PACIFIC GAS AND ELECTRIC COMPANY
PG&E Ref. DRU17656-Case-EUP-SB 884
Data Request OEIS
Requester DR No. Energy Safety-DR-EUP-26-04 - Risk Model Discussion Follow-up

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Request Date: May 27, 2026
Response Date: June 05, 2026

<u>Background:</u>

This Data Request pertains to the PG&E Risk Model Discussion that took place on March 30, 2026. PG&E gave a presentation covering various aspects of their risk modeling. This Data Request aims to clarify portions of the presentation and verify some of the verbal responses PG&E provided during the meeting.

<u>Question No. 001:</u>

Calibration Factor.

Slide 5 mentions a Calibration Factor in the calculation for Distribution Wildfire Risk that is defined by Electrical Undergrounding Plan (EUP) guidelines.
Please answer the following regarding this Calibration Factor:

i. What is the Calibration Factor?
ii. What is the purpose of the Calibration Factor and what is it calibrating for?
iii. At what granularity is the Calibration Factor applied?
iv. What is the source of data for the Calibration Factor?

<u>Response to Question No. 001 Response No. 001:</u>

i. The calibration factor represents the dollar value assigned to each unit of WDRM v4 risk, enabling conversion of unitless WDRM risk points into monetized wildfire risk values. It is calculated by dividing the total system wide monetized wildfire risk from the wildfire bow tie model by the total system wide WDRM v4 risk points. This factor is then used to apportion monetized wildfire risk values across individual circuit segments by multiplying the calibration factor by each circuit segment's specific WDRM v4 risk points.

   a. Example: If the total monetized wildfire risk is $1,000,000,000 and the total WDRM v4 risk points are 800, the calibration factor is $1,250,000 per WDRM v4 risk point. A circuit segment with 0.4 WDRM v4 risk points would therefore be assigned $500,000 in monetized wildfire risk.

ii. The wildfire bow tie estimates wildfire risk as an aggregated value, not specific to circuit segment locations. A calibration factor is required to distribute this value to individual circuit segments.

iii. The calibration factor is applied at the circuit segment level.

iv. The calibration factor is calculated using WDRM v4 risk points from the WDRM v4 risk model and monetized wildfire risk from the wildfire bow tie.

<u>Question No. 002:</u>

Risk-Averse Scaling Function.

This question covers Risk-Averse Scaling to determine if/how PG&E intends to apply scaling in an EUP submission.

i. Is PG&E intending to apply a risk-averse scaling function in the EUP submission?
ii. If so, where is risk-averse scaling applied (Wildfire Consequence Model, Wildfire Bowtie Model, etc.)?
iii. For each use of risk-averse scaling in part ii, is PG&E able to utilize risk neutral scaling to calculate and report risk values and Key Decision-Making Metrics (KDMMs)?
iv. For each use of risk-averse scaling in part ii, does scaling affect only risk ranking or total overall risk?

<u>Response to Question No. 002 Response No. 001:</u>

i. All KDMMs will be calculated and reported using unscaled values in accordance with Energy Safety's EUP guidelines. In alignment with the requirement to provide the "CPUC CBR," PG&E will calculate Benefit-Cost Ratios using the risk-averse scaling function, as allowed in the RDF and applied consistently to risk values and BCR calculations used in PG&E's RAMP and GRC.

ii. Risk-averse scaling is applied within PG&E's Bow Tie Models. For example, the total estimated dollar value of wildfire risk on PG&E's distribution system is calculated using a risk-averse scaling function. This total risk is then allocated equally across the unitless risk points from WDRM.

   a. Note: The Wildfire Consequence Model within WDRM v4 applies some similar techniques to appropriately aggregate the relative consequences of fires with varying levels of severity, however, as the outputs of WDRM do not represent monetized values, PG&E does not consider this to be risk scaling.

iii. Yes, PG&E will report unscaled values for all KDMMs in accordance with Energy Safety's EUP guidelines.

iv. The risk scaling applied in PG&E's Bow Tie Models impacts total overall risk.

Question No. 003:

Value of Service.

Slide 9 presents Value of Service in units of $ per customer minutes within the Customer Outage Cost per Event equation.

i. Is the Interruption Cost Estimate (ICE) calculator used to generate Value of Service?
   a. If no, please clarify what model was used to calculate the Value of Service and provide documentation of the inputs and outputs of this model.
   b. If yes, please provide documentation of the inputs used and outputs generated from the ICE calculator.

ii. What timeframe does the input data from Q03(i) represent?

iii. What version of the ICE calculator or the alternative model discussed in Q03(i) is PG&E anticipating using for the EUP submission?

iv. Please provide the value(s) PG&E anticipates using for Value of Service for the EUP submission and which customers the value(s) represent (e.g., residential and nonresidential).

