



STAFF REPORT

SAUSALITO CITY COUNCIL

AGENDA TITLE:

Discussion Regarding PG&E Gas Transmission Facilities and Smart Meters

RECOMMENDED MOTION:

Information only

SUMMARY

The Pacific Gas & Electric Company ("PG&E") has asked for the opportunity to provide an update on the San Bruno incident as well as provide additional information regarding its Smart Meter program. As part of its response to the San Bruno incident, PG&E has made an effort to provide information to other communities to address concerns that a similar incident could occur. Copies of information provided by PG&E to City Staff are attached.

PG&E last reported to the Council regarding Smart Meters during Council regular meeting of July 27, 2010. On September 2, 2010, the California Public Utilities Commission received the report it commissioned for an independent evaluation of Smart Meters (copies of pertinent information attached), and in an opinion published in the *Marin Independent Journal* published September 9, 2010, Electric Power Research Institute senior technical executive Robert Kavet provided information regarding the electromagnetic field ("EMF") associated with Smart Meter technology (copy attached).

ATTACHMENTS:

San Bruno Incident Information

CPUC and Related Smart Meter Evaluation Information

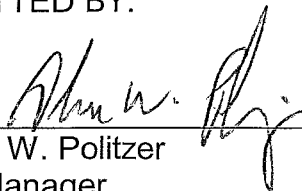
Marin Independent Journal, September 9, 2010, Marin Voice: Health fears and 'smart meters', Robert Kavet, EPRI

PREPARED BY:



Jonathon Goldman
Director of Public Works

SUBMITTED BY:



Adam W. Politzer
City Manager

Adam Politzer

From: Townsend, Joshua [JDTO@PGE.COM]
Sent: Tuesday, September 14, 2010 1:36 PM
To: Townsend, Joshua; Nevin, Kelli
Subject: Gas Pipeline System

Importance: High

September 14, 2010

Many city officials and residents across our service area have requested maps of our gas pipeline system following the San Bruno incident. Given the heightened interest, I wanted to inform you of a valuable resource which can address potential questions and offer details regarding local pipeline locations.

The National Pipeline Mapping System (NPMS) website administered by the U.S. Department of Transportation can be found at <https://www.npms.phmsa.dot.gov/>. The site allows visitors to check specific locations around the state to view their proximity to gas and hazardous liquids transmission pipelines. Due to the recent high volume of traffic, the site has been experiencing some access issues, but it remains one of the most comprehensive resources for pipeline information.

The safety of our customers remains our highest priority. For security and system reliability issues, however, we are not able to distribute more detailed maps. Nonetheless, if you or any appropriate department staff have additional questions beyond those addressed by the NPMS site, we are available to meet with you to review pipeline maps of your area.

If you would like to meet with a PG&E representative to discuss pipelines in your area, please contact me at 415-257-3467 or Kelli Nevin at 707-577-7045 .

Sincerely,
josh

Joshua Townsend
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Pacific Gas & Electric Company
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Adam Politzer

From: Townsend, Joshua [JDTO@PGE.COM]
Sent: Monday, September 20, 2010 1:49 PM
To: Townsend, Joshua; Nevin, Kelli
Subject: PG&E Gas Transmission Line Update
Attachments: 10.22.doc; planning_segments.pdf

September 20, 2010

I wanted to update you about Pacific Gas and Electric Company's (PG&E) ongoing public education efforts related to natural gas transmission pipeline safety and bring to your attention some new online tools to assist you, your staff and our mutual constituents regarding this important topic.

In order to address public concerns and to demystify our natural gas infrastructure for our customers and government officials, PG&E has developed an online tool that provides helpful information about our natural gas transmission system. The web page can be found at: <http://www.pge.com/myhome/customerservice/response/pipelinemaintenance/>. There are two main areas of focus at this site: information (including maps) related to our entire natural gas transmission system and a rolling list known as the "Top 100".

The "Top 100" list is part of our ongoing risk management program used to prioritize our engineering analyses and future work on our transmission pipelines. In many cases this consists solely of monitoring; in others, repair or replacement. This list does not include most reliability projects, valves or regulator stations. The "Top 100" list is not a list of projects PG&E has identified as priority candidates for replacement or upgrade for reasons of public safety. Any issue identified as a threat to public safety is always addressed right away. We do not delay or defer work that is necessary for public safety.

Rather, it is a living document used to help us plan our engineering analyses and future work.

I have attached the media release and "Top 100" list to this email for your reference and review. I can arrange for a briefing to assist you and key staff regarding natural gas safety if you would find that helpful.

Finally, please feel free to contact me should you have any questions, suggestions or concerns regarding this or any other utility matter. I look forward to working with you.

Sincerely,

josh

<<10.22.doc>> <<planning_segments.pdf>>

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FOR IMMEDIATE RELEASE

September 20, 2010

CONTACT: PG&E Media Relations (415) 973-5930

**PG&E PROVIDES UPDATE ON SAN BRUNO RECOVERY EFFORTS
AND DISCUSSES GAS PIPELINE SAFETY AND MAINTENANCE
PROGRAM**

Company shares annual planning tool and clarifies its role in long-term maintenance process

SAN FRANCISCO, Calif. – Pacific Gas and Electric Company (PG&E) today provided an update on recovery activities in San Bruno, CA, following the rupture of a natural gas transmission line on September 9, 2010.

In a press conference earlier today, PG&E shared information on its gas risk management processes, including real-time system status monitoring.

“It’s critical that the public and communities we serve are assured that PG&E is rigorously monitoring its pipelines and responsibly maintaining its system in accordance with proven industry practices,” said Pacific Gas and Electric Company President Chris Johns. Johns added, “By releasing information on the Top 100 today, we are taking another step to provide the public with the information it needs to better understand our long-term process for assessing and maintaining the safe operation of our natural gas transmission system.”

As part of this effort, PG&E has posted on its website the “Top 100” list, one of its protective maintenance and risk management planning tools used by engineers to focus resources and plan for future work on gas transmission pipelines. Also included on www.pge.com are accompanying maps to assist customers with specific questions about the location of gas transmission lines.

The “Top 100” list is one element of PG&E’s pipeline safety practices that include, among other measures, regularly conducting leak inspections and patrols on all of its natural gas pipelines.

“PG&E has a standing practice to regularly evaluate and assess the condition of the company’s key operating facilities,” Johns said. “This planning tool is refreshed every year. This is entirely separate from the work we do every day to monitor our system and respond to issues

requiring immediate attention. Anytime we identify work that needs to be performed to address an imminent safety concern, we do it immediately. The safety of the public and our employees is always our highest priority.”

The information and maps are being provided directly to public officials and regulators as well. Over the next several weeks, PG&E will meet with Northern and Central California officials in whose jurisdictions the company’s gas transmission system operates to review this information. The company will also use the opportunity to provide refresher safety training on its facilities to first responders in those communities.

The document identifies pipeline segments that the company has prioritized for monitoring or, in some instances, future repair or replacement. The segments are placed on the list based on a wide range of criteria, including the potential for third-party damage to the line, the condition of the pipe, its specific design and physical characteristics, its proximity to areas that may be prone to ground movement and its location relative to high density populations or environmentally sensitive areas.

Data used in the assessment are updated regularly throughout the year to reflect the latest engineering evaluations, field tests, hands-on inspections and maintenance work. The list serves as one of the planning tools engineers use to allocate resources and identify future projects. As conditions change from year to year, the company reevaluates the segments that are included.

PG&E, a subsidiary of PG&E Corporation (NYSE: PCG), is one of the largest combined natural gas and electric utilities in the United States. Based in San Francisco, with 20,000 employees, the company delivers some of the nation's cleanest energy to 15 million people in Northern and Central California. For more information, visit <http://www.pge.com/about/newsroom/>.

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Long Range Gas Transmission Pipeline Planning Input

Top 100 Segments

PG&E has a comprehensive inspection and monitoring program to ensure the safety of its natural gas transmission pipeline system. PG&E monitors system status in real time on a 24-hour basis, and regularly conducts leak inspections, surveys, and patrols of all of our natural gas pipelines. Any issues identified as a threat to public safety are immediately addressed.

PG&E also uses the data it collects to help plan and prioritize future work. One of the tools PG&E uses is a risk management program that inventories each of the 20,000 segments within PG&E's natural gas transmission pipeline system and evaluates them against criteria such as:

- the potential for third party damage like dig-ins from construction,
- the potential for corrosion,
- the potential for ground movement, and
- the physical design and characteristics of the pipe segment.

PG&E also considers the proximity to high density populations, potential reliability impacts and environmentally sensitive areas.

Based on all of these factors, PG&E determines which segments warrant further evaluation, monitoring or other future action. PG&E also creates a list of the "Top 100" segments to help inform future work plans. As conditions change from year to year, PG&E reevaluates the segments included on the list.

There are a range of actions PG&E may take for the segments identified on the list. For example, if a segment is on the list due to a high level of construction activity in the area, PG&E might enhance the physical markings of the lines and conduct outreach to help avoid accidental dig-ins. In other cases, PG&E may increase its monitoring or propose to rebuild the line sometime in the future.

Below is PG&E's current list of segments for longer-term evaluation and planning. This list also is available on PG&E's website at www.pge.com/pipelineplanning, along with maps to assist customers with specific questions about the location of PG&E's natural gas transmission lines. The segments have been grouped together for planning purposes. The current ranking for each segment is also provided.

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Factor Key:

A pipeline segment may be placed into planning for further study and long-range planning based upon its risk for one of five factors:

- **Potential for Third-Party Damage:** Third-party damage is the number one risk to PG&E's pipeline system. Indications that a pipe may be at risk for third-party damage include whether or not the line segment has a history of third party damage, the depth at which the pipe is buried, the pipe's diameter, the degree of marking available for the pipe's location, and local awareness in the immediate area of the pipeline's location. Some of the actions PG&E would take to reduce this risk factor would include additional marking of the pipeline location (when possible), additional education in the immediate area for the 811 system to call before digging, and monitoring of construction activity and/or permits in the area around the pipeline.
- **Potential for Corrosion:** Factors include items such as: the coating design, the resistivity of the soil, and other ground-based factors which could reduce the thickness of the pipe wall. Some of the actions PG&E would take to reduce this risk include regular and ongoing monitoring (PG&E monitors both electronically and physically, physically checking every 2 months at over 6,000 locations in its natural gas transmission system), increasing or replacing the pipe's external protective coating, or replacement of the pipe itself.
- **Potential for Ground Movement:** Factors include the proximity to seismically active areas, and the potential for soil erosion around the pipeline. Some of the actions PG&E would take to reduce this risk include enhancing the strength of the pipe, increased monitoring, or burying the pipe a greater depth beneath the ground level (for erosion prevention).
- **Physical Design and Characteristics:** Factors include items such as: the age of pipe, the type of welding performed on the pipe, the fittings used in the pipeline, and the materials used to manufacture the pipe. Some of the actions PG&E would take to reduce this risk factor include replacement of the pipe or fittings in order to upgrade or improve the design or characteristics of the line segment.
- **Overall:** Did not score high in any one factor of the above factors, but scored moderately high in more than one factor.

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Status Key:

- **Monitoring:** PG&E engineers are monitoring and reviewing these line segments to see if they need to be addressed through a project.
- **Initiated:** PG&E engineers have determined that the line segment merits further study and analysis.
- **Engineering:** PG&E engineers are defining the scope of the project and readying it for construction.
- **Construction:** The project is currently under construction.
- **Complete:** The project has been completed and will come off the planning grid.

Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
1	L103, segment 117.1, Mile Points 11.00 – 11.42 (71) L103, segment 117.5, Mile Points 11.42 – 11.65 (72)	3415'	Relocate 6 miles of pipe between Hwy 152 and Crazy Horse Rd. near San Juan Bautista to replace two smaller segments of pipe within the larger pipeline. This section of L103 travels across the San Andreas fault line and through hillsides which are susceptible to landslides and soil erosion problems.	Potential for Ground Movement	Engineering
2	L107, segment 127.1, Mile Points 14.00 – 14.82 (74) L107, segment 127.5, Mile Points 14.82 – 15.12 (tied for	8493'	Evaluating the potential replacement of 13,835 feet of pipe between Livermore and Arroyo del Valle, due to the design materials used and the potential for ground movement. This section of L107 is located across the open hills from south Livermore to Arroyo del Valle.	Physical Design and Characteristics	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	89, 90) L107, segment 127.57, Mile Points 15.13 - 15.36 (tied for 89, 90) L107, segment 127.6, Mile Points 15.36 - 15.36 (91) L107, segment 127.7, Mile Points 15.36 - 15.70 (tied for 79, 80)				
3	L107, segment 129, Mile Points 15.89 - 16.40 (tied for 79, 80) L107, segment 131.5, Mile Points 17.11 - 18.00 (82)	10,707'	Evaluate the potential replacement of 14,730 feet of pipe between Arroyo del Valle and Foleys Crossover, south of Livermore from Arroyo del Valle to the Valecitos Valley due to the design materials used and the potential for ground movement. This segment of L107 is located across the open hills south of Livermore from Arroyo del Valle to the Vallejos Valley.	Physical Design and Characteristics	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	L107, segment 132.2, Mile Points 18.00 - 18.67 (73)				
4	L107, segment 139, Mile Points 21.07 - 22.29 (77)	6441'	Evaluate the potential replacement of 19,115 feet of pipe between Foleys Crossover and Calaveras Rd due to the potential for ground movement. This section of L107 is located across the open hills through the Vallecitos Valley to Calaveras Rd in Sunol.	Potential for Ground Movement	Initiated
5	L108, segment 124.6, Mile Points 12.70 - 12.72 (tied for 43, 44) L108, segment 125, Mile Points 12.72 - 12.76 (tied for 43, 44)	447'	Replace 2.5 miles of pipe from Woodward Rd to West Ripon Rd due to the design materials used. Construction was completed in 2010.	Physical Design and Characteristics	Complete
6	L108, segment 146.35, Mile Points 39.18 - 39.21 (tied for 2,	1559'	Evaluate the potential replacement of 8,000 feet of pipe through the rural area near Armstrong Rd near Lodi due to the design materials used.	Physical Design and Characteristics	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	3, 4) L108, segment 146.6, Mile Points 39.21 - 39.23 (tied for 2, 3, 4) L108, segment 147, Mile Points 39.23 - 39.47 (tied for 2, 3, 4)				
7	L108, segment 179.5, Mile Points 62.57 - 63.29 (15)	3831'	Replace 8,900 feet of pipe through the industrial area from Laguna Blvd to Dwight Road in Elk Grove due to the design materials used. Construction currently is planned for 2011.	Physical Design and Characteristics	Engineering
8	L109, segment 137, Mile Points 15.00 - 15.38 (56) L109, segment 137.19, Mile Points 15.38 - 15.65 (tied for 60, 61, 62)	6005'	PG&E conducted an analysis of the cathodic system that protects this pipeline segment from corrosion. Based on this analysis, the system was adjusted for better protection. Analysis of the system in 2009 showed a marked improvement. Engineering will continue monitoring the segment, but no further action is contemplated at this time.	Potential for Corrosion	Monitoring

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	L109, segment 137.32, Mile Points 15.65 – 16.01 (tied for 60, 61, 62) L109, segment 137.8, Mile Points 16.19 – 16.33 (tied for 60, 61, 62)				
9	L114, segment 106, Mile Points 3.18 – 3.80 (tied for 84, 85) L114, segment 120, Mile Points 7.32 – 7.69 (tied for 87, 88)	5272'	PG&E is conducting an engineering review of the potential for ground movement along 5,272 feet of pipe near the Sacramento and San Joaquin Rivers on Sherman Island. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Ground Movement	Monitoring
10	L114, segment 153.2, Mile Points 28.00 – 28.87 (69)	4675'	Evaluate the potential replacement of 7,000 feet of pipe between Vasco Rd and Dalton Crossover, located on steep slopes from the North Livermore Valley to Vasco Rd due to the potential for ground movement.	Potential for Ground Movement	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
11	L130, segment 101, Mile Points 0.00 – 0.50 (34)	2530'	Evaluate the potential replacement of 4,000 feet of pipe crossing the Sacramento River near the Rio Vista Bridge due to the potential for ground movement. This section of pipeline is located underwater.	Potential for Ground Movement	Initiated
12	L131, segment 151, Mile Points 37.89 – 38.49 (70)	3421'	Evaluate the potential replacement of 4,990 feet of pipeline between Ruby Hills to Foleys Crossover in Livermore due to the potential for ground movement. This pipeline is located on the steep slopes over the Pigeon Pass near Hwy 84 south of Livermore.	Potential for Ground Movement	Initiated
13	L131, segment 157.2, Mile Points 42.16 – 42.35 (59)	764'	Replace 1,350 feet of pipe at Calaveras Rd, Sunol due to the potential for ground movement. This segment of L131 is located on a steep 26% sloping hillside in the Sunol Valley immediately northeast of the Calaveras Fault and Road, just southeast of I-680. Construction is in progress in 2010.	Potential for Ground Movement	Construction
14	L131, segment 165, Mile Points 46.96 – 48.23 (31) L131, segment 167.9, Mile Points 48.94 – 49.36 (12)	14,687'	Evaluate the potential replacement of 22,363 feet of pipe between the Vargas Rd and Irvington Station due to the potential for ground movement. This section of L131 is located over the steep slopes from the Vargas Rd to Mission Blvd and through a 10-15 foot easement through central Fremont to I-880. Construction currently is scheduled for 2012.	Potential for Ground Movement	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	L131, segment 169, Mile Points 49.38 – 50.46 (22)				
15	L131, segment 115, Mile Points 7.39 – 7.75 (75)	2066'	PG&E is conducting an engineering review of 2,066 feet of pipe located in the rural area near Sherman Island Levee Rd and the Antioch Bridge on Sherman Island. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Ground Movement	Initiated
16	L132, segment 106.7, Mile Points 1.35 – 1.87 (26)	2628'	Replace pipe at several locations and install other facilities in order to internally inspect L132 through the urban areas between Milpitas and Crystal Springs reservoir due to the potential for ground movement. Based on this inspection, PG&E will determine whether any repair or replacement action is warranted. Construction currently is scheduled for 2012-13.	Potential for Ground Movement	Engineering
17	L138, segment 116, Mile Points 22.70 – 23.40 (49) L138, segment 130, Mile Points 38.43	6061'	PG&E is conducting an engineering review of 6,061 feet of pipe between Elkhorn Ave and Hwy 99 near Caruthers and Fresno for susceptibility to external corrosion. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Corrosion	Initiated

Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	- 38.58 (16) L138, segment 130.11, Mile Points 38.59 - 38.59 (20) L138, segment 145, Mile Points 48.29 - 48.64 (18)				
18	L147, segment 110.6, Mile Points 3.26 - 3.28 (46)	105'	PG&E is conducting an engineering review of the design materials of 105 feet of pipe near Brittan Ave and El Camino Real in San Carlos. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Physical Design and Characteristics	Initiated
19	L173, segment 102.1, Mile Points 1.01 - 1.11 (38) L173, segment 102.6, Mile Points 1.45 - 1.50 (29)	765'	An engineering review of this 765 foot pipe segment near Hwy 65 and Washington Blvd in Roseville has been conducted to assess risk for potential third party damage. One third party dig-in occurred nearby; however, that portion of the pipeline has since been sleeved. Most of the area has been fully developed and with completion of the Blue Oaks overpass, the risk of third party damage has been reduced and no further action is warranted.	Potential for Third-Party Damage	Initiated
20	L187, segment	1320'	PG&E is conducting an engineering review of 1,320	Potential for	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	160, Mile Points 61.75 – 62.00 (39)		feet of pipe through the rural area near Hwy 101 across from Hartnell Rd near Salinas for the potential for damage by third parties. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Third-Party Damage	
21	L215, segment 104, Mile Points 3.00 – 3.43 (65) L215, segment 122.3, Mile Points 19.46 – 19.48 (tied for 63, 64) L215, segment 123, Mile Points 19.56 – 19.74 (tied for 63, 64)	3310'	PG&E is conducting an engineering review of 3,310 feet of pipe between Hwy 33 in Patterson and Hwy 99 in Turlock based on corrosion monitoring data from segments 122.3 and 123. Three areas around the pipe were dug up to permit physical examinations of the pipe. Engineering will continue to monitor these segments, but no further action is warranted at this time.	Potential for Corrosion	Initiated
22	0401-01, segment 104, Mile Points 2.40 – 2.48 (99)	1887'	PG&E is conducting an engineering review of 1,887 feet of pipe through the suburban area along Linardo St near Albert Park Ln near San Rafael. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Overall	Initiated

Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	0401-01, segment 104.8, Mile Points 2.48 – 2.76 (14)				
23	0407-01, segment 104.8, Mile Points 1.83 – 1.88 (45)	247'	PG&E is conducting an engineering review of the design materials of 247 feet of pipe near Foster Rd and Saint Francis Cir near Napa. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Physical Design and Characteristics	Initiated
24	L114-1, segment 103, Mile Points 7.33 – 7.73 (tied for 87, 88) L114-2, segment 101, Mile Points 3.18 – 3.80 (tied for 84, 85) SP4Z, segment 112, Mile Points 7.45 – 7.82 (83)	7345'	Evaluate the potential of removing 7,500 feet of 3 pipes crossing the San Joaquin River, underwater, near the Antioch Bridge due to the potential for ground movement.	Potential for Ground Movement	Initiated
25	L118A, segment	2114'	Evaluate the potential replacement of 8,850 feet of	Potential for	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	166.13, Mile Points 30.38 – 30.40 (76) L118A, segment 166.17, Mile Points 30.40 – 31.06 (55)		pipe through agricultural areas near Avenue 18½ near Madera due to the potential for third party damage.	Third-Party Damage	
26	L119B, segment 101, Mile Points 0.00 – 0.01 (54)	1437'	PG&E is conducting an engineering review of the design materials of 1,437 feet of pipe Lampasas Ave and Grove Ave in Sacramento. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Physical Design and Characteristics	Initiated
27	1202-16, segment 100, Mile Points 0.00 – 0.08 (19) 1202-16, segment 101, Mile Points 0.08 – 0.19 (tied for 23, 24, 25) 1202-16, segment 101.1, Mile Points 0.19 –	10,331'	All segments (10,331 feet) of pipe along N Clovis Ave between E Shields Ave and E Ashlan Ave in Clovis have been evaluated. Seven excavations were performed to examine the pipe for potential corrosion. Engineering will continue to monitor these segments to determine whether future action is warranted.	Potential for Corrosion	Monitoring

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	0.27 (tied for 23, 24, 25)				
	1202-16, segment 101.2, Mile Points 0.27 – 0.49 (27)				
	1202-16, segment 102, Mile Points 0.49 – 1.03 (tied for 23, 24, 25)				
	1202-16, segment 103, Mile Points 1.03 – 1.05 (13)				
	1202-16, segment 103.1, Mile Points 1.05 – 1.11 (35)				
	1202-16, segment 103.3, Mile Points 1.11 – 1.20 (33)				

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	1202-16, segment 115, Mile Points 1.67 – 2.42 (21) 1202-16, segment 117, Mile Points 2.58 – 2.59 (97)				
28	L142S, segment 114, Mile Points 7.30 – 8.70 (28)	7425'	PG&E is conducting an engineering review of 7,425 feet of pipe along S Union Ave between Watts Dr and 3 rd St in Bakersfield due to the potential for external corrosion. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Corrosion	Initiated
29	1509-04, segment 106, Mile Points 0.78 – 0.88 (47)	531'	PG&E is conducting an engineering review of 531 feet of pipe through the suburban area near N Walton Ave and Bridge St in Yuba City for the potential for damage by third parties. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Third-Party Damage	Initiated
30	1509-05, segment 120.1, Mile Points 6.23 – 6.28 (tied for 36, 37)	1371'	PG&E is conducting an engineering review of 1,371 feet of pipe through the suburban area near N Walton Ave and Bridge St in Yuba City for the potential for damage by third parties. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Third-Party Damage	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
31	1509-05, segment 120.2, Mile Points 6.28 – 6.29 (48) 1509-05, segment 120.3, Mile Points 6.29 – 6.33 (tied for 36, 37) 1509-05, segment 121, Mile Points 6.33 – 6.49 (40)				
31	1815-15, segment 130.3, Mile Points 2.04 – 2.13 (5)	437'	PG&E is conducting an engineering review of 437 feet of pipe through the suburban area near Hwy 68 and Aguajito Rd near Monterey. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Overall	Initiated
32	L195A3-1, segment 100, Mile Points 0.00 – 0.00 (tied for 57, 58) L195A3-1,	885'	PG&E has reduced the operating pressure and is continuing to conduct an engineering review on approximately 2,000 feet of pipe located underwater, crossing the Sacramento River at Isleton, for the potential for damage by third parties. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Third-Party Damage	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	segment 102, Mile Points 0.00 – 0.04 (tied for 57, 58) L195A3-1, segment 102.1, Mile Points 0.04 – 0.17 (42)				
33	L210A, segment 117.5, Mile Points 18.73 – 18.86 (1) L210A, segment 118.1, Mile Points 18.97 – 19.47 (10)	5949'	Install facilities to internally inspect L210A between Creed Station and Cordelia Station. Currently under construction.	Overall	Construction
34	L300A, segment 240.3, Mile Points 277.85 – 278.01 (30) L300A, segment 240.61, Mile Points	1272'	PG&E is conducting an engineering review of 1,272 feet of pipe through the suburban area between Buena Vista Rd and Pacheco Rd in Bakersfield for the potential for damage by third parties. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Third-Party Damage	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	278.01 – 278.10 (32)				
35	L300B, segment 193, Mile Points 161.02 – 161.07 (tied for 67, 68) L300B, segment 194, Mile Points 161.43 – 161.48 (tied for 67, 68)	843'	PG&E is conducting an engineering review of the design materials of 843 feet of pipe through the rural area. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Physical Design and Characteristics	Initiated
36	L316A, segment 111, Mile Points 0.61 – 0.78 (92) L316A, segment 112, Mile Points 0.79 – 1.00 (94) L316A, segment 113, Mile Points 1.00 – 1.09 (86)	7777'	An engineering review of these five segments (7,777 feet) of pipe between Jersey Island Rd on Jersey Island and Taylor Rd on Bethel Island has been conducted. No further assessment or work is planned at this time.	Potential for Corrosion	Monitoring

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	L316A, segment 115, Mile Points 1.19 – 1.23 (81)				
	L316A, segment 116, Mile Points 1.23 – 2.05 (78)				
	L316A, segment 117, Mile Points 2.05 – 2.31 (93)				
37	DCUST1416, segment 100, Mile Points 0.00 – 0.01 (6)	28'	PG&E is conducting an engineering review of 28 feet of pipe through the rural area near Fernbridge Dr and Depot Rd near Ferndale. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Ground Movement	Initiated
38	DFDS3543, segment 100, Mile Points 10.91 – 10.91 (11)	3'	PG&E is conducting an engineering review of 3 feet of pipe near Redwood Blvd and Atherton Ave in Novato. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Overall	Initiated
39	DRIP7966, Mile Points 0.00 –	10'	PG&E is conducting an engineering review of the potential for ground movement along 10 feet of pipe	Potential for Ground	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	0.00 (7)		near Milpitas-Alviso Rd and Ranch Dr in San Jose. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Movement	
40	DRIP7971, segment 651, Mile Points 0.00 – 0.00 (17)	10'	PG&E is conducting an engineering review of the potential for ground movement along 10 feet of pipe near Milpitas-Alviso Rd and Ranch Dr in San Jose. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Potential for Ground Movement	Initiated
41	SP3, segment 160.3, Mile Points 198.49 – 198.49 (41) SP3, segment 160.36, Mile Points 198.49 – 198.49 (tied for 50, 51, 52, 53) SP3, segment 160.4, Mile Points 198.49 – 198.49 (tied for 50, 51, 52, 53)	294'	Replace approximately 300 feet of pipe at Rumrill Rd. in San Pablo due to the potential for ground movement. Construction currently is scheduled for 2011.	Potential for Ground Movement	Engineering

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
42	<p>SP3, segment 160.5, Mile Points 198.49 – 198.52 (tied for 50, 51, 52, 53)</p> <p>SP3, segment 160.6, Mile Points 198.52 – 198.55 (tied for 50, 51, 52, 53)</p> <p>X6337, segment 100, Mile Points 10.84 – 10.84 (tied for 8, 9)</p> <p>X6337, segment 101, Mile Points 10.84 – 10.84 (tied for 8, 9)</p>	60'	<p>PG&E is conducting a review of two 30-foot segments of pipe near Redwood Blvd and Atherton Ave in Novato to determine the construction history of these pipeline segments. Based on this review, PG&E will determine whether any repair or replacement action is warranted.</p>	Physical Design and Characteristics	Initiated
43	X6526, segment 505,	9'	PG&E is conducting an engineering review of the design materials of about 9 feet of pipe through the	Physical Design and	Initiated

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Map No.	Pipeline Segment (Ranking)	Segment Footage	Description	Factor	Status
	Mile Points 0.24 – 0.24 (66)		rural area. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Characteristics	
44	DREG4197, segment 801, Mile Points 0.00 – 0.00 (95)	18'	PG&E is conducting an engineering review of 18 feet of pipe near Dunbarton St. and Donahoe St. in Menlo Park. Based on this review, PG&E will determine whether any repair or replacement is warranted.	Overall	Initiated
45	7221-15, segment 101, Mile Points 0.04 – 1.31 (96)	6709'	PG&E is conducting an engineering review of 6,709 feet of pipe along Dale Rd between Standford Ave and Bangs Ave in Modesto. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Overall	Initiated
46	DREG3875, segment 101, Mile Points 0.00 – 0.00 (98)	285'	PG&E is conducting an engineering review of 285 feet of pipe near Redwood Blvd and Atherton Ave in Novato. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Overall	Initiated
47	STUB7912, segment 551, Mile Points 0.04 – 0.04 (100)	2'	PG&E is conducting an engineering review of 2 feet of pipe near Dale Rd and Bangs Ave in Modesto. Based on this review, PG&E will determine whether any repair or replacement action is warranted.	Overall	Initiated

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California Public Utilities Commission
505 Van Ness Ave., San Francisco

FOR IMMEDIATE RELEASE

PRESS RELEASE

Media Contact: Terrie Prosper, 415.703.1366, news@cpuc.ca.gov

**CPUC RECEIVES RESULTS OF INDEPENDENT EVALUATION
OF PG&E SMART METERS**

SAN FRANCISCO, Sept. 2, 2010 - The California Public Utilities Commission (CPUC) today received the results of the independent evaluation of Pacific Gas and Electric Company's (PG&E) Smart Meter deployment, focused on electric residential customers, which found that the meters and associated software and billing systems are consistent with industry standards and are performing accurately. However, the evaluation identified multiple factors that appeared to contribute to the escalation of Smart Meter-related high bill complaints, including PG&E's customer service practices.

On April 1, 2010, the CPUC contracted with The Structure Group to conduct an independent evaluation of PG&E's Smart Meters in response to concern expressed by consumers over high energy bills that occurred around the same time PG&E installed Smart Meters in the San Joaquin Valley area.

Structure independently tested more than 750 Smart Meters and 147 electromechanical meters. In laboratory testing, field meter testing, and end-to-end system testing, Structure determined that all of the tested Smart Meters and systems were working accurately and that customer billing matched the expected results.

Structure also reviewed 1,378 electric Smart Meter complaints and performed in-depth customer interviews; they found issues with PG&E customer service management and adherence to industry best practices. For example, customer questions regarding Smart Meters and individual customer usage patterns were not effectively addressed by PG&E. In some cases, customers experienced multiple cancelled bills followed by re-billing, which exacerbated customer confusion and

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frustration. In addition, customers indicated to Structure that there was a lack of communication and notification from PG&E about their Smart Meter installation.

The report also said that the CPUC's handling of certain consumer complaints created confusion for the customer when the CPUC deemed the complaint closed even though the customer was still not satisfied with or did not understand PG&E's resolution of their complaint.

"I am happy to hear that PG&E's Smart Meters are functioning properly, but disturbed by PG&E's lack of customer service and responsiveness. We will ensure that PG&E improves their customer service, and we will also continue to improve our own complaint handling processes," said CPUC President Michael R. Peevey. "I hope these findings help ease minds about the accuracy of Smart Meters. Utilities nationwide are installing Smart Meters in order to give consumers greater control over their energy use, including shifting their usage to save money with optional time-based rates, provide for faster outage detection and restoration of service, and to help upgrade and modernize the electric grid."

Said Commissioner Dian M. Grueneich, "The report is encouraging in terms of the performance of actual meter hardware. However, I am very concerned about PG&E's performance in terms of industry best practices and how in some of the best practices areas, PG&E's performance has actually declined."

"The Structure report makes clear that the transition to a Smart Grid is not just a technological event," said Commissioner Nancy E. Ryan. "Consumers won't fully realize the many potential benefits of Smart Meters and other grid upgrades unless utilities and regulators place more emphasis on the human side of the equation," she added. "Better communication and customer service will help ensure that consumers see Smart Meters as something that is done for them, not to them."

Structure's report and press release outlining their findings is available at www.cpuc.ca.gov/PUC/energy/Demand+Response/solicit.htm.

For more information on the CPUC, please visit www.cpuc.ca.gov.

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FOR RELEASE SEPTEMBER 2, 2010

PRESS RELEASE

Media Contact: Phyllis Goodson, 910.616-9160, phyllis.goodson@thestructuregroup.com

Structure Announces Findings of PG&E Smart Meter Assessment

Customer Usage, Rates, Customer Service, and Process Issues are Largest Complaint Factors

HOUSTON (September 2, 2010) - Structure™, an industry leader in business advisory and consulting services to the energy and utilities industries, today provided to the California Public Utilities Commission (CPUC) an Assessment Report of a five month evaluation of Pacific Gas and Electric Company's (PG&E) Advanced Metering Infrastructure (AMI) system focused on electric residential customers. Structure concluded that the residential electric Smart Meters deployed by PG&E are consistent with industry standards and are performing accurately. However, Structure identified gaps in customer service and processes related to the handling of high bill complaints related to Smart Meter deployment, and determined certain PG&E practices to be partially non-compliant relative to industry best practices.

In the presentation to the CPUC, Structure addressed the following questions:

1. Does PG&E's SmartMeter™ system measure and bill electric usage accurately, both now and since PG&E's Smart Meter deployment began?

Structure confirmed that Smart Meters are accurately recording electric usage at present, and the systems are correctly processing data and billing usage. Structure also confirmed there were no systemic issues found since Smart Meter deployment, beyond exceptions already reported by PG&E. The exceptions that were identified are limited and are not prevalent in the general population of deployed meters.

2. What factors contributed to Smart Meter high bill complaints?

Structure's Assessment identified multiple factors that appeared to contribute to the escalation of Smart Meter high bill complaints during late 2009 and early 2010, including findings in the following areas:

- Customer Usage:
 - Meter deployment schedules coincided with increased energy usage caused by a heat wave.
 - Some customers experienced load changes that were reflective of changes in personal circumstances.
 - Electromechanical meter degradation.
- Rates:
 - Rate increases compounded the financial impact of the additional weather-related usage, resulting in higher bills that occurred as Smart Meters were being installed.

- Incorrectly applied rates that were based upon historical premise assumptions that affected customer baselines and rates.
 - Rate-related inquiries increased as customer bills escalated. Requests for new enrollment or failure to manually renew enrollment in financial assistance through California Alternate Rates for Energy (CARE).
 - Customer Service:
 - PG&E processes did not address the customer concerns associated with the new equipment and usage changes.
 - Customer skepticism regarding the new Advanced Metering technology was not addressed early or effectively by PG&E.
 - PG&E's customer complaint resolution process did not utilize detailed interval read information available from Smart Meters, which may have assisted customers' understanding of their individual hourly usage patterns.
 - Some customers interviewed during this assessment did not consider their complaint resolved, despite indications from PG&E and CPUC that the customer agreed with the resolution.
 - Process Issues:
 - PG&E utilized field meter readers for an average of 131 days after Smart Meters were installed, resulting in similar meter reading errors as electromechanical meters. The transition to automate the Smart Meter data for use in billing was not clearly addressed with customers.
 - PG&E's system tolerances related to billing quality control were not stringent enough, resulting in multiple bill cancellations and re-billings, which were confusing to customers.
 - Customers indicated that communications surrounding physical meter installation were lacking, or that the customer had issues with the installation personnel.
3. How does PG&E's SmartMeter™ program's past and current operational and deployment practices compare against the framework of industry best practices?

