

PUBLIC UTILITIES COMMISSION
505 Van Ness Avenue
San Francisco CA 94102-3298



Pacific Gas & Electric Company
ELC (Corp ID 39)
Status of Advice Letter 6885E
As of September 19, 2023

Subject: Information Only Volt-Watt Annual Report for the Period February 18, 2022 thru February 17, 2023 Pursuant to Resolution E-4898

Division Assigned: Energy

Date Filed: 03-17-2023

Date to Calendar: 03-24-2023

Authorizing Documents: E-4898

Disposition:	Accepted
Effective Date:	03-17-2023

Resolution Required: No

Resolution Number: None

Commission Meeting Date: None

CPUC Contact Information:

edtariffunit@cpuc.ca.gov

AL Certificate Contact Information:

Kimberly Loo

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PGETariffs@pge.com

PUBLIC UTILITIES COMMISSION
505 Van Ness Avenue
San Francisco CA 94102-3298



To: Energy Company Filing Advice Letter

From: Energy Division PAL Coordinator

Subject: Your Advice Letter Filing

The Energy Division of the California Public Utilities Commission has processed your recent Advice Letter (AL) filing and is returning an AL status certificate for your records.

The AL status certificate indicates:

- Advice Letter Number
- Name of Filer
- CPUC Corporate ID number of Filer
- Subject of Filing
- Date Filed
- Disposition of Filing (Accepted, Rejected, Withdrawn, etc.)
- Effective Date of Filing
- Other Miscellaneous Information (e.g., Resolution, if applicable, etc.)

The Energy Division has made no changes to your copy of the Advice Letter Filing; please review your Advice Letter Filing with the information contained in the AL status certificate, and update your Advice Letter and tariff records accordingly.

All inquiries to the California Public Utilities Commission on the status of your Advice Letter Filing will be answered by Energy Division staff based on the information contained in the Energy Division's PAL database from which the AL status certificate is generated. If you have any questions on this matter please contact the:

Energy Division's Tariff Unit by e-mail to
edtariffunit@cpuc.ca.gov

March 17, 2023

Advice 6885-E

(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: Information Only Volt-Watt Annual Report for the Period February 18, 2022 thru February 17, 2023 Pursuant to Resolution E-4898

Purpose

The purpose of this Tier 1 information-only advice letter is to submit an annual report to the California Public Utilities Commission (CPUC, Commission) to estimate the impact of activating the Volt-Watt function of all new smart inverters Advice Letter (AL) for one year starting 90 days¹ after February 19, 2021, the approval date of the updated methodologies as required by Resolution E-5016² Ordering Paragraph (OP) 4 and Resolution E-4898³ OP 6.

Background**Rulemaking 11-09-011**

The California Public Utilities Commission initiated Rulemaking (R.) 11-09-011 on September 22, 2011 to review and, if necessary, revise the rules and regulations governing the interconnection of generation and storage facilities to the electric distribution systems of the investor-owned utilities (IOUs).⁴ The IOUs' rules and regulations pertaining to the interconnection of generating facilities are set forth in the Electric Rule 21 Tariff.

¹ Plus, time to compile the report.

² [Resolution E-5016](#) *Rejecting Pacific Gas and Electric Company's, Southern California Edison Company's, and San Diego Gas & Electric Company's Proposal for Standardized Reporting Methodologies to Monitor the Frequency and Amount of Voltage Excursions - Date of Issuance - December 23, 2019.*

³ [Resolution E-4898](#) *Approval, with Modifications, of Request for Modifications to Electric Rule 21 Tariff to Incorporate Smart Inverter Phase 3 Advanced Functions in Compliance with Decision 16-06-052 - dated April 26, 2018. See p4.*

⁴ The IOUs or the "investor-owned utilities" consist of Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric (SDG&E).

