

PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE



February 19, 2021

Advice Letter 5832-E; 5832-E-A

Erik Jacobson
Director, Regulatory Relations
Pacific Gas and Electric Company
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, CA 94177

**SUBJECT: Proposed Reporting Methodology to Monitor the Frequency and Amount of
Voltage Excursion Events Pursuant to Resolutions E-4898 and E-5016.**

Dear Mr. Jacobson:

Advice Letter 5832-E; 5832-E-A is effective as of February 10, 2021.

Sincerely,

A handwritten signature in cursive script that reads "Edward Randolph".

Edward Randolph
Deputy Executive Director for Energy and Climate Policy/
Director, Energy Division

May 21, 2020

Advice 5832-E

(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: Proposed Reporting Methodology to Monitor the Frequency and Amount of Voltage Excursion Events Pursuant to Resolutions E-4898 and E-5016

Purpose

Pacific Gas & Electric Company ("PG&E") hereby submits for approval by the California Public Utilities Commission ("CPUC" or "Commission") a proposed methodology to collect and report on data that informs of the number and duration of voltage excursion events. This reported data will be used to estimate the impact on customers with inverter-based distributed energy resources ("DER") interconnected with the electrical distribution grid.

Background

Within the Rule 21 proceeding, the Commission adopted Decision ("D.")16-06-052 that, in part, required PG&E, San Diego Gas and Electric Company ("SDG&E"), and Southern California Edison Company ("SCE") – collectively the investor-owned utilities ("IOUs") – to submit a Tier 3 advice letter ("AL") with proposed revisions to Rule 21 to set forth technical requirements and effective dates for Phase 3 advance inverter functions.¹ PG&E submitted AL 5129-E on August 18, 2017, which included a proposed date after which the technical requirements associated with smart inverter Phase 2 communications Phase 3 advanced functions would need to be activated on newly interconnected DER systems.

On April 26, 2018, the Commission adopted Resolution E-4898 that incorporated the eight Phase 3 advanced functions recommended by the Smart Inverter Working Group

¹ 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 & Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company*, Ordering Paragraph ("OP") 9.

("SIWG"). The resolution established an effective date for Function 6 Volt-Watt mode² of nine months following approval of a SunSpec Alliance Communication Protocol Certification Test Standard.³ On May 22, 2018, the SunSpec Alliance Communication Protocol Certification Test Standard, and Function 6 was therefore activated nine months later, on February 22, 2019.

The Commission found that the impact of Function 6 activation was expected to be de minimis while the benefits to the electric distribution grid could be realized. The Commission stated that:

The Volt Watt Mode function will simply respond to these voltage events and keep the grid safe. The Volt Watt Mode function will facilitate higher penetration of DERs because it is the DERs interacting in a cumulative fashion (with everchanging load conditions) that can cause system voltage excursions [...] If the activation of Function 6 is harmful to a particular system owner, it will only be because the voltage levels on the circuit are regularly outside acceptable Rule 2 limits.⁴

Finding that Function 6 was warranted and valuable, Resolution E-4898 directed the IOUs to 1) work with stakeholders to develop standardized reporting methodologies to monitor the frequency and amount of voltage excursions and 2) in consultation with the Commission's Energy Division, each submit a Tier 1 Advice Letter on the proposed methodologies by October 1, 2018.

On October 1, 2018, the IOUs submitted Tier 1 ALs with their proposal for standardized reporting methodologies to monitor the frequency and amount of voltage excursions.⁵ The IOUs proposed the following process:

- Utilize each IOU's respective voltage complaint process to help monitor the frequency and amount of voltage excursions experienced by DER customers who have installed a smart inverter with the Volt-Watt function activated.
- Monitor the voltage excursions by estimating the amount of energy reduction due to the activation of the Volt-Watt function.
- Identify and report on voltage issues caused on the utility side of the meter.
- Utilize Advanced Meter Infrastructure (AMI) data in conjunction with PVWatts⁶ production curves to estimate DER curtailment.

² The function 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.

³ A letter from Edward Randolph, Director of the CPUC's Energy Division dated July 11, 2018, clarified that February 22, 2019, was the effective date for Function 6.

⁴ Resolution E-4898, p. 27.

⁵ PG&E 5395-E, SCE 3872-E, and SDG&E AL 3283-E.

⁶ PV Watts is an online interactive tool that estimates the energy production and cost of energy of grid-connected photovoltaic (PV) energy systems throughout the world. It allows homeowners, small building owners, installers and manufacturers to easily develop estimates of the performance of potential PV installations. See: <https://pvwatts.nrel.gov/>

- Perform an energy loss calculation when the results of the investigation would reveal that the voltage issues were due to the customer's equipment, for no more than 20 customers per year.

Sunrun, Inc. (Sunrun) and the Interstate Renewable Energy Council, Inc. (IREC) protested the IOUs' advice letters on October 22, 2018. Sunrun represented that the IOUs' advice letters were missing detail regarding how the IOUs would proactively monitor, collect, report on, and respond to voltage excursions from AMI data. IREC voiced that the proposed methodologies lacked sufficient detail to ensure that the appropriate voltage data is obtained in compliance with Resolution E-4898. PG&E replied to IREC's protest on October 29, 2018. The IOUs' advice letters were suspended and escalated to Tier 3, requiring Commission action.

On December 19, 2019, the Commission adopted Resolution E-5016 ("Resolution") that denied the IOUs' advice letters and proposed methodologies. The Resolution ordered the IOUs to 1) hold at least two meetings with the SIWG beginning within 45 days, and 2) re-submit Tier 1 ALs within 150 days of the issuance the Resolution. PG&E submits this advice letter in accordance with the Resolution.

Smart Inverter Working Group (SIWG) Meeting Overview

The Resolution ordered the IOUs to meet with the SIWG to discuss whether PVWatts or other modeling tool or profile is best-suited to estimate photovoltaic (PV) production curtailment as a result of function 6 activation. In addition, the Resolution ordered the IOUs to provide additional information to the SIWG regarding what AMI data and capabilities are available to determine PV power curtailment, more specificity on the amount of data that would need to be processed under different monitoring approaches, and the feasibility and costs involved in using alarms and/or alerts in lieu of widespread data processing.