Response to Question No. 003 Response No. 001:

i. Yes.

   a. Not applicable. The Interruption Cost Estimate (ICE) calculator is used to generate Value of Service.

   b. Please refer to *"PGE_OEIS_DR-EUP-26-04_20260605_Q003_ATCH001.xlsx"*. The "*Inputs*" worksheet presents the model inputs, and the "*Outputs*" worksheet presents the corresponding results.

ii. Please refer to *"PGE_OEIS_DR-EUP-26-04_20260605_Q003_ATCH001.xlsx"*. Within the "*Inputs*" worksheet, *column D* ("*Data Description*") identifies the timeframe associated with each input used in the ICE 2.0 calculator.

iii. PG&E anticipates applying ICE 2.0 for all outage models in the EUP submission, consistent with the most recent version vetted and available at the time of outage model development. PG&E notes, however, that reliability attribute of the Enterprise Wildfire Bow Tie model continues to apply the Value of Service derived from ICE 1.0. This reflects the version of ICE that was available and approved at the time of that model's development and calibration and ensures consistency with the wildfire risk valuation across concurrent regulatory proceedings including the 2027 GRC.

iv. PG&E anticipates using a Value of Service of $0.08 per customer minute interrupted for residential customers and $23.11 per customer minute interrupted for non-residential customers. These values are expressed in 2024 dollars and will be adjusted for inflation in future reporting periods. The ICE 1.0 value used in the 2027 GRC is an overall estimate of $3.33 per customer minute interrupted (2024$) and is not differentiated by customer class. The comparable system-level value from ICE 2.0 is $2.72 per customer minute interrupted (2024$).

Question No. 004:

Critical Customer Weighting.

Slide 9 includes Critical Customer Weighting within the Customer Outage Cost per Event equation.

i. Please provide documentation of the process used to arrive at the Critical Customer Weighting values including inputs and outputs of any models used and SME determinations.
ii. What timeframe does the input data from Q04(i) represent?
iii. Please provide the values PG&E anticipates using for Critical Customer Weighting for the EUP submission and which customers the values represent.

Response to Question No. 004 Response No. 001:

i. The weighting framework was developed in 2022 by subject matter experts (SMEs) to redistribute risk dollars so that critical customers are attributed a larger share of the risk. It was initially incorporated into the PSPS methodology to support risk prioritization for customers and circuits most impacted by PSPS events. It was approved for use by the WRGSC in May of 2022. In 2025, refinements were made in how customer types such as TT1 and TT2 (Telecommunication Services), were moved to the "Extreme" category, recognizing their role as Public Safety Partners.

   While multiple weighting scenarios were explored, the final methodology expanded the highest weighting category (100x) to include additional customer types determined to be vital (as shown in iii. below).

ii. Critical Customer Weighting values are not derived from a single fixed data set. An evaluation of weighting scenarios was conducted by SMEs in 2022 and 2025 based on available information at that time.

iii. Table 3 PSPS Critical Customer Weighting Overview below contains the weights for each critical customer category used in the PSPS Outage Program Risk Model and provides examples of customer types that fall into each category.

Table 3 PSPS Critical Customer Weighting Overview

Weight	Critical Customer Type	Description & Examples
100	CC1, CE1, TE1, TE2, TT1, TT2	Extremely critical infrastructure, public safety partners or provides emergency services (e.g., critical care facilities, emergency services, telecom hubs, transportation terminals, etc.)
5	Life Support Low Income, Medical Baseline Low Income, Life Support	Medically vulnerable and low-income customers (e.g., life support, low income, medical baseline, low income, etc.)
2	CC2, CC3, CE2, CE3, EE, PR1, SC1, SC2, SC3, SE1, SE2, SE3, Medical Baseline, Self-Identified Vulnerable, Low Income, AFN (Access and Functional Needs)	Moderately vulnerable groups (e.g. medical baseline, self-identified vulnerable, low income, AFN, etc.)
1	Other	Baseline or regular customers without identified critical attributes

Question No. 005:

Global Normalization Factor.

Slide 9 contains a Global Normalization Factor within the Customer Outage Cost per Event equation.

i. Please provide documentation of the process used to arrive at the Global Normalization Factor.
ii. How does PG&E calculate the "total system risk" referenced within the Global Normalization Factor footnote?
iii. If this total system risk is not outage program risk, why does PG&E intend to normalize Customer Outage Cost per Event to the total system risk rather than total outage program risk?

Response to Question No. 005 Response No. 001:

i. The following is the process for arriving at the Global Normalization Factor:

   a. Calculate total unweighted customer outage cost as the sum of Value of Service (VoS) rate (in $/min) * outage minutes across all customers and all events in the 7-year PSPS lookback period.

   b. Calculate total weighted customer outage cost as the sum of VoS rate * outage minutes * critical customer weighting across all customers and all events in the 7-year PSPS lookback period.

   c. Global normalization factor = total unweighted customer outage cost/total weighted customer outage cost.

   d. Multiply each weighted customer event cost by this factor.

ii. Total system risk is the sum of VoS * outage minutes across every event in the lookback, i.e., the total unweighted dollarized cost of all PSPS outages across all customers, all events, all years (see step a in the previous question).

iii. On the referenced slide, "total system risk" refers to PSPS risk only, within the scope of the PSPS model.

   Normalization is performed within the PSPS methodology to ensure that, after applying critical customer weighting, the total PSPS outage program risk remains unchanged while redistributing risk toward more vulnerable customers.

Question No. 006:

Outage Program Reporting.

The UG Risk Model Discussion more closely detailed how PG&E will model Outage Program Risk. The methodology doesn't inherently lend itself to the
data structure in the EUP Guidelines.

