

October 4, 2021

Advice 6350-E

(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: Proposal to Implement Specific Technical Requirements for Telemetering of Distribution-Connected Systems 1 Megawatt (MW) or Greater, and Less Than 10 MW, Pursuant to Resolution E-5038

Purpose

Pursuant to Ordering Paragraph (OP) 2 of California Public Utilities Commission (Commission, CPUC) Resolution E-5038, Pacific Gas and Electric Company (PG&E) hereby submits this Tier 1 Advice Letter to implement specific technical requirements for telemetering of distribution-connected systems 1 Megawatt (MW) or greater and less than 10 MW.

Background**Rulemaking 17-07-007**

In July of 2017, Rulemaking (R.) 17-07-007 was initiated to “*consider a variety of refinements to the interconnection of distributed energy resources [DERs] under Electric Tariff Rule 21 of the Utilities and the equivalent tariff rules of the small and multi-jurisdictional electric utilities*”¹. Rule 21 addresses the safe and reliable interconnection of customer owned generation to the Investor Owned Utilities’ (IOUs)² electric grid.

Scoping Memo and Issue 4

On October 2, 2017 the *Scoping Memo of Assigned Commissioner and Administrative Law Judge* was issued. Included in it was **Issue 4**, which posed the following question: “*As the penetration levels of distributed energy resources increase, what changes to telemetry requirements should the Commission adopt to ensure adequate visibility while minimizing cost?*”

Rule 21 Section J addresses the current telemetry requirements for DERs 1 Megawatt or greater.

¹ Resolution [E-5038](#), page 2

² The “IOUs”, or “Utilities” consist of Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company.

Working Group 1

Working Group 1 (WG1) took up Issue 4 from the Scoping Memo and resulted in five proposals in the final report (in summary):

Proposal 1 allow the Utilities to require telemetry for systems between 250 kW and 9.9 MW if utility costs are less than \$20,000.

Proposal 2 maintains the 1 MW threshold for requiring telemetry.

Proposal 3 implements specific technical requirements for systems larger than 1 MW.

Proposal 4 was found to be unnecessary and

Proposal 5 was adopted to allow customer owned telemetry where practicable.

Decision 19-03-013

On April 5, 2019 the CPUC issued D.19-03-013.³

Workshop

In considering **Proposal 1**, D.19-03-013 found that additional information was necessary for implementation and authorized a public workshop in which the Utilities would present, in detail, the telemetry requirements for systems between 250 kW and 9.9 MW, before filing Advice Letters (ALs) to resolve the issue.

On June 26, 2019, the CPUC's Energy Division hosted a public workshop during which the Utilities presented their proposed telemetry requirements.

OP 9

Ordering Paragraph (OP) 9 required the Utilities to file Tier 3 ALs:

- (1) proposing technical specifications for telemetry,
- (2) including a cost-benefit analysis of the telemetry as a means of collecting data on the distribution system, and
- (3) providing information to indicate that Supervisory Control and Data Acquisition System (SCADA) and smart inverter data would not be able to provide sufficient data to satisfy the Utilities' needs.

OP 9 also directs that the ensuing resolution should seek to implement **Proposal 1**, and it requires that the Utilities publish technical requirements rather than requiring specific equipment if the telemetry is deemed necessary. However, if the Tier 3 ALs do not indicate that the Utilities' proposed approach is cost-effective, the resolution should instead adopt **Proposal 2** (maintain 1 MW threshold) and

³ [D.19-03-013](#) Decision Adopting Proposals From March 15, 2018 Working Group One Report - date of issuance 4/5/2019

Proposal 3 to implement specific technical requirements for systems larger than 1 MW.

Advice Letter 5595-E

On July 26, 2019, PG&E submitted AL 5595-E pursuant to D.19-03-013 OP 9.

