

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

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DRU Index #:		Requester:	Wendy al-Mukdad

**SUBJECT: PG&E 2023 WMP – INQUIRIES (MAINLY REFCL & EPSS & SUPPORTING TECHNOLOGIES)**

**QUESTION 002**

EPSS & Supporting Technologies (DCD & Partial Voltage Detection) Inquiries:

- a. Explain all activities planned to mitigate EPSS reliability impacts.
  - i. Are customer support programs (e.g., battery backup) distinct from or linked to those in place for PSPS implementation?
- b. Explain Sensitive Ground Fault settings for EPSS enabled circuit segments.
- c. Explain Downed Conductor Detection (DCD) technology and how it isolates high impedance faults with EPSS.
  - i. Explain DCD 2023-2025 Targets (i.e., 500, 400 & 250 protective device controllers or relays) and whether they will cover all HFTD and buffer EPSS circuits. Explain why says To Be Updated.
  - ii. Explain how many DCD are currently installed including on top 5% risk circuit segments.
- d. Explain Partial Voltage Detection using SmartMeters and how supplements DCD and EPSS.

**ANSWER 002**

- a. The following includes activities on-going and planned to mitigate EPSS reliability impacts: Enhanced Outage Review Team (ORT) process that includes additional review of circuit/Circuit Protection Zone (CPZ) performance that when multiple outages occur triggers a Multiple Outage Review (MORE) to drive additional actions if needed to reduce repeat outages going forward.
  - Continuing Proactive Vegetation Trimming on the Top 12 circuit segments that were identified last year based on number of outages experienced and a projected enablement of over 50% for the fire season. For 2023 we looked at CEMI (customers experiencing multiple outages) impacted customers and evaluated vegetation outages and identified 9 additional circuit protection zones to be added to this approach.

- Continuing Extent of Condition assessment and trimming. When a vegetation related EPSS outage occurs the incident location and 5 spans in all directions is inspected by our vegetation management team to identify trimming opportunities to prevent an outage from occurring near the previous location reducing risk and improving reliability.
- EPSS CEMI 8+ Targeted customers:
  1. Vegetation clearing for CPZ's with multiple veg caused outages as covered above
  2. Developing an animal mitigation strategy for animal interaction reduction due to high animal-caused outages when EPSS is enabled.
- Fault Indicator Installations
 

Proactively installing 1360 Fault Indicators on EPSS Circuits to expedite outage restoration and assist in finding the cause of outages to be addressed to prevent future unknown outages

  - i. In general, customer support programs for EPSS are linked to those in place for PSPS implementation. In most cases, such as with PG&E's Portable Battery Program (PBP), Disability and Disaster Access and Resource Program (DDAR), and Generator and Battery Rebate Program (GBRP), the programs are the same; PG&E simply expanded eligibility criteria such that programs initially targeting PSPS customer outages now also include the most impacted EPSS customers. One notable exception is the new residential Fixed Power Solutions offering (aka, the Residential Storage Initiative or RSI), which was launched in late 2022. As a new offering, RSI was targeted at EPSS-impacted customers, which happen to overlap with areas historically impacted by PSPS events.
  - b. The Sensitive Ground Fault (SGF) protective element, which was expanded to systemwide use in 2021 and 2022 on 3-wire circuits as a part of EPSS, is a low set non-directional ground overcurrent element typically set at 15A with a 15-20 second delay. Prior to 2021, SGF was in use in limited usage throughout the system. SGF is enabled year-round given the public safety benefit of detecting and isolating wire on ground faults. SGF is only implemented on reclosers and circuit breakers protecting 3-wire or phase-to-phase load connected downstream line sections.
  - c. Down Conductor Detection (DCD) technology is an industry term used to describe different protective relay algorithms that are focused on detection and isolation of high impedance ground faults. The specific algorithm currently in deployment at PG&E is proprietary to the manufacturer and relay being used but at a high-level leverages high sensitivity ground current measurements, current rate of change detection, and harmonic signatures to provide the proper sensitivity and restraint – tripping only when necessary to clear a high impedance fault but not in response to normal fluctuations on the grid - required to detect conditions beyond the capability of traditional protective relay elements.
    - i. DCD 2023-2025 targets are determined and prioritized according to the highest Wildfire Risk Composite Score that covers all High Fire Risk Area (HFRA) and EPSS Buffer Areas as well as capturing the most HFRA miles where existing or upgradable DCD controllers are available. The top 500 highest risk scores are

targeted for 2023, followed by 400 next highest risk scores in 2024 and remaining balance in 2025. Targets in 2024-2025 are subject to change or updated due to future potential changes in conditions (e.g., strategy, scope, priority, new information/discoveries/technology).

54 of the targeted 500 DCD installations completed through February 2023, in addition to 410 DCD installations completed in 2022. We've completed 5 DCD installations on the top 5% risk circuit segments through February, with 7 additional installations scheduled to be completed in 2023.

- d. To support the identification and response to very-low initial current (high-impedance) faults, PG&E is utilizing new data-driven capabilities leveraging our SmartMeter network for Partial Voltage (PV) Detection. PV Alerts work for the 3-wire distribution system with Line-to-Line connected transformers. PV Alert indicates low SmartMeter Voltage (25 - 75% of nominal 240V). Network Interface Card (NIC) remains on and able to return pings down to 25% Voltage, while metrology turns off at 75% voltage. New PV alert configuration settings prevent nuisance alerts from transient conditions:
  - i. Partial Voltage Detection Alert (after 45 seconds of persistence + 20 second trap send wait time)
  - ii. Partial Voltage Repeat Alert (repeats every 20 minute)
  - iii. Partial Voltage Clear Alert (after 90 seconds of normal Voltage persistence)

Partial voltage alarms are aggregated and brought into the outage management system where they indicate to the system operator the general location of the fault based upon the affected meters and their alarms. During periods of EPSS enablement, operational protocol will then proceed to manually de-energize the affected area using the closest upstream SCADA remote controllable device to mitigate the potential hazard which is then followed up with a field patrol response.

The primary purpose of partial voltage detection is to mitigate a certain type of high impedance fault that can occur during a wire down fault event and there exists line to line connected transformers (3-wire) present that can backfeed current from the load side of the fault and create a very high impedance fault path. The amount of fault current supplied from the backfeed condition can be extremely low (< 1A) and at these low levels is not capable of being detected with SGF, DCD, or other traditional protection. This technology adds another layer of defense to detect and respond to high impedance fault conditions in addition to SGF, DCD, and the gang trip operations objectives with EPSS.