consistent with PG&E's explanation of the effect of its suppression adjustment: "*The base consequence curve estimates that it will take about 7,500 miles of work to mitigate 60% of wildfire risk, whereas the adjusted consequence curve estimates that it will require 10,000 miles of work to mitigate the same amount of risk.*"[88] The reason is that the risk is more spread out over PG&E's infrastructure. PG&E confirms this hypothesis in a data request response. "*Collectively, these enhancements altered the relative geographic distribution of modeled risk and produced a flatter risk profile. As a result, the proposed EUP portfolio can have lower relative risk per mile under WDRM v4 than under WDRM v3*."[89]

PG&E's answer to this discrepancy is to double-down: The net effect of PG&E's suppression model is to amplify risk by 30% over the entire system. However, the comparison with WDRM v3 leads to additional uncertainty, so PG&E's response is to apply "*a 20 percent reduction to the projected Ignition and Outage Risk reductions calculated using the risk models*…" to account for uncertainty. A reduction in a reduction is an increase. So PG&E's answer to the uncertainties created by its 30% amplification of risk is to multiply risk by an additional 20%.

However, the real problem, in fact the danger, of the PG&E model is not the overall scaling, but that risk gets reapportioned and reassigned in arbitrary ways geographically. This is demonstrated in PG&E's example map of the western Sierra Mountains shown below:

[86] MGRA GRC Brief; p. 59.
[87] EUP; pp. 55-57.
[88] EUP; WP025; p. 1010.
[89] DRR EUP-PhI_DR_MGRA_003-Q004