Structure performed a review of PG&E's documentation of past and current operational and deployment policies, processes, and procedures against a framework of industry best practices. Structure found PG&E to have been historically in compliance (since the beginning of Smart Meter deployment), or have recently come into compliance, with many best practices associated with Smart Meters. However, Structure identified several items of partial or non-compliance related to industry best practices, particularly in the areas of complaint troubleshooting and account billing.

To arrive at these answers, Structure divided the assessment into six components:

- Laboratory meter testing
- Field meter testing
- End-to-end systems testing
- Analysis of Smart Meter-related high bill complaints
- Review of best practices associated with Smart Meters



- Assessment of AMI security framework.

As part of the assessment, Structure independently tested over 750 Smart Meters and 147 electromechanical meters.

The laboratory meter testing included verifying 156 meters for accuracy and factory programming on a representative sample of new meters shipped from the manufacturer and obtained from multiple geographically-dispersed PG&E warehouse facilities. A portion of these meters were utilized to perform environmental stress testing in a controlled temperature chamber at reference, high, and low temperatures. All of the tested Smart Meters passed the applicable accuracy testing standard established by the industry.

Field meter testing was performed on 611 Smart Meters and 147 electromechanical meters, and included site verification, meter type and form factor verification, proper installation, and meter program and accuracy verification across six scenarios. The pass/fail criteria were based upon the CPUC accuracy standard of $\pm 2.0\%$ for electromechanical and Smart Meters. 100% of the 611 tested Smart Meters successfully passed the CPUC accuracy standard. Of the electromechanical meter field tests, 141 meters passed and 6 failed the CPUC accuracy standard.

End-to-end system testing included both lab and field analysis on a small sample size to confirm meter to bill system accuracy. Structure verified the meter usage and event data from the customer premise, through the AMI and billing systems, to the customer's receipt of the printed bill. For both of these tests, Structure did not identify deviations during the testing that indicated a systemic problem in the meter billing system's accuracy.

For the high bill complaint analysis, Structure reviewed and analyzed 1,378 electric Smart Meter high bill complaints and identified factors around customer usage, rates, customer service, and process issues. Results from 20 high bill complaint customer interviews identified specific service issues around complaint management by PG&E and the CPUC.

Structure performed a review of PG&E's documentation of past and current operational and deployment policies, processes, and procedures against a framework of industry best practices. As summarized above, Structure found PG&E to have been historically in compliance, or have recently come into compliance, with many industry best practices associated with Smart Meters, though certain PG&E practices were evaluated to be partially non-compliant.

The security assessment was performed to provide a confirmation that controls were established and documented on the Smart Meter system. Structure concluded that PG&E has developed a cyber security framework that is compliant with industry best practices.

Structure Principal Stacey Wood summarized Structure's perspective on this project as follows, "While Structure was able to verify the accuracy of the meters and flow of meter data to downstream billing systems, Structure did uncover issues that negatively impacted the customer experience, further complicating an already complex undertaking. Ultimately, the success of advanced metering programs like PG&E's – where improved energy efficiency and demand response are major drivers – will depend on an active dialogue and engagement with customers. We hope that our findings in this effort can be utilized to help PG&E, the CPUC, and other industry stakeholders develop improved practices around advanced metering deployments with an increased focus on appropriately engaging customers."



The full report is available on the CPUC website on the page, Independent PG&E Smart Meter Testing, <http://www.cpuc.ca.gov/PUC/energy/Demand+Response/solicit.htm>. To provide an objective evaluation, Structure developed the findings of this study independently from the CPUC and PG&E, utilizing reasonable efforts to perform the assessment. Structure cannot provide assurances that all issues were identified or that future issues may not develop following completion of this assessment.

About Structure™

Structure is a global consulting firm focused exclusively on the energy and utility industry, providing services and technology solutions. Structure focuses in providing a spectrum of services across business advisory, program management, solution delivery and implementation, and performance improvements and was recognized as the Advisory Firm of the Year 2010 by Energy Risk Magazine. Structure relies on deep industry expertise and proven methodologies to deliver projects across Smart Grid/Distribution Operations/Distribution Automation, SCADA & Energy Management Systems, Energy Trading & Risk Management, and Competitive Energy Market Solutions. For more information, visit www.thestructuregroup.com.

PG&E Advanced Metering Assessment Report

Commissioned by the
California Public Utilities Commission

Prepared and Presented by Structure Consulting Group, LLC.





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September 2, 2010

Ms. Julie Fitch, Director
Energy Division
California Public Utilities Commission

Dear Ms. Fitch:

We are pleased to present our final report, "PG&E Advanced Metering Assessment", focused on Smart Meter accuracy and Customer High Bill Complaints as contracted for by the California Public Utilities Commission on April 1, 2010, and completed on September 2, 2010.

Sincerely,

Stacey Wood
Principal
The Structure Group



Structure Consulting Group Overview

Structure Consulting Group, LLC ("Structure"), is a global consulting firm focused exclusively on the energy and utility industry, providing services and technology solutions in North America and Europe. Since opening the doors in 1998, Structure has served over 100 organizations through all stages of business transformation, from the beginning of wholesale energy markets to the Smart Grid revolution.

Structure focuses in providing a spectrum of services across business advisory, program management, solution delivery and implementation, and performance improvements and was recognized as the Advisory Firm of the Year 2010 by Energy Risk Magazine.

Structure assists companies in implementing their Smart Grid initiatives through comprehensive strategy development, business case creation and refinement, vendor and system selection, program management, process re-engineering, system implementation, legacy system integration, and testing of components and/or end-to-end solutions.

The Structure workforce is comprised of diverse utility and energy professionals with extensive experience in the energy industry, as well as regulatory program development with NERC, FERC, and other compliance standards.

Structure specializes in key energy industry areas including Smart Grid/Distribution Operations/Distribution Automation, SCADA & Energy Management Systems, Energy Trading & Risk Management, and Competitive Energy Market Solutions.



Limitations

In connection with preparing this Report, Structure Consulting Group ("Structure") examined reproductions of documents provided by Pacific Gas & Electric ("PG&E") and the California Public Utilities Commission ("CPUC"). Structure relied upon the completeness and accuracy of all documents and other information requested by and provided to Structure, as well as such other records, agreements, test results, and documents requested from the CPUC and PG&E and deemed necessary or relevant as the basis for our Report. In such examinations, Structure assumed (i) the genuineness of all documents reviewed by Structure, (ii) the conformity of the copies received by Structure to the original documents, and (iii) the authenticity of the original documents. Structure further assumed that each of the parties to the documents and agreements reviewed by Structure had the full power, authority, and legal right under its governing documents, corporate legislation, and applicable laws and regulations to execute and perform its obligations under all documents executed by it. Structure assumed that the documents reviewed by Structure were free from any fraud or misrepresentation and the truth, as were the accuracy of representations and warranties in our interviews with PG&E employees and other representatives. This Report was based solely upon the information received by Structure from the CPUC, PG&E employees, PG&E Customers, PG&E vendors and representatives. Structure assumed that the information received was accurate and complete information and documentation.

Subject to the foregoing, Structure has conducted an independent assessment of the matters that Structure believes to be reasonably necessary to produce this Report. Structure was limited in scope and was not requested nor performed an exhaustive review of all Smart Meter system deployment documentations, configurations, and meter installations. Structure has used its reasonable efforts and impartial assessment to ensure the independence and accuracy of the facts contained in this Report.



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Executive Summary

A. Introduction

Pursuant to California Public Utilities Commission (“CPUC”) decisions D.06-07-027 and D.09-03-026, Pacific Gas and Electric (“PG&E”) was given approval for full deployment of an Advanced Meter Infrastructure (AMI) Project that included upgrading both metering and communications networks as well as the related computerized systems and software for 5.1 million electric meters and 4.2 million gas meters within the PG&E territory. PG&E’s AMI Project, subsequently named the SmartMeter™ Program, initiated meter deployment in 2007. During the first half of 2010, PG&E actively deployed Smart Meters at an average rate of 176,000 gas and electric meters per month. As of June 2010, 3,146,000 electric and 3,101,000 gas Smart Meters had been installed throughout PG&E’s service territory.

By the fall of 2009, the CPUC had received over 600 Smart Meter consumer complaints about “unexpectedly high” bills and allegations that the new electric Smart Meters were not accurately recording electric usage, almost all of which were from PG&E’s service area. The initial CPUC complaints were supplemented by complaints provided by Senators Dean Florez (D-Shafter) and Roy Ashburn (R-Bakersfield), identified during town hall meetings in Bakersfield and Fresno. In response to these complaints, the CPUC committed to conduct an independent review to determine whether PG&E’s Smart Meter system was correctly measuring and billing electric usage.

On April 1, 2010, the CPUC contracted with Structure Consulting Group LLC (“Structure”) to provide an independent report related to testing and validating meter and billing accuracy of PG&E’s residential electric Smart Meters. The five month evaluation, labeled the PG&E Advanced Metering Assessment Report and hereafter referred to as “The Assessment”, culminated in the production of this report, issued on September 2, 2010.

The Assessment focused on addressing residential electric Customer concerns that Smart Meters caused higher energy bills. The Assessment’s scope and objective was to independently assess whether PG&E’s electric Smart Meter system and related billing system had been measuring and calculating electric usage accurately, and billing PG&E Customers appropriately for their usage. The Assessment included meter testing, end-to-end system testing, an evaluation of high bill complaints, and an evaluation of PG&E’s Smart Meter deployment as compared to industry best practices.

Structure segregated The Assessment’s scope into the following areas:

Structure’s PG&E AMI Assessment Scope	
Area	Focus
Laboratory Meter Testing	Conducted to establish whether the meters used by PG&E tested accurately at a functional level and under normal and extreme environmental conditions.
Field Meter Testing	Involved testing Customer meters at their premises to determine Registration Accuracy within an established tolerance range. Customers were selected to provide a representative cross-section of PG&E’s population base, as applicable to the field testing scenarios.
End-to-End System Testing	Comprised of a combination of laboratory and field tests, to determine the effectiveness of PG&E SmartMeter and billing systems’ efficacy to capture meter data information.

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Structure's PG&E AMI Assessment Scope	
Area	Focus
High Bill Complaint Analysis	Performed on a subset of the Customers identified as part of the High Bill Complaint population to determine trends in high bills associated with meter type, usage patterns, and billing issues. The Customer base for this analysis was drawn from complaints received by the CPUC, town hall meetings organized by state senators, and PG&E. Customer interviews were conducted from the High Bill Complaint group to evaluate the circumstances related to the complaint, PG&E's handling of the complaint, and any associated resolutions.
Best Practices Associated with Smart Meters	Assessed across the energy industry to provide insight into Smart Meter operations compared to PG&E's Smart Meter program.
Security Assessment	Performed a review of PG&E's cyber security framework focused on PG&E's Smart Meter system as part of the evaluation. The review was limited and conducted with a focus on the smart grid system utilizing the applicable sections of the "AMI System Security Requirements" developed by the Smart Grid industry's OpenSG AMI-SEC Task Force. The security assessment was performed to determine whether controls were established and documented around industry-standard criteria.

Figure 1: Structure's PG&E AMI Assessment Scope

Structure performed an impartial and independent evaluation, employing reasonable efforts to complete the engagement work agreed to by the CPUC within a reasonable timeframe, and with the understanding that supporting documentation and information was provided by the CPUC and PG&E on a timely basis.

Throughout the duration of the Assessment, Structure did not share the results or findings of the Assessment with PG&E, with the exception of results for a limited number of field meter tests that showed an out of tolerance or unable to test condition. This limited disclosure to PG&E was done independently of this report to allow PG&E the opportunity to promptly investigate the situation and take any mitigation measure at their discretion to minimize the impact on the Customer. The findings from this study were developed independently of the CPUC and PG&E with regards to previous or current litigation and or regulatory actions. While this report may be utilized by the CPUC to determine future requirements related to Smart Meters and the impact of Smart Meters on Customers, Structure's obligation associated with this evaluation should be considered complete upon delivery of this report to the CPUC. Dissemination of the report and its contents will be at the discretion of the CPUC in accordance with applicable State of California regulations.

This Executive Summary should not be taken stand alone from the entirety of the report, and should be considered a culmination of information, facts, tests, explanations, and limitations described throughout the entirety of the report.

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B. Summary of Key Findings

From April 1, 2010, to August 25, 2010, Structure reviewed relevant documentation related to PG&E's SmartMeter™ equipment, systems, and processes and compared it to industry standards, independently-performed customer interviews, and PG&E-provided vendor specifications and internal documentation. This evaluation principally consisted of an assessment of PG&E's accuracy and conformity to meter standards, analytical procedures applied to customer data, business processes, and practices. Due to the number of systems and process within the PG&E framework, this Assessment reflects Structure's opinion on only the scope of work which Structure was requested to perform.

The CPUC tasked Structure with addressing three broad questions related to PG&E's SmartMeter™ system, focusing on residential electric Customers. Working independently and with the facilitation of the CPUC, Structure's Assessment yielded the following findings related to CPUC's inquiries involving PG&E's residential electric SmartMeters™:

1. Does PG&E's SmartMeter™ system measure and bill electric usage accurately, both now and since PG&E's Smart Meter deployment began?

PRESENT: While Structure cannot ensure that all issues related to the SmartMeter™ program have been identified or that future issues may not develop at a later date due to process, controls, or technical modifications instituted after the completion of The Assessment, Structure's evaluation provides the reasonable conclusion that PG&E's SmartMeters™ are accurately recording electric usage within acceptable CPUC tolerances, and are being accurately utilized in Customer billing.

SINCE DEPLOYMENT: Although Structure was unable to test electromechanical and Smart Meters since PG&E's program began, Structure reviewed PG&E's SmartMeter™ program documentation issue logs, incident reports, and analysis of historical customer complaints and did not identify systemic issues in the measuring and billing of electric usage within PG&E's SmartMeter™ system for the deployment period prior to our Assessment beyond those that had already been previously reported to the CPUC. Identified exceptions related to meter and billing issues appeared to have been limited and did not appear to have been prevalent in the overall deployed Smart Meter population.

2. What factors contributed to Smart Meter high bill complaints?

High bill Customer complaint analysis took the form of scrutinizing PG&E's internal meter data processing activities, reviewing historical data provided by PG&E, and performing Customer interviews related to high bill complaints. Structure's Assessment identified multiple factors that appeared to contribute to the escalation of Smart Meter high bill complaints during late 2009 and early 2010, including:

- *Customer Usage:*
 - *Meter deployment schedules coincided with increased energy usage caused by a heat wave.*
 - *Some Customers experienced load changes that were reflective of changes in personal circumstances. Examples included room additions, pool additions, and equipment malfunctions.*
 - *Electromechanical meter degradation that was also identified as part of Structure's field meter testing.*
- *Rates:*



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- *Rate increases compounded the financial impact of the additional weather-related usage, resulting in higher bills that occurred as Smart Meters were being installed.*
 - *Incorrectly applied rates that were based upon historical premise assumptions.*
 - *Rate-based inquiries that increased as Customer bills escalated. Requests for new or renewed financial assistance through California Alternate Rates for Energy (CARE) were identified as potential reductions of financial impacts related to higher bills.*
 - *Customer Service:*
 - *PG&E processes did not address the Customer concerns associated with the new equipment and usage changes.*
 - *Customer skepticism regarding the new advanced meter technology was not effectively addressed by PG&E on a timely basis.*
 - *Customers interviewed during this assessment did not consider their complaint resolved, despite indications from PG&E and CPUC that the Customer agreed with the resolution*
 - *PG&E Customer complaint resolution did not provide of interval read information available with Smart Meters, which may have assisted Customers' understanding of hourly usage patterns.*
 - *Process Issues:*
 - *Customers indicated that communications/notifications surrounding physical meter installation were lacking, or that the Customer had issues with the installation personnel.*
 - *PG&E utilized field meter readers for an average of 131 days after Smart Meters were installed, resulting in similar meter reading errors as electromechanical meters. The transition to automate the Smart Meter data for use in billing was not clearly addressed with Customers.*
 - *PG&E's system tolerances related to billing quality control were not stringent enough, resulting in multiple bill cancelations and re-billings, which were confusing to Customers.*
3. *How does PG&E's SmartMeter™ Program's past and current operational and deployment compare against the framework of industry best practices?*

Structure found PG&E to have been historically in compliance, or have recently come into compliance, with the majority of Best Practices Associated with Smart Meters. Structure identified several items of partial or non-compliance related to industry best practices during The Assessment, which have been recognized by PG&E through their presentations of information as shortcomings to be addressed:

- a. *The lack of documentation verifying compliance with the Meter Deployment best practice to deploy WAN/LAN collectors prior to meter deployment.*
 - i. *By not deploying the communication backbone prior to meter deployment, the time to transition meter reading from manual to Advanced Metering Infrastructure (AMI) system readings is exacerbated, extending to an average of 131 days over the implementation period. This allows a continuation of the higher error rate associated with manual meter reading, and may contribute to the perception that the Smart Meters are inaccurate.*
- b. *The inability to verify compliance around:*



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- i. *The Meter Data Managements (MDMS) Interface best practice to correlate AMI meter events and alarms with Validation, Estimating and Editing (VEE) and Customer Information System (CIS) audits and checks for automated exception handling; and*
- ii. *The VEE Best Practice of MDMS must provide an on-line method, with workflow, resolving validation errors rather than reports.*

These lapses have created a situation where data required manual editing, causing cancel/re-bills and delayed processing of Customer data in a relatively small portion of the bills processed. The cancel/re-bills and delayed processing potentially increased the days within a billing cycle presented in Customer's bills, as reflected in a portion of the High Bill complaints, and furthered Customer perception that Smart Meters may not have been accurate.

