BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company for Approval of Modifications to its SmartMeter™ Program and Increased Revenue Requirements to Recover the Costs of the Modifications (U 39 M)	Application 11-03-014 (Filed March 24, 2011) (**NOT CONSOLIDATED**)
Application of Utility Consumers' Action Network for Modification of Decision 07-04-043 so as to Not Force Residential Customers to Use Smart Meters.	Application 11-03-015 (Filed March 24, 2011) (**NOT CONSOLIDATED**
Application of Consumers Power Alliance, Public Citizen, Coalition of Energy Users, Eagle Forum of California, Neighborhood Defense League of California, Santa Barbara Tea Party, Concerned Citizens of La Quinta, Citizens Review Association, Palm Springs Patriots Coalition Desert Valley Tea Party, Menifee Tea Party - Hemet Tea Party – Temecula Tea Party, Rove Enterprises, Inc., Schooner Enterprises, Inc., Eagle Forum of San Diego, Southern Californians For Wired Solutions To Smart Meters, and Burbank Action For Modification of D.08-09-039 and A Commission Order Requiring Southern California Edison Company (U338E) To File An Application For Approval of A Smart Meter Opt- Out Plan.	Application 11-07-020 (Filed July 26, 2011) (**NOT CONSOLIDATED**

PACIFIC GAS AND ELECTRIC COMPANY'S RESPONSE TO ADMINISTRATIVE LAW JUDGE'S OCTOBER 18, 2011 RULING DIRECTING IT TO FILE CLARIFYING RADIO FREQUENCY INFORMATION

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Application of Pacific Gas and Electric Company for Approval of Modifications to its SmartMeter™ Program and Increased Revenue Requirements to Recover the Costs of the Modifications (U 39 M)	Application 11-03-014 (March 24, 2011)

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I. INTRODUCTION

On October 18, 2011, Administrative Law Judge (ALJ) Yip-Kikugawa issued *Administrative Law Judge's Ruling Seeking Clarification* from Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), Southern California Edison Company (SCE) and Southern California Gas Company (SoCalGas) (collectively, the utilities or IOUs), in the above-captioned proceeding. Specifically, the Ruling directs the utilities to file clarifying information concerning the frequency and duration of radio frequency (RF) emissions from wireless smart meters by November 1, 2011. PG&E hereby timely responds to the Ruling.

II. PG&E'S SMARTMETERS™ COMPLY WITH FEDERAL COMMUNICATIONS COMMISSION (FCC) RADIO FREQUENCY (RF) EMISSIONS STANDARDS

PG&E's SmartMeters™ RF emissions are substantially below the Federal Communications Commission's (FCC) limits for radio transmitters of all types, including SmartMeters™. Indeed, and as PG&E noted in its Response to the Division of Ratepayer Advocates' *Motion to Amend the Scope of the Proceeding to Include Data on RF Emissions and to Order PG&E To Serve Supplemental Testimony on the Costs of an Analog Meter*, "the CPUC has previously found that PG&E's SmartMeters™ comply with FCC RF emissions standards. Specifically, the Commission found that '[a]ll radio devices in PG&E's SmartMeters™ are

licensed or certified by the FCC and comply with all FCC requirements.'[1] Further, the FCC itself has articulated that PG&E's SmartMeters™ comply with RF emissions levels."[2] (*See, PG&E's Opposition to DRA's Motion, p.3)(August 8, 2011*);(*see also, FCC letters, Attachments A and B*).

PG&E continues to recommend and support its proposed radio-off SmartMeter™ as the most feasible alternative to its SmartMeter™ Program, as fully described in Application (A.) 11-03-014 and supporting Testimony. PG&E's radio-off proposal provides an opt-out alternative with no wireless RF communications for customers who want to limit wireless telecommunications technology in their lives.

III. PG&E's RESPONSES TO THE CLARIFYING QUESTIONS IN THE OCTOBER 18, 2011 ALJ RULING

On September 14, 2011, ALJ Yip-Kikugawa held a combined workshop to consider alternatives for customers who may wish to opt-out of receiving wireless smart meters. During the workshop, various parties raised questions and made comments concerning the frequency and duration of the RF-transmissions from the wireless smart meters. The ALJ subsequently requested that the utilities respond to eleven RF-related questions as set forth below.

Each of PG&E's SmartMeter™ vendors – Silver Springs Network (SSN), General Electric (GE), Landis + Gyr (L+G), and Aclara – has confirmed that their SmartMeter™ products fully comply with applicable FCC regulations. PG&E's SmartMeter™ vendors provided the below RF-related data, as applicable to their respective products, in response to the ALJ Ruling.

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1 CPUC Decision 10-12-001, Finding of Fact 2.

