Pacific Gas and Electric Company

Brian K. Cherry
Vice President
Regulatory Relations

Pacific Gas and Electric Company
Mail Code B10C
P.O. Box 770000
San Francisco, CA 94177

Fax: 415.973.7226

October 29, 2012

Advice 3956-E-A
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: SmartMeter™ Home Area Network (HAN) Implementation Plan – Supplement

Pacific Gas and Electric Company ("PG&E") hereby submits for filing its revised SmartMeter™ Home Area Network ("HAN") Implementation Plan.

Purpose

The purpose of this supplemental advice letter is to comply with Ordering Paragraph ("OP") 1 of Resolution E-4527, which requires PG&E, Southern California Edison Company ("SCE"), and San Diego Gas & Electric Company ("SDG&E") to revise their respective "Home Area Network (HAN) Implementation Plan" filings to satisfy the intent and requirements of Ordering Paragraph 11 of the California Public Utilities Commission ("CPUC" or "Commission") Customer Data Access & Privacy Decision (D.) 11-07-056.

Background

In D.11-07-056, The Commission ordered PG&E, SCE, and SDG&E to develop a HAN implementation plan that "should include an estimated roll-out implementation strategy, including a timetable for making HAN functionality and benefits generally accessible to customers in a manner similar across all three companies."[1] The Commission directed that the HAN Implementation Plans should include "an initial phase with a rollout of up to 5,000 HAN devices, which would allow for HAN activation for early adopters upon request, even if full functionality and rollout to all customers awaits resolution of technology and standard issues."[2] D.11-07-56 also requires that the implementation strategy for HAN activation "discuss key issues,

[1] D.11-07-056, OP 11.
[2] Ibid.

such as costs, expanded data access and data granularity, current and evolving national standards & security risk mitigation and best practices, responsibilities for secure HAN connection, outcomes from working on HAN device interoperability, security testing and certification methodologies developed in collaboration with interested third parties…, customer needs and preferences, a strategy for learning from the initial rollout, and provisions for accommodating customers' efforts to utilize HAN functionality independent of the utility."[3] Lastly, D.11-07-056 orders that the "full rollout shall require smart meters to transmit energy usage data to the home so that it can be received by an HAN device of the consumer's choice."[4]

In Advice Letter 3956-E, PG&E presented its SmartMeter™ Home Area Network Implementation Plan.

Resolution E-4527 directs PG&E, SCE, and SDG&E to incorporate specific implementation requirements, as outlined in this Resolution, into a supplemental filing to modify their respective HAN Implementation Plans. As directed by Resolution E-4527, PG&E supplements its Advice Letter 3956-E with its revised HAN Implementation Plan (Attachment 1).

Protests

Anyone wishing to protest this filing may do so by letter sent via U.S. mail, facsimile or E-mail, no later than **November 19, 2012**, which is 21 days after the date of this filing.[5] Protests must be submitted to:

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

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

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

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

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[3] Ibid.
[4] Ibid.
[5] Since the end of the protest period falls on a weekend, the protest period has been moved to the following business day.

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

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

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

Effective Date

As directed in D.11-07-056, OP 11, and Resolution E-4527, OP 1, PG&E submits this advice letter as a **Tier 3** advice letter. PG&E requests that this advice filing become effective upon Commission approval.

Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the service lists for R.08-12-009 and R.08-12-009 Phase 2. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter filings can also be accessed electronically at: http://www.pge.com/tariffs/.

Brian Cherry /slo

Vice President – Regulatory Relations

cc: Service Lists for R.08-12-009 and R.08-12-009 Phase 2

Attachment 1 – PG&E's Revised SmartMeter™ Home Area Network Implementation Plan

CALIFORNIA PUBLIC UTILITIES COMMISSION

ADVICE LETTER FILING SUMMARY
ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No. **Pacific Gas and Electric Company (ID U39 E)**

Utility type:	Contact Person: **Shirley Wong**
☑ ELC ☐ GAS	Phone #: **(415) 972-5505**
☐ PLC ☐ HEAT ☐ WATER	E-mail: **slwb@pge.com**

EXPLANATION OF UTILITY TYPE

ELC = Electric GAS = Gas ☐
PLC = Pipeline HEAT = Heat WATER = Water

(Date Filed/ Received Stamp by CPUC)