In AL 5595-E PG&E:

- seeks telemetry based on IEEE 2030.5 communication standards and the Common Smart Inverter Profile (CSIP) to retrieve measurements from smart inverters or site monitoring equipment.
- compares the IEEE 2030.5 with existing Advanced Metering Infrastructure (AMI) and indicates that an AMI-based solution cannot meet operational needs.
- notes both SCADA and AMI do not help with the masked load issues.
- asserts that an IEEE 2030.5 telemetry solution "will address the challenges with the existing solutions by identifying masked load effects, creating a near real-time system integrated with PG&E Operations, and reducing costs for customers."
- will carry out a pilot to
 - (i) prove out the target of lowering utility-related telemetry costs below \$20,000, and
 - (ii) enable design around future IEEE 2030.5 standards that will provide a way to monitor and control smart inverter based DERs.The pilot is ongoing, and field testing is set to be completed in 2021.
- proposes to transition towards an in-production system for widescale field deployment, following the pilot.
- will roll out the IEEE 2030.5-based solution for systems greater than 1 MW before considering whether to expand to systems between 250 kW and 1 MW.
- notes that requirements will be further refined through the pilot.

AL 5595-E Protests

On August 15, 2019, Advice Letter 5595-E was protested by:

- (i) the Interstate Renewable Energy Council, Inc. (IREC),
- (ii) the Public Advocates Office (PAO), and
- (iii) The California Solar & Storage Association (CALSSA).

AL 5595-E Reply

On August 22, 2019, PG&E, and the other IOUs each replied to the protests they received to their respective advice letters.

Resolution E-5038

On August 20, 2021, Resolution E-5038 was issued to resolve the protests received to the Utilities' Advice Letters. E-5038 "*approves maintaining the threshold for requiring telemetry for projects sized one (1) megawatt (MW) or greater, requires the implementation of certain technical requirements for telemetry, and directs the utilities to*

continue development of a telemetry solution using the IEEE 2030.5 communications standards.”⁴

This Advice Letter

This advice letter addresses E-5038 OP 2 that requires:

Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company shall implement specific technical requirements for telemetering of distribution-connected systems 1 MW or greater and less than 10 MW.

The adopted technical specifications for these systems are as follows:

- 1) **facilities can report measurements in 15-minute increments using customer-owned, nonrevenue-grade metering and a data aggregation device** comparable to the serial device server that SCE⁵ has historically required,*
- 2) customers can choose to connect the reporting device to the utility Energy Management System via cellular modem or dedicated internet connection, and*
- 3) measurements do not have to be made from revenue grade equipment.*

The Utilities shall submit Tier 1 Advice Letters to implement these requirements no later than October 4.

These Advice Letters may also suggest an alternative polling rate following a discussion of the need for more frequent data polling and what an appropriate polling rate would be within a meeting of the Smart Inverter Working Group.

[formatting added]

Proposal

Following the completion of PG&E's CSIP IEEE 2030.5 Pilot, PG&E plans to implement a production CSIP IEEE 2030.5 system for telemetering of Distribution-connected customers with DERs 1 MW and greater and less than 10 MW. This system is designed to fulfill the defined requirements stated in E-5038 OP 2 for using customer-owned equipment, the use of cellular or dedicated internet connection, and measurements allowed to come from non-revenue grade equipment.

⁴ Resolution [E-5038](#), page 1

⁵ Southern California Edison

However, PG&E suggests an alternative reporting rate⁶ to be used in the order of seconds versus the prescribed 15 minutes by Resolution E-5038. The pilot is implementing a reporting rate in seconds to better reflect the need for real-time data. At the Smart Inverter Working Group (SIWG) meeting to discuss alternative reporting rates held on September 16, 2021, the three IOUs explained the rationale for requiring real-time data in the realm of seconds versus the 15-minute requirement. A summary of the points discussed are made below:

1. **Resolution E-5038 seemed to be based on a misunderstanding of the capabilities of SCE's serial device server.** SCE's serial device server is referenced in the resolution as the basis for the 15-minute requirement. However, during the September 16, 2021 SIWG meeting, SCE clarified that this device actually provided real-time data in seconds versus a 15-minute refresh rate.
2. **The IOUs and other applicable jurisdictions (e.g. California Independent System Operator [CAISO]) rely on near-real time data on the order of seconds to make decisions to operate the grid.** PG&E's internal systems and Operations rely on data in the seconds range. Transmission systems are polled every 2-3 seconds. PG&E Distribution reporting rates depend on technology, with cellular and Operational Data Network connections polled within 5 seconds, and radio systems having a maximum of 30 seconds, although generally faster than 30 seconds. The other IOUs provided similar data showing existing data needs in the realm of seconds, not minutes.
3. **The need for real-time telemetry in seconds is based on the high variability of DER resources and their ability to negatively impact grid restoration activities during abnormal conditions.** Grid Operators rely on visibility from various points in the system to create operational switching plans to safely and reliably energize as many customers as possible during abnormal conditions. With the increased penetrations of DERs, DERs become a larger and more impactful presence on the grid that needs to be properly analyzed. Operators need to fully understand the real-time gross load profiles, as well as generation and load impacts of DERs, to properly configure sections of the grid.