2 FCC Letters to Cindy Sage, dated August 6, 2010, and the Honorable Lynn C. Woolsey, dated April 21, 2011

Question 1:

What is an average duration (in seconds) that a residential smart meter transmits in a 24 hour period?

Response 1:

Electric: As PG&E has described many times previously, both in this proceeding and publicly, a typical PG&E electric SmartMeter™ communicates intermittently throughout the day for a total cumulative period of approximately 45 seconds per 24-hour period. This typical cumulative communication period is comprised of thousands of very brief communications.

This reflects the findings of a detailed SSN study in which SSN collected actual field data from 88,000 deployed meters and compared the number of transmissions per meter for roughly 30 minutes each in order to determine that half of the meters transmitted for less than 45 seconds-per-day and half of the meters transmitted for longer than 45 seconds-per-day. In the study, a small number of electric SmartMeters™ in the outer range of the population communicated somewhat longer than 45 seconds-per-day, which resulted in an overall mean duration of approximately 62 seconds.[3]

Gas: The PG&E gas SmartMeter Module (MTU) has a single radio that utilizes the licensed 450-470 MHz band. The module is a one way transmitter; i.e., it sends but does not receive signals. The average duration that a gas SmartMeter™ Module transmits in a 24-hour period is 0.676 seconds. This is a calculated value based on observed individual transmission rates of 0.16 seconds each, and the designed transmission frequency of between 4.15 and 4.35 transmissions per day.

Question 1.a.:

How is this average computed or measured?

Response 1.a.:

Electric: SSN supplies PG&E with the "chipset" contained in the electric SmartMeters™ that GE and L+G supply to PG&E. The chipset, referred to as a "Network Interface Card" or "NIC," processes and stores the data and provides the radio communication back to PG&E. SSN has conducted several studies on these data to compute the type and duration of these transmissions.

In the SSN study referenced in Response 1, SSN calculated the median transmission-time by collecting actual field data from 88,000 deployed meters. By checking the number of transmissions per meter for roughly 30 minutes each, SSN computed the length of these

[3] PG&E's electric SmartMeters™ have two radios installed: 1) a radio that utilizes the licensed 902-928 megahertz (MHz) band for connection to the PG&E back office, and 2) a 2.4 gigahertz (GHz) radio to transmit to devices in the customer premises. The transmissions measured and addressed in this Response relate to the 900 MHz radio. Currently, PG&E does not have any SmartMeters™ utilizing the 2.4 GHz radio.

transmissions per 24-hour day. In another study, SSN worked with PG&E to evaluate the transmissions of roughly 50,000 meters over a 48-hour period to similarly compute these numbers.

Gas: The duration of each transmission from the gas SmartMeter™ Module is less than 0.16 seconds. Using the typical transmission rate of 4.228 transmissions per 24 hours, the average duration over a 24-hour period is approximately 0.676 seconds (4.228 x 0.16 = 0.676).

Question 2:

How many times in total (average and maximum) is a smart meter scheduled to transmit during a 24-hour period?

Response 2:

Electric: Table 2-1 presents scheduled electric SmartMeter™ system messages and their durations. As noted in Response 1, the information presented applies only to the 900 MHz radio. Table 2-1 presents data for all "scheduled" messages; i.e., those inherently required to sustain communications in the network that occur routinely without user intervention. "Non-Scheduled" messages created only at non-recurring times are addressed in Response 3.

TABLE 2-1

Electric System Message Type	**Transmission Frequency Per 24-Hour Period: Average**	**Transmission Frequency Per 24-Hour Period: Maximum (99.9th Percentile)**
[a]	[b]	[c]
Meter Read Data	6	6
Network Management	15	30
Time Synch	360	360
Mesh Network Message Management	9,600	190,000
Weighted Average Duty Cycle	45.3 Seconds[4]	875.0 Seconds

The electric system message types are defined as:

- Meter Read Data refers to the messages generated by each meter to transmit energy usage data.
- Network Management refers to network tasks that need to be performed to maintain the health of the network (e.g., route establishment).
- Time Synch refers to network administration messages needed to update the internal clock in the NIC.
- Mesh Network Message Management refers to activities required to forward routed messages.

Gas: Table 2-2 presents scheduled gas SmartMeter™ system messages and their durations.

TABLE 2-2

Gas System Message Type	**Transmission Frequency Per 24-Hour Period: Average**	**Transmission Frequency Per 24-Hour Period: Maximum**
[a]	[b]	[c]
Meter Read Data	4.228	4.305
Weighted Average Duty Cycle	0.676 Seconds	0.689 Seconds

[4] As stated in Response 1, a small number of electric SmartMeters™ communicate somewhat longer than 45 seconds-per-day, which resulted in an overall mean duration of approximately 62 seconds.