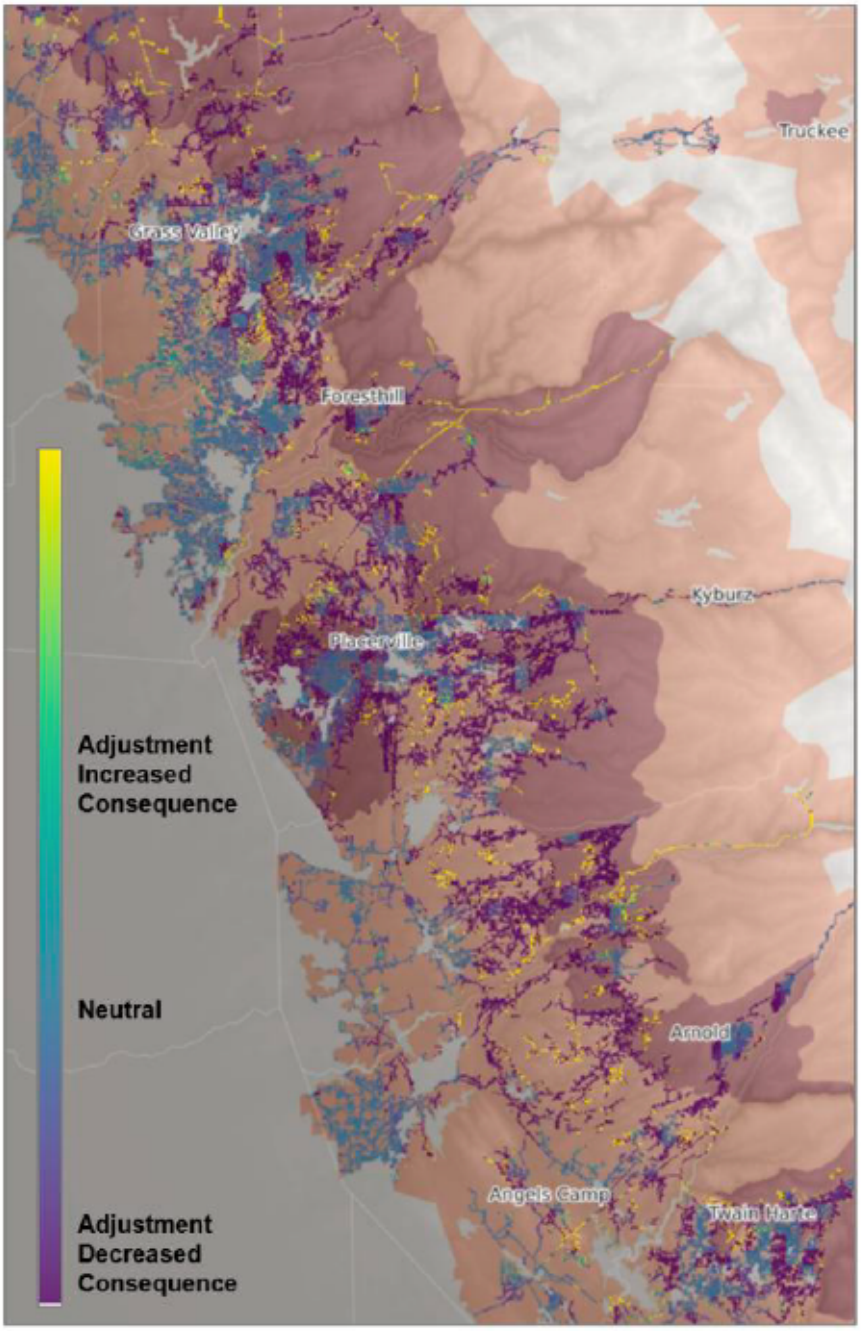


Figure 19 - Relative Adjusted Consequence Differential

Figure 5 - PG&E map showing the difference caused by its consequence scaling approach from its suppression and ingress/egress models. These lead to significant increases for remote and rugged valleys.[90]

If we were to assume that the WDRM v4 is in other respects accurate (which we don't), then the injection of a randomizing element in the geographical distribution of risk is inefficient and actually dangerous. On the one side it leads to massive misallocation of ratepayer funds, and on the other it risks fatalities and property loss.

[90] EUP; WP025; p. 1009. PG&E Figure 19.

It should be noted that after its review in the last WMP, PG&E had its WDRM v4 Consequence Model evaluated by consulting group E3. The E3 consultants provided a one line summary of PG&E's suppression model with no further commentary: ""*To model suppression, PG&E is using Technosylva's Terrain Difficulty Index (TDI) to predict the fraction of a building* [sic] *that is lost from a fire*."[91] That E3 did not conduct a full technical review of the suppression model is evidenced by the fact they did not detect the error in home loss fraction later corrected by PG&E shown currently in Figure 11 of the most recent Consequence model documentation (TDI Level Predicted Wildfire Outcomes). Therefore, the consultants' examination of this particular issue must be regarded as cursory.

MGRA filings, data requests, and hearings have tried to encourage PG&E in every way possible to see the inconsistencies and errors in this approach. One appeal was made via Data Request:

"*Developing an alternative model at this point may be in PG&E's interest, because current remedy suggested by intervenors and the Commission would likely be a requested reduction in PG&E's revenue request based on over-expansion of areas at risk due to the suppression model. Proposed revenue reduction would be ad-hoc and not optimized to for the PG&E service area, whereas an alternative PG&E analysis would be optimized for the PG&E service area. Furthermore, with OEIS now skeptical of PG&E's egress and suppression modeling, a PG&E SB-884 undergrounding proposal based on v4 as-is may meet with delays and modifications, further delaying the deployment of appropriate mitigations in the PG&E service area*."[92]

PG&E refused this request, saying it is not possible to remove the suppression model from WDRM v4. After evaluating the impact of the suppression submodel on WDRM v4, the conclusion of MGRA's GRC testimony was that WDRM v4 is not fit for purpose. That continues to be the MGRA conclusion.

Recommendations:

- Energy Safety should require that PG&E's suppression model be removed from its risk calculation prior to further evaluation of its application.

[91] E3 Review of PG&E's Wildfire Risk Model Version 4; July 2024. (E3 Review); p. 55.
[92] MGRA GRC Testimony; Appendix B; GRC-2027-PhI_DR_MGRA_003-Q009; Submitted December 3, 2025.

- Rejection of PG&E's application in its current form should be expedited so that remedial actions can be taken forthwith.

