

PACIFIC GAS AND ELECTRIC COMPANY
Risk Assessment and Mitigation Phase (RAMP) 2024
Application 24-05-008
Data Response

PG&E Data Request No.:	TURN_006-Q004		
PG&E File Name:	RAMP-2024_DR_TURN_006-Q004		
Request Date:	August 6, 2024	Requester DR No.:	006
Date Sent:	September 10, 2024	Requesting Party:	The Utility Reform Network
PG&E Witness:	N/A	Requester:	Tom Long

SUBJECT: WILDFIRE RISK

QUESTION 004

Regarding PG&E's response to data request TURN 005-Q004(b), which states that PG&E's effectiveness values are not based on historical data from PG&E's deployment of covered conductors:

- a. Given that PG&E reports that it has installed 1,161 miles of covered conductor to date, why does PG&E believe the number of ignitions that PG&E has recorded for those lines is not statistically significant?
- b. How many ignitions has PG&E observed on covered conductor lines to date? Please provide an annual breakdown by year of ignition, beginning with 2018 and continuing through 2023. What mitigation effectiveness does this number of observed ignitions imply, even if PG&E does not consider the number statistically significant? Please show how PG&E calculated this mitigation effectiveness number.
- c. PG&E's response shows that it began installing covered conductor in 2018. At any point in that period, have PG&E's records for outages and ignitions not tracked whether the outage or ignition occurred on a line or equipment that was hardened in the covered conductor program?
 - i. If the answer is yes, (i.e. PG&E was not tracking this information), please state when PG&E was not tracking this information and the month and year PG&E began tracking this information.
 - ii. If the answer is yes, why was PG&E not tracking this information?

ANSWER 004

- a. and b. PG&E strongly believes that the ignition count observed on covered conductor is not appropriate to conduct any meaningful calculation, including effectiveness or statistical significance testing at this time for the following reasons:

1. A portion of the covered conductor projects include rebuilds of distribution overhead circuits in towns and communities in the aftermath of wildfires (~24 % of Covered Conductor installed since 2018). The ignition risk in these areas differ considerably from the non-fire scar areas because the vegetation growth in the fire scar areas takes years to reach the level of areas not previously impacted by wildfires.
2. Covered conductor has been installed relatively recently when compared to most bare overhead systems. As a result, covered conductor has not been exposed to as much weathering from heat, snow, and rain. With additional weathering and exposure to the elements, we expect covered conductor to degrade over time.

For example, during the winter storm events of December 2021, heavy wind, snow and rain damaged over 1,400 spans of overhead distribution infrastructure including relatively recently installed covered conductor, resulting in numerous outages. A similar extreme event during warmer conditions could have produced ignitions and potentially wildfires.

Weathering has a long-lasting degrading impact on the risk-reduction effectiveness and thus, to accurately compare ignition risk from covered conductor and bare overhead systems, it is estimated to require at least 8-10 years of weathering for a reasonable comparison to be made.

3. PG&E's system hardening decision tree indicates that undergrounding is the preferred mitigation in areas with higher tree strike risk. Therefore, PG&E generally installs covered conductor in areas with lower tree strike potential. With fewer potential strike trees, we anticipate fewer outages and ignitions from vegetation contact.

However, in response to this request, as shown in Table 1 below, from 2018 to 2024 PG&E has observed 5 facility ignitions including 2 CPUC Reportable Fire Ignitions (RFIs) on approximately 1,161 miles of overhead Covered Conductor as of July 12, 2024. The 1,161 miles of covered conductor was gradually deployed since 2018 in the HFTD and HFRA.