The IOUs held four meetings with the SIWG, beginning January 23 and ending March 19, 2020. In addition, the IOUs held multiple separate conference calls with NREL and with IREC and Sunrun. An overview and summary of these meetings is provided in Appendix A.

Ordering Paragraph Two of Resolution E-5016 requires the IOUs to hold at least two SIWG meetings that must address at a minimum the following three topics:

- If PV Watts or other modeling PV tool/profile is best suited;
- Alternative proposed methodologies (large IOUs, IREC, NREL or others) and
- What AMI data and capabilities are available to determine PV power curtailment, more specifically on the amount of data that would need to be processed under different monitoring approaches, and the feasibility and costs involved in using alarms and/or alerts in lieu of widespread data processing

Beyond the meeting summary provided within Appendix A, PG&E highlights in greater detail specific discussions held on the three topics highlighted above.

At the January 23, 2020 SIWG meeting, the IOUs discussed various PV modeling tools and profiles that could be utilized within energy loss estimation methodologies. In particular, the discussion focused on estimation method involving the use of PV Watts, typical PV outage profiles and other NREL developed profiles utilized for NREL Estimation Method 1. In addition, alternative methodologies were also discussed at both the January 23 and February 20 SIWG meetings including the use of typical photovoltaic output profile and “PV Watt” estimation methodologies.

During the February 6 SIWG meeting, the IOUs also discussed in greater detail the use of AMI data, individual IOU capabilities and limitations, and how each IOU would obtain the voltage data to estimate PV power curtailment. In particular, the IOUs provided specific feedback on AMI data related to voltage information such as hourly voltage data, fifteen-minute interval voltage data along with average voltage data and instantaneous voltage data.

The IOUs also discussed during this meeting the feasibility to develop systems, tools and processes that manage AMI data, such as the use of alarms and/or alerts in lieu of widespread data processing. The IOUs each have differing capabilities and costs to implement a fully AMI solution to gather voltage data. Due to the expected de minimis energy loss values and the costs to implement widespread data-gathering over AMI, the IOUs maintained the customer voltage complaint process as the most prudent way to gather data and report on voltage excursion events.

Power Curtailment Modeling Tools

In accordance with Resolution E-5016, the IOUs considered multiple available tools for estimating power curtailment in consultation with NREL and the SIWG. PG&E elaborates on the specifics of the available modeling tools, including the pros and cons of each methodology and an assessment of the technical feasibility of each.

NREL Hawaii Method

On a select feeder in Hawaii, NREL staff deployed irradiance monitors, voltage and current measurements, and a communication system to remotely measure the output of several PV systems. With this method, they were able to accurately determine the curtailed power production due to the volt-watt algorithm. This method directly provides the solar irradiance values as well as voltage and current. When coupled with the PV system power production and Volt-Watt curves, this method produces accurate value for curtailed power production. However, this is a costly and labor-intensive approach to determining PV curtailment. It took NREL staff several months to design and construct making it impractical for largescale deployment. Therefore, this method was not reviewed further in the SIWG as a possible approach to compliance with the Resolution.

NREL PVWatts®

The PVWatts calculator is a web application developed by NREL that estimates the electricity production of a grid-connected PV system based on a few simple inputs. To use the calculator, information about the system's location, basic design parameters, and an average annual retail electricity rate must be input. PVWatts calculates estimates of the system's annual and monthly electricity production and of the value of that electricity. PVWatts is suitable for very preliminary studies of a photovoltaic system that uses modules (panels) with crystalline silicon or thin film PV cells.

- *Pros:* This software has been utilized extensively and produces hourly data. It is also available at no charge from NREL's website. It has the most flexibility and also considers seasonal production effects. Moreover, the PV profiles may be generated based on location-specific customer provided information (such as project type, installation angle and zone within the service territory), which may increase the accuracy of the energy loss estimation.
- *Cons:* PVWatts power output data is averaged over time and does not represent the specific output of a given system at specific time. In some cases, it could lead to energy loss estimation inaccuracies by predicting PV output intermittency that may not actually occur, as shown in Figure #1 Prominent PV Production Profiles. In these cases, using PVWatts could result in lower energy loss estimates than what would occur under actual system operating conditions. Finally, the utilization of typical clear day PV output profiles may lead to inaccuracies in the energy loss estimations, because the profile fails to account for inclement weather.

NREL Method 1

This is a simplified method where the power output of a PV system is 100% between the hours of 9:00 a.m. and 3:00 p.m. everyday. It was developed by NREL to provide a simple calculation with reasonable accuracy as compared to the more rigorous method deployed in Hawaii, as mentioned above. An 8760 voltage profile is obtained, the approved volt-watt curve is utilized along with the simplified production profile to calculate the estimated PV curtailment. This method has been demonstrated and validated through NREL's prior work with a different partnering utility.⁷ In Method 1, the voltage measured at the customer premises through the AMI sensor ("smart meter") is used to estimate how much PV output would need to be curtailed from the PV inverter located at the customer's premises. The curtailment amount would be in accordance with the volt-watt curve and is calculated using the following equation:

$$E_{curtailed} = P_{PV} \cdot t_{AMI} \cdot \sum_{V_{AMI}} \max\left(\frac{V_{AMI} - 1.06}{1.1 - 1.06}, 0\right)$$

⁷ "Simulation of Hawaiian Electric Companies Feeder Operations with Advanced Inverters and Analysis of Annual Photovoltaic Curtailment," available at: <https://www.nrel.gov/docs/fy17osti/68681.pdf>

Where:

- $E_{curtailed}$ is the maximum possible curtailment due to volt-watt, in kilowatt hours (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
- v_{AMI} is the set of AMI voltage readings for the time period between 9:00 a.m. and 3:00 p.m. in per-unit (pu)

Method 1 requires the following data as input at the PV system at which the curtailment is to be estimated: time-series AMI voltage data at the customer premises and rated AC power of the PV system at the customer premises.