Advice Letter (AL) #: **3956-E-A** **Tier: 3**

Subject of AL: **SmartMeter™ Home Area Network (HAN) Implementation Plan – Supplement**

Keywords (choose from CPUC listing): **Compliance, Metering**

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

If AL filed in compliance with a Commission order, indicate relevant Decision/Resolution #: **D.11-07-056, Ordering Paragraph 11, and Resolution E-4527, Ordering Paragraph 1**

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

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

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

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

Resolution Required? ☑ Yes ☐No

Requested effective date: Upon Commission approval. No. of tariff sheets: **N/A**

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected:

Service affected and changes proposed:

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

CPUC, Energy Division
ED Tariff Unit
505 Van Ness Ave., 4th Floor
San Francisco, CA 94102
EDTariffUnit@cpuc.ca.gov

Pacific Gas and Electric Company
Attn: Brian K. Cherry, Vice President, Regulatory Relations
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, CA 94177
E-mail: PGETariffs@pge.com

Advice 3956-E-A
October 29, 2012

ATTACHMENT 1

PG&E'S Revised SmartMeter™ Home Area Network (HAN) Implementation Plan

PACIFIC GAS AND ELECTRIC COMPANY

SMARTMETER™ HOME AREA NETWORK

IMPLEMENTATION PLAN

REVISED ON OCTOBER 29, 2012

SMART GRID TECHNOLOGIES

ORDER INSTITUTING RULEMAKING 08-12-009

CALIFORNIA PUBLIC UTILITIES COMMISSION

Prepared in Compliance with Decision 11-07-056 and Resolution E-4527

PG&E'S SMARTMETER™ HOME AREA NETWORK IMPLEMENTATION PLAN
TABLE OF CONTENTS

1. PG&E's SmartMeter™ Home Area Network Vision Statement

Pacific Gas and Electric Company (PG&E) will enable a SmartMeter™ based Home Area Network (HAN) platform that is responsive to the needs of customers and energy markets, providing near real-time electricity usage data as part of a larger ecosystem of enabling technologies that support customer driven energy management programs.

2. Background and Summary of PG&E's HAN Implementation Plan

In Decision No. 11-07-056, Ordering Paragraph 11, the California Public Utilities Commission (CPUC or Commission) required PG&E, Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E) to develop and file Smart Meter HAN implementation plans that include the following elements:

1. An estimated roll-out implementation strategy, including a timetable, for making HAN functionality and benefits generally accessible to customers in a manner similar across all three companies.

2. An initial phase with a rollout of up to 5,000 HAN devices, which would allow for HAN activation for early adopters upon request, even if full functionality and rollout to all customers awaits resolution of technology and standard issues.

3. A HAN implementation strategy that discusses key issues, such as:
   a. Costs;
   b. Expanded data access and data granularity;
   c. Current and evolving national standards and security risk mitigation and best practices;
   d. Responsibilities for secure HAN connection;

e. Outcomes from working on HAN device interoperability;

f. Security testing and certification methodologies developed in collaboration with interested third parties (e.g., Lawrence Berkeley National Laboratories or California State University - Sacramento);

g. Customer needs and preferences;

h. A strategy for learning from the initial rollout; and

i. Provisions for accommodating customers' efforts to utilize HAN functionality independent of the utility.

4. A full rollout requiring smart meters to transmit energy usage data to the home so that it can be received by a HAN device of the consumer's choice.

On November 28, 2011, PG&E filed Advice Letter 3956-E, which presented its SmartMeter™ Home Area Network Implementation Plan in compliance with D.11-07-056.

In Resolution E-4527, the CPUC directed PG&E, SCE, and SDG&E to revise their HAN Implementation Plans to satisfy the intent and requirements of Ordering Paragraph 11 of CPUC's Customer Data Access & Privacy Decision (D).11-07-056. Specifically, in compliance with Resolution E-4527, PG&E's revised HAN Implementation Plan incorporates certain specified requirements:

1. By December 1, 2012, the Utilities shall collaborate to establish and publish common requirements to validate interoperability between commercially available HAN devices and their electric smart meters.

2. By December 15, 2012, the Utilities shall collaborate to begin providing basic education to their customers about the HAN

functionality available with their smart meters and other details.