*Table 1 – Miles of Covered Conductor Deployed, Facility Ignitions, CPUC Reportable Ignitions
(as of July 12, 2024)*

	2018	2019	2020	2021	2022	2023	2024 YTD*	TOTAL
Deployed Covered Conductor miles	15.8	145.0	334.5	146.8	334.7	144.8	39.1	1,160.
Deployed Covered Conductor cumulative miles	15.8	160.8	495.3	642.1	976.8	1,121.6	1,160.7	1,160.7
All facility Ignitions associated with Distribution lines in HFTD / HFRA	261	181	195	201	124	108	81	1,151
All CPUC RFIs associated with Distribution lines in HFTD / HFRA	157	110	137	129	86	58	47	724
Facility Ignitions associated with Overhead Covered Conductor Distribution lines in HFTD / HFRA	0	0	0	1	2	0	2	5
CPUC RFI associated with Overhead Covered Conduct Distribution lines in HFTD / HFRA	0	0	0	1	1	0	0	2

Based on the above data, PG&E has estimated a covered conductor mitigation effectiveness of 79.3 percent. This is done by comparing ignitions observed on bare vs. covered conductor during the 2018 to 2024 YTD period as set forth below.¹

$$\text{Effectiveness} = 1 - (\hat{p}_{\text{Covered}}) / (\hat{p}_{\text{Bare}}) = 1 - 0.146\% / 0.705\% = 79.3\%^2$$

The details of the effectiveness calculation are provided in Appendix A.

PG&E reiterates that it is inappropriate to use the above calculation for the reasons stated in part (a).

- c. As indicated above, PG&E does track ignitions based on conductor type. Ignitions can be traced to a clear location of an ignition point on a circuit.

PG&E does not track outages by conductor type. An outage is caused when a circuit disturbance trips an upstream device. This makes it challenging to

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- ¹ While PG&E does not support the methodology, a similar analysis could be conducted for distribution circuits recently undergrounded as part of PG&E's Wildfire Mitigation efforts. . Given that no facility or CPUC Reportable ignitions have been observed on these undergrounded circuits since 2018, the calculated effectiveness of undergrounding would be 100%.
- ² PG&E participates in the Joint CC Effectiveness Study to better understand the advantages, operative failures modes, and current state of knowledge regarding covered conductors. Based on the latest update, using data through 2022, the estimated effectiveness is 64 percent. This is consistent with the previous results that were completed using data through 2020. See Joint IOU Covered Conductor Working Group Report. A copy of the report is provided as Attachment 2023-03-27 to PG&E's 2023 WMP. (Attachment 2023-03-27_PGE_2023_WMP_R0_Appendix D ACI PG&E-22-11_Atch01.)

determine the exact location of an outage cause on a circuit, unless the outage is caused by an equipment failure or a failure event that leaves a distinct damage to the equipment at the failure point. A circuit can contain both covered and bare conductor segments. Accordingly, data for outages cannot be clearly mapped to covered or bare conductor segments (see picture below).

Picture 1 – Outages on circuit segments

Circuit devices tell us when an outage occurs on a circuit.

Example Circuit Map

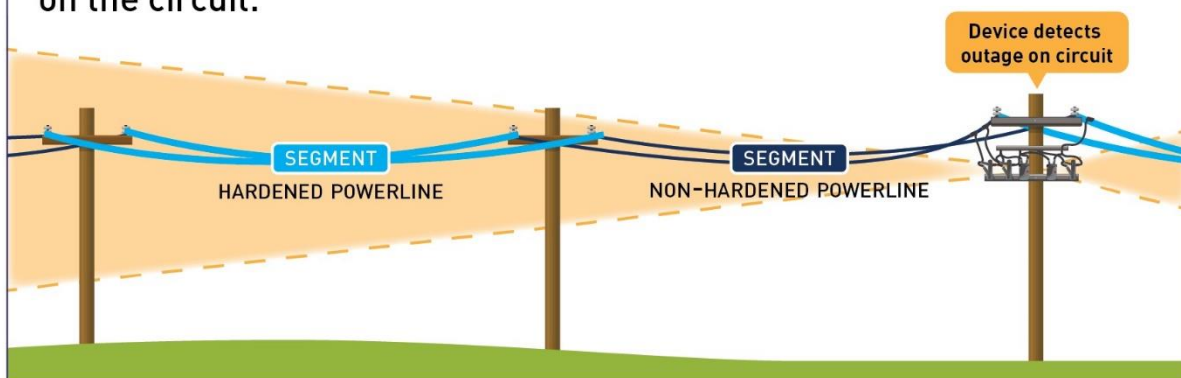


- Segment
- Hardened segment
- Pole
- Non-hardened segment

They do not identify which segment the outage occurs on.