As described in PG&E's Electric Program Investment Charge (EPIC) 2.02 Distributed Energy Resource Management System (DERMS) Report⁷, large DERs connected to the Distribution system can have an outsized impact on feeder load profiles. Figure 1 shows the impact of a 4MW DER participating in the CAISO frequency regulation market, with a before and after load profile of the Distribution

⁶ PG&E is using "reporting" rate throughout this document rather than "polling" rate because depending on the communication technology the data may be transmitted via a poll or a post (as in IEEE 2030.5).

⁷ [Pacific Gas and Electric Company EPIC 2.02 – Distributed Energy Resource Management System \(pge.com\)](https://www.pge.com)

feeder to which it was connected. This battery could swing a total of almost 8MW in a 4 second period depending on market signals.

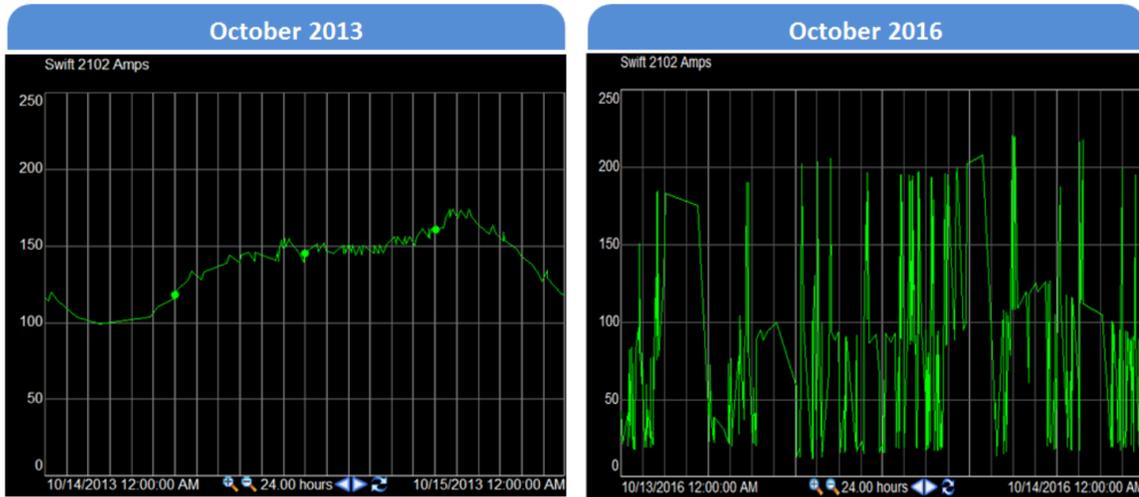


Figure 1: Impact of a Large Distribution-connected DER Participating in the Wholesale Market

In the past, the relatively smooth load profile prior to the large DER installation would have allowed for less frequent SCADA measurements to be adequate for performing switching or other analyses during abnormal conditions. However, after the installation of the large DER on this Distribution feeder, the rapid and large swings in DER generation and load made it difficult to properly assess the actual gross load of the feeder if the DER were to shut-down or be switched. Figure 2 shows the difference in trying to determine the gross load on the feeder (i.e. load profile without the impact of the large DER) using faster sampled data (in this case via a phasor measurement unit) versus slower non-temporally aligned existing SCADA data.