- *Pros:* This is a relatively simple method to implement, is more broadly understandable, and can be used within an energy loss estimation methodology without complexity. It provides a value that is conservative, as a worst-case curtailment when compared to other methods.
- *Cons:* This method overestimates actual curtailment, does not reflect any seasonal changes, and has no adjustment to reflect the actual PV system orientation. Therefore, in some cases, NREL Method 1 may lead to lower or higher energy estimate values depending on the PV system's specific characteristics.

NREL Method 2

The second method (referred to as “Method 2”) overcomes the limitations from Method 1 by using real data for modeling and simulation of distribution feeders to estimate potential curtailment in any desired scenario. In this method, the validated planning models for utility feeders are used for generating synthetic AMI data. The planning models can be augmented to represent future penetration scenarios, different PV inverter settings, and different voltage control device setpoints. This method is represented in Figure 1 below:

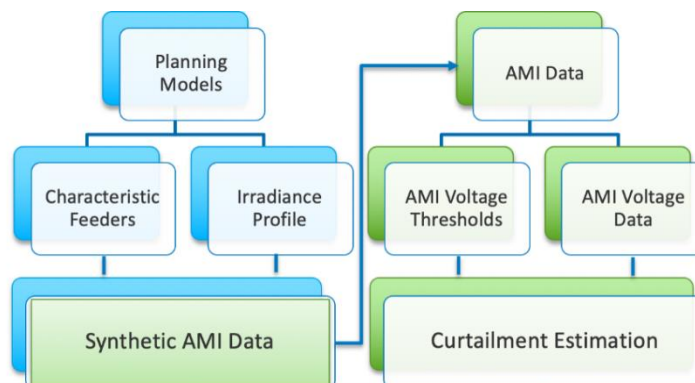


Figure 1. Curtailment Estimation based on Distribution Network Modeling and Analysis

As shown above, the planning models for selected representative feeders are used to generate “synthetic” AMI data for different combinations of PV penetration scenarios, smart PV inverter settings, and irradiance profiles. The synthetic AMI data is used to

estimate PV curtailment. By comparing the PV curtailment from different combinations of parameters like smart PV inverter settings, PV penetration levels, etc., the PV curtailment due to each of these parameters can be estimated better.

- *Pros:* Without AMI data, this method leverages circuit models and irradiance data to generate synthetic AMI data which can be utilized for estimating curtailment under a variety of scenarios.
- *Cons:* This is a costly and labor-intensive approach that first starts by converting existing circuit models into an open source modelling software package before generating synthetic AMI data. Given the high-performance computing requirements necessary to solve the equations and then the time to compute per circuit, this methodology is impractical to scale beyond a small group of characteristic feeder, even at a national laboratory.

Evaluation of Proposed PV Output Estimation Methodologies

At the first SIWG meeting, SCE provided example calculations utilizing three methods:

- 1) PVWatts generated profile based on typical installation parameters;
- 2) Typical clear day PV output profile based on historical performance data; and
- 3) NREL proposed PV output profile that, although not realistic, provides a simplified profile that can be used for estimating energy losses with adequate precision.

This graphical representation of each production profile is shown in Figure 2, Prominent PV Production Profiles. Figure 3, Energy Loss Estimation Methods, shows illustrative curtailment calculations for each production profile.