Given the above, please answer the following:

i. How does PG&E plan on reporting the Outage Program Likelihood, Consequence and Risk in an EUP Submission utilizing the Outage Program Risk Modeling described in the UG Risk Model Discussion presentation?
ii. Does PG&E plan on including any of the upstream Outage Program Risk values as additional KDMMs in an EUP submission (Baseline outage risk, EPSS likelihood/consequence/risk, PSPS likelihood/consequence/risk)?
iii. Will the system baseline for the EUP submission include PSPS risk, EPSS risk, or both risks?

<u>Response to Question No. 006 Response No. 001:</u>

i. Outage Program Likelihood, Consequence, and Risk are calculated as a function of both EPSS and PSPS Likelihood, Consequence and Risk.

   a. Outage Program Risk = PSPS Risk + EPSS Risk

   b. Outage Program Likelihood = PSPS Likelihood + EPSS Likelihood

   c. Outage Program Consequence = Outage Program Risk / Outage Program Likelihood

   Because Outage Program Risk is the combination of two independently modeled and conceptually distinct risk streams (EPSS and PSPS), the representation of a single aggregated likelihood and a single aggregated consequence should be understood as a construct required for standardized reporting, rather than a direct physical or causal metric. PG&E will describe its methodology for reporting KDMMs in greater detail in Chapter 7 of the EUP filing, including how each KDMM is derived, the unit values associated with each KDMM, and the approach used to aggregate them.

ii. No, PG&E will not be introducing any additional KDMMs in its EUP submission. Baseline outage risk, EPSS risk, and PSPS risk will all be components of the Outage Program Risk Model.

iii. The following two baselines represent PG&E's interpretation of what the question may refer to:

   a. Overall Utility Risk (OUR) Baseline: The OUR baseline will be the sum of Unscaled PSPS risk, Unscaled EPSS risk and Unscaled Wildfire risk as required by the EUP guidelines section 2.7.3(a). This approach aligns with the precedent set in prior WMPs (with the exception of the EUP's unscaled risk requirements).

   b. Benefit Cost Ratio (BCR) Baseline: The BCR Baseline will consist of Wildfire Risk with PSPS in place as an operational mitigation measure, PSPS Risk, Public Safety Risk, and Baseline Outage Risk. To appropriately represent the risk tradeoffs from introducing EPSS as part of Alternative Mitigation 1 (which requires Covered Conductor with fast trip settings), the BCR baseline does not include EPSS Risk.

<u>Question No. 007:</u>

PSPS Modeling.

PG&E provided further details on PSPS Risk Modeling that was not included in the presentation. Please confirm or answer the following:

i. The years of PSPS events that PSPS Risk Modeling covers.
ii. Provide details on which years use actual PSPS events and which years are modeled with current PSPS criteria.
iii. For modeled PSPS years, did PG&E apply the current PSPS criteria to historical PSPS events or to all weather events for those years?
iv. Can PG&E utilize historical weather data to model PSPS events for more than 5 years?
v. What are the PSPS criteria PG&E is using to model PSPS events?
   a. Is undergrounding the only mitigation that would factor into whether a PSPS is called if the criteria are met?

<u>Response to Question No. 007 Response No. 001:</u>

i. The PSPS Risk Modeling covered in the aforementioned presentation is inclusive of 2018-2024.

ii. 2018-2022 are modeled using "lookback" criteria, meaning that PG&E assumes current PSPS protocols applied against historic weather, regardless of whether an event did occur in the past. This is because past PSPS activation protocols may vary from current practice. Since 2023-2024 events are aligned with current PSPS activation protocols, actual PSPS event data was used for these years.

iii. PG&E applied current PSPS criteria to all recorded weather events for the years modeled in the PSPS lookback, not just for specific events.

iv. Yes, PG&E can utilize historical weather to model PSPS lookback events for more than 5 years.

v. The criteria and models used for PSPS events begin by applying minimum fire potential conditions across all hours and locations of PG&E's service territory for the periods 2018-2022. These minimum fire potential conditions must all be met for a location to be considered for PSPS. This applies for both Distribution and Transmission. Minimum fire potential conditions include:

- Sustained WS above 19 miles per hour;
- Dead fuel moisture (DFM) 10 hours less than 9 percent;
- DFM 100-hour, 1,000 hours less than 11 percent;
- Relative Humidity (RH) below 30 percent;
- Herbaceous live fuel moisture below 65 percent;
- Shrub (Chamise) Live Fuel Moisture below 90 percent; and
- FPI above 0.7

Once the area meets minimum fire potential conditions, PG&E applies Catastrophic Fire Probability (CFP). The CFP Model is the primary method used to determine if PSPS is necessary. This model combines the probability of fire ignitions due to weather impacting the electric system with the probability that a fire will be catastrophic if it starts. The CFP is derived by combining outputs from our FPI and the IPW Models.

FPI Model

The FPI Model determines the probability that a fire will become large or catastrophic, which is considered as part of the PSPS decision making process. FPI is used as an hourly and daily tool to drive operational decisions to reduce the risk of utility caused ignitions and wildfires. The FPI Model combines the following information to predict the probability that an ignition could grow into a large and/or catastrophic fire:

- Fire weather parameters (WS, temperature, vapor pressure deficit);
- Fuel moisture data (dead fuel: dead grass and fallen branches; live fuel: grass and growing shrubs);
- Topography (terrain ruggedness, slope, wind-terrain alignment); and
- Fuel type data (grass, shrub, timber, or urban).