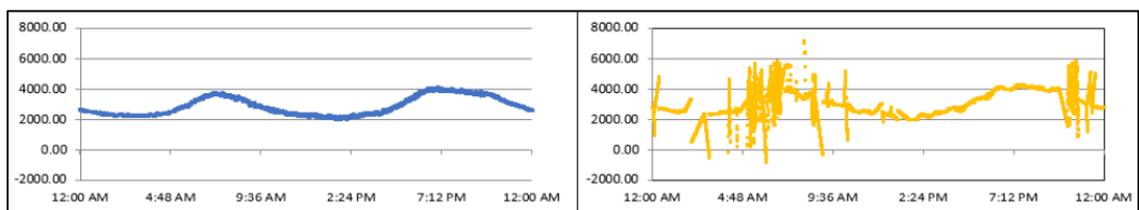


Figure 2: Comparison of Calculating Gross Load (Amps) on a Distribution Feeder with a Large Market-Participating DER using Faster and Slower Sampling Rates during the Same Time Period

The inadequate sampling rate and temporal alignment of data had a direct impact on the ability for more advanced systems, particularly the Advanced Distribution Management System (ADMS) and DERMS in the EPIC 2.02 DERMS project, to operate by creating failures of convergence in the real-time load flow models.

There continues to be an increase, not decrease, in the need and use of data as technology and automation advances. PG&E is proposing investments via the General Rate Case for communication infrastructure in direct response to the increased importance and abundance of data to operate the grid. These

improvements via projects like the field area network, help improve existing SCADA polling rates and allow more data to be captured across the system. Constraining polling to 15 minutes as Resolution E-5038 initially suggests, would be a backwards step and only exacerbate the types of problems faced with automation as shown in the EPIC 2.02 DERMS project. As the industry moves toward more automation, and more grid services, inadequate telemetry across the system will lead to these automated systems not providing the situational awareness nor automated capabilities that they are designed and funded to perform.

4. **There is expected to be little to no impact on cost between a reporting rate in seconds versus 15 minutes.** The motivations for this telemetry discussion are primarily driven by cost. Customer ownership, internet-based communication, and the need for non-revenue grade equipment are the main drivers for the cost reduction for customers using the planned CSIP IEEE 2030.5 interface when compared to PG&E's existing telemetry methods of either a miniRTU or line recloser. The data rate also does not impact the other major expenses of a telemetry installation including the installation labor, equipment used, communication hardware, and maintenance activities.

A preliminary analysis indicates that the difference between reporting in seconds versus minutes should have little effect on cost. While it would impact the amount of data being exchanged between the utility and customer, the cost would depend on the base data plan the customer chooses and any modifications they may or may not need to have adequate capabilities for 30 second data. With network capabilities ever improving, this suggests sufficient data plans should be less expensive as time goes on. For customers with an adequate baseline data plan, PG&E does not expect any additional costs. For a customer with a low baseline data plan, PG&E estimates a potential maximum of an extra \$25 per month. As PG&E implements more pilot sites as part of the EPIC 3.03 project, there will be an analysis done on the amount of data required at different types of sites to have a more quantitative analysis on this subject.

5. **The CSIP Standard acknowledges that Utilities' Interconnection Handbooks should define the ultimate reporting rate.** CSIP actually defines the default for posting monitoring information more stringently than Resolution E-5038, as every 5 minutes, but provides for the utilities to make the final determination via their Interconnection Handbooks or programs/contracts because of the understanding that telemetry requirements are based on the needs of the utility or program:

“Unless specified in each utility's Interconnection Handbook or programs/contracts, default polling and posting rates SHALL be as follows:

- Polling of DERControls and DefaultDERControls (Direct DER Communication)– every 10 minutes

- Posting monitoring information (Direct and Aggregator Mediated Communications)– every 5 minutes

For DERs with an external SMCU [Smart Inverter Control Unit], the SMCU SHALL transfer the DER control to the DER within 10 minutes of receiving the control from the server.

For DERs with a GFEMS [Generating Facility Energy Management System], the GFEMS SHALL transfer the DER control to the DERs within 10 minutes of receiving the control from the server.

For DERs mediated by Aggregators, the Aggregator SHALL transfer the DER control to the DERs within 15 minutes of receiving the control from the server.”⁸

PG&E’s EPIC 3.03 pilot is testing a 30 second rate for acquiring monitoring data. This rate was chosen to align with PG&E’s worst-case scenario on Distribution and what was considered to be an achievable starting point while testing a new technology in IEEE 2030.5. For the near-term, PG&E proposes a 30 second rate for acquiring monitoring data, however as technology, use cases, or programs change, PG&E may modify this in the future following an analysis to not create a significant additional burden to customers. As described during the SIWG presentation, PG&E already receives data in about 5 seconds for cellular or Operational Data Network connections, and even faster for Transmission related SCADA.