3. By January 15, 2013, the Utilities shall begin accepting HAN activation requests from customers through a common process and establish support for initially accommodating 5,000 HAN activation requests and gradually increasing to 200,000 requests, and thereafter unrestricted, on a specified timetable.

4. By February 1, 2013, each Utility shall validate at least five commercially available HAN devices as interoperable with their smart meters, publish a list of the validated devices, and continue to expand the list based on additional device testing.

As discussed in more detail below, PG&E's HAN Implementation Plan will provide its customers, on a phased schedule, the capability to receive near real time electricity usage data using HAN radio-equipped SmartMeters™ as required by the Commission. The key functionalities required to deliver real-time usage include:

1. SmartMeters™ equipped with HAN radios and appropriate meter firmware; and

2. Back-office process and systems which allow customers to register a HAN-enabled usage display device. The registration process authorizes the device to communicate with the customer's specific meter only.

PG&E will provide the real time metering information to registered devices over a three phased approach.

1. **Initial Rollout** - the required HAN platform capability and HAN devices for up to 500 customers on an initial rollout beginning March 1, 2012, with full, end-to-end customer registration and technical support. This phase will create foundational infrastructure for HAN, help PG&E in determining how

customers are engaging with the tools, and obtain customer feedback on the process and usefulness of the device and ways to optimize/improve customer experience (e.g. meter connectivity and support issues).

2. **Early Adopter** - PG&E will expand its HAN program to up to 5,000 customers starting in February 2013, providing customers with a list of at least five PG&E validated devices (i.e. the device can work on PG&E's network and provide a reasonable customer experience) that they can purchase through retail channels. Customers will be able to purchase, install and self-register the HAN device of their choice. This phase will move HAN from a utility run pilot (i.e. the Initial Rollout phase) to a platform which opens up third party products and services to customers to help manage their energy usage.

3. **Mass Market** - PG&E will provide the infrastructure to support a cumulative number of activation requests as follows:
   - 5,000 before June 30, 2013
   - 25,000 before December 31, 2013
   - 200,000 before December 31, 2014
   - Thereafter, the number of activation requests shall be unrestricted

   Note that PG&E is dependent upon the delivery of new vendor software that will enable full self-registration (though MyEnergy), a synchronous process which will enable registration to scale beyond 5,000 registration requests.

PG&E has established a set of specific objectives for the initial deployment and early adopter phases. The objectives are as follows:

1. **Customer Experience:** Help provide or support an engaging and simple customer experience for early adopters—from device acquisition, to installation/activation and timely customer issue resolution support. PG&E will educate customers on the role of the

utility, the device vendor, and the customer in activating and supporting a home area network.

2. **Lessons Learned/Market Driven Incremental Deployment:** Utilize lessons learned from initial rollout phase to shape the early adopter and mass market phases.

3. **PG&E Systems and Process Scalability:** Develop PG&E processes and systems with ability to grow to support an unlimited number of activation requests.

Table 2.1 below summarizes PG&E's HAN capability deployment, scale, timing and guiding regulatory documentation.

Table 2.1: PG&E's HAN Implementation Plan Summary

Phase Description	Capability	Scale	Timing	Guiding Regulatory Decision
Initial Rollout Phase	Near real-time energy usage (SEP 1.0)	500 (early adopters)	March to December 2012	Smart Meter™ Upgrade Program and Smart Grid OIR Privacy Decisions
Early Adopter Phase	Near real-time energy usage (SEP 1.0/1.X)	Up to 5,000 (early adopters)	Early 2013 start	Smart Meter™ Upgrade Program and Smart Grid OIR Privacy Decisions
Mass Market Phase	Near real-time energy usage (TBD; launching with SEP1.0 and moving to SEP1.1)	Beyond 5,000 customers -- ability to support unlimited number of activation requests	Late 2013 start	SmartMeter™ Upgrade Program Decision

3. HAN Implementation Plan Phases

3.1. Initial Rollout Phase: March 1, 2012 to Early 2013

PG&E initiated the Initial Rollout Phase efforts in August 2011. Current readiness of underlying components, including UIQ (Silver Spring Networks' Head-End software) and HAN Firmware make SEP 1.0 the only possible option for deployment of a HAN platform by March 1, 2012. PG&E met the March 1, 2012 deadline as ordered by the CPUC. Successful deployment by this date was dependent on several key factors, including PG&E's vendor's delivery of required firmware and head-end software in time for testing and certification by PG&E, and successful testing by PG&E to ensure that there are no critical defects or compatibility issues that would adversely affect activities such as billing or data collection from other meters in PG&E's Advanced Metering Infrastructure (AMI) network. PG&E also had other ongoing projects that were affected by UIQ and meter firmware changes which were carefully coordinated.