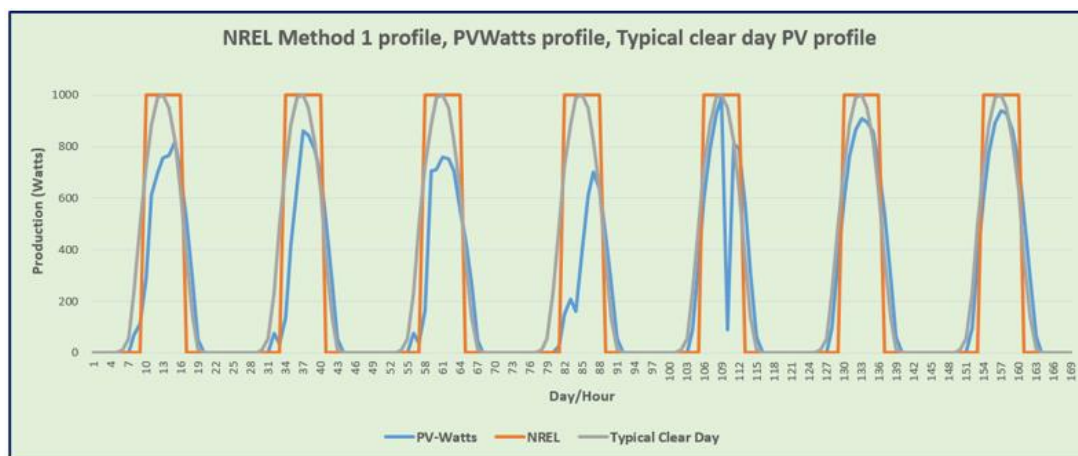


Figure 2. Prominent PV Production Profiles

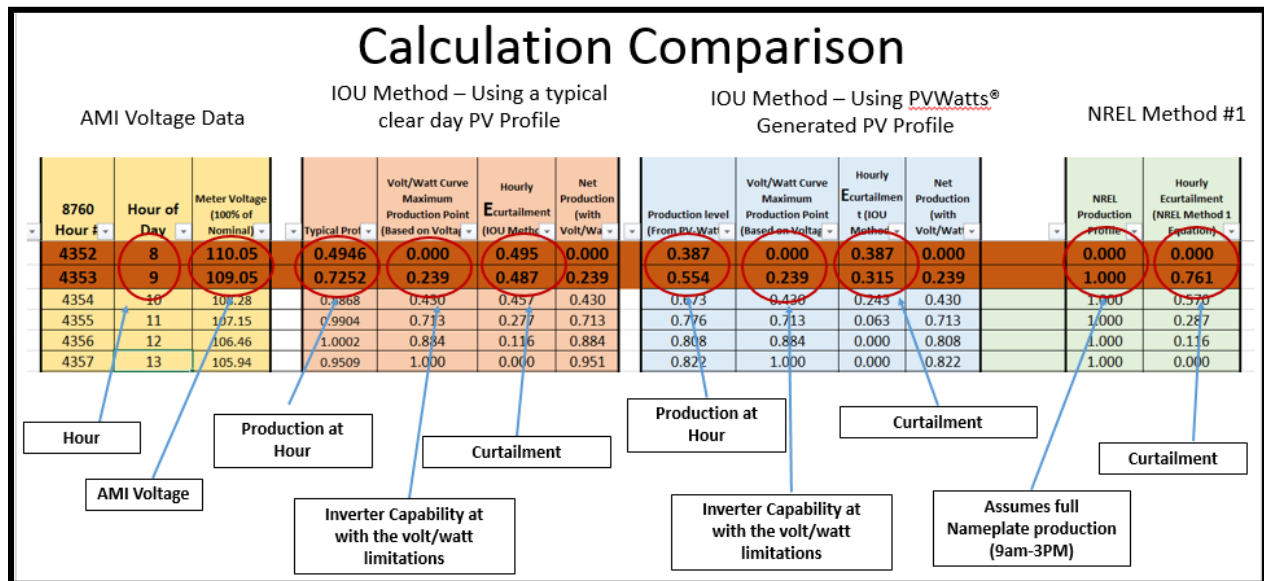


Figure 3. Energy Loss Estimation Methods

Recognizing that the estimation methods discussed above all inherently involve a level of uncertainty due to estimation assumptions, the SIWG discussed which method would be the most appropriate accounting for the complexity and accuracy associated with each method. SCE presented Figure 4, Comparative Results, to the SIWG to facilitate a comparison of energy loss method estimations assuming a representative AMI meter voltage profile as shown in Figure 5, Representative AMI Hourly Voltage Profile.

As shown in Figure 4, the estimated energy loss values from each method are generally similar to each other and within the margin of error. The SIWG concurred that all three methods could yield a similar energy loss estimation.

