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August 18, 2009

Advice 3508-E

(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California (CPUC)

Subject: Revisions to Electric Rule 21 – *Generating Facility Interconnections* Section D

Purpose

Pacific Gas and Electric Company (PG&E) hereby submits for filing revisions to its Electric Rule 21 – *Generating Facility Interconnections* Section D regarding certain requirements for generating facilities interconnecting with PG&E's secondary distribution system.

Background

PG&E seeks approval for changes to Rule 21 Section D. *Generating Facility Design and Operating Requirements*, to provide PG&E greater flexibility in determining generating facilities' interconnection requirements. The proposed new language in section D.3 affords PG&E discretion in determining when transformer changes are actually needed utilizing existing standard system design and transformer loading criteria, whereas the existing language only provided a rigid requirement. Additionally, changes are made to add clarity regarding existing voltage requirements.

For example, based on the current language, when a residential photovoltaic generator is greater than 20 kilovolt-ampere (kVA), a dedicated transformer is required. Under the new proposed language, PG&E must evaluate the interconnection, again using existing standard system design and transformer loading criteria, to determine if a dedicated transformer is needed. In some cases, an applicant may not be required to install a dedicated transformer, where under the current rule they would face this requirement. Such an assessment would consist of ensuring that the existing, shared transformer was capable of handling the generator output with respect to thermal loading, Rule 2 distribution voltage constraints, and phase imbalance.

Tariff Revisions (changes in bold typeface)Rule 21– *Generating Facility Interconnections*

- Eliminate Section D.3.d which reads:

Single-Phase Generators. For single-phase Generators connected to a shared single-phase secondary system, the maximum Net Nameplate rating of the Generating Facilities shall be 20 kVA. Generators connected to a center-tapped neutral 240-volt service must be installed such that no more than 6 kVA of imbalanced power is applied to the two “legs” of the 240-volt service. For Dedicated Distribution Transformer services, the maximum Net Nameplate Rating of a single-phase Generating Facility shall be the transformer nameplate rating.

And replace it with a new paragraph at the beginning of Section D.3., which would apply to all generating facilities covered in Section D.3, and would read:

All Generating Facilities – The maximum Net Nameplate Ratings for all the Generating Facilities connected to a secondary distribution system shall be limited to the capability of the transformer, as determined by PG&E. The operation of any generating facility must not cause either the existing Electric Rule 2 load balance limits or the operating voltage limits to be exceeded.

- Change language related to voltage in Section D.2.b clarifying how it is consistent with the Rule 2 voltage requirements:

Section and D.2.b.1 was changed from:

*Generating Facilities (30 kVA or less). Generating Facilities with a Gross Nameplate Rating of 30 kVA or less shall be capable of operating within the voltage range normally experienced on PG&E’s Distribution System. The **operating range shall** be selected in a manner that minimizes nuisance tripping between 106 volts and 132 volts on a 120 volt base (88-110% of nominal voltage). Voltage **shall** be detected at either the PCC or the Point of Interconnection.*

to:

*Generating Facilities (30 kVA or less). Generating Facilities with a Gross Nameplate Rating of 30 kVA or less shall be capable of operating within the voltage range normally experienced on PG&E’s Distribution System **from 114 V to 126 V, on a 120V base, at the service panel or PCC.** The **trip settings at the generator terminals may be** selected in a manner that*

*minimizes nuisance tripping between 106 volts and 132 volts on a 120 volt base (88-110% of nominal voltage) **to compensate for voltage drop between the generator terminals and the PCC.** Voltage may be detected at either the PCC or the Point of Interconnection. **However, the operating voltage range at the PCC, with the generator on-line, shall stay within the 114-126 V range.***

Section and D.2.b.2 was changed from:

*Generating Facilities (greater than 30 kVA). PG&E may have specific operating voltage ranges for Generating Facilities with Gross Nameplate Ratings greater than 30 kVA, and may require adjustable operating voltage settings. In the absence of such requirements, the Generating Facility shall **operate** at a range between 88% and 110% of the applicable interconnection voltage. Voltage shall be detected at either the PCC or the Point of Interconnection, with settings compensated to account for the voltage at the PCC. **Generating Facilities that are Certified Non-Islanding or that meet one of the options of the Export Screen (Section I.3.b) may detect voltage at the Point of Interconnection without compensation.***

to:

*Generating Facilities (greater than 30 kVA). PG&E may have specific operating voltage ranges for Generating Facilities with Gross Nameplate Ratings greater than 30 kVA, and may require adjustable operating voltage settings. In the absence of such requirements, the Generating Facility shall **be capable of operating** at a range between 88% and 110% of the applicable interconnection voltage. Voltage shall be detected at either the PCC or the Point of Interconnection, with settings compensated to account for the voltage at the PCC. **However, the operating voltage range at the PCC, with the generator on-line, shall stay within the 114-126 V range.***

- Modified one entry in Table D.1 *Voltage Trip Setting* under section D.2.b.3 for the *Maximum Trip Time* column in the row starting *Greater than or equal to 106 Volts but less than or equal to 1.32 Volts*. The entry was changed from **Nominal Operation** to **No Trip**.
- Minor formatting changes were made in the continued heading for section D.1. to correct a typographical error.

Protests

Anyone wishing to protest this filing may do so by letter sent via U.S. mail, by facsimile or electronically, any of which must be received no later than **September 8, 2009**¹, which is 21 days after the date of this filing. Protests should be mailed to:

CPUC Energy Division
Tariff Files, Room 4005
DMS Branch
505 Van Ness Avenue
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: ijnj@cpuc.ca.gov and mas@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 also should be sent via U.S. mail to PG&E at the address shown below on the same date it is mailed or delivered to the Commission:

Brian K. Cherry
Vice President, Regulatory Relations
Pacific Gas and Electric Company
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-7226
E-mail: PGETariffs@pge.com

Effective Date

PG&E requests that this advice filing become effective, **September 17, 2009**.

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. Address changes to the General Order 96-B service list should be directed to San Heng at (415) 973-2640. Advice letter filings can also be accessed electronically at: <http://www.pge.com/tariffs>

¹ The 20th day falls on Labor Day. PG&E is moving the protest end date to the following business day, September 8, 2009.

Brian Cherry 08

Vice President, Regulatory Relations
Attachments

cc: Service List, R.08-03-008

CALIFORNIA PUBLIC UTILITIES COMMISSION

ADVICE LETTER FILING 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 M)**

Utility type:

ELC

GAS

PLC

HEAT

WATER

Contact Person: Olivia M. Brown

Phone #: 415.973.9312

E-mail: oxb4@pge.com

EXPLANATION OF UTILITY TYPE

ELC = Electric

GAS = Gas

PLC = Pipeline

HEAT = Heat

WATER = Water

(Date Filed/ Received Stamp by CPUC)

Advice Letter (AL) #: 3508-E

Tier: 2

Subject of AL: Revisions to Electric Rule 21 – Generating Facility Interconnections Section D

Keywords (choose from CPUC listing): Text changes

AL filing type: Monthly Quarterly Annual One-Time Other _____

If AL filed in compliance with a Commission order, indicate relevant Decision/Resolution #: N/A

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: N/A

Is AL requesting confidential treatment? If so, what information is the utility seeking confidential treatment for: No

Confidential information will be made available to those who have executed a nondisclosure agreement: N/A

Name(s) and contact information of the person(s) who will provide the nondisclosure agreement and access to the confidential information: N/A

Resolution Required? Yes No

Requested effective date: September 17, 2009

No. of tariff sheets: 9

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) N/A

Tariff schedules affected: Electric Rule 21

Service affected and changes proposed: Greater flexibility in determining generating facilities' interconnection requirements