Ignition Probability Weather (IPW) Model

The IPW Model is a machine learning model that uses ten or more years of weather data, outage, and historical ignition data to determine the likelihood of an outage for specific circuits during past weather events. The model also uses historical data to identify the outage causes. Some tracked causes include vegetation, structural failures, electrical malfunctions, and animal or third-party damage. The IPW model then analyzes the potential for that outage to be the source of an ignition. IPW learns from, and accounts for, changes on the grid from year to year.

To account for the hardening work performed, our IPW framework analyzes positive and negative changes in grid performance and reliability year over year and applies a timeweighted approach to weigh more recent years of learned performance more heavily in the final model output. The model learns the performance of local grid areas hour by hour based on the WS observed at that hour and if outages or ignitions occurred or not.

The guidance values PG&E uses when making a PSPS decision is a CFPD (IPW*FPI) value greater than 9. This value was determined by running 70 PSPS sensitivity studies from 2008 through 2020. Through this 13-year historical analysis, PG&E evaluated the customer impacts by: (1) multiple dimensions (size, duration, frequency, repeat events, etc.), (2) the days when PSPS events would have occurred, and (3) whether historic fires caused by utility infrastructure could have been avoided due to the lines being de energized in this analysis.

Catastrophic Fire Behavior

Lastly, we consider output from millions of fire events simulated by using state-of-the-art fire simulation technology. This allows us to also evaluate areas where the probability of an outage and ignition event may be low, but the consequences of any ignition could be catastrophic. These locations are only considered for PSPS once the minimum fire potential conditions are met.

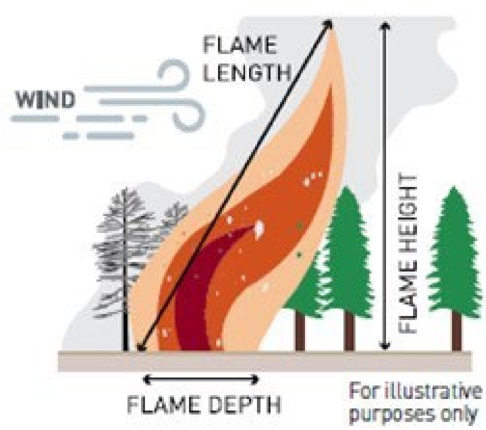
By leveraging a large set of fire spread simulations from 2000-2020, published agency literature, workshops with fire scientists, and sensitivity studies, we established our CFB guidance for PSPS decision making starting August 1, 2021. This guidance takes advantage of the fire behavior outputs from fire spread simulations to identify locations where fires are less likely to be contained should a fire ignition occur. The final CFB guidance selected aligns with USFS published research, presented below.

The United States Forest Service Rocky Mountain Research Station, a federal hub of wildfire research, has published documentation relating the observed and modeled fire behavior to the type of fire suppression efforts that may be effective or ineffective. This includes a study of fire line intensity, which analyzes how wildfires can grow and spread. Figure below summarizes the fireline intensity analysis:

The two rows outlined are considered catastrophic fire behavior, which would necessitate a PSPS.

FLAME LENGTH (L)	FIRELINE INTENSITY	INTERPRETATION
ft	Btu/ft/s	
<4	<100	■ Fires can generally be attacked at the head by using hand tools ■ Hand line should hold the fire
4-8	100-500	■ Fires are too intense for direct attack on the head using hand tools ■ Hand line cannot be relied on to hold the fire ■ Equipment such as dozers, pumpers and retardant aircraft can be effective
8-11	500-1,000	■ Fires may present serious control problems — torching out, crowning and spotting ■ Control efforts at the fire head will probably be ineffective
>11	>1,000	■ Crowning spotting and major fire runs are probable ■ Control efforts at head of fire are ineffective

Fireline intensity is determined by the size and components of flames. It is measured as the rate of heat energy released (British thermal unit (BTU)) per unit length of the fire line (feet) per unit times. It can also be calculated by estimating the flame length, which is the distance measured from the average flame tip to the middle of the base of the fire, as shown in the figure below:



PG&E uses flame length and rate of a fires spread from fire simulations in an operational setting to evaluate the potential need to turn off power. Flame lengths of 8-11 and >11 pose a serious control problem and therefore, are considered CFB and require a PSPS.

For Transmission, we also review lines and structures in areas experiencing dry, windy weather conditions during the 2018-2022 period. We review the same minimum fire potential conditions as with distribution lines. If these conditions are met, we will then look at:

Asset Health

The Operability Assessment (OA) model determines the probability that an asset (a tower or pole structure including the equipment and conductors it supports) will fail during wind gusts of a given speed. While WS is the intensity measure used to determine this probability, the OA considers damage mechanisms, such as corrosion, fatigue, wear, and decay that could lower the capacity of an asset to resist extreme winds.

Catastrophic Fire Behavior (Consequence)

The CFB is determined using Technosylva's fire spread modeling. Technosylva inputs PG&E weather data and then runs over 100 million fire spread simulations at 3-hour time intervals for the territory, out multiple days, creating a dataset of potential consequence of new ignitions. To meet CFB guidance, an ignition must meet a set Flame Length, Rate of Spread, and 8 hour burned acreage, in addition to a minimum asset fragility from the OA model. The use of CFB helps PG&E identify areas where the potential consequence from an ignition is high, but where the IPW score may be low due to high circuit resiliency.

a. Please see PG&E's response to Q7 above for details on the criteria that must be met when determining whether to call a PSPS event. Please note that these criteria apply exclusively to overhead lines, as PSPS events are not initiated due to adverse weather conditions in areas where all high-voltage facilities are underground.