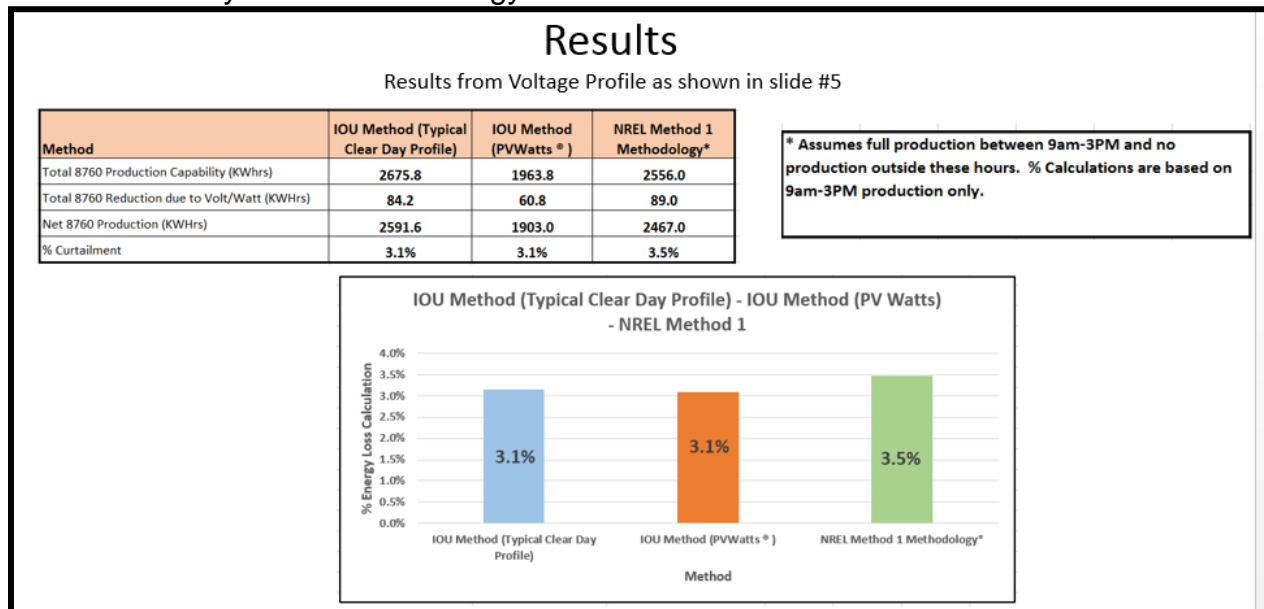


Figure 4. Comparative Results

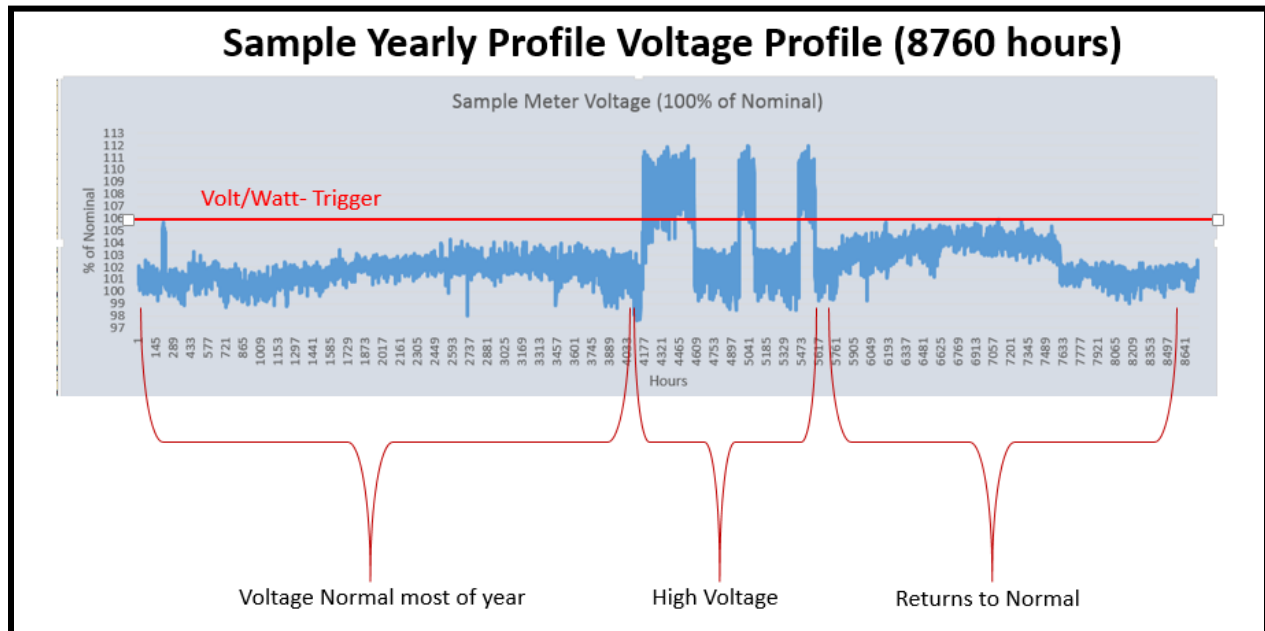


Figure 5. Representative AMI Hourly Voltage Profile

During the February 20, 2020, SIWG meeting, PG&E presented an analysis of AMI data and the calculation of PV curtailment utilizing the NREL Method 1. The findings for voltage outside the Rule 2 limits was based upon examining data from all their meters.⁸ As shown in the Figure 6 below, the analysis demonstrated that the impact of Volt-Watt function would be *de minimus*. PG&E also conducted an analysis of the NREL Method 1, which is shown in Figure 7 below. Again, the results demonstrate the *de minimus* impact of the Volt-Watt implementation and the ability of all the IOUs to conduct this consensus analysis.

⁸ Per Rule 2, the IOUs are allowed limited excursions beyond American National Standards Institute (ANSI) Range A (i.e. normal conditions) that may result from some temporary grid configuration of equipment problems.