Based upon Structure's review of requested PG&E documentation and Structure's associated testing, Structure determined that previously-identified issues brought to CPUC's attention were being appropriately addressed by PG&E. Structure's testing did not uncover issues that would challenge that PG&E's Smart Meters were accurately measuring and recording electric usage, or that PG&E's internal systems were accurately utilizing this data for billing purposes. Structure identified no relevant correlation between installed Smart Meters, impacts to billing on installed Smart Meters, and residential Customer Smart Meter high bill complaints. Structure did identify certain events and circumstances, including sub-optimal Customer service and variable implementations of industry best practices that contributed to the increase in Smart Meter high bill complaints. The concerns uncovered should be addressed, but did not appear to be related to the ability of PG&E's Smart Meter System to measure and bill electric usage correctly.

Overall, Structure found that the AMI technology deployed by PG&E appears to be 1) consistent with industry standards, based upon the goals of the AMI implementation and upgrades approved by the CPUC, and 2) accurate from a metering and billing perspective. Structure identified gaps in Customer services and processes related to high bill complaints, and determined certain PG&E practices to be partially non-compliant relative to industry best practices.

The following Figure provides a high-level summary of Structure's findings for each of the PG&E AMI Assessment's areas of focus.



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Structure's PG&E AMI Assessment Findings Summary	
Area	Finding
Laboratory Meter Testing	All of the Smart Meters tested in Structure's independent laboratory passed the accuracy testing. The Smart Meters subjected to environmental stress testing in a controlled temperature chamber at reference, high, and low temperatures all fell within the American National Standards Institute (ANSI) standards.
Field Meter Testing	<ul style="list-style-type: none"> Structure's Pass/Fail Criteria was based upon the CPUC Standard of $\pm 2.0\%$ for electromechanical meters and Smart Meters. Of the 613 Smart Meter field tests, 611 meters were successfully tested and 100% passed Average Registration Accuracy. One meter was found to have serious errors and be malfunctioning on arrival, and one was found to have serious event errors upon installation; these meters were therefore excluded from testing. Of the 147 completed electromechanical meter field tests, 141 meters passed and 6 failed Average Registration Accuracy. One meter was found to be non-functional, registering zero on all tests, and was therefore excluded from testing.
End-to-End System Testing	By utilizing a representative, small sample size to confirm meter-to-bill system accuracy, Structure did not identify deviations during testing that indicated a systemic problem in the meter billing system's accuracy.
High Bill Complaint Analysis	After reviewing and analyzing over 1,378 High Bill complaints, Structure did not identify pervasive issues with meter data or billing systems. Results from 20 High Bill Complaint Customer interviews identified service issues around complaint management by PG&E and the CPUC.
Best Practices Associated with Smart Meters	Structure found PG&E to have been historically in compliance, or have recently come into compliance, with the majority of industry best practices associated with Smart Meters. Structure identified several items of some concern during the Assessment, which have been recognized by PG&E, through their presentation of information, as shortcomings to be addressed.
Security Assessment	Structure concluded that PG&E has developed a cyber security framework that meets the objectives established in the Smart Grid industry's OpenSG AMI-SEC Task Force "AMI System Security Requirements" that were reviewed as part of this evaluation.

Figure 2: Structure's PG&E AMI Assessment Findings Summary

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C. Work Scope

Structure's evaluation focused primarily on evaluating meter accuracy and advanced metering system capabilities to accurately determine and bill Customer electric usage for PG&E's residential electric Smart Meter installations. Structure also evaluated PG&E's Smart Meter system deployment current and historical business practices against industry best practices and standards and assessed PG&E's AMI security framework. The Assessment also included addressing the influx of high bill complaints that were perceived by Customers as being Smart Meter-related. Historical meter accuracy and associated meter replacement firmware upgrades were not tested as part of the scope of this engagement, as Structure was not able to evaluate the meters at the time that those complaints were initiated.

During project planning and initiation, PG&E provided a system overview that included previous meter testing performed, meter reading and billing transition scheduling, and high bill complaints received. Based upon the overview provided, Structure consulted with the CPUC to increase the meter accuracy testing and associated Customer complaint analysis on PG&E's electric Customers as part of The Assessment. Structure worked with the CPUC to modify the project scope to better evaluate PG&E's AMI systems based upon data availability, budget constraints, and the available timeframe. Some scope modifications resulted from additional efforts required to complete the proposed work, as discussed in the Scope of Work section of this report.

During the course of The Assessment that spanned April to August of 2010, Structure independently tested over 750 Smart Meters and 147 electromechanical meters. Structure also reviewed the 1,378 electric Smart Meter Customer accounts from a PG&E provided list of 2,915 Smart Meter electric and gas high bill-based complaints. Structure requested that PG&E provide a detailed explanation of 73 accounts where Structure identified billing data anomalies that could not be attributed to the Customer's usage profile. Structure also attempted to contact over 100 of the high-bill complaint Customers, resulting in 20 high-bill complaint phone interviews. Structure reviewed the accounts of each of the interviews with PG&E's complaint resolution team for further analysis.

Throughout the evaluation, less than a 1,000 pages of double sided hard-copy sheets were transmitted in consideration of California's green initiatives. Approximately 6GB of zipped compressed data in the form of 1,600 documents was provided by PG&E, which contained approximately 27,000 pages or slides and 2,000 worksheets. Structure electronically pulled 2.4 million sample Customer stratifications from over 5.2 million Customer meter locations.

During the course of the project, Structure reviewed manufacturer specifications, procedures, and relevant data associated with meter manufacturers, communication network, and meter data management and billing systems. Structure also held interviews with PG&E vendors and performed site visits to PG&E and vendor facilities to observe processes and procedures. Detailed methodology, procedures, test results, and identified issues can be found in the appropriate sections of this Assessment.

Structure's work included meetings and interviews with PG&E resources and subject matter experts and Customers to obtain insight and information relevant to our evaluation. Structure also maintained a call center associated with the field meter testing that allowed Customers to address questions associated with the evaluation meter testing. In addition, a meeting was held with the TURN consumer advocacy group at their request. As part of the assessment, Structure reviewed documents and held over numerous interviews with PG&E personnel, focused on process and methodology. Additional time was spent with PG&E security personnel to conduct the security assessment.

The number of meter tests and customer interviews performed was based upon cost/benefit analysis conducted by Structure in conjunction with the CPUC at various points throughout the project. The sample



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sizes selected were determined to provide a reasonable representation of the PG&E meter and high bill complaint populations based upon the CPUC-requested scope of work.

The project scope was divided into the following areas:

- Laboratory Meter Testing
- Field Meter Testing
- End-to-End System Testing
- High Bill Complaint Analysis
- Best Practices Associated with Smart Meters
- Security Assessment

From the initial RFP response throughout the project, Structure contracted for the services of Trimark Associates ("Trimark"). Trimark's credentials included certification as a Meter Service Provider (MSP) in California by the CPUC. Trimark has provided metering and meter data management services for over nine years within California and throughout North America. The synergy between the two companies allowed Structure to utilize Trimark as a dedicated contractor to perform the meter-based field and laboratory testing defined throughout this report. As the sole contractor to Structure for this Assessment, further reference to Trimark work within this report may be included under the Structure reference.

The following sections provide scope overviews associated with each of the key project areas.

C.1 Laboratory Meter Testing

Laboratory meter testing was performed in a qualified, non-PG&E laboratory located within the PG&E territory and overseen by Structure resources. Structure verified meter accuracy and factory programming laboratory tests on a representative meter sample set obtained from PG&E's warehouse facilities. Structure allocated a portion of the sample set meters for end-to-end and environmental testing, and the remainder for installation at residential Customer premises.

Structure utilized a subset of the PG&E warehouse randomly selected meters to perform environmental testing in the laboratory, where the meters were subjected to temperature-based stress tests. An additional set of meters were used for end-to-end system testing to monitor meter activity from installation through billing. The tests are highlighted in the following Figure, Summary of Structure's Test Scenarios, Scenarios 1 and 2.

Summary of Structure's Test Scenarios		
Location of Test	Scenario	Description
Laboratory	Scenario 1	Environmental and End-to-End Smart Meter Laboratory Test
Laboratory	Scenario 2	Warehouse Stock Smart Meter Accuracy Laboratory Test
Field	Scenario 3	Electromechanical Meter Test & Smart Meter Field Replacement
Field	Scenario 4	Non-High Bill Complaint Smart Meter Field Test
Field	Scenario 5	High Bill Complaint Smart Meter Field Test
Field	Scenario 6	High Bill Complaint Shadow Meter Field Test
Field	Scenario 7	Non-High Bill Complaint Electromechanical Meter Field Test
Field	Scenario 8	High Bill Complaint PG&E Installed Shadow Meter Test Verification

Figure 3: Summary of Structure's Test Scenarios

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The laboratory and field test scenarios were developed as a representative set of tests normally used by utility companies to determine compliance to Public Utility Commission accuracy standards based on ANSI Standard C12.20.

C.2 Field Meter Testing

The Assessment's field meter testing utilized the Standards for Meter Installation, Maintenance, Testing and Calibration as set forth in the Direct Access Standards for Metering and Meter Data (DASMMMD) and American National Standards Institute (ANSI) standards to verify the accuracy associated with PG&E's Smart Meters. Structure also performed field testing on a sample of electromechanical meters installed at electric residential Customer locations in order to confirm meter accuracy. The guidelines for testing were based on DASMMMD standards that were established in 1998, which provided for electromechanical meters and did not include updates applicable to Smart Meter systems. Meter accuracy was monitored based upon the DASMMMD requirements. Based upon discussion with CPUC, the DASMMMD standards were the established regulatory guidelines to be followed. The PG&E and manufacturer comparisons were utilized for reference purposes only.

Field meter testing was conducted using six scenarios that were identified by Structure to test both the electromechanical and Smart Meters in the field and evaluate both the accuracy of Customers' electromechanical and Smart Meters and the associated procedures. The conducted tests are summarized in Figure 3, Scenario 3 through Scenario 8. Customers whose meters were selected for testing were contacted by mail and/or by a Structure representative to describe the process and test coordination.

Each of the field testing scenarios was conducted by Structure and accompanied by PG&E's meter technicians, and followed industry-standard established procedures as described in this report and associated documentation. All meter testing was performed by Structure technicians for Scenarios 3-7; in Scenario 8, Structure observed PG&E's field processes for shadow meter tests. The field meter testing included:

- Site verification
- Meter type and form factor verification
- Proper installation
- Meter program and accuracy verification

Field-based testing focused on residential meters; thus, testing of commercial meters was excluded from the scope and the test scenarios.

C.3 End-to-End System Testing

End-to-End System Testing included both laboratory and field testing.

End-to-End laboratory testing was performed on five PG&E Smart meters, with five Elster™ digital meters used as "shadow" meters. Each of these meter pairs were subjected to a different amount of load, reflecting measurement at various rate tiers over the test period. In addition, the end-to-end "shadow" meters were also subjected to common exceptions to normal conditions, including power outages, voltage swells, voltage sags, and loss of Radio Frequency reception. Inclusion of common exceptions facilitated testing PG&E's capability to perform validation, editing, and estimation (VEE) processes in compliance with CPUC rules, and without introducing errors into Customer bills.



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“Proxy” Customer accounts were created within PG&E’s billing system for each of the end-to-end meters, giving Structure the ability to determine PG&E’s application of billing determinants and rate assignments, as well as the accuracy and the timeliness of physical bill issuance to residential electric Customers. The end-to-end test process was designed for completion over the course of one PG&E billing cycle.

End-to-End field testing utilized the field testing shadow meter installations for selected High Bill Complaint Customers as part of field meter testing Scenario 6. The field testing shadow meter setup used the existing installed PG&E Smart Meter and an Elster digital shadow meter installed side-by-side to measure the Customer’s usage simultaneously through both meters. Structure also utilized these same installations to verify the flow of meter usage and event data from the Customer premise, through the AMI and Billing systems, to the Customer’s receipt of the printed bill.

A PG&E-provided representation of PG&E’s metering and billing system connectivity is found in the Figure below. The information tested in end-to-end system testing was processed through these systems.

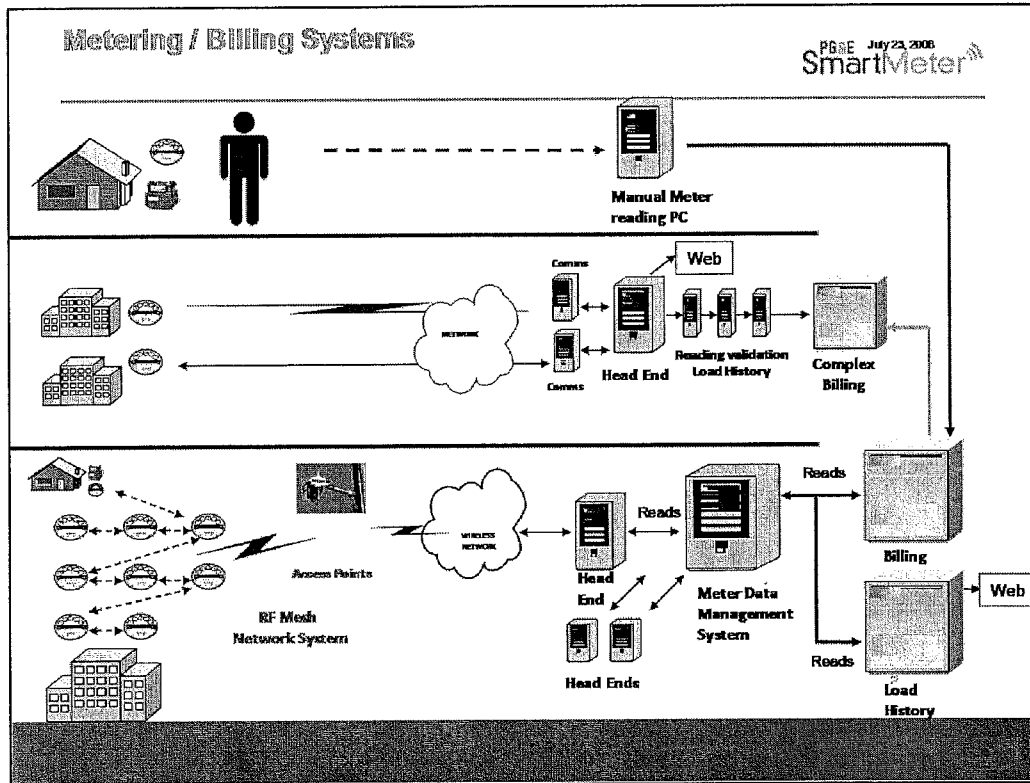


Figure 4: PG&E-Provided Representation of PG&E’s Metering/Billing Systems Connectivity

C.4 High Bill Complaint Analysis

To perform the High Bill Complaint Analysis, Structure examined the entire population of 1,378 Smart Meter electric high bill complaints consisting of those officially filed with the CPUC, those provided by the office of Senate Majority Leader Dean Florez (D-Shafter), and Smart Meter High Bill Complaints specifically identified

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and provided by PG&E for the period September 17, 2007 to April 30, 2010. Structure further refined the High Bill complaint list to focus on determining the underlying nature of the complaint by utilizing account information and reviewing detailed historical usage for 1,066 of the Customer complaint accounts with available historical usage data specifically related to residential electric Smart Meters. The detailed analysis of 1,066 accounts was done by evaluating the High Bill Complaint Customers' usage patterns and account specific information prior to and after Smart Meter installation to identify impacts of weather, extended bill cycles, cancel/re-bills, estimated meter reads, and usage spikes on Customer complaints.

A targeted selection of 73 Customer complaints was chosen based on account activity that suggested the potential for identifying underlying system or process issues, and was further analyzed to identify contributing factors for the complaints. The analysis on the 73 complaints included a detailed review of complaint resolution documentation, usage analysis, complaint history, account history, and Customer Service and Customer interaction notes. Structure utilized the 73 complaints reviewed and an additional 27 complaints with similar profiles to contact Customers for potential interviews. Of the 100 potential Customer interview participants, 20 agreed to participate in one-on-one interviews focused on documenting Customer rationale when initiating the complaint process, the Customer's experiences, premise conditions, energy usage, and the Customer's insight into the subsequent PG&E resolution process. Structure followed the 20 Customer interviews with an examination of each of their accounts with the PG&E Escalated Complaints team, to better understand the PG&E processes followed and the PG&E outcome of the Customer complaint.

Structure also specifically reviewed Customer usage and resolution status associated with 231 of 300 Bakersfield and Fresno electric Smart Meter town hall complaints, including the underlying analysis performed by PG&E and the associated resolution process for these accounts.

C.5 Best Practices Associated with Smart Meters

To evaluate Best Practices, Structure reviewed PG&E's documentation of past and current operational and deployment policies, processes, and procedures against a framework of industry best practices. The framework was developed by Structure subject matter experts with combined electric and gas field, operations, and billing experience of over 75 years, and presented to three independent Smart Meter industry experts for review and input. Structure compiled the contributions of these experts, applied it to the framework, and compared PG&E's policies, processes, and procedures against the established framework.

The Best Practices work included review of eight key areas associated with Smart Meters:

- Meter manufacturing quality control
- Meter installation standards
- Meter equipment safety
- Meter deployment
- Meter Data Management interfaces
- Validating, Estimating and Editing for monthly and interval data
- Account billing
- High bill complaint troubleshooting

The Best Practice analysis also identified business process improvements initiated by PG&E since January 2010 to enhance meter accuracy and increase customer satisfaction. Inclusion of the improvements was intended to document PG&E's efforts to align with industry Best Practices associated with Smart Meters.



Best Practices included in this report are reflective of the current industry environment for the areas addressed, as provided by Structure and industry experts retained by Structure. The views and opinions expressed in The Assessment may not reflect the views or opinions of all industry experts, and may change as Smart Meter systems continue to mature.