As part of this Initial Rollout Phase launch to validate platform capabilities and evaluate new technologies, PG&E provided up to 500 customers with usage display devices. These devices are compatible with PG&E's Silver Spring Networks SmartMeter™ system and are capable of receiving near real-time electric usage from their SmartMeter™. Installation and activation of customer devices began in March 2012 and the pilot runs through April 2013. More information can be found on www.pge.com/HAN.

Features of the **Initial Rollout Phase** include:

- PG&E provided color touch screen devices;
- High touch customer experience;
- Fully enabled customer support;
- Integrated knowledge capture/lessons learned; and
- Security driven best practices

Proven Color Touch Screen Usage Displays: PG&E selected the Control4 EC-100 In-Home Display device, as shown below, to be provided to Initial Rollout Phase customers free-of-charge. This HAN device is currently used in a large pilot at Oklahoma Gas and Electric (which currently uses the Silver Spring Networks SmartMeter™ system). This SEP 1.0 device provides near real time electric usage information for customers on color touch screen. The device also has Wi-Fi connectivity and can serve as a gateway device allowing access to internet based data (i.e. weather in this deployment).

Customers will be provided with near real time electric usage from the meter. PG&E also provided current price information on the device (note: this only addresses customers on E-1 residential rates in one baseline territory and with other qualifying criteria).

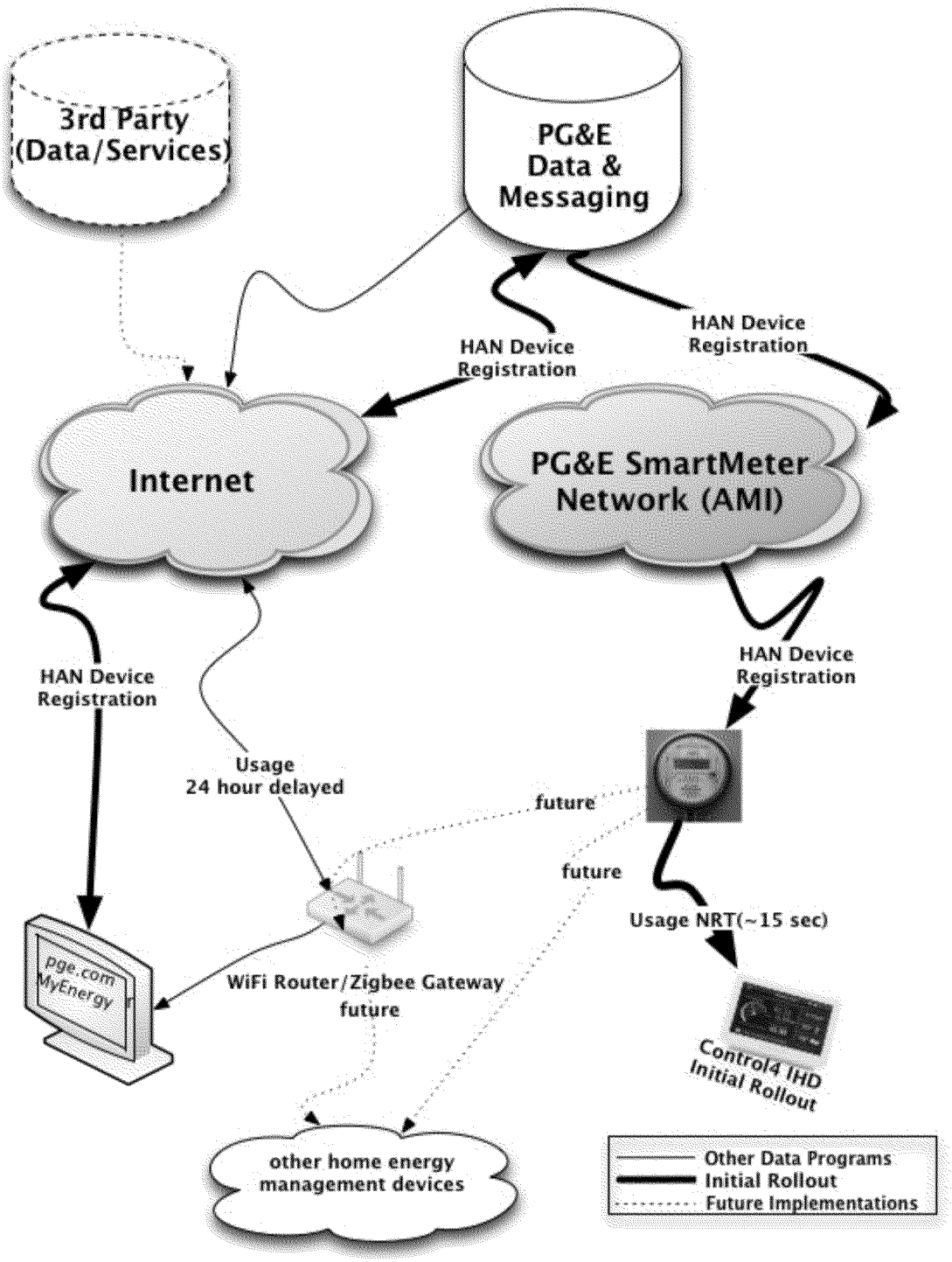
High Touch Customer Experience: PG&E provided in-home professional installation/registration of the 500 in-home display devices. The focus of the professional install is to provide a positive, success-oriented customer experience up front. While this install/register process is not a long-term cost effective solution, it is important in ensuring a positive customer experience with our customers for a highly visible technology program. Professional installation also provides PG&E with an opportunity to gain field experience with potential connectivity issues that should be expected in early phases of HAN deployment. Installers will also be able to troubleshoot the same without excessively inconveniencing customers.