In early 2013, the Smart Inverter Working Group (SIWG) was formed by parties of R.11-09-011 to develop proposals to take advantage of the new, rapidly advancing technical capabilities of inverters. In March 2016, the SIWG completed its first set of recommendations for the Phase 3 advanced functions.^{5,6}

Among the key Phase 3 advanced functions of relevance to this advice letter function 6, the Volt Watt Mode. In E-4898 it is described as:

“As a general rule, the production of active power raises voltage. This relationship can be problematic when solar photovoltaic (PV) systems interconnect in large numbers on distribution circuits where utilities have not planned for voltage rise and where existing distribution equipment cannot lower voltage. Volt Watt Mode modifies active power from DERs based on predetermined voltage ranges to prevent the local voltage on the distribution circuit from rising/dropping outside of allowable levels. Voltage regulators are a common mitigation measure used on circuits with and without PV to ensure that voltage stays within acceptable levels all the way to the end of the circuit. As PV injects power to the grid at various points along a circuit, the complex interaction of ever-changing load and generation conditions can cause imbalances in voltage levels. These voltage excursions can be mitigated by the smart inverter’s Volt Watt Mode raising or lowering voltage but that change in voltage reduces the amount of real power that is exported.” (Emphasis added)

Decision (D.) 16-06-052

On June 23, 2016, the Commission adopted Decision (“D.”) 16-06-052,⁷ which directed the IOUs to submit ALs proposing revisions to Rule 21 setting forth any agreed-upon technical requirements, testing and certification processes, and effective dates for Phase 3 functions.

On November 17, 2016, the Energy Division hosted a public workshop with the purpose of providing guidance to the IOUs on the Advice Letter submittals.

⁵ SIWG Phase 3 DER Functions: Recommendations to the CPUC for Rule 21, Phase 3 Function Key Requirements, and Additional Discussion Issues, Issued March 31, 2017.

⁶ The SIWG’s Phase 1 and Phase 2 recommendations were incorporated into Rule 21 in April 2015 and April 2017.

⁷ [D.16-06-052](#) *Alternate Decision Instituting Cost Certainty, Granting Joint Motions to Approve Proposed Revisions to Electric Tariff Rule 21, And Providing Smart Inverter Development A Pathway Forward for Pacific Gas and Electric Company, Southern California Edison Company, And San Diego Gas & Electric Company*- Issued July 1, 2016.

Joint Advice Letter 4983-E

On December 20, 2016, the IOUs jointly submitted Tier 1 AL 4983-E⁸ that provided a work plan and an outline of next steps for tariff development including a status update on the activities outlined in the work plan by March 30, 2017.

Phase 3 Recommendations

On March 31, 2017, the SIWG submitted final revisions to the Phase 3 recommendations. In addition, the IOUs filed the required status update on March 30, 2017. In accordance with the work plan, the IOUs each anticipated submitting a Tier 3 Advice Letter in June 2017.

PG&E Advice Letter 5129-E

On June 27, 2017, the IOUs were granted a request to extend the submittal date of the Tier 3 Advice Letters to August 18, 2017. On August 18, 2017, PG&E submitted AL 5129-E⁹ to comply with D.16-06-052 proposing Rule 21 tariff revisions.

Following the submission of AL 5129-E, the Energy Division held a public workshop to discuss and, if possible, resolve issues raised in protests to the Advice Letters.

Resolution E-4898

On April 27, 2018 the CPUC issued Resolution E-4898. Among other things, OP 1 stated that PG&E AL 5129-E is approved as modified therein.

However, E-4898 OP 5 also required the IOUs “*to develop standardized reporting methodologies to monitor the frequency and amount of voltage excursions and, in consultation with the Commission’s Energy Division, shall each file a Tier 1 Advice Letter on the proposed methodologies by October 1, 2018.*” In its Discussion¹⁰ it provided additional requirements and clarification.¹¹

Additionally, E-4898 OP 6 requires that the IOUs, “*shall each file quarterly reports via Tier 1 information-only Advice Letter for one year starting three months after the mandatory activation of Function 6 on voltage data with the methodologies approved by the Tier 1 Advice Letters from Ordering Paragraph 5, and following the completion of the quarterly reports, shall file annual reports on voltage excursions via Tier 1 information-only Advice Letter. No sooner than five years after the*

⁸ [AL 4983-E](#) Information-Only Advice Letter Joint Investor-Owned Utilities Status Report and Supporting Action Plan for the Development of Advanced Inverter Functions for Smart Inverters (Phase 3), submitted December 20, 2016, approved January 26, 2017, and made effective January 19, 2017.

⁹ [AL 5129-E](#) - Modifications to PG&E’s Electric Rule 21 Tariff and Interconnection Agreements and Forms to Incorporate Smart Inverter Phase 3 Modifications – submitted August 18, 2018, and approved May 8, 2018 effective April 25, 2018, per E-4898.

¹⁰ Sub-issue: Impact of Activation of Function 6 starting on Page 30 of E-4898.