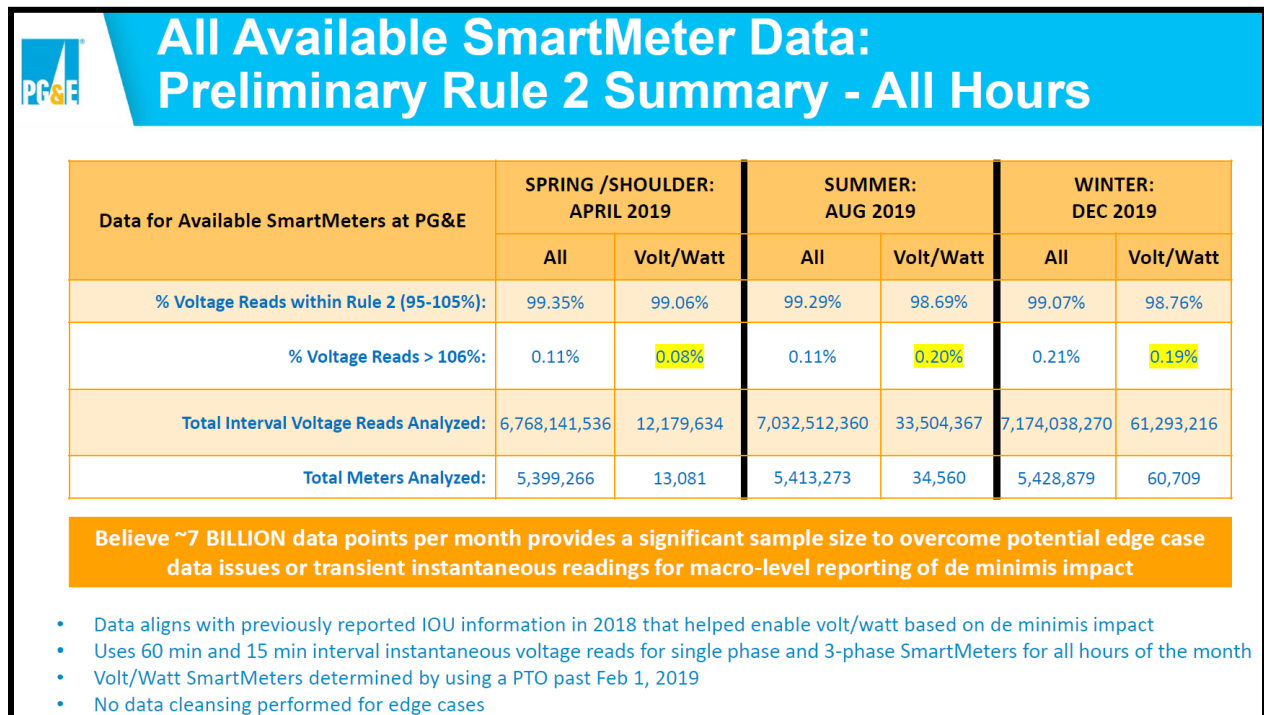


Figure 6. PG&E Analysis of Voltage Readings from AMI

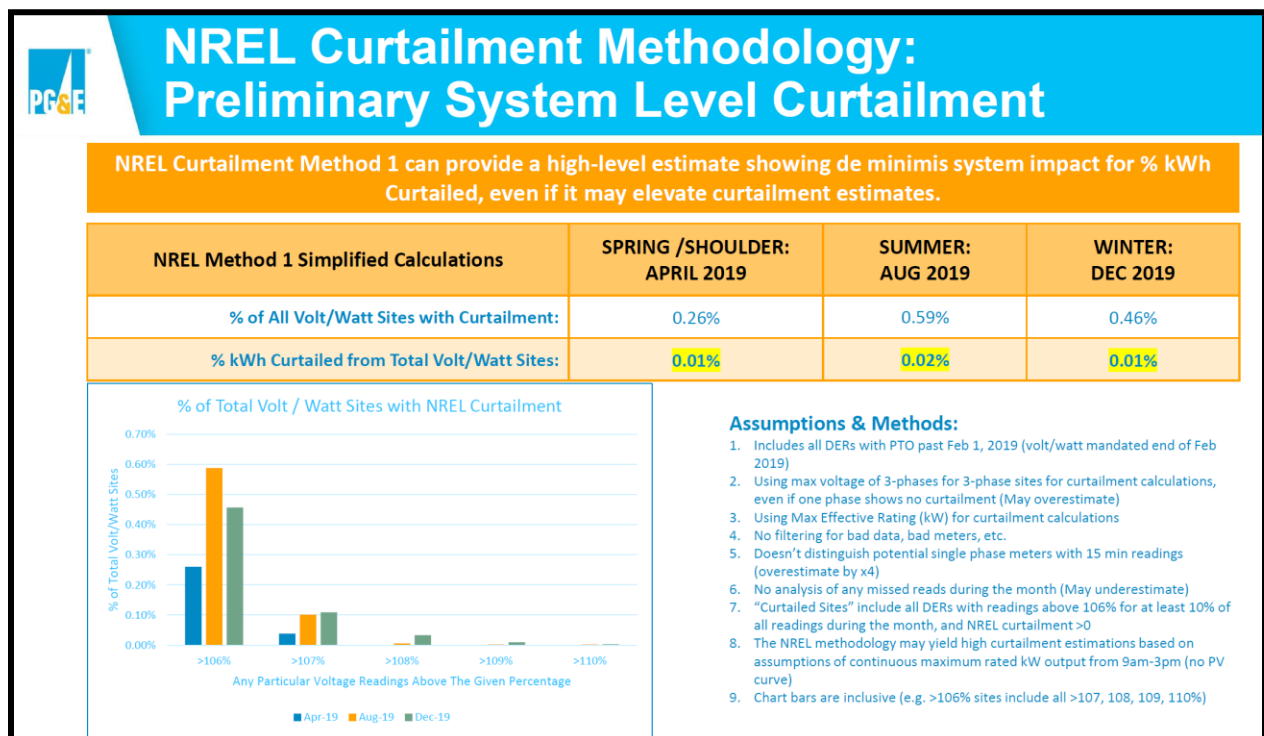


Figure 7. PG&E Analysis of Curtailment Percentage using NREL Method 1

Therefore, the SIWG determined that the simplest method (NREL Method 1) along with NREL PV profile was the most appropriate. Although providing a conservative (i.e.,

higher) estimate of the energy loss, given its simplicity of calculation, this approach will yield an appropriate level of estimation accuracy.

AMI Voltage Data Capabilities and Constraints

To promote transparency, Resolution E-5016 orders PG&E to specify in this advice letter what AMI data is available (i.e. instantaneous, average, minimum/maximum) and whether it has the same data available as the other IOUs, or what data is available for the different customer classes. The Resolution also directs PG&E to include more specificity on AMI data and monitoring methodologies available, and how alarms and/or alerts could be set up to notify PG&E of voltage excursions.

PG&E prepared a cost estimate for creating a basic system tool that could be used to evaluate the currently available daily voltage AMI data along with identification of voltage conditions for AMI meters that have the Volt/Watt Smart Inverter Function Six activated.

The results of such a tool were shared for historic PG&E data during the February 20th SIWG Meeting (see Figure 6 and 7). PG&E estimates that it would cost approximately \$15k annually to run the tool and \$3k quarterly to manually analyze the data for continued volt/watt reporting. While PG&E's costs for this type of reporting may be reasonable, the other IOUs do not have the same capabilities, and therefore investment costs on a whole make the voltage complaint process a more prudent use of joint ratepayer funds. However, if PG&E needed to provide more real-time alarming, more frequent data, or different types of data than currently available, then PG&E costs become much more expensive as detailed below.

Capabilities:

As discussed with the SIWG, PG&E currently retrieves and stores instantaneous voltage at 60 minute intervals for the majority of residential meters and at 15 minute intervals for the majority of commercial and industrial meters. This interval data is retrieved every 4 hours, and data extracts are processed within 2 days for analytical and exception reporting purposes. In addition to interval data, non-priority "events" are also retrieved every 4 hours. These events include voltage sags and swells, however these single swell thresholds are higher than the start of the volt/watt curtailment curve, thus not as useful. Also, these sag/swell settings cannot be changed remotely for many meters (~40% of total meter population). In addition to events, more urgent alarms or "traps" are transmitted in near real-time for things like outage (last gasp) and brown-out (partial voltage) conditions to inform critical outage response and restoration.

Challenges:

PG&E shared challenges working with such large data sets including data processing, cleansing, and data quality issues. In addition, stakeholders at the SIWG inquired into the ability for PG&E to provide more data than was currently available including 1) average values (non-instantaneous); 2) faster data sampling beyond just 15 or 60 minutes; and 3) real-time alarms for customer voltage excursions.

PG&E is planning to evaluate these types of functions via an enhancement project on approximately 500k meters for 18 months. The current estimate to scale that type of enhanced functionality to all meters is an initial investment around \$6M-\$8M with ongoing annual investments of \$3M. Therefore, at this time, PG&E does not believe it to be a prudent use of ratepayer funds to implement this type of functionality in order to enhance the volt/watt reporting process.

Recent Data Analysis Shared with SIWG:

PG&E shared an analysis of available voltage data with the SIWG to help provide transparency regarding the potential impacts of volt/watt using the discussed NREL Method 1 for energy curtailment of PV. Because each IOU differs in their current AMI retrieval and analysis capabilities, this type of analysis would not be able to be replicated at scale for the other IOUs without considerable investment from them, and therefore was not proposed as discussed. However, while this is PG&E specific data, it provided stakeholders insight into a typical utility system and the expected de minimis impacts of volt/watt.