   In each post-event report, PG&E describes mitigation efforts utilized to reduce impacts of a PSPS event. Some of these mitigations include but are not limited to sectionalization devices, temporary generation, microgrids, backup generation, transmission switching, etc. However, undergrounding is the most broadly available and permanent mitigation to address PSPS risk. For detailed information on the mitigation efforts, see Section 10 (Mitigations to Reduce Impact) of one of the past post-event reports.[1]

Question No. 008:

EPSS Modeling.

PG&E provided further details on PSPS Risk Modeling that were not included in the presentation. Please confirm or answer the following:

i. Are all circuit segments in Tier 2/3 High Fire Threat Districts EPSS-enabled?
ii. Describe the process and criteria for EPSS being activated for a given circuit.
   a. Are EPSS settings active year-round/during fire season/other criteria?
   b. Are the EPSS activation criteria applied to all HFTD circuits as a whole or individually?
   c. How often does PG&E determine whether to activate or deactivate EPSS settings (yearly/monthly/etc.)?

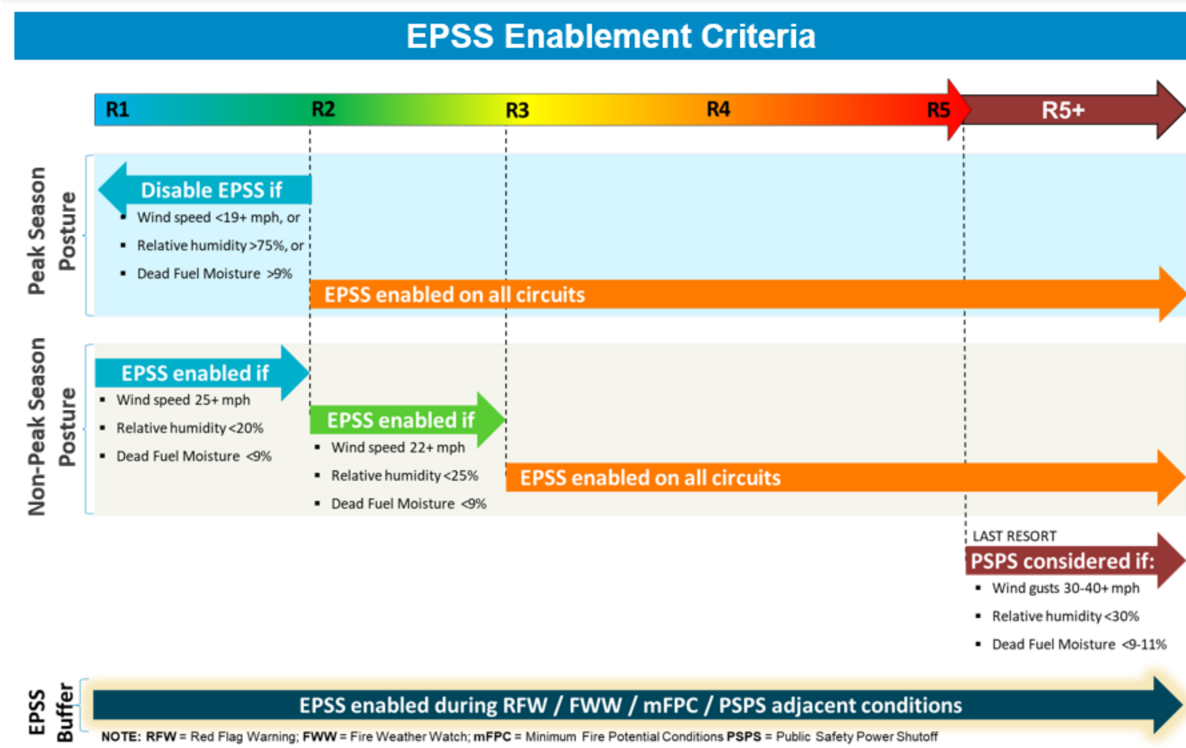
Response to Question No. 008 Response No. 001:

[1] Public Safety Power Shutoffs | PG&E

i. EPSS is enabled at the circuit level and is primarily deployed across Tier 2 and Tier 3 areas within PG&E's service territory. EPSS-capable circuits are not universally enabled; rather, enablement occurs on an individual circuit basis when defined criteria and conditions are met. These criteria are informed by a risk-based model that evaluates elevated wildfire risk, including factors such as weather conditions, fuel moisture, and fire potential indicators.

ii. EPSS settings are activated on a circuit when risk models indicate elevated wildfire risk due to extreme weather conditions such as dry weather, wind, low fuel moisture, relative humidity in High Fire Risk Areas (HFRA) and red flag warnings or minimum fire potential index for EPSS buffer areas. See *"PGE_OEIS_DR-EUP-26-04_20260605_Q008_ATCH001_CONF.pdf"*, which describes the process using risk-based criteria for enabling Enhanced Powerline Safety Setting (EPSS) protection settings in HFRAs and EPSS Buffer Areas.