Because we conduct system hardening by segment, some circuits include a mix of hardened and non-hardened segments.

As a result, we cannot identify if the outage occurs on a hardened or non-hardened segment, just that the outage occurs somewhere on the circuit.



Appendix A

Details of the effectiveness calculation

Defining the key variables for the calculation:

- F_{Covered} – Facility Ignitions on Covered Conductors
 - F_{Bare} – Facility Ignitions on Bare Conductors
 - M_{Total} – Total Distribution miles (includes covered, bare and undergrounded that were operational through the sample period of 6.5 years in HFTD / HFRA from 2018 through 2024 year-to-date)
 - T – Time period in years between 2018 and YTD 2024
 - n_{Covered} – Number of Covered Conductor mile-years over the 6.5 years
 - n_{Bare} – Number of Bare Conductor mile-years over the 6.5 years
 - $n_{\text{Undergrounded}}$ – Number of Undergrounded mile-years over the 6.5 years
 - n_{Total} – Number of Total mile-years over the 6.5 years
 - $\hat{p}_{\text{Covered}}$ – Facility ignition rate (per mile-year) of Covered Conductors
 - $\hat{p}_{\text{Bare}}$ – Facility ignition rate (per mile-year) of Bare Conductors

Input Variables:

- $F_{\text{Covered}} = 5$ (as shown in Table 1)
- $F_{\text{Bare}} = 1,146$ (as shown in Table 1)
- $M_{\text{Total}} = 25,655$
- $T = 6.5$ years

Calculated Variables:

- $n_{\text{Total}} = M_{\text{Total}} \times T = 25,655 \times 6.5 = \mathbf{166,758}$ mile-years
- n_{Covered} is calculated as follows: For each year, the number of covered conductors installed that year, multiplied by the number of years from the mid-point of the installation year³ until end-of-sample (i.e., counting 2024 year-to-date as 0.5 years).

$$\underbrace{15.8 \times 6}_{2018} + \underbrace{145.0 \times 5}_{2019} + \underbrace{334.5 \times 4}_{2020} + \underbrace{146.8 \times 3}_{2021} + \underbrace{334.7 \times 2}_{2022} + \underbrace{144.8 \times 1}_{2023} + \underbrace{39.1 \times 0.25}_{2024} = \mathbf{3,422} \text{ mile-years.}$$

- $n_{\text{Undergrounded}}$ - is similarly calculated as:

$$\underbrace{7 \times 5}_{2019} + \underbrace{5 \times 4}_{2020} + \underbrace{40 \times 3}_{2021} + \underbrace{119 \times 2}_{2022} + \underbrace{291 \times 1}_{2023} + \underbrace{57 \times 0.25}_{2024} = \mathbf{718} \text{ mile-years}$$

³ Approximating that the installation was at a constant rate over the year

- $n_{\text{Bare}} = n_{\text{Total}} - n_{\text{Covered}} - n_{\text{Undergrounded}} = 166,758 - 3,422 - 718 = \mathbf{162,617}$ mile-years
- $\hat{p}_{\text{Covered}} = \frac{F_{\text{Covered}}}{n_{\text{Covered}}} = \frac{5}{3,422} = \mathbf{0.146\%}$
- $\hat{p}_{\text{Bare}} = \frac{F_{\text{Bare}}}{n_{\text{Bare}}} = \frac{1,146}{162,617} = \mathbf{0.705\%}$
- Effectiveness = $1 - (\hat{p}_{\text{Covered}})/(\hat{p}_{\text{Bare}}) = 1 - 0.146\%/0.705\% = \mathbf{79.3\%}$