Implementation Plan:

As previously described, PG&E is in the midst of the EPIC 3.03 pilot that is testing a future production CSIP Certified IEEE 2030.5 System that will allow customers to more affordably fulfill the telemetry requirement for Distribution-connected DERs greater than or equal to 1MW and less than 10MW using customer-owned equipment, a cellular or other public internet connection, and non-revenue grade metering as required by Resolution E-5038 and described below:

1. **Customer-Owned Equipment:** PG&E plans to initially provide customers with at least two 3rd-party vendor options for a CSIP certified gateway that can interoperate with PG&E’s CSIP certified 2030.5 Headend. This gateway would be installed and maintained by the customer to provide monitoring information from other customer-owned devices for net loading and generation information from the site. These gateways will be able to translate information coming from customer owned metering, data concentrators, or energy management systems from protocols like Modbus into IEEE 2030.5 to send to the utility.

⁸ Common Smart Inverter Profile, March 2018, Version 2.1, Section 4.5 Communication Interactions, page 10.

2. **Cellular or Other Public Internet Connection:** The customer will be responsible for obtaining and maintaining an internet connection for the gateway device to send data to PG&E. The main specification is that it must use a public static IP address at this time to conform to PG&E's cybersecurity requirements for access control management.
3. **Non-Revenue Grade Metering:** PG&E does not require the customer to provide telemetry data via revenue grade metering.

The other preliminary telemetering requirements have not changed substantially from those presented in PG&E Advice Letter 5595-E⁹. As stated in that Advice Letter, the requirements will be further refined and detailed near pilot completion to be ready for the subsequent production CSIP IEEE 2030.5 system. The pilot is currently working through interoperability issues between CSIP certified clients and the CSIP certified Headend Server. Once these issues are resolved, PG&E's goal is to have the CSIP IEEE 2030.5 ecosystem ready for non-pilot sites by early 2022. This assumes that all interoperability challenges will be resolved by that time. This timeline may be modified if additional challenges arise that cannot be addressed in that timeframe. Until that time, PG&E will continue the process for interconnecting Distribution-connected DER customers described in AL 5595-E, summarized below:

Until PG&E's lower cost telemetry solution is deployed in production, the PG&E team will assess each 1MW and greater Distribution-connected DER telemetry requirement on a project-by-project basis to determine if conditional Permission to Operate (PTO) could be offered to the interconnection customer. Some of the factors considered include whether PG&E can achieve grid visibility on a subset of the monitoring parameters with other methods and/or can temporarily accept the operational risk of reduced telemetry at specific locations. Note, that the CSIP IEEE 2030.5 system is not applicable to Transmission-connected DERs, and these sites will continue to require telemetry and no conditional PTO will be available for Transmission-connected DERs.

It should be noted that this implementation plan is focused on addressing the near-term telemetry requirements for large DERs. However, PG&E sees this as the first step toward the larger context of leveraging IEEE 2030.5 beyond just telemetry towards enabling additional use cases in the future. As the industry continues to mature PG&E expects updates to various aspects of the ecosystem from this initial starting point.

⁹ PG&E AL [5595-E](#), pages 6-10.

Protests

*****Due to the COVID-19 pandemic, 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*****

Anyone wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than October 25, 2021, which is 21 days¹⁰ 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:

Sidney Bob Dietz II
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

¹⁰ The 20-day protest period concludes on a weekend, therefore, PG&E is moving this date to the following business day.

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 General Order (GO) 96-B, Rule 5.2, and OP 2 of E-5038, this advice letter is submitted with a Tier 1 designation. PG&E requests that this Tier 1 advice submittal become effective upon date of submittal, which is October 4, 2021.

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.19-09-009. 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/

Sidney Bob Dietz II
Director, Regulatory Relations

cc: Service List R.19-09-009



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) #: 6350-E

Tier Designation: 1

Subject of AL: Proposal to Implement Specific Technical Requirements for Telemetry of Distribution-Connected Systems 1 Megawatt (MW) or Greater, and Less Than 10 MW, Pursuant to Resolution E-5038

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-5038

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: 10/4/21

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: Sidney Bob Dietz II, 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:

**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.
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
Cenergy Power
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

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

GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz &
Ritchie

Green Power Institute
Hanna & Morton
ICF

IGS Energy
International Power Technology

Intertie

Intestate Gas Services, Inc.
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
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.
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
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