EPSS enablement criteria changes for peak season posture due to an elevated risk level during higher wildfire risk periods (see below for seasonality criteria).



a. Please see the visual above for EPSS enablement criteria.

b. EPSS activation only applies to HFRA and EPSS Buffer Area circuits where criteria are met. Not all EPSS circuits are necessarily activated at the same time.

c. EPSS settings are available year-round. However, activation is based on forecasted risk levels and weather conditions. These conditions are reviewed daily, and EPSS settings are enabled or disabled accordingly. Seasonal posture also adjusts the criteria for enablement and disablement. Please refer to the information above for a detailed overview of the EPSS process and the criteria used to activate EPSS settings.

<u>Question No. 009:</u>

Statistical Distributions/Truncation points.

i. How does PG&E choose how to represent parametric distributions based on past events and in what applications are these distributions used to replace or augment historical data sets?

ii. For each application identified above, what parametric families are considered and how are their parameters chosen?

   a. If using an objective function (such as root mean square, information criteria, or area under curve) to determine one or more parameters; what objective function(s) does PG&E consider and how were those objective functions chosen?

   b. If using hand crafted parameters, what factors do the subject matter experts use to select parameters?

      i. Specifically, if PG&E uses truncation points, please justify how these truncation points are chosen.

<u>Response to Question No. 009 Response No. 001:</u>

i. PG&E represents uncertain consequence outcomes of wildfires using parametric probability distributions calibrated to historical event data within the enterprise wildfire risk bow tie model to calculate the Consequence of a Risk Event (CoRE) as part of the Cost-Benefit Approach (CBA) under the CPUC Risk-Based Decision-Making Framework (RDF), D.22-12-027. Appendix A (Rows 5, 7, 13, and 24) establishes a structured process requiring: (1) when risk event consequences are uncertain, assess the level of uncertainty and represent using statistical methods, (2) apply risk scaling based on (monetized) outcome magnitude, and (3) use expected value for Consequence of a Risk Event (CoRE). Parametric consequence distributions enable PG&E to meet these requirements by providing a probabilistic and continuous representation of consequence outcomes that can be consistently incorporated into CoRE calculations.

Specifically, the use of parametric distributions allows PG&E to:

- <u>Capture variability and uncertainty</u>:

  Parametric distributions translate discrete historical observations into a continuous representation that preserves distributional characteristics (e.g., variance and skewness), which are not fully captured using event-level data alone.

- <u>Support extrapolation beyond observed data</u>:

  For risk events with limited observations, particularly low-frequency, high-consequence events—parametric forms allow representation of plausible but unobserved outcomes, while remaining grounded in the empirical data used for calibration.

ii. For wildfire consequence modeling application, PG&E considers a set of parametric distributions, including truncated Pareto Type I, truncated Pareto Type II, truncated lognormal, binomial and a compound distribution of zero-truncated Poisson combined with a Bernoulli component.

- PG&E primarily uses Maximum Likelihood Estimation (MLE) to estimate distribution parameters by selecting values that maximize the log-likelihood of the candidate distribution given the observed data. MLE leverages the full distribution of the data and provides a robust characterization of distributional shape, including tail behavior relevant for risk modeling. The Generalized Method of Moments (GMM) is used as a secondary approach in limited cases where MLE-based estimates result in material divergence between modeled and empirical moments (e.g., mean or standard deviation). When applied, GMM estimates parameters by minimizing a weighted sum of squared moment errors between model-implied moments and empirical moments.

- Not applicable. PG&E does not use hand crafted parameters in modeling wildfire risk consequences.

   i. Truncation is applied to Pareto Type I, Pareto Type II, and lognormal distributions used in wildfire consequence modeling. These distributions can exhibit heavy-tailed behavior, and truncation is used to ensure modeled outcomes remain consistent with observed data while avoiding implausible extrapolation into unsupported ranges. The truncation points and associated justification are as follows:

   - Pareto Type I (Destructive Fire – Safety Consequence):

     An upper truncation value of 625 equivalent fatalities[2] is applied (approximately five times the maximum observed value of serious injuries and fatalities). In Appendix C of PG&E's power law distribution white paper,[3] PG&E evaluated a range of truncation multipliers relative to historical maxima and selected a factor of approximately five as a balanced approach that remains anchored in observed data while preserving tail risk and avoiding implausible extreme outcomes.

   - Pareto Type II (Destructive Fire – Financial Consequence):

     An upper truncation value of $100 billion is applied (approximately five times the maximum observed financial loss). This approach is consistent with the truncation methodology used for the corresponding safety consequence and reflects a data-anchored, order-of-magnitude scaling to define a plausible upper limit.

   - Lognormal (Other Reliability and Financial Consequence Categories):

     An upper truncation is applied at $\mu + 5\sigma$ in log space, where μ and σ are the mean and standard deviation of the corresponding normal distribution. This corresponds to approximately the 99.99997th percentile of the lognormal distribution. As such, the truncation has minimal impact on modeled expected values (CoRE) and is primarily used to exclude implausible extreme outcomes while preserving the empirical distribution over the supported data range.

[2] Serious injuries are converted to equivalent fatalities at a 4:1 ratio. PG&E assumes one injury per fatality observed.

[3] PG&E "Power Law Distribution," (Sept. 3, 2021), available at: https://data.mendeley.com/public-files/datasets/8nds4cx88k/files/c0178e67-92fc-4ab3-9ea7-7fdcdf3b45 (accessed May 30, 2026).

Question No. 010:

WBCA Inputs/Outputs.