¹¹ Ibid, Page 32

activation of Function 6, the IOUs may file proposals via Tier 2 Advice Letter on whether to continue or modify the reporting requirement.” (emphasis added)

PG&E Advice Letter 5395-E

AL 5395-E¹² was submitted to respond to the E-4898 OP 5 requirement to develop standardized reporting methodologies to monitor the frequency and amount of voltage excursions, pursuant to E-4898 OP 5 and included a Proposal for A Standardized Reporting Methodologies to Monitor the Frequency and Amount of Voltage Excursions.

Resolution E-5016

On December 26, 2019, AL 5395-E was rejected per Resolution E-5016¹³ OP 1. E-5016 OP 2 ordered the IOUs “*to hold at least two meetings with the Smart Inverter Working Group. Meetings*” to discuss modeling tools, alternate methodologies, and AMI capabilities.

And E-5016 OP 3 ordered the IOUs “*to re-submit Tier 1 Advice Letters, within 150 days, after issuance of this Resolution and after meeting with the Smart Inverter Working Group.*”

PG&E Advice Letter 5832-E

Subsequently on May 21, 2020, in compliance with E-5016 OP 3, PG&E submitted AL 5832-E¹⁴ with a proposed methodology for monitoring the amount of voltage excursion events pursuant to Resolutions E-4898 and E-5016.

Based on the consensus in the SIWG, the IOUs proposed an eight-step process that would rely on the established customer voltage complaints process to trigger collecting voltage and other data needed to estimate PV production curtailment in accordance with Resolution E-5016.

As stated in AL 5832-E, stakeholders did not raise objections to the majority of the eight steps. But additional comments were received and the IOUs, along with the SIWG, held additional discussions.^{15,16}

¹² [AL 5395-E](#) - *Proposal for Standardized Reporting Methodologies to Monitor the Frequency and Amount of Voltage Excursions, Pursuant to Resolution E-4898* – submitted October 1, 2018.

¹³ [Resolution E-5016](#) *Rejecting Pacific Gas and Electric Company’s, Southern California Edison Company’s, and San Diego Gas & Electric Company’s Proposal for Standardized Reporting Methodologies to Monitor the Frequency and Amount of Voltage Excursions* - issued December 23, 2019.

¹⁴ [AL 5832-E](#) *Proposed Reporting Methodology to Monitor the Frequency and Amount of Voltage Excursion Events Pursuant to Resolutions E-4898 and E-5016*

¹⁵ See background in AL 5832-E for additional details.

¹⁶ E-4898, p27

Protests

On June 10, 2020, IREC protested SDG&E's AL 3546-E, PG&E's AL 5832-E, and SCE's AL 4217-E.

On June 17, 2020, the IOUs each replied to IREC's protest. The IOUs subsequently collaborated with IREC to resolve the protest issues and refine the proposed eight-step process for monitoring the frequency and amount of voltage excursion events.

PG&E Supplemental Advice Letter 5832-E-A

On February 2, 2021 PG&E submitted supplement AL 5932-E-A¹⁷ to its original AL 5832-E, where PG&E proposed updates to the eight-step process to reflect the consensus achieved among the IOUs and IREC.

Disposition Letter

On February 19, 2021, the CPUC issued a disposition letter making AL 5832-E and AL 5832-E-A effective as of February 10, 2021.

Prior Advice Letter Reports Submitted

- [AL 6232](#) - Information Only Volt-Watt Quarterly Report for the Period February 19, 2021 Through May 20, 2021 Pursuant to Resolution E-5016
- [AL 6232-E-A](#) - Supplemental: Information Only Volt-Watt Quarterly Report for the Period February 19, 2021 Through May 20, 2021 Pursuant to Resolution E-5016
- [AL 6338-E](#) - Information Only Volt-Watt Quarterly Report for the Period May 21, 2021 Through August 19, 2021 Pursuant to Resolution E-5016
- [AL 6439-E](#) - Information Only Volt-Watt Quarterly Report for the Period August 20, 2021 Through November 18, 2021 Pursuant to Resolution E-5016
- [AL 6531-E](#) - Information Only Volt-Watt Quarterly Report for the Period November 19, 2021 thru February 17, 2022 Pursuant to Resolution E-5016

This Advice Letter

Pursuant to Resolution E-4898, OP 6 requires:

Pacific Gas and Electric, Southern California Edison, and San Diego Gas & Electric shall each file quarterly reports via Tier 1 information-only Advice Letter for one year starting three months after the mandatory activation of Function 6 on voltage data with the methodologies approved by the Tier 1 Advice Letters from Ordering Paragraph 5, and following the completion of the quarterly reports, shall file annual reports on voltage excursions via Tier 1 information-only Advice Letter...