C.6 Security Assessment

Structure performed a review of PG&E's cyber security framework focused on the smart grid system as part of The Assessment. The review was limited based on priority, time, and budget, and was conducted with a focus on the smart grid system, utilizing the applicable sections of the "AMI System Security Requirements" developed by the Smart Grid industry's OpenSG AMI-SEC Task Force. The security assessment was performed to provide a confirmation that controls were established and documented around:

- Corporate Cyber Security Approach
- Confidentiality and Privacy
- Data and System Integrity
- System Availability
- Identification and Authentication of Users
- Authorization of Users
- Accounting and Non-Repudiation
- Anomaly Detection Services
- Boundary Services and Interfaces
- Cryptographic Services
- Resource Management Services
- Development Rigor
- Organization Rigor
- Handling and Operating Rigor
- Accountability

Per The Assessment's scope, Structure utilized several methods to perform the review, including interviews and documentation reviews of PG&E policies and procedures, referred to as a "paper" review of PG&E's security framework. The review included interviews with key PG&E personnel tasked with managing security, inspection of relevant PG&E documents, and review of third-party audit reports where applicable and available. The information obtained through these methods was then compared against the applicable sections of the "AMI System Security Requirements" standards developed by the Smart Grid industry's OpenSG AMI-SEC Task Force. A comparison to cyber security "best practices" was also performed.

An in-depth qualitative assessment of PG&E's framework implementation was beyond the scope of this Assessment. An evaluation of this nature would have taken several months to evaluate each major sub-system within the Smart Grid system, as well as additional time to evaluate the implementation within PG&E's security framework. An in-depth review would involve reviewing firewall rules, system configurations, user permissions, training, background checks, etc.



D. Detailed Summary of Observations and Findings

The following summary of Structure's findings reflects the results of The Assessment's testing and analysis. Structure found the summarized results to be representative of the overall PG&E AMI program; however, due to the accelerated nature of the engagement, Structure's Assessment was limited its ability to express an opinion on all of the AMI processes and procedures used at PG&E. Accordingly, the results should be taken in the context of the data reviewed.

D.1 Laboratory Meter Testing

D.1.1 Laboratory Meter Testing Findings Summary

Structure utilized a laboratory testing facility that was independent from PG&E to conduct tests for meter accuracy, environmental stresses, and end-to-end system functionality. Structure selected 174 Smart Meters from PG&E's warehouses using a randomized selection process based on representative vendor and meter type criteria, and then tested the meters for accuracy in the independent laboratory. All of the tested Smart Meters passed the accuracy testing. Structure then utilized a portion of the selected Smart Meters for environmental stress testing, and found all of the meters to fall within the American National Standards Institute (ANSI) standards when tested in a controlled temperature chamber at reference, high, and low temperatures.

D.1.2 Laboratory Meter Testing Findings Details

Structure set aside 18 of the 174 meters selected from the warehouses as "spares", and conducted laboratory-based accuracy tests on the remaining 156 stock PG&E Smart Meters selected from the five randomly selected PG&E warehouses. The sample set consisted of a range of meter types and meter manufacturers representing a representative sample of meters available in the PG&E in-stock inventory, which were procured using a random meter selection methodology.

The Results of the Laboratory Accuracy Tests were:

- 100% of the 156 PG&E stock Smart Meters tested were within an accuracy range of 99.81% to 100.15%, with an average accuracy of 100.01% and a standard deviation of 0.0408%.
- The meters passed the $\pm 0.2\%$ acceptable accuracy standard established by the meter manufacturer, which also satisfied the CPUC accuracy requirement of $\pm 2.0\%$.

Following an initial test to verify the accuracy of the meters at full load, light load, and with a 50% power factor in accordance with ANSI standards, a subset of these meters were used in Structure's laboratory and field test scenarios.

Environmental testing consisted of subjecting six of the PG&E Smart Meters to extreme hot and cold conditions in a controlled environmental chamber designed to accurately replicate these conditions in accordance with ANSI C12.20 specifications. The meters were placed into the environmental chamber for 24 hours and allowed to reach "equilibrium". The temperature was then adjusted, and the test performed.

The summary findings from the Environmental Laboratory Meter Tests were:

- When subjected to +50 degrees Celsius (+122 degrees Fahrenheit) for 24 hours, all of the meters tested within the $\pm 2\%$ CPUC standard; however, one out of the six meters did not conform to the ANSI C12.20 maximum deviation of $\pm 0.5\%$ from reference test temperature standard used by the meter



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manufacturer. The non-conforming meter exceeded the allowed 0.5% deviation by 0.07% during the full load test. The non-conforming meter's deviation was slightly out of tolerance on the Full Load and Light Load test, but the meter passed the CPUC standard for accuracy when adjusted for Average Meter Registration Accuracy (Full Load Test + Light Load Test)/2.

- When subjected to -20 degrees Celsius (-4 degrees Fahrenheit) for 24 hours, all of the meters tested within the PG&E and CPUC criteria of $\pm 0.5\%$ and $\pm 2\%$, respectively. All of the meters passed the ANSI C12.20 maximum deviation of $\pm 0.5\%$ from the reference test temperature standard used by the meter manufacturer.

D.2 Field Meter Testing

D.2.1 Field Meter Testing Findings Summary

Structure conducted field tests on 797 meters using defined procedures and protocols for each of the following six scenarios:

- Scenario 3: Electromechanical Meter Test and Smart Meter Field Replacement
- Scenario 4: Non-High Bill Complaint Smart Meter Field Test
- Scenario 5: High Bill Complaint Smart Meter Field Test
- Scenario 6: High Bill Complaint Shadow Meter Field Test
- Scenario 7: Non-High Bill Complaint Electromechanical Meter Field Test
- Scenario 8: High Bill Complaint PG&E-Installed Shadow Meter Test Verification

Structure's field tests measured accuracy of the meters at full load, light load, and with an applied power factor. The results were tracked to acceptance levels for the CPUC ($\pm 2\%$ for both Smart Meters and electromechanical meters), PG&E ($\pm 0.5\%$ for Smart Meters, $\pm 2\%$ for electromechanical meters), and the manufacturer ($\pm 0.2\%$ for Smart Meters, $\pm 2\%$ for electromechanical meters). Structure's Pass/Fail criterion used in this report was based upon the CPUC standard of $\pm 2.0\%$ for electromechanical meters and Smart Meters.

Structure attempted 897 field meter tests and completed 797 field meter tests, including both Smart Meters and electromechanical meters. Structure was unable to complete the remaining 100 meters due to normal reasons, such as meter banks on apartment buildings preventing the installation of the dual socket required for testing and meters locations that required extension ladders for access. Overall, a statistically valid, randomized sample of Smart Meters representing the entire installed base of Smart Meters in the P&GE territory was found to pass accuracy reading. Using the CPUC pass/fail criterion of $\pm 2.0\%$, 611 of the 613 Smart Meter field tests were completed, with 100% passing CPUC registration accuracy readings. Two Smart Meters were found to have serious errors and be malfunctioning. One meter was found to have serious errors and be malfunctioning on arrival, and one was found to have serious event errors upon installation; these meters were therefore excluded from testing. The Average Registration Accuracy of the 611 meters tested was 100.067%, with a Standard Deviation of 0.271%. Of the 147 completed electromechanical meter field tests, 141 meters, or 95.92%, passed and 6, or 4.08%, failed accuracy readings.

Structure identified one meter that was registering a zero read during the field meter testing. After further examination of PG&E's issue logs, the error was identified as a "data storage" issue. These data storage issues had been identified by PG&E in 12,735 meters as of May 2010, potentially resulting in a subset of Customers receiving zero usage or lower estimated bills. Data storage issues are one type of exception disclosed by PG&E, and may include:

- Negative intervals



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- Large intervals
- Zero table
- Negative register readings
- Table resets

Structure noted that these data storage issues were identified in early October 2009, with replacements starting in May 2010. These errors were disclosed to the public and to the CPUC in May 2010. PG&E subsequently initiated processes to address these issues in a timely and effective manner. As of July 2010, the outstanding data storage issues had been reduced to 1,526 meters.

The following Figure illustrates the number of meters that passed and failed the accuracy test for all of the Structure Field Meter Testing Scenarios, delineated by electromechanical meter tests in blue, and Smart Meter tests in yellow. The field testing scenarios were referred to as “High Bill Complaint” and “Non-High Bill Complaint” populations. The High Bill Complaint population was derived from complaints received directly by the CPUC or PG&E and those received at the town hall meetings organized by state senators. Non-High Bill Complaint refers to Customers who had not filed a high bill complaint through one of these channels.

Pass/Fail Results of Structure Field Meter Accuracy Tests by Scenario			
Scenario	Total Meters	Pass	Fail
3: Replace Electromechanical Meter with Smart Meter – Electromechanical Meter Test	47	41	6
3: Replace Electromechanical Meter with Smart Meter – Smart Meter Test	44	44	0
4: Smart Meters (Non-Complaint)	531	531	0
5: Smart Meters (High Bill Complaint)	36	36	0
6: <i>Shadow Meters (High Bill Complaint, Structure)</i>	19	N/A-S	N/A-S
7: Test Electromechanical Meter	100	100	0
8: <i>Shadow Meters (High Bill Complaint, Structure-PG&E)</i>	18	N/A-S	N/A-S
Total of all Field-Tested Meters	795	752	6
Total - Smart Meters	611	611	0
Total - Electromechanical Meters	147	141	6
Percentage of Total Smart Meters Tested	-	100.00%	0.00%
Percentage of Total Electromechanical Meters Tested	-	95.92%	4.08%

Figure 5: Structure’s Field Meter Testing Pass/Fail Accuracy Results by Field Test Scenario

N/A–S: Not Applicable–Shadow Meter

Of the 613 completed Smart Meter field tests, 611 meters were successfully tested and 100% passed Average Registration Accuracy. One meter was found to have serious errors and be malfunctioning on arrival, and one was found to have serious event errors upon installation; these meters were therefore excluded from testing.

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D.2.2 Field Meter Testing Findings Details

A description of Structure's field testing scenarios and summary of the scenario-based testing results are presented in the following Figure. The field testing scenarios were referred to as "High Bill Complaint" and "Non-High Bill Complaint" populations. The High Bill Complaint population was derived from complaints received directly by the CPUC or PG&E and those received at the town hall meetings organized by state senators. Non-High Bill Complaint refers to Customers who had not filed a high bill complaint through one of these channels. Average registration accuracy is calculated using the equation $(\text{Light Load Test} + \text{Full Load Test})/2$ and refers to the average accuracy of a "register," which maintains a measure of the total power consumption that passed through the meter over time.

Each of the following scenarios was performed independently of each other, and involved a unique Customer premise.



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Structure Field Testing Scenarios and Results			
Scenario	Description	Synopsis	Results
Scenario 3	Electromechanical Meter Test & Smart Meter Field Replacement	Structure used a representative sample of 50 Customers that were scheduled to have their electromechanical meter replaced by PG&E. The electromechanical meters were removed and accuracy tested in the field at full load, light load, and 50% power factor. A laboratory-tested Smart Meter was then accuracy-tested in the field before being installed in the Customer's premise. The results of each of these tests were recorded by the Structure contractor. 47 successful electromechanical meter tests and 44 successful Smart Meter tests were conducted for this Scenario. The difference in number of electromechanical tests and Smart Meter tests was due to 6 electromechanical meters that failed. These meters subsequently did not receive a Smart Meter installation at the time of the test; therefore, Structure did not conduct a Smart Meter test at that premise.	<ul style="list-style-type: none"> • One Smart Meter was found to have a serious event error and be malfunctioning upon installation, and was therefore excluded from testing. • 100% of the 44 tested Smart Meters used for this scenario passed CPUC's accuracy testing acceptance standard of $\pm 2.0\%$ in the field test. • Field test results of 44 of the previously laboratory-tested Smart Meters indicated an Average Registration Accuracy of 100.27% during the field tests with a standard deviation of 0.112%. • One electromechanical meter was not found to be functional, registering zero on all tests; and was therefore excluded from testing. • 41 of 47 tested electromechanical meters passed the CPUC's accuracy testing standard of $\pm 2.0\%$ in the field test. • Six of the 47 tested electromechanical meters failed the CPUC Accuracy Standard of $\pm 2.0\%$, with one failing the Full Load and Power Factor tests, one failing the Light Load test, one failing the Power Factor test, and three meters failing the Light Load and Power Factor standard tests. • Two of the six electromechanical meter failures failed the Average Registration Accuracy standard. All field-tested electromechanical meters that were replaced with Smart Meters were returned to PG&E with an indication of whether or not they passed the field test. • The 47 tested electromechanical meters had an Average Registration Accuracy of 99.556%, with a Standard Deviation of 1.343% for the successful tests.

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Structure Field Testing Scenarios and Results			
Scenario	Description	Synopsis	Results
Scenario 4	Non-High Bill Complaint Smart Meter Field Test	A representative sample of 532 Smart Meters was chosen from the population of PG&E Customers where a Smart Meter had previously been installed by PG&E and the Customers were not in the High Bill Complaint list. These meters were removed from the Customer's meter socket and placed in a calibrated field test set on-site at the Customer's premise, where the meters were then accuracy-tested at full load, light load and a 50% power factor. In addition, the existing internal meter program was verified to confirm proper functionality.	<ul style="list-style-type: none"> One Smart Meter (of the 532) was found to have a serious event error and was malfunctioning, and was thus excluded from testing. The communication module on this device was functional and had been reporting zero usage for almost six months. 100% of the 531 tested meters tested within the CPUC accuracy standard of $\pm 2.0\%$. Average Registration Accuracy ranged from 98.345 % to 100.78% with an average of 100.075% and a standard deviation of 0.275%.
Scenario 5	High Bill Complaint Smart Meter Field Test	Structure selected 50 Smart Meter installations from the High Bill Complaint population to verify that the meter was properly installed and to field test the registration accuracy of the installed Smart Meter. 36 Smart Meter tests were conducted for this Scenario. At each location, the Smart Meter was removed and installed in a calibrated field test set, where the meter was accuracy tested at full load, light load and a 50% power factor. In addition, the existing internal meter program was verified as functioning properly.	<ul style="list-style-type: none"> All 36 Smart Meters tested passed the CPUC acceptance standard of $\pm 2.0\%$. The Average Registration Accuracy for the Scenario 5 meters was 100.004%, with a Standard Deviation of 0.351%.
Scenario 6	High Bill Complaint Shadow Meter Field Test	Structure selected 20 locations from the High Bill Complaint population to install a Field Shadow Meter setup, and completed tests at 19 locations. The Field Shadow meter setup consisted of the existing installed PG&E Smart Meter and an Elster digital Shadow meter installed side-by-side to measure the Customer's usage simultaneously through both meters. These meters were used to establish the accuracy of the Customer meters already installed by performing a weekly accuracy check and comparing the readings from the two meters. In addition to verifying Smart Meter accuracy, these installations were also used to verify the end-to-end accuracy thru the PG&E AMI system to the customer bill.	<ul style="list-style-type: none"> The results of the 19 shadow meter tests showed that the shadow meter reads were in concert with the Smart Meter reads. The bills from both the lab-tested shadow meters and the field-tested shadow meters matched the expected results from manual bill calculations. Structure encountered four unauthorized PG&E meter swaps/meter tests during the execution of this scenario, as noted in the "Unauthorized PG&E Meter Swaps" section of this report, and in Appendix F: Unauthorized Scenario 6 Meter Swaps Exhibitions. These meters were subsequently not tested by Structure in the field, but were retrieved from PG&E and evaluated in the laboratory with no noted issues. Structure selected additional accounts to test in lieu of the meters excluded from test sample due to the unauthorized meter swap.



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Structure Field Testing Scenarios and Results			
Scenario	Description	Synopsis	Results
Scenario 7	Non-High Bill Complaint Electromechanical Meter Field Test	Structure used a representative sample of 100 installed PG&E electromechanical meters to verify the accuracy of these meters in the field. The meters were removed from the customer installation and placed in a calibrated field test set to verify their accuracy at full load, light load, and at a 50% power factor.	<ul style="list-style-type: none"> Scenario 7's test included 100 installed PG&E electromechanical meters, with no failures on the CPUC Standard of $\pm 2.0\%$. The 100 meters had an Average Meter Registration Accuracy of 99.798% with a Standard Deviation of 0.528%. The minimum Registration across all tests (Full Load, Power Factor, and Light Load) was 98.1%, and the maximum registration across all tests was 101.95%.
Scenario 8	High Bill Complaint PG&E Installed Shadow Meter Test Verification	Structure accompanied PG&E Meter personnel during the installation of 18 shadow meter tests performed by PG&E. These installations consisted of the installation of a side-by-side electromechanical meter and Smart Meter at the site of Structure-selected High Bill Complaint Customer's premises. Structure reviewed PG&E's installation practices to determine if they were in line with documented installation, testing and meter reading procedures and to determine if PG&E followed their documented practices and procedures.	<ul style="list-style-type: none"> Of the 27 meters selected for Scenario 8, 18 were successfully completed with no identified deviations, and nine were unable to be completed due to premise restrictions and meter installation routing schedules. In all test cases, PG&E complied with internally documented practices and procedures for the shadow test verification.

Figure 6: Structure's Field Meter Testing Summary of Results

D.3 End-to-End System Testing

D.3.1 End-to-End System Testing Findings Summary

End-to-end system testing was used to verify the accuracy of the PG&E Smart Meters, data communications and associated systems, estimation routines, and the customer billing system, including bill printing. A laboratory end-to-end test scenario was used to simulate system exception handling in a controlled environment, including the addition of a meter access point that served as the collection point for the meter information that was sent back to PG&E.

End-to-End laboratory testing was performed on five PG&E Smart Meters, with five Elster digital meters used as parallel, side-by-side measurement, referred to in this Assessment as "shadow" meters. These end-to-end laboratory tests involved creating a proxy Customer account, installing a Smart Meter for this account and an electronic meter side-by-side to shadow the account's usage, and conducting tests from the time of installation through to receiving a bill. Structure established shadow meter test boards and conditions in the independent laboratory for use in the end-to-end system testing, to determine whether the Smart Meters were accurately

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measuring energy consumption as compared to an independent electronic Meter. A field end-to-end test scenario, Scenario 6, was used to test the actual performance at Customer-installed facilities.