PG&E provided an overview of WBCA inputs and outputs as well as some WBCA process.

i. What model(s) are used to calculate the baseline and post-mitigation KDMMs required by the EUP Guidelines?

ii. What is GRIP U?

iii. Will WBCA be used to implement Screen 1 Circuit Segments Eligibility requirements?
   a. If no, why is the incorporation of High Risk, High Frequency Outage Program, and Ignition Tail Risk Thresholds portrayed within the WBCA?

iv. Will WBCA be used to calculate Screen 2 Benefit Cost Analysis (BCA)?
   a. If no, what are the limitations of WBCA that prevent the use of it to calculate Screen 2 BCA?
   b. If yes, what data from Table 11 (Screen 2 Table) will WBCA output?

v. Will WBCA be used to calculate Screen 3 projected post-mitigation KDMMs?
   a. If no, what are the limitations of WBCA that prevent the use of it to calculate Screen 3 projected post-mitigation KDMMs?
   b. If yes, what data from the Model Risk Landscape JSON, Table 12 (Screen 3 Table), and Table 14 (Subproject Table) will WBCA output?

vi. Will WBCA be used to calculate Screen 4 BCA?
   a. If no, what are the limitations of WBCA that prevent the use of it to calculate Screen 4 BCA?
   b. If yes, what data from Table 13 (Screen 4 Table) will WBCA output?

vii. Is PG&E planning to include any projected post-mitigation KDMMs in its EUP that are not required? If so, will they be outputs of WBCA?

viii. Will WBCA output projected post-mitigation PSPS and EPSS risk with the same structure as the response to Q06?

Response to Question No. 010 Response No. 001:

WBCA is a tool implemented within PG&E's Palantir Foundry environment that performs specific analytical functions, including the Benefit-Cost Ratio (BCR), to support evaluation of mitigation alternatives. In addition to BCR outputs, WBCA is also capable of producing both KDMM risk metrics and the risk values used within BCR calculations.

However, WBCA represents only one component of the broader Foundry platform. Foundry serves as PG&E's system of record for integrating, managing, and reporting data used across the Electric Undergrounding Plan's (EUP) analysis. It brings together inputs from multiple upstream sources, including approved risk models and program data, and enables the storage, access, and operationalization of outputs across the EUP workflow.

While WBCA performs specific analytical calculations within this environment, response to data-related questions may reference Foundry as the overarching platform through which data and outputs are stored, accessed and operationalized.

i. The models PG&E used to calculate the baseline and post-mitigation KDMMs required by the EUP Guidelines are:

a. Ignition Likelihood Model (WDRM), implemented through Distribution Event Probability Models (DEPM), consisting of 23 cause-specific Probability of Outage models and a final Probability of Ignition Given Outage model.
b. Ignition Consequence Model, also referred to as the Wildfire Consequence Model.
c. Outage Program Risk Models, including EPSS and PSPS risk models.
d. Overall Utility Risk (OUR) Model.
e. Wildfire Benefit Cost Analysis (WBCA) Model.
f. Enterprise Risk Bow Tie models.

ii. GRIP-U (Grid Resilience Integrated Planning – Undergrounding) is a circuit-segment analysis tool hosted in PG&E's Palantir Foundry Platform that supports the evaluation and prioritization of circuit segment for prioritization and eligibility for potential inclusion in undergrounding and system hardening portfolios. It integrates outputs from approved risk models and standardized datasets into a single environment, enabling consistent comparison of segments and the development of portfolio options. GRIP-U does not perform independent risk calculations; rather, it operates existing model outputs.

iii. WBCA/Foundry will be used to implement Screen 1 Circuit Segments Eligibility.

a. Not applicable. WBCA will be used.

iv. Yes, WBCA will be used to calculate Screen 2 Benefit Cost Analysis.

a. Not applicable. WBCA will be used.

b. The following data points will be outputs of Foundry:

a. Screen 2 Table fraction_undergrounded
b. Screen 2 Table reliability_benefits
c. Screen 2 Table financial_benefits
d. Screen 2 Table safety_benefits
e. Screen 2 Table total_risk_reduction
f. Screen 2 Table unit_cost_per_overhead_mile_deenergized
g. Screen 2 Table unit_cost_per_circuit_mile_energized
h. Screen 2 Table total_costs
i. Screen 2 Table cost_benefit_ratio benefit_cost_ratio

v. WBCA/Foundry will be used to calculate Screen 3 projected post-mitigation KDMMs.

a. Not applicable. WBCA will be used.

b. The following data points will be outputs of Foundry:

a. Screen 3 Table fraction_undergrounded
b. Screen 3 Table cumulative_overall_utility_risk_in_year_55
c. Screen 3 Table cumulative_wildfire_risk_in_year_55
d. Screen 3 Table cumulative_outage_ program_risk_in_ year_55
e. Screen 3 Table mean_ignition_consequence_in_first_10_years_of_program
f. Screen 3 Table mean_outage_program_likelihood_in_first_10_years_of_ program
g. Subproject Table project_risk_reduction_fraction
h. Subproject Table circuit_risk_reduction_fraction

i. Subproject Table pre_mitigation_length

vi. WBCA/Foundry will be used to calculate Screen 4 BCA.

a. Not applicable. WBCA will be used.

b. The following data points will be outputs of Foundry:

a. Screen 4 Table fraction_undergrounded
b. Screen 4 Table reliability_benefits
c. Screen 4 Table financial_benefits
d. Screen 4 Table safety_benefits
e. Screen 4 Table total_risk_reduction
f. Screen 4 Table unit_cost_per_overhead_mile_deenergized
g. Screen 4 Table unit_cost_per_circuit_mile_energized
h. Screen 4 Table total_costs
i. Screen 4 Table benefit_cost_ratio

vii. PG&E is not planning to include any projected post-mitigation KDMMs in its EUP beyond those required by the EUP guidelines.