Fully Enabled Customer Support: Based on our SmartMeter™ experience, PG&E provides HAN contact center personnel and other operations center support staff trained to quickly resolve issues associated with the HAN functionality. HAN related calls are routed to a specially trained HAN support team member.

Integrated Knowledge Capture/Lessons Learned: Active customer engagement through surveys, focus groups, and problem analysis will provide a knowledge base to develop lessons learned for the larger rollouts. Customers will be asked to commit to provide feedback in return for use of the device.

Security Driven Best Practices: The implementation plan will incorporate results of a security risk management plan and security test plans and will be consistent with industry security standards.

Diagram 3.1: PG&E Data Architecture



3.2. Early Adopters Phase: Early – Mid 2013

Beginning in early 2013, utilizing the lessons learned from the **Initial Rollout Phase**, PG&E will expand the use of the HAN platform to allow up to 5,000 early adopters to purchase (retail or directly from a manufacturer) and install a HAN device. The key additional features that will be implemented in 2012 to support a 2013 Early Adopter Phase launch include:

- **Device Testing - August to December 2012:** Using a gated testing methodology, PG&E is validating five SEP 1.X in-home display, gateway, repeater, and/or PCT devices that interoperate with the meters and provide reasonable customer experience. The set of validated HAN devices will be diversified in terms of functionality, cost, and suppliers. Note that any device (unless it is shown to cause issues to the network) is permitted to register to the PG&E network.

  The validation process may be exercised by the PG&E to validate commercially available third party HAN devices for interoperability on a non-discriminatory, first come–first serve basis until a robust standards-based interoperability certification process by independent third-party laboratories becomes available and is applicable to PG&E's smart meters.

- **Activation Requests - By Jan 15, 2013:** Begin accepting requests from customers via www.pge.com for activating the HAN function of the customer's electric smart meter to allow the customer to use a commercially available HAN device (of customer's choosing and obtained by the customer from the marketplace independently of PG&E) to monitor in near real-time the household electricity usage recorded by the customer's smart meter.

  PG&E will make the electric smart meter available for secure pairing to the customer's HAN device but will not be responsible for the performance or quality of the customer's HAN device. If the customer elects to use a device

other than those validated by PG&E, then PG&E will not provide further support if the device cannot interoperate with the smart meter.

PG&E will utilize a first-come, first-served approach for registering devices for qualified customers.