¹⁷ [AL 5832-E-A](#) - Supplemental: Proposed Reporting Methodology to Monitor the Frequency and Amount of Voltage Excursion Events Pursuant to Resolutions E-4898 and E-5016 – submitted February 10, 2021 and approved by a February 19, 2021 Energy Division disposition letter, making it effective February 10, 2021.

This Tier 1 information-only advice letter is being submitted pursuant to E-4898 OP 6 and E-5016 OP 3.

The IOUs requested clarification on the submission date, since it requires the IOUs additional time to compile the report after the quarterly data period ends. The IOUs were advised to submit their respective reports by the 30th day after the end of reporting period.

Annual Volt-Watt Report for the Period February 18, 2022 thru February 17, 2023.

Please find the Annual Report as **Attachment A**.

Protests

This is an information-only advice letter submittal. Pursuant to General Order 96-B Section 6.2, PG&E is not seeking relief through this advice letter and is not subject to protest.

Effective Date

PG&E requests that this information-only advice submittal become effective upon date of submittal, which is March 17, 2023.

Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically to parties shown on the attached list and the parties on the service lists for R.11-09-011 and R.17-07-007. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter filings can also be accessed electronically at: <http://www.pge.com/tariffs/>.

/S/

Sidney Bob Dietz II
Director, Regulatory Relations

Attachment

cc: Service Lists R.11-09-011 and R.17-07-007



ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39 E)

Utility type:

- ELC GAS WATER
 PLC HEAT

Contact Person: Kimberly Loo

Phone #: (415)973-4587

E-mail: PGETariffs@pge.com

E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE

ELC = Electric GAS = Gas WATER = Water
 PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 6885-E

Tier Designation: Information-Only

Subject of AL: Information Only Volt-Watt Annual Report for the Period February 18, 2022 thru February 17, 2023 Pursuant to Resolution E-4898

Keywords (choose from CPUC listing): Compliance

AL Type: Monthly Quarterly Annual One-Time Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #: E-4898

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? Yes No

If yes, specification of confidential information:

Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? Yes No

Requested effective date: 3/17/23

No. of tariff sheets: 0

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed¹: N/A

Pending advice letters that revise the same tariff sheets: N/A

¹Discuss in AL if more space is needed.

Protests and correspondence regarding this AL are to be sent via email and are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:

California Public Utilities Commission
Energy Division Tariff Unit Email:
EDTariffUnit@cpuc.ca.gov

Contact Name: Sidnev Bob Dietz II. c/o Megan Lawson
Title: Director, Regulatory Relations
Utility/Entity Name: Pacific Gas and Electric Company

Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email: PGETariffs@pge.com

Contact Name:
Title:
Utility/Entity Name:

Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

CPUC
Energy Division Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102

Clear Form

Attachment A

**Annual Volt-Watt Report for the Period
February 18, 2022 thru February 17, 2023**

Volt-Watt Production Curtailment Report - Background

Volt-Watt Production Curtailment Report Background and Summary

The Volt-Watt Production Curtailment Report is filed by each of the California Investor Owned Utilities pursuant to Resolutions E-4898 and E-5016 to provide transparency that the voltage provided to customers at scale should have a de minimis impact on curtailment with the implementation of the volt-watt functionality in smart inverters as discussed in resolution E-4898. The method and process to create this report was developed, and agreed to, by a consensus of industry stakeholders, and is defined in PG&E Advice Letter AL5832-E-A.

This report confirms expectations described in E-4898 that enabling the volt-watt functionality within smart inverters has a de minimis impact to curtailment for the population of meters. PG&E currently has over 150,000 customer smart inverter installations with the volt-watt functionality enabled. As shown in this report, the customers who experienced curtailment as part of the voltage complaint procedure represent a very small percentage of the overall population of smart inverters with volt-watt functionality. However, PG&E still recognizes that individual customers can occasionally be negatively affected, and PG&E provides a voltage complaint process to resolve potential issues that is described below.