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

CPUC, Energy Division

Tariff Files, Room 4005

DMS Branch

505 Van Ness Ave., San Francisco, CA 94102

jn@cpuc.ca.gov and mas@cpuc.ca.gov

Pacific Gas and Electric Company

Attn: Brian K. Cherry, Vice President, Regulatory Relations

77 Beale Street, Mail Code B10C

P.O. Box 770000

San Francisco, CA 94177

E-mail: PGETariffs@pge.com

**ATTACHMENT 1
Advice Rule 21**

**Cal P.U.C.
Sheet No.**

Title of Sheet

**Cancelling Cal
P.U.C. Sheet No.**

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28392-E	ELECTRIC RULE NO. 21 GENERATING FACILITY INTERCONNECTIONS Sheet 12	23688-E
28393-E	ELECTRIC RULE NO. 21 GENERATING FACILITY INTERCONNECTIONS Sheet 13	23689-E
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ELECTRIC RULE NO. 21
GENERATING FACILITY INTERCONNECTIONS

Sheet 10

D. Generating Facility Design and Operating Requirements

This section has been revised to be consistent with the requirements of ANSI/IEEE 1547-2003 *Standard for Interconnecting Distributed Resources with Electric Power Systems* (IEEE 1547). Exceptions are taken to IEEE 1547 Clauses 4.1.4.2 Distribution Secondary Spot Networks and Clauses 4.1.8.1 or 5.1.3.1, which address Protection from Electromagnetic Interference. These are being studied for inclusion in a subsequent version of this Rule. Also, Rule 21 does not adopt the Generating Facility power limitation of 10 MW incorporated in IEEE 1547.

1. General Interconnection and Protection Function Requirements

(T)

The Protective Functions and requirements of this Rule are designed to protect PG&E's Distribution System and not the Generating Facility. A Producer shall be solely responsible for providing adequate protection for its Generating Facility and Interconnection Facilities. The Producer's Protective Functions shall not impact the operation of other Protective Functions utilized on PG&E's Distribution System in a manner that would affect PG&E's capability of providing reliable service to its Customers.

a. Protective Functions Required. Generating Facilities operating in parallel with PG&E's Distribution System shall be equipped with the following Protective Functions to sense abnormal conditions on PG&E's distribution system and cause the Generating Facility to be automatically disconnected from PG&E's Distribution System or to prevent the Generating Facility from being connected to PG&E's Distribution System inappropriately:

- 1) Over and under voltage trip functions and over and under frequency trip functions;

(Continued)



ELECTRIC RULE NO. 21
GENERATING FACILITY INTERCONNECTIONS

Sheet 11

D. Generating Facility Design and Operating Requirements (Cont'd.)

1. General Interconnection and Protection Function Requirements (Cont'd.) (T)

a. Protective Functions Required (Cont'd.)

- 2) A voltage and frequency sensing and time-delay function to prevent the Generating Facility from energizing a de-energized Distribution System circuit and to prevent the Generating Facility from reconnecting with PG&E's Distribution System unless PG&E's Distribution System service voltage and frequency is within the ANSI C84.1-1995 Table 1 Range B Voltage Range of 106V to 127V on a 120V basis, inclusive, and a frequency range of 59.3 Hz to 60.5 Hz, inclusive, and are stable for at least 60 seconds, and
- 3) A function to prevent the Generating Facility from contributing to the formation of an Unintended Island, and cease to energize the PG&E system within two seconds of the formation of an Unintended Island.

The Generating Facility shall cease to energize PG&E's Distribution System for faults on PG&E's Distribution System circuit to which it is connected (IEEE1547-4.2.1). The Generating Facility shall cease to energize PG&E's Distribution circuit prior to reclosure by PG&E's Distribution System equipment (IEEE1547-4.2.2).

- b. Momentary Paralleling Generating Facilities. With PG&E's approval, the transfer switch or scheme used to transfer the Producer's loads from PG&E's Distribution System to Producer's Generating Facility may be used in lieu of the Protective Functions required for Parallel Operation.
- c. Suitable Equipment Required. Circuit breakers or other interrupting devices located at the Point of Common Coupling must be Certified or "Listed" (as defined in Article 100, the Definitions Section of the National Electrical Code) as suitable for their intended application. This includes being capable of interrupting the maximum available fault current expected at their location. Producer's Generating Facility and Interconnection Facilities shall be designed so that the failure of any one device shall not potentially compromise the safety and reliability of PG&E's Distribution System.