4. MITIGATION ALTERNATIVES

4.1. Covered Conductor Mitigation Efficiency is Much Higher than EUP States

In its Mitigation Effectiveness Analysis, PG&E states that the average system-wide mitigation effectiveness for overhead hardening (with covered conductor) plus EPSS is 79%.[93] The basis for PG&E's estimation was SME review based on outages that occurred between 2015 and 2024. SMEs estimated the effectiveness of the mitigation against 21 different failure modes, then aggregated these into an overall efficiency. When EPSS, which PG&E estimates is 60% effective, is removed from the calculation their estimate of OH hardening risk reduction only 47.5% for a system in which EPSS is operating.[94]

4.1.1. PG&E's Claimed System Ignition Reduction for CC, EPSS+DCD, and PSPS

In its 2027-2030 GRC Reply Brief, PG&E states that:
"*Overhead Hardening can, on average, reduce 67 percent of the distribution overhead asset ignitions caused by equipment failures or external contact/strikes with energized lines and 79 percent of asset ignitions when used in combination with Enhanced Powerline Safety Settings (EPSS) and Downed Conductor Detection (DCD),*" also noting that "*Overhead Hardening may also reduce ignition risk as much as 97% when used with EPSS, DCD, and Public Safety Power Shutoffs (PSPS), however this mitigation effectiveness varies greatly by location based on factors such as wind, tree strike, and exposure.*"[95]

In the EUP, PG&E calculates residual risk reduction when EPSS is in place.

"*Because EPSS is assumed to reduce approximately 60% of wildfire risk, OH paired with EPSS receives credit only for the incremental reduction in residual risk beyond that baseline. As an example, if OH paired with EPSS reduces wildfire risk by approximately 79% relative to an unmitigated overhead system, the incremental reduction beyond the EPSS baseline is 79% - 60% =*

[93] EUP; WP001; p. 501.
[94] Id; p. 502.
[95] CPUC

19%. Because EPSS has already reduced risk by 60%, only 40% of the original risk remains, calculated as 100% - 60% = 40%. The incremental effectiveness of OH against that residual risk is therefore 19% / 40% = 47.5%."[96]

It is important to guard against conflation of ignition reduction and residual risk reduction and apparently PG&E fails to do this when it provides estimates of covered conductor effectiveness for risk drivers.

4.1.2. PG&E Underestimates Effectiveness for Risk Drivers

Looking at Table PCS-6, PG&E's estimate for various drivers appear dubious and far lower than those previously reported. For example, reduction in outages due to balloon contacts for overhead hardening is listed at 67%[97], whereas in previous filings and in the filings of other IOUs this value is always determined to be well over 90%. Likewise, line slap, a mitigation completely eliminated by covered conductor, shows a reduction of only 57%. In its analysis of PG&E's 2026-2028 WMP filing, MGRA compared PG&E's estimates to those of SCE, which has had much greater experience with the deployment of covered conductor. These findings are summarized in the table below:

[96] EUP; WP001; pp. 502-503.
[97] EUP; p. 471. Table PCS-6.

Ignition Driver	PG&E WMP (CC+EPSS+DCD)	PG&E EUP PCS-6 PVM Inputs	SCE (CC only)
Crossarm failure	70-89%	52%	50%
Pole Damage	70-89%	52%	0%
Vegetation Contact	70-89%	25-60%	71%
Animal	70-89%	64-71%	65%
Balloon	70-89%	67%	99%
Vehicle	70-89%	42%	82%
Other Contact	40-59%	24%	77-81%
Wire-to-Wire Contact	90-99%	57%	99%

Table 7 – PGE's EUP PVM estimates[98] as compared to previous estimates by both PG&E and SCE. MGRA 2026-2028 Comments, Table 12.[99] Ignition reduction effectiveness estimates for different drivers from PG&E (covered conductor + EPSS + downed conductor detection) and SCE (covered conductor alone).

The results for balloon and wire-to-wire contact particularly stand out because there has already been consensus among stakeholders and utilities that the effectiveness of covered conductor in reducing ignitions for these mitigations is nearly 100%. For wire slap, it is generally assumed that for covered conductor with an intact covering ignition through slap is nearly impossible, unless the clashing is violent enough to damage the cladding. For balloons, ignition is only possible if the balloon contacts near to pole attachments, which takes up a very small fraction of the conductor length.