- **List of devices on www.pge.com – February 1, 2013:** PG&E is providing the initial list of five validated devices[1] on www.pge.com to assist customers entering into this market. Promotion of the availability of the HAN platform is anticipated to be marketed on www.pge.com as an early adopter program, with a list of approved devices and other participation requirements. PG&E will publish the list of at least five commercially available HAN devices that have been validated for interoperability with our smart meters by February 1, 2013.

- **Device testing going forward:** PG&E make a reasonable effort to expand the list of validated HAN devices within six months. PG&E can exercise discretion, in consultation with CPUC Staff, in terminating the list of PG&E validated devices when alternative means become available to communicate information about interoperable HAN devices to customers via third parties.

[1] Note that, as directed by the HIP Resolution, PG&E will not be held liable for the market success or failure of a third-party HAN device that PG&E validates or when PG&E publishes information about the validation results for these devices.

3.3. Mass Market Phase: Mid 2013 and Beyond

PG&E will open its HAN platform to mass registration (above 5,000 customers) via a self-service, web based, registration process on www.pge.com. Customers will be able to log into MyEnergy and self-register their HAN devices. PG&E is dependent upon the delivery of new vendor software that will enable this synchronous process to enable registration to scale beyond 5,000 registration requests. PG&E will provide the infrastructure to support a cumulative number of activation requests as follows:

- 5,000 before June 30, 2013
- 25,000 before December 31, 2013
- 200,000 before December 31, 2014
- Thereafter, the number of activation requests will be unrestricted

It should be noted that in PG&E's initial HAN Implementation Plan filing, PG&E proposed waiting on SEP 2.0 to support secure, interoperable, and reliable HAN devices that are accurate and convenient for consumer use before scaling above 5,000 customers. It should be noted that the Resolution requires scaling based on timeline and depending on timing of SEP 2.0 finalization, significant back office and meter firmware modifications may be required to support future SEP 2.0 device deployment. Also, SEP 1.X devices may not be upgradeable to SEP 2.0.

Going forward, PG&E will continue to monitor and help shape, where appropriate, HAN market developments, including maturation of the SEP standards, security/privacy standards, deployment of dynamic pricing models, customer-driven energy efficiency and demand response programs, internet only provided data platforms and HAN provided data platforms, and the development of the device retail channel market.

4. Customer Outreach, Education and Support

Prior to rolling out HAN network services to customers, PG&E will complete a customer outreach and education plan. This will ensure that customers who use HAN devices and connect those devices to PG&E's HAN network are fully aware of the attributes and benefits of the new technology as another tool to assist in understanding and managing energy use. PG&E's customer research and analysis, as well as its experience with SmartMeter™ technology, has demonstrated that this preliminary customer outreach and education is essential to a positive and beneficial customer experience with the new HAN technology.

PG&E will provide education on its website, beginning December 15, 2012, to customers about HAN including:

- information about the HAN function available with its electric smart meters, its potential applications and benefits, potential interoperability risks associated with HAN devices that have and have not been subjected to interoperability validation tests; and

- The respective responsibilities of PG&E, the third party HAN device supplier, and the customer in 1) achieving device pairing with the smart meter, 2) meeting device performance and quality expectations, and 3) protecting customer's usage data, network and appliances.

4.1. PG&E's Customer Outreach and Education Strategy for Learning from Its Phased HAN Implementation Plan

As part of its HAN Implementation Plan, PG&E will actively engage with customers to capture learnings, which include:

- Obtaining customer feedback on the registration and customer support process

- Objective evaluation of the technology (connectivity stability, accuracy)

- Evaluate the device certification; registration and customer support processes to establish a sustainable model

4.2. Provisions for Accommodating Customers' Efforts to Utilize HAN Functionality Independent of the Utility

PG&E believes that for the foreseeable future, customers will need to register/deregister devices with PG&E because as the current SmartMeter™ architecture requires that any new HAN device(s) be recognized by the meter as a trusted device, as the current HAN provisioning capability requires integration of the HAN device with PG&E's SmartMeter™ back office applications (UIQ HCM). However, as part of PG&E's ongoing evaluation of new technologies associated with advanced metering, PG&E will test and validate (if testing criteria is met) gateway device which can communicate via the HAN link with the meter and ZigBee or via Wi-Fi to downstream devices (e.g., programmable communicating thermostats, electric vehicle systems, and smart appliances). PG&E will monitor customer preferences and HAN market developments.