Accordingly, no additional KDMMs will be produced by WBCA or any other tool for inclusion in the EUP.

viii. Yes, WBCA is capable of calculating post-mitigated PSPS and EPSS Risk.

Question No. 011:

In PG&E's 2026-2028 Wildfire Mitigation Plan – Final Revision Notice dated July 28, 2025, PG&E states that: "Covered Conductor is estimated to be approximately 52% effective in mitigating EPSS outages." In reference to this statement:

i. Please provide a detailed description of how the effectiveness of covered conductor in reducing EPSS outages is being accounted for in PG&E's EUP outage risk calculations.
ii. Please provide a detailed description of how PG&E calculated its 52% risk reduction estimate. In this description, please identify all data sources used and provide all calculations used.

Response to Question No. 011 Response No. 001:

i. Please refer to the provided attachment *"PGE_OEIS_DR-EUP-26-04_20260605_Q011_ATCH001.pptx"*, which describes how EPSS outage risk is calculated at the circuit segment level. Once EPSS risk is quantified and attributed to each circuit segment, PG&E incorporates this risk into the Wildfire Benefit-Cost Analysis (WBCA) tool. The WBCA evaluates each circuit segment and calculates a high-level benefit-cost ratio (BCR) for various mitigation alternatives.

As part of this process, the EPSS risk is multiplied by mitigation effectiveness values corresponding to each mitigation alternative to calculate both risk reduction and residual risk. For example, the covered conductor mitigation alternative applies an EPSS effectiveness value of 52%, resulting in 48% residual EPSS risk (100% − 52%). The covered conductor effectiveness value used in this calculation is derived as described in part (ii) below.

ii. Please refer to *"PGE_OEIS_DR-EUP-26-04_20260605_Q011_ATCH002.xlsx"*, which documents the methodology used to derive the 52% EPSS mitigation effectiveness for covered conductor referenced in part (i).

This estimate is based on a review of sustained outages occurring between 2015 and 2024, evaluated at the sub-driver level. For each outage, subject matter experts assessed the underlying cause and assigned a mitigation effectiveness rating (i.e., N/A, None, Medium, Medium-High, High, or Very High) to reflect the degree to which covered conductor would have reduced the likelihood of the EPSS outage event. These ratings were then systematically aggregated to produce the overall mitigation effectiveness value applied within the WBCA.

Question No. 012:

In PG&E's 2026-2028 Wildfire Mitigation Plan – Final Revision Notice dated July 28, 2025, PG&E states that: "Covered Conductor is estimated to be approximately 52% effective in mitigating EPSS outages but has no impact on PSPS planned outages. The resulting blended average effectiveness for Outage Program (defined as PSPS and EPSS) risk is 23%." In reference to this statement:

i. Please indicate whether this or another "blended average effectiveness" figure for covered conductor is being used in PG&E's EUP outage risk calculations.
ii. Please provide a detailed description of how PG&E calculated its 23% "blended average effectiveness" estimate. In this description, please identify all data sources used and provide all calculations used.

Response to Question No. 012 Response No. 001:

i. The blended average effectiveness value of 23% presented in PG&E's 2026–2028 WMP will not be applied in EUP outage risk calculations for covered conductor. Instead, the EUP will apply the same discrete effectiveness assumptions for EPSS and PSPS risk—52% and 0%, respectively. As a result, each circuit segment will reflect a unique blended effectiveness based on its specific mix of EPSS and PSPS risk.

ii. Please see *"PGE_OEIS_DR-EUP-26-04_20260605_Q012_ATCH001.xlsx"*, which details the calculation of the 23% blended average effectiveness from PG&E's 2026-2028 WMP.

Question No. 013:

For each year from 2017 to the present, please provide the following:

i. The total PSPS customer-outage-minutes for PG&E's system.
ii. The total EPSS customer-outage-minutes for PG&E's system.
iii. The total customer-outage-minutes for PG&E's system for all other outages (non-PSPS and EPSS outages).

<u>Response to Question No. 013 Response No. 001:</u>

Please see the table below for the information requested in i-iii:

Year	i. The total PSPS customer-outage-minutes for PG&E's system.	ii. The total EPSS customer-outage-minutes for PG&E's system.	iii. The total customer-outage-minutes for PG&E's system for all other outages (non-PSPS and EPSS outages).
2017	0	0	2,064,625,530
2018	91,042,234	0	1,625,256,571
2019	5,930,501,837	0	1,869,033,675
2020	1,360,779,114	0	1,379,833,123
2021	152,805,483	0	3,401,732,851
2022	0	387,224,265	1,477,077,673
2023	5,806,513	378,635,335	3,709,641,756
2024	104,855,113	342,618,417	2,508,901,396
2025	36,872,455	249,499,038	1,445,173,748
2026	8,487,377	49,674,308	649,026,773

Data as of May 29, 2026