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ELECTRIC RULE NO. 21
GENERATING FACILITY INTERCONNECTIONS

Sheet 12

D. GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd)

1. General Interconnection and Protection Function Requirements (Cont'd) (T)

c. Suitable Equipment Required (Cont'd.)

The Generating Facility paralleling-device shall be capable of withstanding 220% of the Interconnection Facility rated voltage (IEEE 1547-4.1.8.3). The Interconnection Facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE Std C62.41.2-2002 or IEEE Std C37.90.1-2002 as applicable and as described in J.3.e (IEEE 1547-4.1.8.2).

d. Visible Disconnect Required: When required by PG&E's operating practices, the Producer shall furnish and install a ganged, manually-operated isolating switch (or a comparable device mutually agreed upon by PG&E and the Producer) near the Point of Interconnection to isolate the Generating Facility from PG&E's Distribution System. The device does not have to be rated for load break nor provide over-current protection.

The device must:

- 1) allow visible verification that separation has been accomplished. (This requirement may be met by opening the enclosure to observe contact separation.)
- 2) include markings or signage that clearly indicate open and closed positions.
- 3) be capable of being reached quickly and conveniently 24 hours a day by PG&E personnel for construction, maintenance, inspection, testing or reading, without obstacles or requiring those seeking access to obtain keys, special permission, or security clearances.
- 4) be capable of being locked in the open position.
- 5) be clearly marked on the submitted single line diagram and its type and location approved by the PG&E prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a PG&E-approved location providing a clear description of the location of the device.

Generating Facilities with Non-Islanding inverters totaling one (1) kilovolt-ampere (kVA) or less are exempt from this requirement.

(Continued)



ELECTRIC RULE NO. 21
GENERATING FACILITY INTERCONNECTIONS

Sheet 13

D. Generating Facility Design and Operating Requirements (Cont'd.)

1. General Interconnection and Protection Function Requirements (Cont'd.) (T)

e. Drawings Required. Prior to Parallel Operation or Momentary Parallel Operation of the Generating Facility, PG&E shall approve the Producer's Protective Function and control diagrams. Generating Facilities equipped with a Protective Function and control scheme previously approved by PG&E for system-wide application or only Certified Equipment may satisfy this requirement by reference to previously approved drawings and diagrams.

f. Generating Facility Conditions Not Identified. In the event this Rule does not address the Interconnection conditions for a particular Generating Facility, PG&E and Producer may agree upon other arrangements.

2. PREVENTION OF INTERFERENCE

The Producer shall not operate Generating or Interconnection Facilities that superimpose a voltage or current upon PG&E's Distribution System that interferes with PG&E operations, service to PG&E customers, or communication facilities. If such interference occurs, the Producer must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by PG&E. If the Producer does not take corrective action in a timely manner, or continues to operate the facilities causing interference without restriction or limit, PG&E may, without liability, disconnect the Producer's facilities from PG&E's Distribution System, in accordance with Section B.9 of this Rule. To eliminate undesirable interference caused by its operation, each Generating Facility shall meet the following criteria:

- a. Voltage Regulation. The Generating Facility shall not actively regulate the voltage at the PCC while in parallel with PG&E's Distribution System. The Generating Facility shall not cause the service voltage at other customers to go outside the requirements of ANSI C84.1-1995, Range A (IEEE 1547-4.1.1).
- b. Operating Voltage Range. The voltage ranges in Table D.1 define protective trip limits for the Protective Function and are not intended to define or imply a voltage regulation Function. Generating Facilities shall cease to energize PG&E's Distribution System within the prescribed trip time whenever the voltage at the PCC deviates from the allowable voltage operating range. The Protective Function shall detect and respond to voltage on all phases to which the Generating Facility is connected.