PG&E states in a data request response that "*the differences in the balloon and line-slap values do not indicate that PG&E concluded covered conductor became less effective. Rather, we reflect differences in the mitigation scenario and analytical methodology being evaluated.*

Please refer to PG&E's Mitigation Effectiveness Workpaper in the EUP (WP 001, Section 2.3.1, Vol 2, pp. 501-503)."[100]

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[98] Id.

[99] MGRA WMP Comments; p. 62; Table 12. Cites:
CPUC Docket A.23-05-010; DIRECT TESTIMONY OF THE MUSSEY GRADE ROAD ALLIANCE SOUTHERN CALIFORNIA EDISON COMPANY 2025 GENERAL RATE CASE; ERRATA 2A – CLEAN; pp. 64-66. Dated: February 29, 2024.
https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2305010/7338/531383951.pdf
PG&E 2026-2028 WMP; pp. 191-194.

[100] DRR EUP-PhI_DR_MGRA_003-Q003.

Specifically, PG&E states that the PVM methodology is being applied to results of "*The most recent Joint IOU Grid Hardening Working Group report is particularly relevant. Using PG&E's methodology and historical outages classified according to WDRM v4 drivers, it reported PG&E Overhead Hardening effectiveness of 88% for Third Party (Balloon) and 85% for Primary Conductor-Line Slap*.".[101] This is seriously problematic at two levels. First PG&E's claim in the Joint IOU estimate is dubious, in that it is hard to imagine failure scenarios that match PG&E's low estimates, and other utilities do not present similar estimates. Secondly, applying the PVM methodology, which applies to residual risk reduction efficiency, to a question of ignition likelihood (in Table PCS-6) is erroneous from a logical and engineering standpoint.

PG&E's PVM method looks at the amount of risk reduction to be gained in a mitigation if another mitigation (EPSS) is already employed. The causality chain doesn't matter in this method, because the risk has already been reduced by EPSS, and one is looking at the value of adding another mitigation in addition. However, for ignition, the order calculation must be reversed. EPSS is triggered only after a fault has occurred, so whether or not EPSS protects the system depends on whether the primary mitigation has failed. Therefore, the efficiency in reducing likelihood of ignition for a particular mitigation is ***greater*** if EPSS is active, not lesser. Taking the example of a mitigation that is 85% effective in reducing ignitions on its own, its residual risk will be reduced by 60% by EPSS, unless EPSS is not effective against that particular driver. So:

Effectiveness = 85% + (1-0.85) X 60% = 94%

This is a fairly obvious error and needs to be corrected and Table PCS-6 updated accordingly.

Wire slap and balloons are used as examples because to low-ball ignition reduction estimates for mitigations that are considered much more effective by other IOUs and by consideration of the engineering and physics principles involved implies that PG&E's estimated

[101] Id.; Cites Joint IOU Grid Hardening Working Group, Report: Update for 2026-2028 Wildfire Mitigation Plan, ACI 25U-03, Continuation of Grid Hardening Joint Studies (Mar. 19, 2025), Table 1, 'PG&E Covered Conductor Mitigation Effectiveness Estimate.' https://www.pge.com/assets/pge/docs/outages-and-safety/outage-preparedness-andsupport/aci-25u-03-continuation-of-grid-hardening-joint-studies.pdf

ignition reduction effectiveness for other mitigations is also likely to be questionable. The estimates PG&E provides are by SMEs, as they have been since the first Joint IOU report, despite the fact that PG&E has now amassed considerable operational history with covered conductor. It is to that data instead that Energy Safety should look to understand the actual measured effectiveness of covered conductor.

Recommendation:

- Energy Safety should require PG&E to correct its errors in PCS-6 in a revision or second application. Inclusion of EPSS in ignition reduction effectiveness calculations should be calculated properly so that effectiveness of mitigation+EPSS is higher than mitigation alone.