Structure did not identify issues during the testing of the meter billing system accuracy. Structure encountered an issue with PG&E's set-up of the proxy accounts, wherein Structure specified a specific billing address and PG&E sent all of the proxy account bills to the wrong address. PG&E indicated that this occurred because they did not follow their standard practices.

D.3.2 End-to-End System Testing Findings Details

Twenty-six Elster digital meters procured from the Elster meter manufacturer were laboratory-tested for accuracy and utilized as an auxiliary/additional meter to record energy consumption on the secondary meters, hereby referred to as a "shadow" meters in both the laboratory end-to-end testing and the field end-to-end testing scenarios.

End-to-end laboratory testing was performed on five PG&E Smart Meters, with five Elster digital meters used as shadow meters. Each of these meter pairs was subjected to a different amount of load, reflecting measurement at various rate tiers over the test period. In addition, the meters were also subjected to common exceptions to normal conditions often found in the field, including power outages, voltage swells, voltage sags, and loss of Radio Frequency reception. Inclusion of the common exceptions facilitated testing PG&E's capability to perform validation, editing, and estimation (VEE) processes in compliance with CPUC rules, and without introducing errors into Customer bills. The referenced VEE standard was California Interval Data VEE Rules Revision 2.0.

"Proxy" Structure Customer accounts were created within PG&E's billing system for each of the laboratory-based end-to-end meters, giving Structure the ability to determine PG&E's application of billing determinants and rate assignments accuracy and the timeliness of physical bill issuance to residential electric Customers. The end-to-end test process was designed for completion over the course of one PG&E billing cycle.

Structure encountered an issue with PG&E's set-up of the proxy accounts, wherein Structure specified a specific billing address to be used instead of the premise address and PG&E sent all of the proxy account bills to the wrong address. Structure specifically requested use of the billing address instead of the premise address in order to accommodate a specific route and satisfy the specified bill cycle. The proxy bills were sent to the "premise address" that was created for the proxy accounts, which was a fictitious address created by PG&E for internal use for a premise that does not exist. Structure contacted PG&E when the bills were not received, and subsequently received the bills. PG&E indicated that the bills were sent to the incorrect address because they did not follow their standard practices for account setup. PG&E failed to note on the account that bills were to be sent to the billing address, instead of the premise address, and told Structure that the billing system defaulted to the premise address for bill delivery.

End-to-end field testing utilized four Scenario 6 field test shadow meter installations on selected High Bill Complaint Customers. The field test shadow meter setup used the existing installed PG&E Smart Meter and an Elster electronic shadow meter installed side-by-side to measure the Customer's usage simultaneously through both meters. The meter comparison results are discussed in the Field Meter Testing section. Structure also utilized these installations to verify the flow of meter usage and event data from the Customer premise, through the PG&E AML and Billing systems, to the Customer's receipt of the printed bill.

Structure experienced initial laboratory testing setup challenges that were resolved within the first days of testing. The challenges identified during setup did not impact the overall scope or development of testing conclusions. The results of the end-to-end tests included:



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- End-to-End laboratory system testing verified that the representative sample of five Smart Meters being billed through the PG&E systems had average accuracies compared to the reference Elster meters of 0.06% with a standard deviation of 0.001%. Meter Data Management System (MDMS) validation routines were verified to be working accurately under the tested conditions, and billing matched the expected results.
- Meter readings were verified as accurate between the Advanced Metering Infrastructure (AMI) head-end, the Meter Data Management System (MDMS), and the Customer Care and Billing (CC&B) systems.
- Application of billing determinants were verified as accurate, including the assignment of baseline allocations, transition of billing through seasons, and transition of billing through new tariffs.

D.4 High Bill Complaint Analysis

D.4.1 High Bill Complaint Analysis Findings Summary

Structure obtained the complaint register associated with the electric Smart Meter High Bill Complaints from both PG&E and the CPUC since the implementation of Smart Meters through June 10, 2010, for inclusion in our analysis which included usage history for 1,378 records. A detailed analysis was performed on 1,066 of these records. The records were analyzed for usage sensitivity to weather, unusual spikes, meter problems, manual or system based issues, meter reading issues, rate impacts, and service issues. Structure further analyzed a targeted sample of 73 complaints that were identified as having multiple issues and would likely provide the greatest insight into potential PG&E system or process issues. Structure contacted 100 High Bill Complaint including the 73 researched complaints, and conducted interviews with 20 Customers that had filed complaints during the period and exhibited excessively high bill periods, cancel/re-bills, or complaint resolution codes that reflected a potential problem. The 73 complaint accounts were also included in the field meter tests.

As a result of the high bill complaint analysis, Structure did not identify problems with the Smart Meter data utilized for billing. Structure identified the following factors that contributed to high bill complaints during late 2009 and early 2010:

- *Customer Usage:*
 - *Meter deployment schedules coincided with increased energy usage caused by a heat wave.*
 - *Some Customers experienced load changes that were reflective of changes in personal circumstances. Examples included room additions, pool additions, and equipment malfunctions.*
 - *Electromechanical meter degradation that was also identified as part of Structure's field meter testing.*
- *Rates:*
 - *Rate increases compounded the financial impact of the additional weather-related usage, resulting in higher bills that occurred as Smart Meters were being installed.*
 - *Incorrectly applied rates that were based upon historical premise assumptions.*
 - *Rate-based inquires that increased as Customer bills escalated. Requests for new or renewed financial assistance through California Alternate Rates for Energy (CARE) were identified as potential reductions of financial impacts related to higher bills.*
- *Customer Service:*



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- *PG&E processes did not address the Customer concerns associated with the new equipment and usage changes.*
- *Customer skepticism regarding the new advanced meter technology was not effectively addressed by PG&E on a timely basis.*
- *Customers interviewed during this assessment did not consider their complaint resolved, despite indications from PG&E and CPUC that the Customer agreed with the resolution*
- *PG&E Customer complaint resolution did not provide of interval read information available with Smart Meters, which may have assisted Customers' understanding of hourly usage patterns.*
- *Process Issues:*
 - *Customers indicated that communications/notifications surrounding physical meter installation were lacking, or that the Customer had issues with the installation personnel.*
 - *PG&E utilized field meter readers for an average of 131 days after Smart Meters were installed, resulting in similar meter reading errors as electromechanical meters. The transition to automate the Smart Meter data for use in billing was not clearly addressed with Customers.*
 - *PG&E's system tolerances related to billing quality control were not stringent enough, resulting in multiple bill cancelations and re-billings, which were confusing to Customers.*

Additionally, Structure determined that the PG&E complaint resolution process was inefficient and ineffective in providing Customers with resolution details and education related to Smart Meters. Recent process changes adopted by PG&E created Customer Relations resources that were focused on Smart Meters, along with a group focused on resolving escalated complaints. Structure performed a complaint walkthrough with both the PG&E groups and was satisfied that additional focus was being placed on resolving Customer complaints.

D.4.2 High Bill Complaint Analysis Findings Details

D.4.2.1 Customer Complaint Process

The Customer complaint process followed multiple paths, including contacting the CPUC Consumer Affairs Branch (CAB) to file a complaint and filing directly with PG&E's Customer Relations Department. In some cases, Customers registered complaints with both the CPUC and PG&E. Typically, Customers had filed more than one complaint with PG&E. Included in the CPUC complaint list were complaints received during town halls hosted by Senators Dean Florez (D-Shafter) in October 2009. The complaint process is illustrated in the Findings section of this document.

All complaints filed with the CPUC were provided to PG&E for resolution and expected to either be resolved in 10 days or to provide a required \$30 credit to the Customer. CPUC was responsible for communicating results back to the Customer. Complaints filed with PG&E were handled through the Customer Relations call center and logged into the Customer's account profile.

The following Figure illustrates the number of Smart Meter high bill complaints received by PG&E on a monthly basis.

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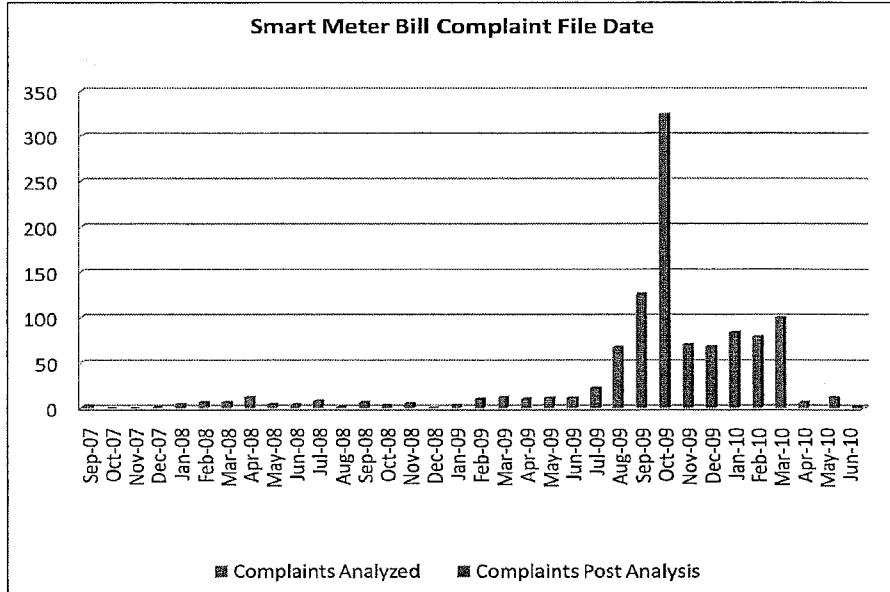


Figure 7: PG&E-Provided Smart Meter Electric Customer Account Complaints

Structure noted a disproportionate number of complaints filed with the CPUC than with PG&E, as indicated in the Figure below.

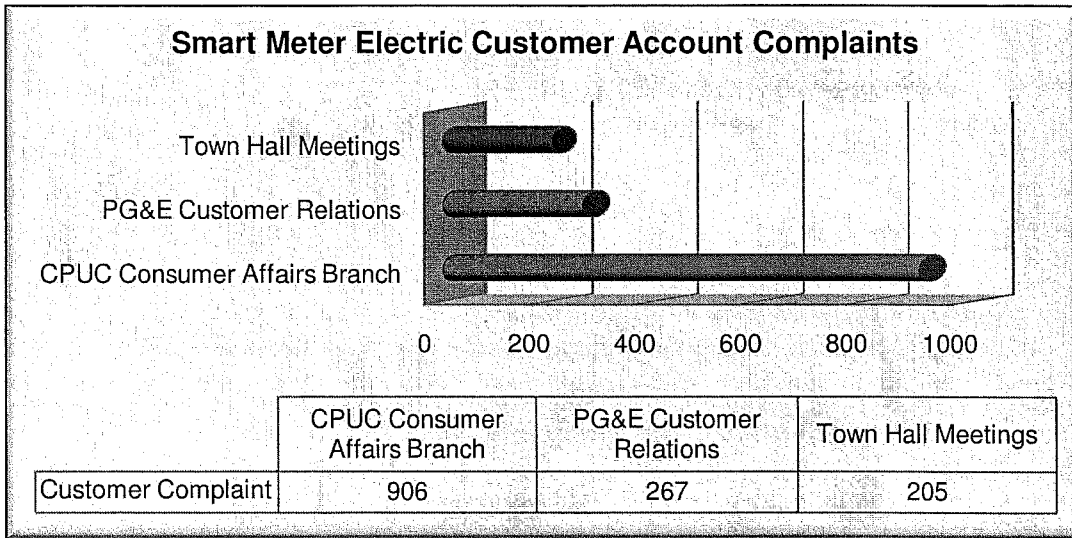


Figure 8: Structure-Identified Smart Meter Electric Customer Complaints

Structure was told by PG&E that a complaint was not marked as a Smart Meter complaint if the Customer did not mention that they had a Smart Meter. This approach may result in complaints not being accurately coded

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and reported as Smart Meter complaints. Some Customers interviewed indicated that complaints were registered with both the CPUC and PG&E, although only the CPUC record was identified.

Structure also performed a historical usage analysis utilizing an aggregated Smart Meter complaint inventory file provided by PG&E. The file included identification of the complaint source, relevant complaints, and related account detail. Structure conducted an analysis of the Smart Meter Complaint inventory to remove duplicate and non-Smart Meter billing data, and concluded that of the 2,915 Smart Meter complaints that were filed by PG&E Customers from September 2007 through April 2010, there were 1,378 distinct Customers that filed complaints related to residential electric accounts. Structure's evaluation included a further detailed review that evidenced 1,066 represented electric residential Smart Meter Customer accounts.

Subsequent to the conclusion of our analysis, Structure received additional high complaints from both PG&E and the CPUC. Structure reconciled the lists and determined that an additional 117 CPUC CAB Customer complaints had been excluded from the PG&E-provided consolidated list. Structure utilized the complaint lists and supplemental complaints as the basis for our testing selection, but did not include a complete analysis on these accounts.

As part of a follow-up to the Town Hall meeting complaint process, Structure reviewed the detailed Customer analysis performed by PG&E and the associated complaint resolutions. The PG&E analysis included a comparison of the Customer's average daily usage in kWh vs. the monthly average temperature for the region to demonstrate the trend in usage pre- and post- Smart Meter installation.

Structure reviewed the Town Hall Meeting historical usage profile for each complaint to determine accounts that were impacted by weather. Structure included the Town Hall complaints within the potential selection group for the Customer Interviews and in the Smart Meter High Bill meter tests for further validation.

Structure also performed an independent analysis on the high bill complaint Customer accounts by reviewing the historical usage for 1,378 accounts, and performing detailed analysis on 1,066 accounts. The analysis performed included:

- Weather impacts on average daily usage
- Average Daily Usage prior month prior year
- Extended billing cycles
- Unresolved complaints
- Cancel/re-bill review

Structure compared the historic average daily kilowatt hours (kWh) usage for each of the 1,066 Customer accounts with the objective of determining if the high bill complaint Customers experienced increased kilowatt hour (kWh) usage after installation of Smart Meters due to weather. The comparison utilized the 2006 and 2009 years with similar summer profiles and determined that in 86% of the 2009 complaints, the average daily usage was less than the 2006 summer although the 2006 summer months were hotter. Structure verified that the weather in the same July/August period for 2007 and 2008 was 2 to 3 degrees cooler than in 2009. The remaining 14% of accounts required additional analysis to determine the potential cause for the increased usage.

Structure also reviewed the average daily usage for the same period of the prior year for each Customer Complaint account history, and identified less than 6% of the records for the complaint Customers that exceeded 150% of the same period prior year. Structure utilized the 150% value to reflect the differential in weather between 2008 and 2009 and focus on identifying unusual spikes in energy usage.



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Additional complaint analysis focused on the extent to which bills were included in an extended billing cycle, or delayed bills, outside of the typical (27-32 day) billing cycle. Structure's evaluation discovered that in 2009 and 2010, approximately 9% of the bills reflected a billing period beyond the standard cycle, although less than 0.4% extended past a 45 day window. Extended billing cycles that resulted in higher overall bills were identified as contributing to high bill complaints. Structure recalculated several bills and determined that the appropriate baseline adjustments were included in the bills and that the bills were accurately calculated.

Structure also noted that during late 2009 and early 2010, a significant portion of complaints were not resolved within the CPUC-required 10 day complaint resolution period. PG&E indicated that the resolution time period extended well beyond the 10-day timeframe due to the influx of complaints during the second half of 2009 and early 2010. Structure calculated that PG&E took more than 10 days to resolve complaints for more than 67% of the Customer accounts during this time period. Structure did not review all accounts to identify whether the CPUC credit for account resolution was provided, but did identify that in several cases where detailed review was performed, the adjustment was properly applied after Structure's additional review and discussion with PG&E.

The cancel/re-bills documented by PG&E represented 1% of the total high bill complaints. A portion of the cancel/re-bills related to overbilling from estimated meter reads identified by Customers subsequently required adjustments by PG&E. Billing adjustments were also made to compensate for meter installation issues.

D.4.2.2 Customer Interviews

Structure contacted 100 high-bill complaint Customers for potential in-depth interview participation related to their high bill complaint. Of the 100 Customers contacted, 20 Customers agreed to be interviewed. Some Customers permitted inclusion of their information in The Assessment, and permitted Structure to follow up with PG&E on their behalf. The Customer interviews focused on the nature of the complaint described to PG&E, PG&E's approach to resolving the Customer's complaint, and the current status of the complaint. The 20 Customers participating in interviews were also included in the field meter testing population.

Based upon Customer interviews, Structure identified gaps in PG&E's approach taken to resolve Customer complaints, including but not limited to:

- Some Customer complaints were not logged into the service history on Customer accounts.
- Follow-up with Customer was not performed on a timely basis.
- PG&E indicated that account was resolved did not align with Customer perception.
- Lack of resolution communication back to Customer.
- Customer lacked clear understanding of complaint resolution process.
- Customer consistently treated by PG&E as wrong, until the Customer proved to PG&E that they were right.
- Customer perception of Smart Meter functionality resulted in complaint escalation.
- PG&E front-line customer call representatives lacked professionalism while dealing with Customer complaints.
- Underlying cause of billing issue not discovered in most cases, even when monetary resolution was reached.

Recent process changes adapted by PG&E allocated Customer Relations resources focused on Smart Meters, along with a group focused on resolving escalated complaints. Structure performed a complaint walkthrough



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with both of the PG&E groups and was satisfied that additional focus was being placed on effectively resolving Customer complaints.

In regards to the CPUC complaint resolution process, Structure noted that the Complaint closure letter Customers received from the CPUC provided no further information than had been provided by PG&E, and both were considered to be ineffective.

Structure followed-up on the Customer interviews by reviewing the Customer Complaints with PG&E. As an outcome of Structure's review with PG&E, two accounts were adjusted based upon the Customer's satisfaction of certain criteria, including low income CARE eligibility and major customer equipment malfunctions, which were subsequently repaired by the Customer.

During the interview process, Structure identified discrepancies in the retroactive application of the CARE eligibility for two Customers. These discrepancies were later resolved by PG&E, following Structure's inquiries, in favor of the Customer.