Customer Support Information

PG&E has a voltage complaint process to help ensure that PG&E is providing voltage within Rule 2 limits and to quickly address any possible voltage issues customers might be experiencing. The following link provides a description of the voltage complaint process and contact information for customers to initiate a voltage complaint investigation:

https://www.pge.com/en_US/residential/outages/current-outages/report-view-an-electric-outage/additional-resources/report-voltage-problem.page

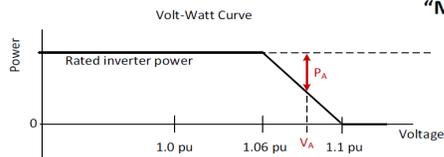
High-Level Methodology Description for Curtailment and Histogram Information Provided in Report

The method and process to create this report was developed, and agreed to, by a consensus of industry stakeholders, and is defined in detail in PG&E Advice Letter AL5832-E-A. However, the following provides a high-level summary of the information provided:

Curtailment Calculations:

The curtailment calculations provided are based on the NREL Method 1 estimation using available SmartMeter voltage information. Calculations are provided for both the past 30 days and past year of data from when a voltage complaint was received. The following diagram and equation provide an explanation of how NREL Method 1 calculations are defined based on the volt-watt settings. For this report, curtailment calculations are provided as percentages of expected output to help with comparison regardless of size, rather than energy as shown in the original NREL Method 1 calculation below.

Estimating curtailment from AMI voltage



- When the voltage is V_A , the maximum possible curtailed power due to volt-watt is P_A
- This assumes the inverter *could have been* at maximum power whenever voltage was above 1.06 pu

Estimating curtailment from AMI voltage

- Expressing it in math:

$$E_{\text{curtailed}} = P_{PV} * t_{AMI} * \sum_{v_{AMI}} \max\left(\min\left(\frac{v_{AMI} - 1.06}{1.1 - 1.06}, 1\right), 0\right)$$

- $E_{\text{curtailed}}$ is the maximum possible curtailment due to volt-watt, in kWh, over the time period of interest
- P_{PV} is the rated AC power of the PV system, in kW
- t_{AMI} is the period of the AMI measurements, in hours (so for 15-minute readings, t_{AMI} is 0.25)
- v_{AMI} is the set of AMI voltage readings for the time period between 9am and 3pm, in per unit (pu)

Voltage Histograms:

Voltage histograms are provided to visualize the distribution of customer voltage readings for the customer with the highest level of curtailment (if over 5%) for the past 30 days or past year. The customer ID is indicated below the histogram. The histograms show the percentage of SmartMeter (AMI) voltage reads within a voltage range bucket over the course of the period (30 days or 1 year). For example, the 107% bucket represents any AMI voltage read that is within the range of $\geq 107\%$ and $< 108\%$ of nominal voltage. Depending on the specific voltage reading this can represent a different curtailment level as shown in the above diagram based on the volt-watt curve.

Mitigations:

Mitigations describe how the voltage issue was resolved. If it was a utility related issue, the mitigation by the utility is described. If it was not related to a utility problem and was customer related, the mitigation is marked as a customer issue.

Legend for Voltage Issue Mitigations

Mitigation:	Description:
CUSTOMER ISSUE	CUSTOMER ISSUE indicates the issue experienced by the customer is not PG&E related. Examples include wiring within the customer premise, customer owned devices creating issues, etc.
Secondary Service Drop Repair	Indicates a repair was needed to resolve an issue with the low voltage (e.g. 120V, 240V, 480V, etc.) secondary system or secondary service between the distribution transformer and the customer. This is generally related to issues with splices, connections, or wires between the transformer and the customer.
Secondary Service Drop Replacement	Indicates a replacement of equipment was needed to resolve an issue with the low voltage (e.g. 120V, 240V, 480V, etc.) secondary system or secondary service between the distribution transformer and the customer. This is generally related to issues with splices, connections, or wires between the transformer and the customer.

Volt-Watt Production Curtailment Report

Utility Name	Pacific Gas & Electric	
	Start Date	End Date
Reporting Period	02/18/2022	02/17/2023
Report Issued Date	Original: 3/17/2023	

Report Section 1:

Up to two utility events per customer excluded as described in AL-5832-E-A

Summary Results for Utility (or Pending) Mitigations

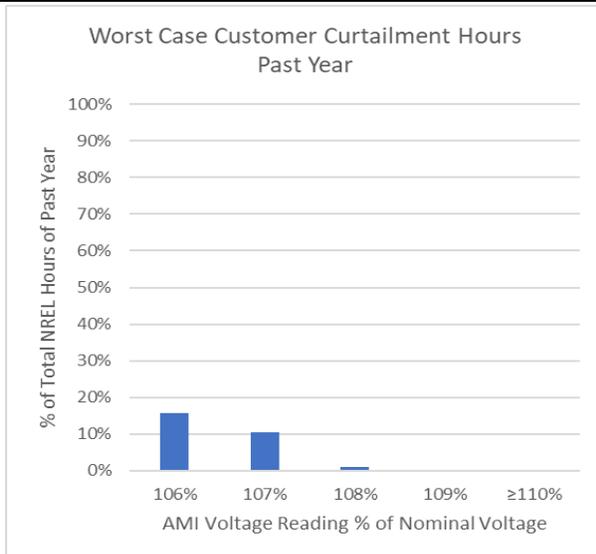
NREL Method 1 Estimation of Curtailment %	# of Customers with 1 year Curtailment %	# of Customers with 1 month Curtailment %
≤ 2%	33	25
> 2% ≤ 4%	4	3
>4%	1	10
Utility Mitigation Total	38	38

Summary Results for Customer Issues

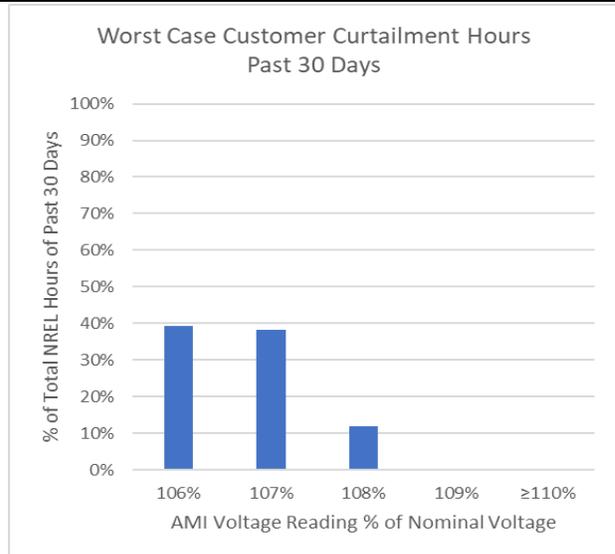
NREL Method 1 Estimation of Curtailment %	# of Customers with 1 year Curtailment %	# of Customers with 1 month Curtailment %
≤ 2%	40	43
> 2% ≤ 4%	3	0
>4%	2	2
Customer Issue Total	45	45

Total Reported Issues	83	83
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Worst Case Customer (>5% Curtailment) Voltage Histograms



Customer ID: 35



Customer ID: 57

Per Customer Curtailment Calculations and Mitigations

Customer ID	1 Year Curtailment %	1 Month Curtailment %	Mitigation
1	0.1%	0.2%	CUSTOMER ISSUE
2	0.1%	0.0%	CUSTOMER ISSUE
3	0.1%	0.0%	CUSTOMER ISSUE
4	0.1%	0.0%	CUSTOMER ISSUE
5	0.2%	0.0%	CUSTOMER ISSUE
6	1.4%	0.0%	CUSTOMER ISSUE
7	1.2%	0.0%	CUSTOMER ISSUE
8	1.0%	0.1%	CUSTOMER ISSUE
9	0.1%	0.0%	CUSTOMER ISSUE
10	0.2%	0.0%	CUSTOMER ISSUE