4.1.3. PG&E Ignition Data

As of September, 2026, PG&E has deployed 1,701 cumulative miles of covered conductor and has been deploying over 100 miles per year since 2019.[102] During this period, only 5 ignitions have been observed on lines with overhead hardening. During its 2024 RAMP, PG&E was asked to calculate the effectiveness of its covered conductor as wildfire mitigation based on expected versus observed ignitions, and calculated the value as 79.3%, inclusive of EPSS mitigation.[103] The cited MGRA data request asked for this calculation to be repeated with data updated through September 2026. Based on this calculation, the estimated efficiency of overhead hardening is calculated at 87.8%. It should be noted that there is no indication that EPSS was preferentially deployed on either bare wire or covered conductor hardened circuits, so this mitigation value is the pre-EPSS value.

PG&E dismisses this calculation for several reasons, none of which are convincing, First, it states that these circuits are subject to PSPS. PSPS is engaged for a very short fraction of the total time that data is collected, at most 1-2% (3-6) days in a high risk area. Therefore, ignition data may be less statistically significant, but should not show any CC/bare wire bias. Outage and ignition rates would be much higher in the PSPS areas in a counterfactual in which PSPS was not activated, but in the actual case potential data during these periods has been removed by PSPS itself, leaving only PSPS damage reports.

[102] DRRs EUP-PhI_DR_MGRA_002-Q005.
[103] RAMP-2024_DR_TURN_006-Q004. (Attached)

Weathering may be a consideration over the long term, but PG&E does not provide any discussion or modeling of weathering in its EUP, and there is no evidence in the ignition data that shows only one ignition in 2024 and no ignitions at all in 2025 or to date in 2026.

PG&E also argues that the measurements are biased because areas with high tree strike risk, which can break covered conductors, have been preferentially undergrounded.[104] However, as PG&E continues to underground it is likely to continue to regard tree-strike risk as an overriding consideration over other selection metrics. Additionally, tree fall-ins have been responsible for some of the PG&E ignitions, and if future planning will remove this risk then these would be removed from the sample used to calculate risk reduction efficiency, which would likely drive CC ignition reduction efficiency even higher. Where trees continue to coexist with overhead lines, DCD is particularly effective at reducing tree-strike ignition risk more so than other mitigations. PG&E has provided wire down data for 2023-2025, the dates for which DCD has been enabled on all HFTD circuits.[105] Of the 67 wire down events recorded, none resulted in an energized wire down.[106] Of these, 39 were vegetation-related events, mostly tree fall in (29 events). This shows a very high risk reduction efficiency for DCD even in areas prone to tree fall-in.

PG&E also notes there is a selection bias because re-build areas, which have different risk profiles, which one would assume to be lower risk in the short term particularly for vegetation-related ignitions. Even assuming risk in rebuild areas is 0%, and no ignitions were from those areas, this would reduce PG&E's total mile-years of covered conductor deployed in wildfire risk areas from 6,503 to 4,682 and its corresponding risk reduction efficiency from 87.8% to 83.0%.

If covered conductor ignition reduction efficiency were as low as PG&E claims, it should show up in its data. It does not. Instead, PG&E continues to base its ignition reduction efficiency on the claims of SMEs, which have never been technically supported and should be considered opinions. Therefore, all risk and BCR calculations in the EUP should be calculated using a higher covered conductor ignition reduction efficiency, which based on PG&E's data should be at least 80%.

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[104] DRRs EUP-PhI_DR_MGRA_002-Q004.
[105] DRR EUP-PhI_DR_MGRA_002-Q006.
[106] Workpaper EUP-PhI_DR_MGRA_002-Q006Atch01-jwm.xlsx

Recommendation:

- PG&E should be required to submit risk and BCR calculations based on actual data to estimate ignition risk reduction for covered conductor. Based on current data this should be approximately 80%.

4.1.4. Covered Conductor and Reliability

PG&E is the only utility that does not use covered conductor status as a criterion for determining shutoff thresholds. Covered conductor reduces wind-related failure modes that result in wildfire. Large branch and tree fall-ins remain concerns but are at least partly addressed by PG&E's Downed Conductor Detection (DCD) technology that neutralizes open conductors. It would therefore be reasonable to raise PSPS wind speed thresholds in areas where covered conductor have been deployed. Both SDG&E and SCE apply higher thresholds on covered conductor hardened circuits.