Of the 20 Customer interviews completed, Structure identified the following non-unique account issues:

- 9 Customers experienced unusually high bills in the initial months after the Smart Meter was installed
 - Explanations identified:
 - Estimated meter reads
 - Cancel/re-bill adjustments
 - Weather related
 - Usage pattern adjustments
- 9 Customers do not have an explanation, personally or from PG&E, for the spike in electricity usage.
 - Potential explanation identified:
 - Electromechanical degradation (similar to those found in field testing)
- 5 Customers were on the wrong rate structure, or PG&E changed their rate structure as a result of their complaint.
 - Explanations included:
 - Historical premise classified incorrectly, affecting the baseline applied to the premise
 - Lapse in CARE qualification, or not registered for lower income-based programs
- 1 Customer experienced a 500% increase in kWhs used after Smart Meter installation
 - Explanation included:
 - Correction of estimated meter reads.
 - Note: The lack of adequate PG&E exception and validation controls resulted in the bill being processed.
- 2 Customers interviewed experienced electrical problems due to Smart Meters causing "surges" or interruptions in timed electrical services such as security lights and hot tub pumps.
 - Explanations included:
 - There is a possibility for a meter in close proximity to FCC Part 15 Unlicensed Radio Frequency (RF) devices and transmitting data via a 1 watt radio transmitter to create operational interference (e.g., static, trip, or outage) when the RF signal passes through these devices. This is an issue that is prevalent with any RF device, such as walkie-talkies, garage door openers, etc. Electrical issues may be due to a matter of proximity to the transmitter, strength of the transmitter, frequency of the transmitter, and the impact on the neighboring device.
 - FCC Part 15 Unlicensed RF devices include:



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- Motion sensors
- Garage door openers
- Baby monitors
- Wireless telephones
- Wireless speakers
- PG&E has determined that certain models of Ground Fault Interrupter (GFI) breakers (such as those used on hot tubs) may be impacted if they are in close proximity to the meter. PG&E has also engaged Smart Meter manufacturers to develop low power transmitter solutions to the GFI interference issue, and has trained the installation contractors to listen for GFI tripping upon installation of a new meter.

On average, Customers indicated a 4.5 month delay between complaint submission and ultimate resolution. The quickest resolution was reached in four days; however, the longest resolution took 12 months and significant effort on the part of the Customer.

While the Customer interviews and related detail account reviews provided significant insight into potential issues within the Smart Meter program, Structure did not identify recurrent issues that impacted the overall population of High Bill Complaints analyzed.

D.5 Best Practices Associated with Smart Meters

D.5.1 Best Practices Associated with Smart Meters Findings Summary

Structure found PG&E to have been either historically in compliance, or to have recently come into compliance, with the majority of industry best practices associated with Smart Meters. Recognizing that some of these practices have matured over PG&E's three year AMI deployment period, it is reasonable that they have recently come into compliance with standards associated with best practices. Some concerns were noted around PG&E's practices related to Meter Deployment, Meter Data Management Interfaces, and VEE.

The following Figure presents a pictorial representation of Structure's evaluation of PG&E's historical and current adherence to industry best practices.

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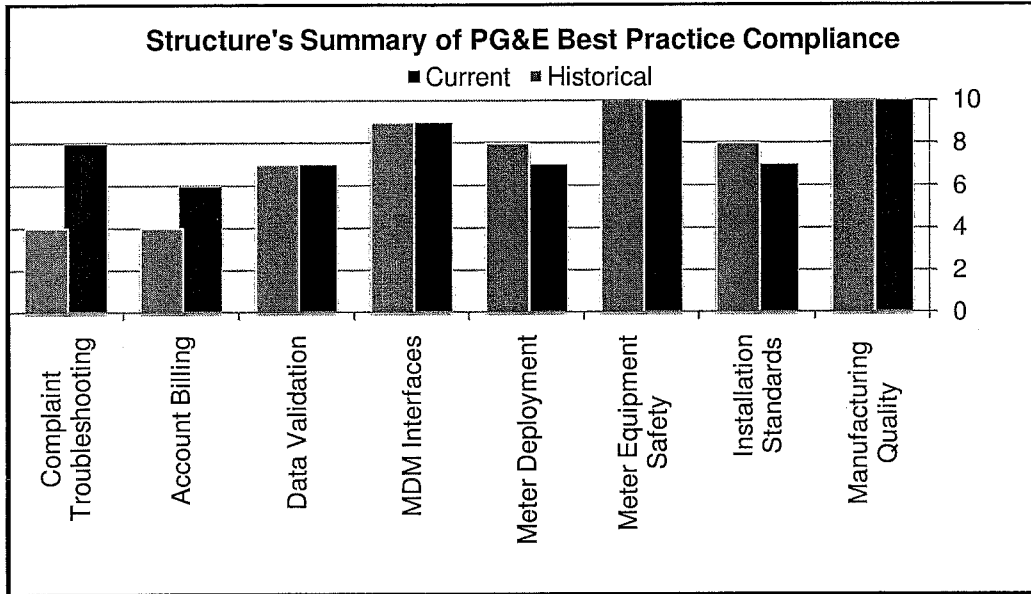


Figure 9: Structure's Summary of PG&E Best Practice Compliance

The Findings section of this report addresses the specific areas in which PG&E is historically and/or currently not compliant with best practices.

D.5.2 Best Practices Associated with Smart Meters Findings Details

Although PG&E was not in compliance with the recommendation to utilize IEC 61968-9 interoperability standards, PG&E provided documentation that it was employing a set of interoperability standards for MDM Interfaces.

Of some concern is the lack of documentation verifying compliance with the Meter Deployment best practice to deploy WAN/LAN collectors prior to meter deployment. By not deploying the communication backbone prior to meter deployment, the time to transition meter reading from manual to AMI system readings is exacerbated, extending to an average of 131 days over the implementation period. This allows a continuation of the higher error rate associated with meter reading and may contribute to the perception that the Smart Meters are inaccurate.

Additionally, the inability to verify compliance around the Meter Data Management Interface best practice to "Correlate AMI meter events and alarms with VEE and CIS audits and checks for automated exception handling" and the VEE Best Practice of "MDMS must provide an on-line method, with workflow, resolving validation errors rather than reports" has created a situation where there is manual editing of data causing numerous cancel/re-bills and delayed processing of Customer data. This, coupled with extensive manual, instead of automated, exception handling of issues has allowed many metering and billing errors to occur on a repetitive basis, over time, furthering the perception that the Smart Meters are not accurate.

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PG&E has recognized, through the presentation of information, their shortcomings on these issues and has been actively pursuing remedies such as process improvements and the recent consolidation of the Billing, VEE, Smart Meter Engineering, and Troubleshooting operations into one Operation Center.

D.6 Security Assessment

D.6.1 Security Assessment Findings Summary

Structure concluded that PG&E has developed a cyber security framework that meets the objectives of the Smart Grid industry's OpenSG AMI-SEC Task Force "AMI System Security Requirements" that were reviewed as part of this evaluation.

D.6.2 Security Assessment Findings Details

Structure independently reviewed PG&E's cyber security framework as it applies to their Smart Meter system. Structure also evaluated PG&E's cyber security framework against industry best practice standards to identify deviations in current and historical business practices. Structure concluded that PG&E had developed a cyber security framework that met the objectives of the OpenSG AMI-SEC Task Force "AMI System Security Requirements" that were reviewed as part of this evaluation. An assessment of the implementation of the cyber security framework was not within Structure's agreed-upon scope of work.

D.7 Other Observations

Structure submitted data requests, using PG&E's standard request procedures as agreed to with PG&E and CPUC to obtain information used as the basis for this report. At PG&E's request, Structure assigned priorities to the data requests to facilitate response focus and expedition. While PG&E accommodated the requests, 28% of the requests were substantially delayed due to PG&E's internal processing and legal review. The delayed resulted in Structure requiring additional time and resources to process, integrate and reconcile information in an effective manner once received. While Structure does not feel that the delayed information impacted the results of the Assessment, the receipt of limited data and the differences in data presentation in the received data impacted the amount of time required to complete the planned analysis, and led to scope modifications and a revised project completion date of September 2, 2010.

SmartMeter Ambassador Toolkit

Share the Message



How to read your meters—quick reference guide

Frequently asked questions

Customer installation: before, during and after

Program facts and benefits

Pacific Gas and Electric Company (PG&E) is dedicated to providing our customers with the best service possible. We're always looking for new and innovative ways to make daily interactions with us faster, easier and more convenient.

That's why we're implementing the PG&E SmartMeter™ program. Through our SmartMeter™ program, we are installing an automated gas and electric metering system for all our customers. With this new system, we are improving the way we obtain meter readings and providing new features and tools to help customers see how and when they use energy, better manage their energy use and save money.

Employee Intranet link:
<http://pgeatwork/CUST/SmartMeter/>

Customer Information link:
www.pge.com/smartmeter

For more information, please visit
www.pge.com/smartmeter or call 1-866-742-2223



Smart Meter
PG&E
PG&E
PG&E



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Program facts and benefits

Pacific Gas and Electric Company (PG&E) is dedicated to providing our customers with the best service possible. We're always looking for new and innovative ways to make daily interactions with us faster, easier and more convenient.

That's why we're implementing the PG&E SmartMeter™ program. Through our SmartMeter™ program, we are installing an automated gas and electric metering system for all our customers. With this new system, we are improving the way we obtain meter readings and providing new features and tools to help customers see how and when they use energy, better manage their energy use and save money.

We use an ongoing quality assurance process for all our SmartMeter™ devices to ensure they are properly measuring energy use. The main difference in the new meters is that a SmartMeter™ communication device, installed in or on the meter, automatically transmits meter reads to PG&E.

SmartMeter™ System Key Facts

What is the SmartMeter™ system?

- The SmartMeter™ system integrates automated wireless technology with gas and electric meters, enabling PG&E to read meters remotely.
- Remote access means faster response times to outages and service interruptions.

Why is PG&E using the SmartMeter™ system?

- The SmartMeter™ system is part of a statewide effort approved by the California Public Utilities Commission (CPUC) to upgrade California's energy infrastructure with automated metering technology.
- Policymakers and utilities in much of the country are focused on accelerating the transition to a Smart Grid. Modernizing the electrical system to be stronger, smarter and more efficient is essential to encouraging growth in renewable energy sources, empowering consumers to reduce their energy use if they choose, and laying the foundation for sustainable, long-term economic expansion.
- This technology will enable new programs that encourage California energy customers to use less energy and save money.

How does the SmartMeter™ system work?

- The SmartMeter™ system uses programmable, solid-state metering technology that provides one-way communication for gas modules and two-way communication for electric meters between the meter and PG&E using secure wireless network technology.
- Meter usage data is transmitted daily directly to our network.



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SmartMeter™
Customer Benefits

Current benefits:

- Customers can see how and when they use energy, giving them the power to control their energy use and costs.
- Customers can view their energy use online at www.pge.com/myaccount once their SmartMeter™ devices are activated on the SmartMeter™ system.
- Customers enjoy convenience because we no longer need to visit their property or interrupt their schedule to read the meter.

Future benefits:

- Customers can sign up to receive notifications from PG&E that provide information about energy usage and the likelihood of moving into higher pricing tiers.
- Customers will have access to new electric pricing plans that allow greater control over energy bills.
- Customers will receive faster power restoration because SmartMeter™ technology pinpoints power outages and locations, allowing PG&E to respond faster.
- Customers will be able to automate their energy use by installing home energy management systems that will communicate with automated appliances and electronic devices via PG&E's planned Home Area Network.
- Customers will enjoy smarter, cleaner energy supplies.

The ability to monitor energy usage gives customers the information they need to conserve or shift energy usage. When many individuals conserve, the results can include decreased pressure on the power grid, less need to build new power plants, and reduced carbon emissions.

SmartMeter™
Employee Benefits

Safety

We'll collect meter data without having to set foot on the customers' property, mitigating safety risks for our field personnel.

Faster power restoration

We'll be able to resolve service problems more easily and provide current information to service personnel through the SmartMeter™ systems.

Faster problem resolution

We'll become more efficient by utilizing our SmartMeter™ technology on routine service requests.

Reduced access issues

We'll no longer need to rely on customers to provide appropriate access, and estimated bills will decrease.

Energy usage data

We'll have fewer energy cost inquiries because customers can monitor their own energy usage online at www.pge.com.

Customer installation: before, during and after

-
- 1 Two to eight weeks prior to installation, the customer will receive:
- **Installation letter:** This letter explains what to expect during the installation process and identifies the meter(s) to be upgraded.
 - **Two-sided insert:** Included with the installation letter, the insert describes the short- and long-term benefits of SmartMeter™ technology.

-
- 2 Day of installation
- A PG&E representative or an authorized contractor from Wellington Energy, Inc., will knock on the customer's door before starting the work.
 - The customer doesn't need to be home as long as the installer has access to the meter(s).
 - The installer will replace the existing electric meter with a digital electric meter and add a small module to the gas meter.
 - The installer will leave a door hanger after the installation is complete.

Note: The upgrade doesn't require an interruption in gas service, but electric service could be interrupted for approximately five minutes. If so, customers may need to reset digital clocks on their appliances or equipment.

-
- 3 After installation
- PG&E meter readers will continue to read meters on a monthly basis until the SmartMeter™ device begins transmitting the meter reads automatically. Once their SmartMeter™ devices are connected to the system, customers will be able to log on to www.pge.com/myaccount to view and track their hourly electric and daily gas usage up to the previous day.

-
- 4 Continued learning
- Once the SmartMeter™ installation is complete and the meter begins transmitting data, customers will receive a booklet filled with important information about how to use their SmartMeter™ technology to better manage their energy use and costs as well as about how it will enable our energy future.

For more information about PG&E's SmartMeter™ program, visit www.pge.com/smartmeter or call our SmartMeter™ line at 1-866-743-0263.



Frequently asked questions

Q: Why is PG&E upgrading to SmartMeter™ technology?

A: The PG&E SmartMeter™ program is part of a statewide effort, approved by the California Public Utilities Commission (CPUC), to upgrade California's energy infrastructure. SmartMeter™ technology will enable new tools and programs that can help our customers learn more about how they use energy, understand how their usage affects their bills and make changes to their usage habits to save energy and reduce costs.

Q: What is a Smart Grid and what role does the SmartMeter™ program have in its development?

A: A Smart Grid is an intelligent monitoring system that keeps track of all electricity flowing through the system using two-way digital technology that allows customers to see how and when they use energy. Modernizing the electrical system to be stronger, smarter and more efficient is essential to encouraging growth in renewable energy sources, empowering consumers to reduce their energy use and costs and laying the foundation for sustainable, long-term economic expansion.

The evolution to a Smart Grid is a vital step toward realizing California's vision for a low-carbon, clean-energy economy, and SmartMeter™ technology is the foundation for this change. We believe this technology is a sound and wise investment for our customers, our economy and our environment.

Q: What are the benefits of the SmartMeter™ program?

A: There are a number of benefits for SmartMeter™ customers, including the ability to view energy usage data online within a day of actual usage or in near real time on the meter, which helps customers better manage their energy use and costs. The technology will also give customers the ability to obtain electric service within minutes and will enable faster power restoration.

In addition, SmartMeter™ residential customers have access to pricing plans like SmartRate™ that reward energy reduction on peak days. A number of future capabilities are planned, including customer notifications via text and email to provide information about energy usage and the likelihood of moving into higher pricing tiers, and PG&E's Home Area Network that will enable customers to remotely manage a new generation of smart appliances in the home, like dishwashers and clothes dryers.

Q: How does PG&E ensure that SmartMeter™ meters are accurate?

A: Before PG&E began installing SmartMeter™ technology, our manufacturing partners rigorously tested the new technology. Each meter is tested at the factory, with a number of meters being spot tested again prior to installation. In addition, PG&E randomly inspects and field tests meters during and after installation. If a customer asks to have their SmartMeter™ device tested, we will work with that customer to investigate the situation, test the meter and provide all the information needed to resolve the issue.

Q: Why is the CPUC randomly testing SmartMeter™ meters?

A: The CPUC is conducting an independent assessment of PG&E's SmartMeter™ program to provide additional verification of the accuracy of SmartMeter™ technology—including the meters, the communications system and PG&E's billing software—for our customers' reassurance. PG&E is committed to ensuring the accurate measurement of our customers' energy use and welcomes this third-party testing.

Q: If SmartMeter™ devices are accurate, why do some customers have higher bills?

A: A number of factors can increase a customer's bill from month to month, including hot or cold weather, being at home more often, having visitors or additional people living at the home and getting a new electronic device, such as a TV or computer.

Recent rate increases or failing to re-enroll in financial assistance programs that provide discounted electric rates can also cause a customer's bill to increase. With California's tiered pricing system, people pay more for electricity as they reach certain levels of consumption. In some cases, increased energy use could disproportionately increase a customer's monthly energy bill.



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Q: Is SmartMeter™ technology the cause of the bill increases in Bakersfield?

A: No. A number of factors contributed to the perceived connection between SmartMeter™ devices and bill increases, including an increased number of extremely hot days during the month of July, which led to higher energy use (greater than 95 degrees), a previously scheduled rate increase taking effect and customers who didn't realize that they needed to re-enroll in financial assistance programs to continue receiving discounted electric rates.

Of the 230 complaints from customers at Bakersfield and Fresno Town Hall meetings, PG&E has contacted 95 percent of these customers to resolve their issues - 101 customers experienced higher usage during the summer, 44 had similar or lower usage but were impacted by rate increases, 14 didn't actually have a complaint, 13 had not re-enrolled in the CARE program, 12 did not have a SmartMeter™ device, 10 had a complaint that wasn't related to SmartMeter™ technology and five had an estimated bill issue, which we addressed.

Q: How are electric rates set?

A: PG&E's electric rates are set through a process overseen by government regulatory agencies, with full public input. Rates include authorized costs to provide electricity generation, transmission and distribution services, including a fair rate of return on capital provided by PG&E investors. They also factor in state-approved incentives to encourage energy efficiency and renewable energy, and funding for programs to help lower-income customers afford electricity.

Q: Why does California have a tiered-rate system for residential electric customers?