11	0.9%	0.9%	CUSTOMER ISSUE
12	0.2%	0.0%	CUSTOMER ISSUE
13	0.1%	0.0%	CUSTOMER ISSUE
14	0.1%	0.0%	CUSTOMER ISSUE
15	0.0%	0.1%	CUSTOMER ISSUE
16	1.5%	0.1%	CUSTOMER ISSUE
17	0.1%	0.0%	CUSTOMER ISSUE
18	1.3%	0.0%	CUSTOMER ISSUE
19	0.1%	0.0%	CUSTOMER ISSUE
20	3.4%	0.5%	CUSTOMER ISSUE
21	0.2%	0.3%	CUSTOMER ISSUE
22	0.1%	0.0%	CUSTOMER ISSUE
23	5.8%	1.3%	CUSTOMER ISSUE
24	1.5%	17.7%	CUSTOMER ISSUE
25	0.1%	0.9%	CUSTOMER ISSUE
26	3.2%	7.4%	CUSTOMER ISSUE
27	0.2%	0.0%	CUSTOMER ISSUE
28	0.0%	0.1%	CUSTOMER ISSUE
29	0.8%	0.0%	CUSTOMER ISSUE
30	0.0%	0.1%	CUSTOMER ISSUE
31	0.1%	1.4%	CUSTOMER ISSUE
32	2.2%	0.0%	CUSTOMER ISSUE
33	0.0%	0.3%	CUSTOMER ISSUE
34	0.8%	0.0%	CUSTOMER ISSUE
35	6.3%	0.7%	CUSTOMER ISSUE
36	0.2%	0.0%	CUSTOMER ISSUE
37	0.0%	0.1%	CUSTOMER ISSUE
38	0.1%	0.0%	CUSTOMER ISSUE
39	0.0%	0.1%	CUSTOMER ISSUE
40	0.4%	0.0%	CUSTOMER ISSUE
41	0.1%	0.0%	CUSTOMER ISSUE
42	0.2%	0.0%	CUSTOMER ISSUE
43	0.3%	0.4%	CUSTOMER ISSUE
44	0.5%	0.9%	CUSTOMER ISSUE
45	0.0%	0.1%	CUSTOMER ISSUE
46	1.5%	8.6%	Replace Capacitor Bank
47	1.4%	16.8%	Replace Regulator
48	0.9%	10.1%	Replace Regulator
49	0.3%	0.1%	Distribution Equipment Settings
50	4.7%	0.0%	Change Distribution Equipment Settings
51	0.1%	0.0%	Change Distribution Equipment Settings
52	0.4%	2.1%	Change Distribution Equipment Settings
53	0.0%	0.1%	Change Distribution Equipment Settings
54	0.2%	2.2%	Change Distribution Equipment Settings
55	0.3%	0.0%	Change Distribution Equipment Settings
56	0.1%	0.1%	Change Distribution Equipment Settings
57	2.2%	25.2%	Change Distribution Equipment Settings
58	2.3%	24.9%	Change Distribution Equipment Settings
59	1.4%	15.1%	Return Circuit to Normal Configuration
60	0.3%	0.0%	Return Circuit to Normal Configuration
61	0.2%	1.9%	Install New Transformer
62	0.6%	7.2%	Repair Distribution Equipment
63	0.0%	0.1%	Replaced Pole
64	0.1%	0.0%	Replaced Pole
65	1.1%	0.0%	Replaced Failing Transformer
66	2.1%	24.9%	Replaced Failing Transformer
67	0.4%	0.3%	Replaced Failing Transformer
68	0.2%	0.0%	Vegetation on Distribution Lines
69	3.2%	0.0%	Vegetation on Distribution Lines
70	0.0%	0.3%	Replaced Meter
71	0.1%	0.2%	Secondary Service Animal Issue
72	0.1%	0.0%	Secondary Service Replace Splice Box
73	0.3%	3.3%	Secondary Service Drop Repair
74	1.9%	13.2%	Secondary Service Drop Repair
75	0.3%	0.2%	Secondary Service Drop Repair
76	0.1%	0.0%	Secondary Service Drop Repair
77	1.2%	0.1%	Secondary Service Drop Repair

78	0.1%	0.0%	Secondary Service Drop Repair
79	0.8%	7.2%	Secondary Service Drop Replace
80	0.1%	0.0%	Vegetation on Service Drop
81	0.0%	0.2%	Vegetation on Service Drop
82	0.1%	0.0%	Vegetation on Service Drop
83	0.1%	0.0%	Vegetation

Volt-Watt Production Curtailment Report

Utility Name	Pacific Gas & Electric	
	Start Date	End Date
Reporting Period	02/18/2022	02/17/2023
Report Issued Date	Original: 3/17/2023	

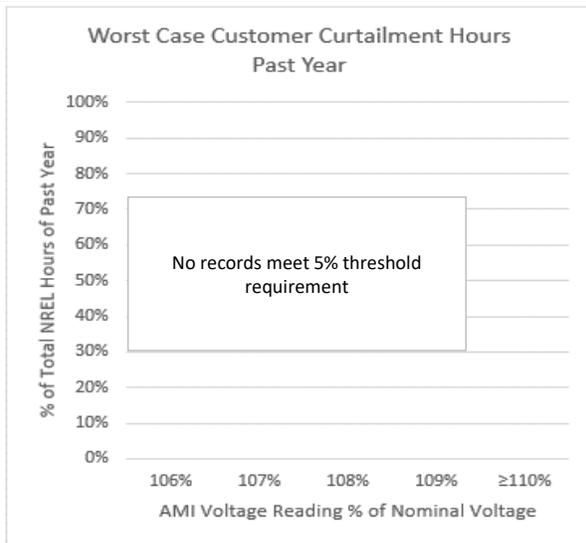
Report Section 2:

All abnormal grid configurations and operations excluded as described in AL-5832-E-A. All customer-caused issues reported in Section 1.