The benefits of raising the threshold can be seen by looking at Table 3 in Section 3.1.4.1. There are 461 PG&E weather stations in the HFTD with gusts exceeding 50 mph, while this number drops to 199 weather stations if the criterion is 60 mph, a drop of 57%. As shown in MGRA's 2026-2028 WMP, the number of counts over threshold drops even more dramatically as a function of shutoff threshold.[107] This means that not only is area affected by power shutoff reduced, but shutoff duration and frequency is reduced as well.

It could reasonably be asked if raising thresholds is prudent given the PSPS failure scenario discussed in Section 3.1.3. There are several mitigating factors. First, EPSS will likely be active during borderline sub-threshold weather events. Second, DCD is specifically designed to manage tree fall-in risk, and from existing wire down data appears effective in de-energizing wires during for fall-ins. Finally, undergrounding will be PG&E's suggested primary mitigation for areas with high tree fall-in risk. In any case, raising shut-off threshold would not be advisable in areas with significant tree fall-in risk or for circuit segments designated as "extreme wind".

[107] MGRA WMP Comments; p.

If a higher threshold is adopted for CC+DCD circuits, then this should be reflected in calculated reliability benefits for this mitigation.

Recommendation:

- Higher wind speed thresholds for PSPS shut-off should be in place, and if they are this reliability benefit should be included in mitigation calculations.

5. BENEFIT COST RATIOS

Benefit cost ratios are critical to the undergrounding analysis process as they are used throughout the Screens for selection and prioritization. MGRA has advocated for using cost-benefit ratios in wildfire mitigation decision making since 2009,[108] and has supported the centrality of this metric since. The details of how the BCR values are calculated can be dependent on the assumptions made about what constitutes a cost and what constitutes a benefit.

5.1. PG&E Methodology

PG&E's definition given in the WBCA is:

$$\boldsymbol{BCR} = \frac{(NPV\ Lifetime\ Risk\ Benefit)}{(NPV\ Lifetime\ Costs)}$$

Where:

- *NPV Lifetime Risk Benefit = Present value of the sum of Wildfire, Public Safety, Baseline Outage, EPSS, and PSPS risk-reduction benefits over the applicable asset life.*
- *NPV Lifetime Costs = Present value of installation capital costs and incremental lifetime O&M costs associated with the mitigation alternative.*[109]

While the benefit to cost ratio should be straightforward, in PG&E's formulation it can become negative:

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[108] D.09-09-030; pp. 55;
A.08-12-021; MGRA Opening Comments; Appendix A; Mitchell, Joseph W; M-bar Technologies and Consulting, LLC for the Mussey Grade Road Alliance; "WHEN TO TURN OFF THE POWER? COST/BENEFIT OUTLINE FOR PROACTIVE DEENERGIZATION"; March 27, 2009

[109] EUP; WP006; WILDFIRE BENEFIT COST ANALYSIS (WBCA) WHITEPAPER; p. 565.

"*Occasionally, BCR calculations may result in a negative number. There are two instances where this happens:*

1) When the O&M cost savings of the selected mitigation (PV over the life of the asset) exceeds the capital installation costs of the Project (i.e., the BCR calculation would have a negative denominator).

2) When the mitigation alternative introduces a net new risk (e.g., EPSS risk) to the system that outweighs the wildfire risk reduction. Such outcomes represent economically unfavorable mitigations, as the risk introduced to the system exceeds the potential benefits (i.e., the BCR calculation would have a negative numerator)"[110]

One of these circumstances is beneficial, and the other non-beneficial, which compromises the integrity of BCR as a metric. One cannot tell from the value which of these is the case. Furthermore, these two cases could potentially be mixed together. Another pathology of allowing negative BCRs is that there is a discontinuity from a "very good" mitigation, with a high BCR, to a "very good even without risk reduction" with a negative value. Necessarily the combination of these would be an indeterminate value somewhere between a high BCR and a negative BCR.