(Continued)



ELECTRIC RULE NO. 21
GENERATING FACILITY INTERCONNECTIONS

Sheet 14

D. Generating Facility Design and Operating Requirements (Cont'd.)

2. PREVENTION OF INTERFERENCE (Cont'd.)

b. Operating Voltage Range. (Cont'd.) (T)

- 1) Generating Facilities (30 kVA or less). Generating Facilities with a Gross Nameplate Rating of 30 kVA or less shall be capable of operating within the voltage range normally experienced on PG&E's Distribution System from 114 V to 126 V, on a 120 V base, at the service panel or PCC. The trip settings at the generator terminals may be selected in a manner that minimizes nuisance tripping between 106 volts and 132 volts on a 120-volt base (88-110% of nominal voltage) to compensate for voltage drop between the generator terminals and the PCC. Voltage may be detected at either the PCC or the Point of Interconnection. However, the operating voltage range at the PCC, with the generator on-line, shall stay within the 114-126 V range. (T)
- 2) Generating Facilities (greater than 30 kVA). PG&E may have specific operating voltage ranges for Generating Facilities with Gross Nameplate Ratings greater than 30 kVA, and may require adjustable operating voltage settings. In the absence of such requirements, the Generating Facility shall be capable of operating at a range between 88% and 110% of the applicable interconnection voltage. Voltage shall be detected at either the PCC or the Point of Interconnection, with settings compensated to account for the voltage at the PCC. However, the operating voltage range at the PCC, with the generator on-line, shall stay within the 114-126 V range. (T)
- 3) Voltage Disturbances. Whenever PG&E's Distribution System voltage at the PCC varies from and remains outside normal (nominally 120 volts) by the predetermined amounts set forth in Table D-1, the Generating Facility's Protective Functions shall cause the Generator(s) to become isolated from PG&E's Distribution System:

(Continued)



ELECTRIC RULE NO. 21
GENERATING FACILITY INTERCONNECTIONS

Sheet 15

D. Generating Facility Design and Operating Requirements (Cont'd.)

2. PREVENTION OF INTERFERENCE (Cont'd.)

b. Operating Voltage Range. (Cont'd.)

Table D.1: Voltage Trip Settings			
Voltage at Point of Common Coupling		Maximum Trip Time ⁽¹⁾	
Assuming 120 V Base	% of Nominal Voltage	# of Cycles (Assuming 60 Hz Nominal)	Seconds
Less than 60 Volts	Less than 50%	10 Cycles	0.16 Seconds
Greater than or equal to 60 Volts but less than 106 Volts	Greater than or equal to 50% but less than 88%	120 Cycles	2 Seconds
Greater than or equal to 106 Volts but less than or equal to 132 Volts	Greater than or equal to 88% but less than or equal to 110%	No Trip	
Greater than 132 Volts but less than or equal to 144 Volts	Greater than 110% but less than or equal to 120%	60 Cycles	1 Second
Greater than 144 Volts	Greater than 120%	10 Cycles	0.16 Seconds

(T)

(1) "Maximum Trip time" refers to the time between the onset of the abnormal condition and the Generating Facility ceasing to energize PG&E's Distribution System. Protective Function sensing equipment and circuits may remain connected to PG&E's Distribution System to allow sensing of electrical conditions for use by the "reconnect" feature. The purpose of the allowed time delay is to allow a Generating Facility to "ride through" short-term disturbances to avoid nuisance tripping. Set points shall not be user adjustable (though they may be field adjustable by qualified personnel). For Generating Facilities with a Gross Nameplate Rating greater than 30 kVA, set points shall be field adjustable and different voltage set points and trip times from those in Table D.1 may be negotiated with PG&E.

(Continued)



ELECTRIC RULE NO. 21
GENERATING FACILITY INTERCONNECTIONS

Sheet 19

D. Generating Facility Design and Operating Requirements (Cont'd.)

3. TECHNOLOGY SPECIFIC Requirements

All Generating Facilities – The maximum Net Nameplate Ratings for all the Generating Facilities connected to a secondary distribution system shall be limited to the capability of the transformer, as determined by PG&E. The operation of any generating facility must not cause either the existing Electric Rule 2 load balance limits or the operating voltage limits to be exceeded.