A: By California law, all electric utilities must charge more per energy unit as the customer's energy use increases. This policy gives customers a financial incentive to conserve energy. Currently, energy use is divided into five tiers, with higher prices for each higher tier of use.

Q: Does PG&E earn more money by selling more electricity?

A: No. PG&E collects a fixed level of revenue, determined by independent regulators, regardless of actual energy sales. If energy sales are higher than the approved level, the excess revenues go back to customers. If sales are lower than the approved level, the shortfall is recovered the next year through a rate adjustment. PG&E actually earns incentives by achieving energy efficiency targets that may reduce sales. This system has helped California keep per-capita energy use flat over the past 30 years, while the rest of the nation has seen a 50 percent increase.

Q: Is SmartMeter™ technology and the network it uses to communicate safe?

A: Yes. SmartMeter™ technology is safe and more than 76 million meters are in use around the world each day. In fact, the radio frequency (RF) fields generated by SmartMeter™ technology are generally far weaker than the levels produced by many devices found in everyday environments, such as cell phones, microwave ovens and wireless Internet services.

The World Health Organization has reviewed this issue in-depth and has not concluded that low-level, long-term RF exposure causes negative health impacts. A study of RF fields produced by the transmitting components of SmartMeter™ devices shows the devices comply with applicable Federal Communications Commission regulations by a very wide margin.

Q: Is the customer's personal information secure with SmartMeter™ technology?

A: Yes. PG&E has done extensive testing and preparation to ensure that the SmartMeter™ network is protected and that customer data is safe. We require our vendors to meet strict security guidelines and work quickly if any potential security issues arise.

Q: Does the SmartMeter™ device allow PG&E to see which appliances a customer is using and when?

A: No. SmartMeter™ technology transmits the customer's total energy use at 15-minute or hourly intervals for billing purposes only. PG&E can see the customer's energy use, but keeps this information private. The goal is to encourage customers to use this information so they can adjust their energy use and save money.

Q: Will my neighbors be able to see my energy usage patterns?

A: No. the technology that communicates a customer's data back to PG&E is private and secure. It can be compared to a phone network that shares many calls but keeps them all separate.

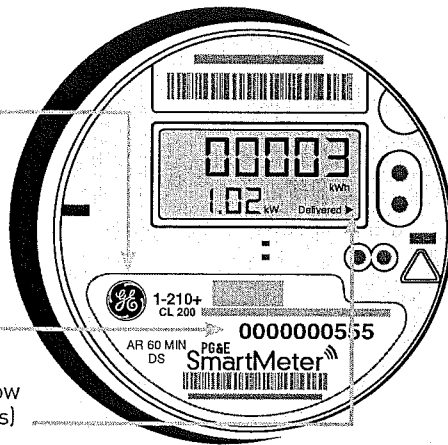
Q: Can PG&E customers opt out of the SmartMeter™ program?

A: PG&E's SmartMeter™ program was approved by the CPUC for all PG&E customers and does not have an opt-out option. We work with our customers on a case-by-case basis regarding any concerns they may have.

How to read your meters—quick reference guide

How to read your GE-brand electric meter

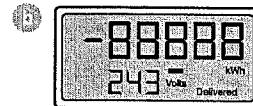
- GE Logo:**
Confirm you have a GE-brand meter
- Meter Number:**
This is the number shown in the Electric Account Detail of your energy statement under the heading Meter #
- Digital Display Window:**
Check your energy use (see below and right for display descriptions)



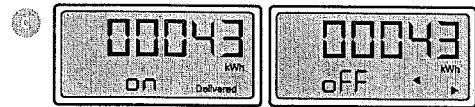
Your GE SmartMeter™ electric meter automatically cycles through four displays.



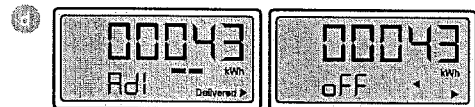
The **five-digit number at the top** is the amount in kilowatt hours (kWh) of energy you have used to date since the installation of the meter. For reference, if you leave a 100-watt light bulb on in your home for one hour per day for 30 days, the energy used is 100 watts × 30 hours = 3,000 watt hours, or 3 kWh. The **three-digit number at the bottom** is the actual amount of energy you're using right now. For instance, 1.02 means you're using 1.02 kilowatts—or 1,020 watts.



The **number 88888** with all the elements lit verifies that the display is working properly. The **three-digit number at the bottom** is the actual voltage (or electrical potential) right now.



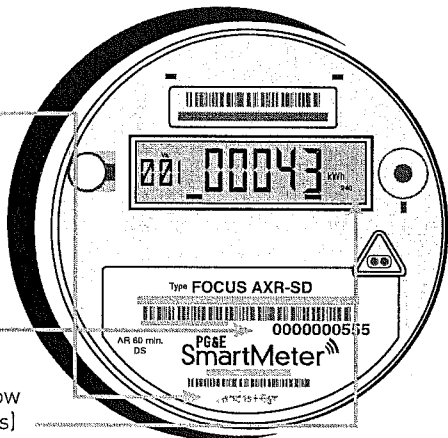
On indicates the switch is closed, and power is being delivered. **Off** indicates the switch is open, and power is not being delivered.



AdI (for Advanced Distribution Infrastructure) displays when the meter is communicating with the on-board SmartMeter™ module. **Delivered**, at the bottom right of the displays, indicates use. If there is no power being used, it doesn't display.

How to read your Landis+Gyr-brand electric meter

- Landis+Gyr Logo:**
Confirm you have a Landis+Gyr-brand meter
- Meter Number:**
This is the number shown in the Electric Account Detail of your energy statement under the heading Meter #
- Digital Display Window:**
Check your energy use (see below and right for display descriptions)



Your Landis+Gyr SmartMeter™ electric meter automatically cycles through either three or five displays, depending on your model.



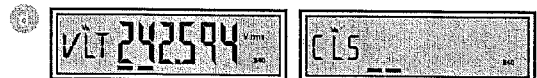
This **five-digit number** is the amount in kilowatt hours (kWh) of energy you have used to date since the installation of the meter. If you leave a 100-watt light bulb on in your home for one hour per day for 30 days, the energy used is 100 watts × 30 hours = 3,000 watt hours, or 3 kWh.



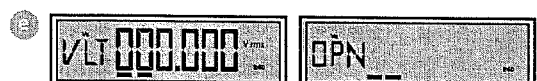
The **number 88888** with all the elements lit verifies that the display is working properly.



This **six-digit number** is the actual amount of energy you're using right now. For instance, 001.939 means you're using 1.939 kilowatts—or 1,939 watts.



VLT indicates voltage (or electrical potential) is being delivered. **CLS** indicates the switch is closed and power is being delivered. *These displays are not available on all models.*



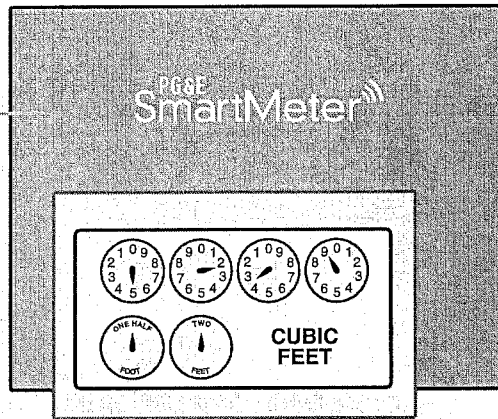
VLT reading of zeros indicates voltage is not being delivered. **OPN** indicates the switch is open and power is not being delivered. *These displays are not available on all models.*

Read the bottom section on the back to find out how to track your hourly electric use online.

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How to read your SmartMeter – residential gas meter

The SmartMeter™ gas module added between the meter and the rotary dials records daily meter reads and then transmits the reads to PG&E.



The odometer-like mechanical dials on your gas meter measure the therms of gas that have traveled through the meter into your home.

Your gas meter uses multiple clock hands and typically has four dials to read. The first and third dials spin counter clockwise, while the second and fourth dials spin clockwise. When reading the meter, if the dial is between two numbers, use the lower number. For instance, the meter pictured here reads 5, 2, 3, 9.

The two dials without numbers are used by PG&E when testing the meter for accuracy.

Read the next section to find out how to track your daily gas use online.

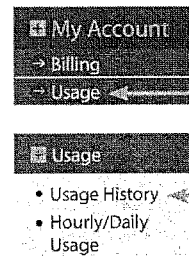
How to track your energy use online

Now for the first time ever, you can see exactly how much gas and electricity you're using up to the previous day and when you're using it. Knowing how much energy you're using puts you in control of your energy use, and allows you to make smarter energy choices.

With SmartMeter™ technology, you can track your energy use history online. If you don't already have an online account, you can set one up in just a few minutes:

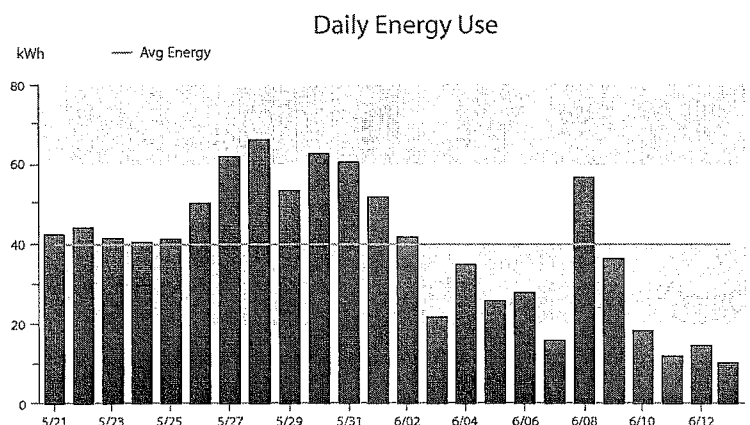
- 1 Go to: www.pge.com/myaccount
- 2 The first time, you will click on 'Sign Up'
- 3 Fill in the required information. You'll need your PG&E account number and the primary phone number on your account.

Once you've established your online account, you can 'Login' and access your gas and electric energy use history right up to the previous day at www.pge.com/myaccount.



Once you've logged in, click on 'Usage' on the left navigation bar.

Select 'Usage History' to see your month-by-month energy use and compare your monthly bills. Clicking on 'Hourly/Daily Usage' will show you hour-by-hour electric or day-by-day gas energy use information (example shown below).



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 For more information about the SmartMeter™ program, visit www.pge.com/smartmeter or call 1-866-743-0263.

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CDR-0210-0391





Marin Voice: Health fears and 'smart meters'

Robert Kavet

Posted: 09/06/2010 05:35:47 AM PDT

THIS COMMENTARY addresses recent concerns expressed in California about the safety of radio-frequency electromagnetic emissions from "smart meters."

Since the beginning of AM radio broadcasting in the United States about 100 years ago, and through the advent of FM radio and TV, radio-frequency electromagnetic waves have been ubiquitous in our outdoor and indoor environments.

Today, wireless technology is used by well over 200 million cell phone subscribers in the U.S., and thanks to wireless communications, our police, fire, and emergency medical personnel are prepared to respond instantly to critical situations.

The electric utility industry is incorporating wireless technologies into the development of a nationwide "smart grid" to deliver electricity ever more efficiently and reliably. Coordinating electric transmission and distribution infrastructure functionality with the customer interface, the resulting smart grid can achieve significant gains in reliability, capacity, and demand response and also offer value-added customer services.

An essential component of the future grid is a network of wireless communications enabling one part of the grid to communicate with another, assuring that electric load flows are evenly distributed and undesirable situations, such as outages, avoided.

"Smart meters" are an integral component of this emerging infrastructure, collecting and wirelessly transmitting data on electricity use from residential, commercial and industrial

sites. This technology thus informs customers about their electricity use and the utility about consumption patterns in its service area, enabling effective planning for load growth and other contingencies.

For example, a smart meter system can monitor and pinpoint the extent of an outage, allowing a utility to restore service more efficiently.

Here are some relevant facts about the health and safety aspects of electromagnetic fields from smart meters.

First, organizations including the Federal Communications Commission, the International Commission on Non-Ionizing Radiation Protection (which works in cooperation with the World Health Organization), and the IEEE, a professional society of electrical and electronic engineers, have all published exposure limits for electromagnetic fields based on in-depth expert reviews of the health and safety scientific literature. All agree that the only established adverse effect from radio-frequency exposure results from the heating of tissue, and correspondingly, the exposure limits protect against this effect with adequate margins of safety built in.

Second, the smart meters are programmed to transmit signals for no more than about one percent of the time, meaning they're off for about 99 percent of the time, and in many cases, more.

Third, when smart meters transmit, emission levels are very low, even at close range.

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For example, the average exposure of a person standing a foot from a typical meter operating one percent of the time would be less than one percent of the FCC exposure limit; at a yard this would diminish to less than one-tenth of a percent. Thus, the exposures to smart meter emissions are neither long enough nor strong enough to approach the safety standards set by the FCC and other bodies.

Even prior to large-scale deployment of smart meters, the U.S. Department of Energy's National Energy Technology Laboratory stated in a 2007 report that implementing automated metering infrastructure "must be of highest priority since it is the first step in building the modern grid." The electric utility industry is committed to infrastructure that delivers on the great promise of smart grid technology in a manner that preserves the safety and confidence of utility customers across the country.

Robert Kavet is a senior technical executive at the Electric Power Research Institute in Palo Alto. The nonprofit institute has done consulting work for PG&E and other companies. He earned a doctorate in respiratory physiology and master's degree in environmental health sciences, from Harvard School of Public Health.

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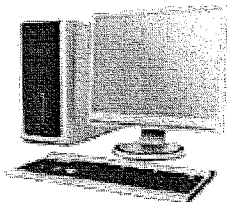
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Federal Communications Commission
Washington, D.C. 20554

August 6, 2010

Ms. Cindy Sage
Sage Associates Environmental Consultants
1396 Danielson Road
Montecito, CA 93108-2857

Dear Ms. Sage:

Thank you for your letter of March 15, 2010, in which you request that we review compliance with FCC radiofrequency (RF) exposure limits for the "Smart Meter" technology being implemented by utilities across the country. In particular, you expressed concern about multiple adjacent Smart Meter installations used to service multiple dwellings such as condominiums, and the effect of increased data traffic on exposure from collector or controller units.

The FCC Equipment Authorization (EA) program in the Office of Engineering and Technology has taken a very conservative approach to RF exposure compliance for low-power network devices such as Wi-Fi base stations and Smart Meter transceivers. For such devices that are not expected to be used close to the body, it is generally unnecessary to perform routine specific absorption rate (SAR) evaluations as field strength or power density is a sufficient and appropriate measure of exposure. The maximum field strength at a distance can be derived from the effective radiated power (ERP). Also, FCC field strength limits, like the SAR limits, are time-averaged. Accordingly, for devices that will not be used within 20 centimeters of the body, we rely on the "source-based" time-averaged ERP and require that it be less than our specified values of 1.5 or 3 watts, depending on frequency,¹ in order to ensure compliance with our exposure limits. This does not imply that FCC exposure limits will be exceeded at distances less than 20 cm, but only that detailed evaluation of the SAR is not required if the 20 cm separation distance can be maintained.

It is useful in considering this issue to recognize that the power level specified on the Grants of Equipment Authorization issued by the EA program is the peak power as this is the power relevant to interference concerns. For exposure evaluations, however, the average power is relevant, which is determined by taking into account how often these devices will transmit. Since the purpose of these devices is to provide very infrequent information they transmit in occasional bursts. Thus, for exposure purposes the relevant power is maximum time-averaged power that takes into account the burst nature of transmission, and based on the typical maximum time-averaged transmitter power for many of these devices, they would generally be compliant with the local SAR limit even if held directly against the body.

With respect to multiple adjacent Smart Meter installations, since the antennas for each device are mounted individually on each utility meter, the separation distance from people for most of the transmitting antennas is relatively large compared to 20 cm and the

¹ See Section 2.1091(c) of the FCC rules.

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meters' contributions to the total potential exposure at any location are small, as only the nearest few transmitters can add meaningfully to the total. Further, as a practical design matter, when several of these meters are placed in a cluster, they have to communicate with a single controller. In order to ensure that the controller receives the information properly, only one transmitter can communicate with the controller at a time, eliminating the potential for exposure to multiple signals at the same time.

The general issue of cumulative exposure from an arbitrary group of transmitter installations or from all transmitters distributed in the environment can appear to be complex, but as discussed, the need for orderly communications requires that a few sources normally dominate. In addition, the exponential decrease in signal strength over distance and additional signal losses due to non line-of-sight conditions for distant sources ensures that only the contributions of nearby transmitters are significant.

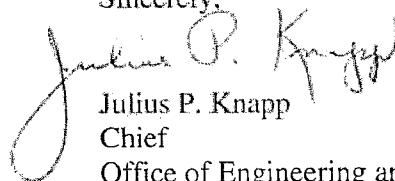
In summary, compliance for Smart Meters is determined according to the operating and installation requirements of each type of meter during equipment certification, and is based on the maximum transmission duty cycle for the device, including relay functions. Necessary installation requirements to maintain compliance for each meter are specified in the Grant. Irrespective of duty cycle, based on the practical separation distance and the need for orderly communications among several devices, even multiple units or "banks" of meters in the same location will be compliant with the public exposure limits. These conditions for compliance are required to be met before a Grant can be issued from the EA program and auditing and review of Grants is a routine function of the FCC laboratory.

With respect to interference to medical devices, which you also raise in your letter, Smart Meters typically operate under Part 15 of the FCC Rules. Those rules specify power limitations to avoid interference. The Smart Meter wireless technologies used today are not significantly different from Wi-Fi devices, cell phones and other typical consumer products. Certain medical devices may need specific precautions in many other environments; these are generally considered during FDA approval of the individual medical device.

I hope that this information will be helpful. In addition, some technical information on the subject has been developed by the Electric Power Research Institute (EPRI) and we have enclosed that information for reference.

Please know that the FCC is continually monitoring the issue of RF exposure and related health and safety concerns, both in the general terms of the continuing propriety of its regulations, and in individual cases where substantive concerns are raised.

Sincerely,


Julius P. Knapp
Chief
Office of Engineering and Technology

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