The analysis looked at all available interval voltage data for a summer, winter, and shoulder month in 2019. This amounted to approximately 7 Billion voltage readings on 5.4 Million meters per month. This data was then coupled with interconnection data to identify meters with DERs with permission to operate post February 1, 2019 (Volt/watt mandated Feb 22, 2019) to determine the impact on DER sites with volt/watt enabled. Using NREL Method 1 to estimate curtailment based on the smartmeter voltage available, it was estimated that the total curtailment for all volt/watt sites combined was approximately 0.01% to 0.02%. This helped support the assertion of de minimis impacts of volt/watt at the system level. However, it also highlighted that a small percentage of specific customers do see higher curtailment values. PG&E understands that a particular customer may have a different experience than the system wide statistics, and provides a robust voltage complaint process to support these customers to resolve issues.

Voltage Complaint Process

In addition to information around AMI capabilities and historic data, PG&E also discussed the voltage complaint process with the SIWG. PG&E has a free and robust voltage complaint process to help customers determine the cause of an issue and help mitigate it. PG&E already proactively uses AMI data to address issues where voltage is greater than 10% of nominal with a focus on customer safety, and PG&E is evaluating whether this can be expanded to voltages greater than 7% of nominal in 2020.

PG&E recognizes there may be a gap in relying solely on the voltage complaint process to capture customers who may not know they have a problem. Two alternatives were discussed during the SIWG 1) IOUs provide additional reporting on a complete (or subset) population of meters; or 2) Vendors / developers provide support for customers to identify potential voltage issues to then submit within the voltage complaint process. Regarding the first alternative, implementing this requires varying levels of investment by IOUs

based on their existing capabilities. Because reporting requires standardization among the IOUs, even if PG&E could implement this at a reasonable cost, the ratepayer investments at the other IOUs (as outlined in their respective advice letters) may not justify the benefit for the DER sub-set of customers this particular reporting addresses. Regarding the second alternative, while this may be beneficial and was discussed well among stakeholders, the IOUs remain neutral on recommending it as it is out of the control of this proceeding.

Therefore, through the sharing of information by the IOUs regarding their existing data capabilities, recent data analysis on available voltage data, and a discussion on preferred methods for determining curtailment for PV sites with volt/watt, there was consensus around relying on the voltage complaint procedure and NREL Method 1 to create a standardized reporting for volt-watt via the following proposed voltage reporting methodology.

Proposed Reporting Methodology

PG&E's proposed methodology is the same methodology as is being proposed by SCE and SDG&E, based on collaboration with the SIWG and recommendations from IREC and Sunrun. The IOUs discussed the methodology below with SIWG stakeholders at the March 19 SIWG meeting. Stakeholders did not raise objections to the majority of the eight steps proposed below; however, one stakeholder stated that additional internal review was required on certain items (namely, 3.d and 7). However, this stakeholder provided no additional feedback following the conclusion of the SIWG discussions. In regards to step 2.c, only one stakeholder commented against implementing this step.

Below is the eight-step process proposed:

Step	Activity	Consensus
1	The IOU voltage complaint process will be the basis for voltage reporting to satisfy CPUC requirements.	Yes
2	The IOUs will provide curtailment calculations for volt/watt-enabled customers in the voltage complaint process with voltage readings over 106% of nominal voltage with the following characteristics:	Yes
	a. Include calculations for all utility-caused, customer-reported issues per reporting period.	
	b. Report on up to 20 of the first customer-caused and reported issues on an annual basis.	
	c. When the event duration is less than 48 hours, it will be considered a limited anomaly and will not be reported.	

3	IOUs will use the NREL Method 1 process using currently available AMI data to calculate estimated curtailment utilizing the following processes for estimation calculation:	
	a. Voltage intervals of 1-hour for residential or 15-minute for commercial as available	Yes
	b. Average voltage readings utilized over the voltage interval for SDG&E/SCE and instantaneous voltage readings for PG&E based on existing capabilities	Yes
	c. NREL Method 1 is only being approved for generalized/anonymous reporting but not for potential individual customer claims	Yes
	d. For 3-phase service points, the average voltage per phase will be used for curtailment estimation	Yes
	e. Any missing or removed data due to data quality will be removed from numerator and denominator of % curtailment calculations	Yes
4	Report will provide yearly % energy loss calculation using the previous 12 months of the available voltage data per customer*	Yes
5	Report will provide 1 month % energy loss calculations using the previous 30 days of data as available per customer*	Yes
6	Report will provide the utility mitigation used in the voltage complaint process or indicate if the reported complaint was a customer created issue	Yes
7	Report will summarize the customer curtailment studies by the number of customers with curtailment estimates in the following buckets: a) $\leq 2\%$, b) $2\% \leq 4\%$, c) $>4\%$	Yes
8	Provide voltage histogram for % of total hours in volt/watt curtailment range ($>106\%$) for the worst case customer with energy loss $> 5\%$.	Yes

* Will use available data within these date ranges from data stored in centralized AMI databases (PG&E/SCE) or the limit of meter memory (SDG&E). The yearly and 30-day reports are triggered when the voltage complaint is received.

Protests

*****Due to the COVID-19 pandemic and the shelter at home orders, PG&E is currently unable to receive protests or comments to this advice letter via U.S. mail or fax. Please submit protests or comments to this advice letter to EDTariffUnit@cpuc.ca.gov and PGETariffs@pge.com*****

Any party wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than June 10, 2020, which is 20 days after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

Effective Date

Pursuant to Resolution E-4898, PG&E believes that this filing is subject to Energy Division disposition and should be classified as Tier 1 (effective pending disposition) and respectfully requests an effective date of May 21, 2020, the date submitted.

Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for 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 submittals can also be accessed electronically at: <http://www.pge.com/tariffs/>.