(N)
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 (N)

- a. Three-Phase Synchronous Generators. For three-phase Generators, the Generating Facility circuit breakers shall be three-phase devices with electronic or electromechanical control. The Producer shall be responsible for properly synchronizing its Generating Facility with PG&E's Distribution System by means of either manual or automatic synchronizing equipment. Automatic synchronizing is required for all synchronous Generators that have a Short Circuit Contribution Ratio (SCCR) exceeding 0.05. Loss of synchronism protection is not required except as may be necessary to meet D.2.d (Flicker) (IEEE 1547-4.2.5). Unless otherwise agreed upon by the Producer and PG&E, synchronous Generators shall automatically regulate power factor, not voltage, while operating in parallel with PG&E's Distribution System. A power system stabilization Function is specifically not required for Generating Facilities under 10 MW Net Nameplate Rating.
- b. Induction Generators. Induction Generators (except self-excited Induction Generators) do not require a synchronizing Function. Starting or rapid load fluctuations on induction generators can adversely impact PG&E's Distribution System's voltage. Corrective step-switched capacitors or other techniques may be necessary and may cause undesirable ferro-resonance. When these counter measures (e.g., additional capacitors) are installed on the Producer's side of the Point of Common Coupling, PG&E must review these measures. Additional equipment may be required as determined in a Supplemental Review or an Interconnection Study.
- c. Inverters. Utility-interactive inverters do not require separate synchronizing equipment. Non-utility-interactive or "stand-alone" inverters shall not be used for Parallel Operation with PG&E's Distribution System.

(D)

(Continued)



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**PG&E Gas and Electric
Advice Filing List
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Alcantar & Kahl	Day Carter Murphy	Norris & Wong Associates
Ameresco	Defense Energy Support Center	North Coast SolarResources
Anderson & Poole	Department of Water Resources	Northern California Power Association
Arizona Public Service Company	Department of the Army	Occidental Energy Marketing, Inc.
BART	Dept of General Services	OnGrid Solar
BP Energy Company	Division of Business Advisory Services	Praxair
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California Cotton Ginners & Growers Assn	Foster Farms	Santa Fe Jets
California Energy Commission	G. A. Krause & Assoc.	Seattle City Light
California League of Food Processors	GLJ Publications	Sempra Utilities
California Public Utilities Commission	Goodin, MacBride, Squeri, Schlotz & Ritchie	Sierra Pacific Power Company
Calpine	Green Power Institute	Silicon Valley Power
Cameron McKenna	Hanna & Morton	Southern California Edison Company
Cardinal Cogen	Hitachi	Sunshine Design
Casner, Steve	International Power Technology	Sutherland, Asbill & Brennan
Chamberlain, Eric	Intestate Gas Services, Inc.	Tabors Caramanis & Associates
Chevron Company	Los Angeles Dept of Water & Power	Tecogen, Inc.
Chris, King	Luce, Forward, Hamilton & Scripps LLP	Tiger Natural Gas, Inc.
City of Glendale	MBMC, Inc.	Tioga Energy
City of Palo Alto	MRW & Associates	TransCanada
City of San Jose	Manatt Phelps Phillips	Turlock Irrigation District
Clean Energy Fuels	Matthew V. Brady & Associates	U S Borax, Inc.
Coast Economic Consulting	McKenzie & Associates	United Cogen
Commerce Energy	Merced Irrigation District	Utility Cost Management
Commercial Energy	Mirant	Utility Specialists
Consumer Federation of California	Modesto Irrigation District	Verizon
Crossborder Energy	Morgan Stanley	Wellhead Electric Company
Davis Wright Tremaine LLP	Morrison & Foerster	Western Manufactured Housing Communities Association (WMA)
	New United Motor Mfg., Inc.	eMeter Corporation