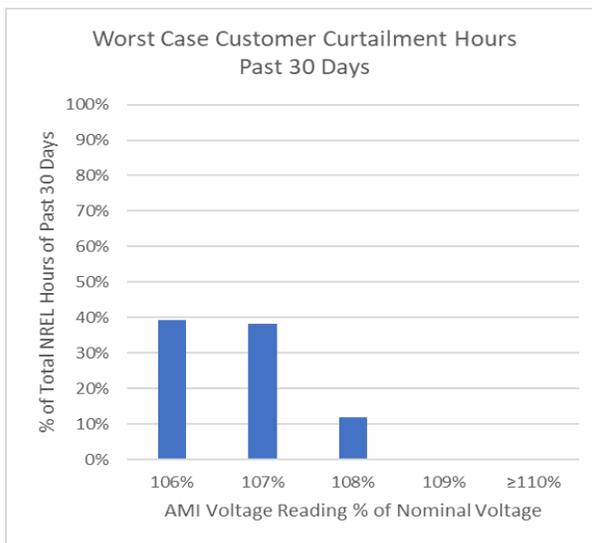
Summary Results for Utility (or Pending) Mitigations

NREL Method 1 Estimation of Curtailment %	# of Customers with 1 year Curtailment %	# of Customers with 1 month Curtailment %
≤ 2%	13	13
> 2% ≤ 4%	3	2
>4%	1	2
Utility Mitigation Total	17	17

Worst Case Customer (>5% Curtailment) Voltage Histograms



Customer ID: n/a



Customer ID: 57

Per Customer Curtailment Calculations and Mitigations

Customer ID	1 Year Curtailment %	1 Month Curtailment %	Mitigation
49	0.3%	0.1%	Distribution Equipment Settings
50	4.7%	0.0%	Change Distribution Equipment Settings
51	0.1%	0.0%	Change Distribution Equipment Settings
52	0.4%	2.1%	Change Distribution Equipment Settings
53	0.0%	0.1%	Change Distribution Equipment Settings
54	0.2%	2.2%	Change Distribution Equipment Settings
55	0.3%	0.0%	Change Distribution Equipment Settings
56	0.1%	0.1%	Change Distribution Equipment Settings
57	2.2%	25.2%	Change Distribution Equipment Settings
58	2.3%	24.9%	Change Distribution Equipment Settings
61	0.2%	1.9%	Install New Transformer
68	0.2%	0.0%	Vegetation on Distribution Lines
69	3.2%	0.0%	Vegetation on Distribution Lines
80	0.1%	0.0%	Vegetation on Service Drop
81	0.0%	0.2%	Vegetation on Service Drop
82	0.1%	0.0%	Vegetation on Service Drop
83	0.1%	0.0%	Vegetation

**PG&E Gas and Electric
Advice Submittal List
General Order 96-B, Section IV**

AT&T
Albion Power Company

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
Braun Blasing Smith Wynne, P.C.
California Cotton Ginners & Growers Assn
California Energy Commission

California Hub for Energy Efficiency
Financing

California Alternative Energy and
Advanced Transportation Financing
Authority
California Public Utilities Commission
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell
Downey Brand LLP
Dish Wireless L.L.C.

East Bay Community Energy Ellison
Schneider & Harris LLP
Engineers and Scientists of California

GenOn Energy, Inc.
Green Power Institute
Hanna & Morton
ICF

iCommLaw
International Power Technology
Intertie

Intestate Gas Services, Inc.

Johnston, Kevin
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc.

Los Angeles County Integrated
Waste Management Task Force
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McClintock IP
McKenzie & Associates

Modesto Irrigation District
NLine Energy, Inc.
NRG Solar

OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy

Public Advocates Office

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.

Resource Innovations

SCD Energy Solutions
San Diego Gas & Electric Company

SPURR
San Francisco Water Power and Sewer
Sempra Utilities

Sierra Telephone Company, Inc.
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Stoel Rives LLP

Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Utility Cost Management
Utility Power Solutions
Water and Energy Consulting Wellhead
Electric Company
Western Manufactured Housing
Communities Association (WMA)
Yep Energy