5. Security and Standards Applicable to HAN Implementation Plan

5.1. Current and Evolving National Standards and Security Risk Mitigation and Best Practices

5.1.1. Platform Standards

All of PG&E's electric meters contain an 802.15.4 ZigBee HAN radio, which is consistent with the HAN radio selection of the majority of the utility industry. Most of the installed and planned smart meters at other utilities also contain a ZigBee radio for HAN communications to connect a premise with the grid. Other non-radio frequency (RF) solutions available in the marketplace for the utility to communicate with a customer include powerline carrier solutions. A broadband (internet) solution may also be a

viable solution for delivering pricing, messages, and load control signals, however the ZigBee channel is a unique connection to the utility since the AMI network is fully owned and operated by the utility and is perceived by some to be more reliable for key messages (e.g., demand response) than third-party-owned internet connections within a home. About 30 percent of California residents do not have a broadband internet connection. [2] The AMI channel will be used to at least deliver a minimum set of information (e.g., real-time consumption and demand) to our customers that would like this information and to provide universal coverage and benefits to those customers without a broadband connection.

ZigBee was selected as the HAN communication protocol at PG&E based on the following functionality assessment:

- Low cost;
- Low power usage; and
- Mesh networking and reach.

The dominant standard to date within this market has been the ZigBee SmartEnergy (ZSE) protocol. The ZSE 1.0 protocol (released in December 2004) left many items optional and lacked many of the security items needed to realize a truly secure, interoperable, plug and play standard. The SEP 2.0 specification is intended to close these gaps and is widely seen as the way towards a dominant meter to in-premise communication. The ZigBee SEP 2.0 specification is an IP-based application specification that has been identified by ZigBee Alliance, Wi-Fi Alliance, HomePlug Alliance, the Society of Automobile Engineers (SAE), and the National Institute of Standards and Technology (NIST) as the common protocol for energy information and control in the home and for electric vehicles.

[2] Public Policy Institute of California,"California's Digital Divide," August 2010.

Table 5.1 below provides a quick overview of other prominent home energy management standards in the marketplace along with their pros and cons.

Table 5.1: Prominent Home Energy Management Standards

Name	Description	Pros	Cons	Market Presence
Smart Energy Profile 2.0	Standard for interoperable products that monitor, control, inform and automate the delivery and use of energy	▪ Low cost ▪ Low power ▪ Reach within premise (mesh networking)	▪ Path from ZSE1.0 to SEP 2.0 introduces the risk of stranded assets ▪ Limited flash memory in some legacy devices ▪ Uncertainty in standard completion timeline ▪ Uncertainty in interoperability across multiple types of network	Widely seen as the dominant standard by most utilities with AMI deployments (actual and planned)
ZigBee Home Automation (HA)	Standard for interoperable products enabling smart homes that can control appliances, lighting, environment, and security, as well as the expandability to connect with other ZigBee networks	▪ Low cost ▪ Low power ▪ Reach within premise (mesh networking)	▪ Does not support the metering functions needed for communication with utility AMI meters (only for home automation without utility connection). Requires ZigBee HA Gateway	Widely adopted in home automation products Would need to link to ZigBee SmartEnergy (e.g., through a gateway or hub) to connect with the utility

Table 5.1: Prominent Home Energy Management Standards (Continued)

Name	Description	Pros	Cons	Market Presence
Wi-Fi	Institute of Electrical and Electronics Engineers (IEEE) based standard for high speed wireless local area networks (LAN)	▪ Speed. Faster than ZigBee or Z-Wave ▪ Ability to serve up data rich applications ▪ Household penetration of Wi-Fi devices	▪ No open mesh standard is available ▪ Battery powered Wi-Fi may be impractical ▪ May be complicated to re-boot gateway	Wi-Fi is widely adopted and known by consumers Good for gateway applications
HomePlug	HomePlug "Green PHY" specification allows users to plug devices directly into the wall where electrical wires serve as the communications backplane (powerline carrier)	▪ As long as there is electricity, there is a network ▪ Low speed ▪ Low cost ▪ Ease of set up (plug it in) ▪ Enables hard to reach premise connections	▪ Limited data can be transmitted (narrow band communication) ▪ Chipsets are not yet widely available	Not yet a dominant market player but widely seen as a good solution for Multi Dwelling Units (MDU)/hard to reach premises, especially if Home Plug is involved in the development of SEP 2.0
Z-Wave	Proprietary specification	▪ Low frequency/ long range ▪ Reliable signal ▪ Established in retail channels and within home automation and security products ▪ Good interoperability between devices	▪ Proprietary ▪ Membership is expensive	Established in-home automation and security products Not an open standard. Not attractive for utilities/smart grid products, but may be featured in gateway/hub products