Question 2.a.:
How many of those times (average and maximum) are to transmit electric usage information?

Response 2.a.:

Electric: Generally, the Meter Read Data messages shown in Table 2-1 transmit electric usage data from the meter generating the data. Mesh Network Message Management messages also transmit electric usage data from neighbor meters.

Gas: In Table 2-2, the Meter Read Data messages transmit gas usage data.

Question 2.b.:
How many of those times (average and maximum) are for other purposes? What are those other purposes? Please specify number of times (average and maximum) by type/category of transmission.

Response 2.b.:

Electric: The scheduled electric messages are shown in Table 2-1 and defined in Response 2. The Network Management and Time Synch messages are for administration and mesh maintenance, as explained in Response 2. They are required to sustain the routing capability of the mesh network.

Gas: There are no other standard messages than the usage data transmission.

Question 3:
Under what scenarios does a meter transmit outside of the daily schedule, i.e., unscheduled transmission such as on-demand read, tamper/theft alert, last gasp, firmware upgrade etc.?

Response 3:

Electric: For purposes of providing this data, PG&E is using data for all messages that inherently are required to sustain communications in the network, and occur routinely without user intervention as "scheduled"; messages created only at non-recurring times such as startup or to satisfy non-typical events or user requests are considered "non-scheduled".

Table 3-1 shows the categories of electric messages generated outside of the daily schedule. These messages are event-driven and are not predictable on any given day.

TABLE 3-1

Electric Message Type	Scenario
Interrogation for network (Initial)	Initial attempt to discover network availability or after an outage restoration
Interrogation for network (Extended)	Infrequent polling when network discovery is not immediate
Network Activation	Upon successful discovery of network route either upon initial startup or outage restoration
Last gasp	Upon loss of power
On-demand read	Request from PG&E back-office user
Firmware upgrade	Pushed from PG&E back-office user
Power status check	Request from PG&E back-office user
Other 'as-triggered' alarms	Sent as needed (e.g., power restored)
Meter disconnect or reconnect	Request from PG&E back-office user

Gas: The only unscheduled transmission would be for a tamper alarm. Tamper alarms are rare.

Question 4:
Typically, how much of the communication between the customer's meter and the utility is unscheduled vs. scheduled?

Response 4:

Electric: Typically, the majority of the communication between the customer's electric SmartMeter™ and PG&E is scheduled. SSN estimates that very little of the overall electric SmartMeter™ transmission time would be for unscheduled transmissions.

Gas: Aclara estimates that effectively 100 percent of the transmissions are due to scheduled activity. Tamper alarms are rare.

Question 5:
Are there any other factors that go into determining duration and/or frequency of meter transmissions (e.g., if a meter can't access the network when it's trying to send data, type of a meter etc.)? If yes, please identify these factors.

Response 5:

Electric: With respect to PG&E's electric SmartMeter™ system, there are no other factors that go into determining the duration or frequency of the electric meter system transmission other than those discussed in Responses 2 and 3.

Gas: With respect to PG&E's gas SmartMeter™ system, there are no other factors that go into determining the duration or frequency of the gas meter system transmission other than those discussed in Responses 2 and 3.

Question 6:
What is the amount of RF emission at the source when a meter is transmitting data (instantaneous maximum peak level, averaged over 30 minutes)?

Response 6:

Table 6-1 provides the requested data for electric SmartMeters™ and gas SmartMeter™ Modules.

TABLE 6-1[5]

Radio Type	Transmit Power	Antenna Gain (Decibel Isotropic)	Instantaneous Peak Level (Effective Isotropic Radiated Power)	Average Exposure Over 30 Minutes	Percent of FCC Allowable RF Emissions
[a]	[b]	[c]	[d]	[e]	[f]
Electric 900 MHz	1000 mW	4.0 dBi	2500 mW	0.35 µW/cm2	0.058%
Electric 2.4 GHz[6]	125 mW	None	125 mW	N/A	N/A
Gas Standard Module	132 mW	None	132 mW	0.01µW/cm2	0.0033%
Gas Extended Range Module	794 mW	None	794 mW	0.059µW/cm2	0.02%

[5] Average electric exposure has been calculated from duty cycles consistent with field observations at a distance of 20 centimeters. Average gas exposure has been calculated based on system specifications.

[6] As stated in Response 1, the 2.4 GHz radio is not currently in use in PG&E's SmartMeter™ system.

Question 7:
Does the amount of RF emission vary depending on duration of transmission/volume of data being sent? For example, are RF emissions higher when there is a larger volume of data to be transmitted?