5.2. BCR and Risk Scaling

As discussed in Section 2.2, PG&E's risk scaling is highly problematic and all decision-making should be based on unscaled values. This is particularly true due to the fact that the CPUC in its SPD-37 PD seems inclined to require risk neutral scaling unless and until a common scaling approach is developed for utilities.[111]

5.3. Safety Policy Division Disaggregated BCR (Method 3)

Questions of BCR calculation methodology were addressed in CPUC proceeding A.26-02-005. As part of this proceeding, the CPUC's Safety Policy Division provided a White Paper that described three potential approaches to the calculation of BCRs.[112] SPD states that "*a robust and*

[110] EUP; p. 139.
[111] SPD-37 PD; p. 18.
[112] CPUC A.26-02-005; Staff White Paper on Benefit-Cost Ratio Methodology; CPUC SENATE BILL 884 APPLICATION 26-02-005; April 10, 2026. (BCR Whitepaper)

consistent BCR framework requires (a) selecting a well-defined, structurally stable formulation that doesn't fail under practical use cases and (b) enforcing methodological consistency across all projects, utilities, and mitigation types, with key methodological nuances explicitly defined rather than left to interpretation."[113]

To achieve this, SPD recommends adopting a "Disaggregated BCR". This follows the general formula:[114]

$$BCR = \frac{Risk\ Reduction\ Benefits + O\&M\ Savings}{Capital\ Costs + O\&M\ Costs}$$

One advantage of this approach is that it is well-behaved under all circumstances and negative values do not occur.

With the issuance of the SPD-37 PD on October 16, the Disaggregated BCR approach will be the default for utility EUPs that have been passed on to the Commission. To the extent that PG&E has adopted a different BCR methodology its EUP application as it stands would not be eligible for consideration by the CPUC. PG&E must supplement its application with the Disaggregated BCR methodology. It should do so prior to Energy Safety's evaluation of the EUP, since its Screens and decisions use BCR as a determinative factor, and Energy Safety should review the application in the form it will arrive at the CPUC.

Recommendations:

- Energy Safety should require that the benefits used in the calculation of BCRs are based on unscaled risk values.
- Energy Safety should require PG&E's application to use Disaggregated BCRs (SPD Method 3) as the basis for its EUP application and supporting documents.

[113] Id.; p. 27.
[114] Id.; p. 20.

6. OTHER EUP ISSUES

6.1. External Analysis

6.1.1. Third Party Impact Analysis

PG&E has provided a third party impact analysis from Marsh Global Risk Management group.[115] This appears to be a rather abbreviated analysis, as the data was only received by Marsh in August 2026 and the report totals only 14 pages. The analysis provides input on three topics: overall reduction in losses, climate change impacts, and reductions in homeowner insurance costs. The analysis states that it uses a Monte Carlo simulation based on the AIR wildfire catalogue in addition to CPUC, Cal Fire, and PG&E data. Technical details of the analysis have not been provided in the report itself and PG&E claims that it has no access to the data or additional insight into the analysis, and additionally that the analysis is proprietary and requires an NDA to discuss.[116] Regardless it is possible to make the following observations:

- The report correctly notes that 9 percent of the wildfires in the PG&E service territory between 2014 and 2024 were responsible for over 80% of the $40 billion in losses in this time frame.
- However, the loss projections do not appear to be consistent with losses observed. Specifically, tail end 99% losses are estimated to be reduced by $533M, or 19%, which implies that the unmitigated tail end losses would be $2.5 B, grossly less than observed catastrophic wildfire losses.

The analysis' claim regarding homeowner insurance impact is dubious. The report shows that PG&E's undergrounding program could reduce homeowner insurance rates by 18% over the course of PG&E's undergrounding program. This reduction is approximately the same as the report's claimed reduction in wildfire risk due to the program. Therefore the report appears to assume:

[115] EUP; WP005; p. 519.
[116] EUP-PhI_DR_MGRA_001-Q003,4; EUP-PhI_DR_MGRA_002-Q007,8.