_____/S/

Erik Jacobson
Director, Regulatory Relations

Appendix A: Summary of SIWG Meetings

cc: Service List 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 U39E)

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) #: 5832-E

Tier Designation: 1

Subject of AL: Proposed Reporting Methodology to Monitor the Frequency and Amount of Voltage Excursion Events
Pursuant to Resolutions E-4898 and E-5016

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 #:
Res. E-4898 and E-5016

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: 5/21/20

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

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

Name: Erik Jacobson, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility Name: Pacific Gas and Electric Company
Address: 77 Beale Street, Mail Code B13U
City: San Francisco, CA 94177
State: California Zip: 94177
Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

Clear Form

Appendix A

Summary of SIWG Meetings

Appendix A

Summary of SIWG Meetings

The IOUs held four meetings with the SIWG, beginning January 23 and ending March 19, 2020. In addition, the IOUs held multiple separate conference calls with NREL and with IREC and Sunrun. An overview of these meetings is provided below.

Side Meeting – January 9: Meeting held between NRELS and IOUs and centered upon discussions surrounding available software/options for estimating DER curtailment in response to voltage excursion events with Function 6 Volt-Watt mode activated.

Side Meeting – January 17: Meeting with IREC, Sunrun and IOUs with discussions regarding areas of the IOU Advice Letter filings and related protests that should be focused upon for SIWG discussions.

Meeting 1 – January 23: SCE and NREL presented various energy loss estimation methodologies including a comparison of the following three methods:

- IOU energy loss methodology as proposed in the October 18, 2018 AL which relied on PVWatts® as the PV output data source,
- IOU energy loss methodology as proposed in the October 18, 2018 AL but using a typical clear day PV profile,
- Energy loss methodology developed by NREL (method #1) which uses a maximum PV output profile from 9am to 3pm and zero output for the remainder of the hours.

The discussion found that the three energy loss estimation methodologies yield approximately the same estimated energy loss value. NREL's simplified curtailment calculation produced the highest estimated curtailment but was the easiest to implement.

Meeting 2 – February 6 (SIWG Meeting): Each IOU gave presentations on the capabilities and limitations of their AMI systems. There was some discussion of the manufacturers providing voltage data to the IOUs to assist in vetting voltage violations, since the voltage at the inverter terminals is a known value.

Meeting 3 – February 20 (SIWG Meeting): This meeting was focused on discussing the upcoming IOU advice letters and reporting – and what these items could look like along with confirming if prior outstanding issues and concerns had been resolved. Consensus appeared to coalesce around the NREL simplified curtailment calculation. Additional discussion ensued regarding the customer complaint process and what potential enhancements could be made including manufacturers directly submitting a complaint to each utility's customer complaint process on behalf of the customer. The main focus of the meeting was to discuss preliminary voltage analysis based on data provided by SDG&E and PG&E. Both presentations demonstrated that the estimated energy curtailment would be expected to be de minimis under the NREL energy loss methodology (Meeting 1).

Outside SIWG Meeting – March 4: The IOUs met with IREC and Sunrun to walk through the IOU proposal for the May advice letter filing. PG&E shared a presentation that summarized at a high level the process. The meeting focused on trying to confirm the areas of consensus and address the points of disagreement.

Outside SIWG Meeting – March 12: The IOUs met again with IREC and Sunrun to walk through all eight points, identifying where there was consensus and where there was disagreement. Proposals to resolve the disagreements were discussed with the understanding that this process would be presented at the upcoming fourth SIWG meeting.

Meeting 4 – March 19 (SIWG Meeting): The IOUs presented the outline of their proposed methodologies and reporting approach to stakeholders. Consensus has been reached on most items, but the IOUs and protesting parties (IREC and Sunrun) are not in agreement regarding application of a cutoff for the duration of voltage events for running calculations. No third-party stakeholders have offered any formal proposals at this point, and the IOUs will now start drafting their advice letters. The foundation of this advice letter was presented at this last SIWG meeting.

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

AT&T	Downey & Brand	Pioneer Community Energy
Albion Power Company	East Bay Community Energy	Redwood Coast Energy Authority
Alcantar & Kahl LLP	Ellison Schneider & Harris LLP	Regulatory & Cogeneration Service, Inc.
	Energy Management Service	SCD Energy Solutions
Alta Power Group, LLC	Engineers and Scientists of California	
Anderson & Poole		
Atlas ReFuel	GenOn Energy, Inc.	SCE
BART	Goodin, MacBride, Squeri, Schlotz & Ritchie	SDG&E and SoCalGas
Barkovich & Yap, Inc.	Green Power Institute	SPURR
California Cotton Ginners & Growers Assn	Hanna & Morton	San Francisco Water Power and Sewer
California Energy Commission	ICF	Seattle City Light
California Public Utilities Commission	IGS Energy	Sempra Utilities
California State Association of Counties	International Power Technology	Southern California Edison Company
Calpine	Intestate Gas Services, Inc.	Southern California Gas Company
	Kelly Group	Spark Energy
Cameron-Daniel, P.C.	Ken Bohn Consulting	Sun Light & Power
Casner, Steve	Keyes & Fox LLP	Sunshine Design
Cenergy Power	Leviton Manufacturing Co., Inc.	Tecogen, Inc.
Center for Biological Diversity		TerraVerde Renewable Partners
		Tiger Natural Gas, Inc.
Chevron Pipeline and Power	Los Angeles County Integrated	TransCanada
City of Palo Alto	Waste Management Task Force	Troutman Sanders LLP
	MRW & Associates	Utility Cost Management
City of San Jose	Manatt Phelps Phillips	Utility Power Solutions
Clean Power Research	Marin Energy Authority	Water and Energy Consulting Wellhead
Coast Economic Consulting	McKenzie & Associates	Electric Company
Commercial Energy		Western Manufactured Housing
Crossborder Energy	Modesto Irrigation District	Communities Association (WMA)
Crown Road Energy, LLC	NLine Energy, Inc.	Yep Energy
Davis Wright Tremaine LLP	NRG Solar	
Day Carter Murphy		
Dept of General Services	Office of Ratepayer Advocates	
Don Pickett & Associates, Inc.	OnGrid Solar	
Douglass & Liddell	Pacific Gas and Electric Company	
	Peninsula Clean Energy	