Response 7:

Electric: While the power-level in PG&E's electric SmartMeters™ is fixed, the total RF energy varies based on the duration of the communication. When a larger volume of data is transmitted, the duration of the communication may increase, resulting in a greater emission of RF energy.

Gas: The usage read data messages are fixed in length and fixed in scheduled transmissions. Only tamper alarms are sent outside of scheduled transmissions. As noted earlier, tamper alarms are very rare.

Question 8:
Are there any other factors that impact the amount of RF emissions? If so, please identify the factor(s) and its impact on RF emissions.

Response 8:

Electric: PG&E is not aware of any other factors that affect the amount of RF emissions at the electric endpoint, i.e., at the customer's premises.[7]

Gas: PG&E is not aware of any other factors that affect the amount of RF emissions at the gas endpoint, i.e., at the customer's premises.[8]

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[7] PG&E notes that in addition to electric meters, there are network devices – generally mounted on PG&E distribution facilities at 25 feet or higher above the ground – called Relays or Access Points that receive the data from electric meters and forward the data over a public network cellular back haul (850 MHz or 1900 MHz) to the PG&E data center.

[8] PG&E notes that in addition to gas meters, there are network devices – generally mounted on PG&E distribution facilities at 25 feet or higher above the ground – called Data Collection Units (DCUs) which receive the data from the gas SmartMeter™ Modules and forward the data over a public network cellular back haul (850 MHz or 1900 MHz) to the PG&E data center. The DCUs also send out one network administration message per day over the 450-470 MHz band.

Question 9:
Is there RF emission when the meter is not transmitting? If yes, what is the amount of RF emission?

Response 9:

Yes, all digital circuitry – from that contained in clocks, in stereo equipment, or in answering machines – emits de minimus RF that is governed by FCC limits for unintentional RF emissions.[9]

Table 9-1 provides the requested data for electric SmartMeters™ and gas SmartMeter™ Modules.

TABLE 9-1

Meter Type	RF Measured Value With Radio Off	FCC Allowable RF Emissions
[a]	[b]	[c]
Electric: GE	39.3 dBμV/m	49.0 dBμV/m
Electric: L+G	24.7 dBμV/m	49.0 dBμV/m
Gas: Aclara	No discernable emissions	40.0 – 54.0 dBμV/m

Electric: Note that PG&E's electric system communications equipment is installed inside of either of two SmartMeters™, one manufactured by GE and the other manufactured by L+G. Both of these meters are tested during meter certification testing and have been shown to emit de minimus RF when the SSN communications radio is turned off. The radio-off RF emissions are below FCC limits for unintentional RF emissions.

Gas: With respect to PG&E's gas SmartMeter™ Modules, there are no RF emissions when the Module is not transmitting.

[9] See Code of Federal Regulations, Title 47, Part 15, for a Class B digital device.

Question 10:

Is there a difference in the amount of RF emissions for a wireless smart meter with the radio off and a smart meter with the radio out? If yes, what is that difference and how is it calculated?

Response 10:

Table 10-1 provides the requested data for electric SmartMeters™ and gas SmartMeter™ Modules.

TABLE 10-1

Meter Type	RF Measured Value With Radio Out	RF Measured Value With Radio Off	FCC Allowable RF Emissions
[a]	[b]	[c]	[d]
Electric: GE	38.3 dBμV/m	39.3 dBμV/m	49.0 dBμV/m
Electric: L+G	31.3 dBμV/m	24.7 dBμV/m	49.0 dBμV/m
Gas: Aclara	No discernable emissions	No discernable emissions	40.0 – 54.0 dBμV/m

Electric: Both of PG&E's electric SmartMeter™ manufacturers test the meters without any communications radio installed during meter certification. The information provided in Table 10-1 reflects the measured values of the RF emissions from the electric SmartMeters™ with the radio out.

Note that the difference between the radio-out RF-emissions shown in Table 10-1 and the radio-off RF-emissions presented in Table 9-1 (and re-presented in Table 10-1 for comparison purposes) are de minimus.

Gas: With respect to PG&E's gas SmartMeter™ Modules, there are no discernable RF emissions when the radio is off.

Question 11:

Is there a difference in the amount of RF emissions for a wireless smart meter with the radio off and an analog meter? If yes, what is that difference and how is it calculated?

Response 11:

Electromechanical meters emit no RF. Therefore, there is a de minimus difference in RF between radio-off and an analog meter. Please also see PG&E's Response to Question 9.

IV. CONCLUSION

PG&E respectfully submits the requested clarifying information concerning the frequency and duration of RF emissions from its electric and gas SmartMeter™ technology.

Respectfully Submitted,

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