

**PACIFIC GAS AND ELECTRIC COMPANY  
Wildfire Mitigation Plans Discovery 2022  
Data Response**

PG&E Data Request No.:	CalAdvocates 026-Q02		
PG&E File Name:	WMP-Discovery2022_DR_CalAdvocates 026-Q02		
Request Date:	July 15, 2022	Requester DR No.:	CalAdvocates-PGE-2022WMP-26
Date Sent:	July 28, 2022	Requesting Party:	Public Advocates Office
PG&E Witness:		Requester:	Tyler Holzschuh

**QUESTION 02**

- a) Has PG&E studied the use of cumulative distribution functions for high-impedance fault detection<sup>3</sup> to achieve the desired tradeoff between risk mitigation and reliability? This would entail measuring the frequencies of various trip thresholds (i.e. if the threshold is surpassed every month, three months, year, etc.) to control the number of nuisance trips for high-impedance relay functions.
- b) If the answer to part (a) is yes, when did PG&E conduct this analysis?
- c) If the answer to part (a) is yes, please provide all such studies or analyses that PG&E has produced or performed.
- d) If PG&E has reviewed any external (i.e., not created by PG&E) reports, studies or analyses related to the distribution protection scheme described in part (a), please *identify* each such document.
- e) Does PG&E plan to implement the distribution protection scheme described in part (a) on any portion of its electric distribution system?

**ANSWER 02**

- a) PG&E is currently studying and testing several vendor technologies related to high impedance fault detection. Two vendors offering technology consistent with the question in a) are the GE F60 Hi-Z fault detection scheme and the SEL ArcSense technology. Both approaches utilize a machine learning strategy to determine the base thresholds used to detect high impedance faults while avoiding nuisance trips.
- b) Our study and testing of these technologies is currently on-going.
- c) No formal study results are currently available given our on-going analysis of these technologies.
- d) We are aware of numerous pieces of literature produced by SEL and GE on their proprietary methods and applications, which can be reviewed on their respective websites. There are also numerous technical papers on these methods that

---

<sup>3</sup> Previous efforts to detect high impedance faults include power spectral density, sum of differences, and sensitive ground fault based relay functions.

have been presented at various relay conferences and IEEE events which have been attended by our employees. Unfortunately, given the large amount of literature on this subject, we cannot identify specific reports, studies, or analyses on this subject that we have reviewed.

- e) Further research and testing will inform if a field pilot trial will be implemented. Initial findings show that the two vendor algorithms tests to date have had mixed results in being successful at high impedance fault detection.