5.2. Responsibilities for Secure HAN Connection

PG&E's HAN solution architecture will require a customer to provide device ID information (e.g. MAC address and Install code) in order for the customer's device to be added to the list of the meter's trusted devices. This registration function currently is maintained by each of the IOUs in California, in part due to the different smart meter solution between PG&E (Silver Spring Networks system) and SCE/SDG&E (Itron system). PG&E will follow standards based, secure processes when opening a customer's meter for secure registration with their device. PG&E will make reasonable efforts to connect the customer's device to their smart meter, however PG&E cannot guarantee successful registration in all cases. If the customer elects to use a device other than those validated by PG&E, then PG&E will not provide further support if the device cannot interoperate with the smart meter.

Additionally, PG&E will not be responsible for the performance or quality of the customer's HAN device or identifying or resolving issues caused the HAN device (e.g. issues with other wireless networks or other devices), and PG&E will not be responsible if a customer decides to share their device or metering/consumption information with a third party.

5.3. Security Testing and Certification Methodologies Developed In Collaboration with Interested Third Parties (For Example, With Lawrence Berkeley National Laboratories or California State University-Sacramento)

PG&E views cyber security as an essential, fundamental and embedded tenet to the evolution of the Smart Grid. PG&E recognizes that customer HAN devices can present security challenges if deployed without the appropriate controls. Protecting sensitive data, including customer energy use, requires utilities, consumer groups, and vendors to collaborate and develop secure software, hardware, security tools and new standards that are appropriate to this environment. PG&E's existing information security and cyber security policies and standards will be leveraged and further evolved to secure the Home Area Network devices.

Threats in the HAN environment must be well assessed, understood, and addressed in order to protect our networks, customer data and PG&E's overall reputation. As a result, efforts are underway to partner with meter penetration testing teams to better understand the risks involved with HAN devices. This evaluation will encompass the cyber and physical risks these devices and overall architecture introduces to the utility network. Risks identified with this process will be clearly delineated to the business stakeholders so that proper mitigation strategies can be analyzed and executed.

6. Interoperability and Collaboration with Other Utilities

PG&E will collaborate with other California IOUs and other parties, as needed to develop the following:

- **Testing Requirements and Process (to be published in a joint Tier 1 Advice Letter by December 1, 2012)**: PG&E will collaborate to develop a common set of reasonable requirements to be satisfied by a HAN device supplier for its device to be eligible for interoperability validation testing and a common testing process for validating interoperability between PG&E's electric smart meters and commercially available HAN devices offered by third parties for the purpose of monitoring in near real-time the electricity usage recorded by smart meters.

- **Customer Education (available on www.pge.com beginning December 15, 2012)**: PG&E will collaborate with the other IOUs and third parties to provide basic education on its website to customers about the HAN function available with their electric smart meters, its potential applications and benefits, potential interoperability risks associated with HAN devices that have and have not been subjected to interoperability validation tests, and the respective responsibilities of the Utility, the third party HAN device supplier and the customer in 1) achieving device pairing with the smart meter, 2) meeting device performance

and quality expectations, and 3) protecting customer's usage data, network and appliances.

- **Third Party Laboratories**: PG&E is also working with the other IOUs and third parties to support the establishment of independent third-party laboratories that can conduct HAN device interoperability testing relative to the Utilities' smart meters; however, the Utilities will not be responsible for the financing, ownership, or operation of such laboratories. Moving the testing to third party laboratories will alleviate the need for testing by the individual Utilities.

7. Data Access and Granularity

PG&E envisions near real-time usage data (~15 seconds old) to be provided by the HAN platform while historical usage data will be provided by PG&E's back-office systems through the MyEnergy website or other methods, such as OpenADE.

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