- Wildfire risk in the PG&E service area is mostly due to the risk of wildfire from PG&E power lines, as represented by the observation that 80% of losses since 2014 have been due to such wildfires.
- That wildfire risk represents almost the entire cost of homeowners' insurance, ignoring other risks and the premium retained by the insurer.
- That PSPS and EPSS programs have not had an appreciable impact on the relative or absolute risk from PG&E power lines, nor have PG&E's hardening programs to date.
- That reductions in wildfire losses will be immediately absorbed by the insurance market and that this savings will be passed back to customers.

It is important to note that the majority of reported losses due to PG&E-related wildfires occurred during the 2014-2018 period prior to PG&E's implementation of PSPS.

In toto, the assumptions made in the homeowner insurance analysis do not appear to be reasonable, although without additional insight into the methodology it is not possible to comment on how insurers actually incorporate this information.

Recommendations:

- Before adopting any finding in the Third Party Impact Analysis, Energy Safety should require that all methods and assumptions be disclosed and analyzed.
- If PG&E wishes to rely on the results of the Third Party Impact Analysis in areas of its technical capability, it should be asked to independently verify the claim.

7. CONCLUSION

The changes required by SB 884 have required extensive effort by regulators, utilities, and stakeholders to prepare and implement. Guidelines and regulations have had to be prepared, and in the meantime General Rate Cases have gone forward such as PG&E's A.25-05-009 which had to implement a "bridge" program in order to extend the period that undergrounding continues under the auspices of the GRC rather than SB 884. PG&E released its EUP on the last day of Q3 in 2026.

Two weeks after the EUP was released, the Commission's own SB 884 Guidelines PD (SPD-37) was issued and it calls for a risk-neutral scaling function to be used in all BCRs and also

calls for a different BCR methodology than PG&E has used in order for the EUP to be accepted by the Commission. While this event was beyond PG&E's control, a number of other things have not been. PG&E has been amply warned by Energy Safety and MGRA that its suppression model was not supportable, and this mode has a huge effect on PG&E's results, particularly with regard to prioritization. MGRA and other stakeholders have repeatedly questioned the validity of PG&E's risk scaling assumptions. MGRA has been providing feedback regarding the danger of PG&E's ignition models underweighting the probability of ignition during extreme winds during fire weather. And MGRA has repeatedly pointed out that PG&E's estimated risk reduction effectiveness for covered conductor is too low.

Given the incompatibility with the CPUC expectations regarding EUP methodology at least, and the OEIS-acknowledged weakness in PG&E's suppression model, the current application should not go forward. In fact, Energy Safety could provide the greatest service by rejecting the application as soon as possible, before significant additional effort is spent, allowing PG&E to reformulate its analysis and application according to the new requirements and resolving its outstanding errors. At the same time, Energy Safety could take the opportunity to apply the recommendations put forward in these comments in its decision rejecting PG&E's application.

Whether or not the application is immediately rejected, Energy Safety should ensure that the prioritization of undergrounding projects – whether in the present or in a resubmitted application – maximizes the risk reduction for residents. Removal of PG&E's faulty suppression model would be one component of this improvement. The other part would be to ensure that the areas with largest actual tail risk, in other words high wind areas, with regular gusts over 70 mph (or another value to be determined by Energy Safety), are specifically flagged for prioritized undergrounding in the same manner that PG&E prioritizes ingress/egress constrained roads and areas with high tree fall-in risk.

Finally, without appeal to risk scaling, the BCR of the overall plan falls to nearly 1.0, most of which is due to reliability risk. Under these circumstances, it may be necessary significantly scale back PG&E's EUP to concentrate on locations with the highest overall risk, and also shift PG&E's emphasis from wildfire risk reduction to PSPS risk reduction.

The importance and effectiveness of undergrounding as a mitigation both for reducing reliability and wildfire risks cannot be overstated. Nevertheless, with a 10-year, 5,000 mile undergrounding program being considered, it is essential that the magnitude of the spending be justified and that all of the methods used for prioritizing where undergrounding will be used are valid. The current EUP does not meet these criteria, and Energy Safety's response should enable PG&E's new or revised EUP to be justifiable from both the safety and affordability standpoints.

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