



CA Investor-Owned Utilities' Home Area Network Device Eligibility and Compatibility Validation Guide

We're committed to offering customers choice, control and convenience over how they manage their energy use. We welcome you to our Home Area Network testing process and hope that you find this information useful.

This guide is for Home Area Network Device Manufacturers who are interested in subjecting their commercially available Home Area Network (HAN) devices to testing by California's three major electric Investor-Owned Utilities—Southern California Edison Company (SCE), Pacific Gas and Electric Company (PG&E) and San Diego Gas and Electric Company (SDG&E) to receive CA Investor-Owned Utility (IOU) validation for their commercially available HAN devices. The validation is given when the devices are tested and proven to be able to join safely and securely to our smart meters.

The California IOUs will continue to collaborate about the testing requirements and reserve the right to make periodic changes at any time to this guide. Refer to the utilities' websites for the latest version of the guide.

This document was produced pursuant to California Public Utilities Commission Resolution E-4527 ("HAN Implementation Plan Resolution").

Table of Contents

INTRODUCTION.....	3
<i>OVERVIEW.....</i>	3
<i>SMART METERS.....</i>	3
<i>VALIDATION ASSUMPTIONS</i>	3
<i>ACCEPTED DEVICE TYPES.....</i>	4
<i>HAN DEVICE COMPATIBILITY WITH SMART METERS.....</i>	4
DEVICE SUBMISSION PROCESS	5
<i>OVERVIEW.....</i>	5
<i>SUBMISSION</i>	5
<i>VALIDATION QUEUE</i>	5
<i>INTEROPERABILITY TEST CASES</i>	5
<i>SECURITY TEST CASES</i>	5
<i>PERFORMANCE FEEDBACK</i>	5
<i>DEVICE ACCEPTANCE OR REJECTION</i>	5
<i>METER HARDWARE AND FIRMWARE UPDATES</i>	6
<i>DEVICE RETESTING AND REVALIDATION REQUIREMENTS.....</i>	6
DEVICE SUBMISSION FORM, APPLICATION AND AGREEMENT.....	7
RELEASE AND LIMITATION OF LIABILITY	9
APPENDIX A, INTEROPERABILITY TEST CASES.....	11

INTRODUCTION

Overview

This guide provides Home Area Network (HAN) device manufacturers and other stakeholders a comprehensive overview of the California IOUs' HAN device eligibility and compatibility validation process. CA IOUs are pleased to open its process to test HAN devices so that these devices can get into the marketplace and become more widely available to our customers. This guide assumes the reader possesses some basic level of HAN device knowledge and the Smart Energy Profile (SEP) standard for HAN devices.

The goal of the validation process is to test eligible HAN devices in order to provide CA IOU customers a public list of devices that are network compatible with their utility's smart meters. **The devices on this public list must be commercially available for end-use customers to purchase.**

Please be aware that this device validation process is not a certifying body. The role of this process is not to ensure that submitted HAN devices will function as described by their manufacturers regarding all areas of their promised functionality. Rather, **this process is to test and validate that the submitted, eligible HAN device can successfully pair with the smart meters at the respective utility and their specific hardware /firmware meter versions in order to provide customers with their real-time energy use.**

Due to the continuing evolution of the technology, this guide is subject to ongoing revisions as CA IOUs modify the validation process to accommodate and encompass new developments in both HAN and smart meter technologies. Please note that the testing for each IOU may be done at the utility's lab or a third party lab (the "testing body"). This testing may involve a fee. For more information on the device validation testing process for each utility, please refer to each IOU's website (refer to "device submission process" section, below, for website information).

Smart Meters

Deployment in service territories:

- PG&E has deployed approximately 4.8 million Silver Springs Network (SSN) electric smart meters through its service territory.
- SDG&E has deployed approximately 1.4 million Itron smart meters throughout its service territory.
- SCE has deployed approximately 5.3 million Itron and Landis and Gyr (L&G) smart meters throughout its service territory.

Validation Assumptions

Each IOU's testing body operates under the following test conditions:

- There are ZERO known issues with the device when it is submitted.
- Each HAN device submitted for validation must be submitted in the same packaging as the device will be sold in.
- It is required that the MAC address and Install Code be printed on the actual device itself or available programmatically within the device.
- Private profiles/clusters are not allowed.
- Number of devices allowed to connect to the meter:
 - PG&E – SSN enabled GE and L&G residential and small commercial customer meters will be tested with the devices. Up to 20 devices can be provisioned to the meter; however PG&E strongly recommends using a gateway device if a customer intends to connect more than 5 devices.
 - SDG&E - Itron residential meters used by SDG&E are tested with the devices. Up to 3 devices can be provisioned at any given time.
 - SCE – SCE will conduct HAN device testing using Itron smart meters with a mixture of hardware, firmware, and configurations. Up to 5 devices can be provisioned at any given time.

Accepted Device Types

Each IOU's testing body is familiar with and able to validate the following HAN device types that connect directly to the smart meter:

- Gateways
- In-Home Displays
- USB dongles
- Load Control Devices and Plug Load Controls
- Programmable Communicating Thermostats (PCT)
- Range Extenders
- Smart Appliances

HAN Device Compatibility with Smart Meters

CA IOUs **require** that the HAN devices be tested with Itron, and/or SSN meters to make sure successful meter pairing and connectivity is possible before submitting your device to the CA IOU(s) of your choice. Confirming your device is compatible with the meter manufacturer's technology is paramount within the IOUs' HAN environments. Note that testing with a test harness does not replicate testing with the physical meter hardware and firmware combination for the utility. There are situations where a device may pass the test harness and fail testing with the physical meter hardware and firmware combination.

For more information on these meter manufacturers' test harnesses, please refer to:

SSN – <http://www.silverspringnet.com/partners/partner-registration.html>

Itron – <https://itron.com/na/ContactUs/Pages/default.aspx>

DEVICE SUBMISSION PROCESS

Overview

This section describes how to submit your HAN devices for validation. For more information on the testing process for each utility, including what meter manufacturer and firmware versions are currently in production, please refer to each IOU's website. Any updates to each utility's process will be posted on their respective websites.

PG&E: www.pge.com/HAN (*vendor information will be available online starting Jan 2013*)
SDG&E: www.sdge.com/hantest
SCE: www.sce.com/HANTesting

Submission

Completely fill out, sign and submit your HAN Device Submission Form, Application and Agreement via email with a copy of all required documents. All items on the HAN Device Submission Form, Application and Agreement are mandatory unless indicated otherwise. Email your documents to:

PG&E - HANvalidation@pge.com
SDG&E - HANvalidation@semprautilities.com
SCE - HANvalidation@sce.com

Upon receipt of your submission documents, each utility will make sure that all required information have been provided and will then clear your device for submission. You will be notified by email to send **the four devices (or two devices, in the case of appliances)** and all applicable items noted in the submission form to an address provided by the utility.

Device hardware and firmware versions submitted for validation testing must be those that will be sold to customers and must match the SEP certificate. If they don't, please contact certification@zigbee.org to obtain instructions on how to get your devices submitted for retesting and recertification. Resubmit your application to the IOUs for validation testing once all documentation has met the mandatory requirements.

If additional information is needed, the utility will contact you.

NOTE: Do not send your device samples without first emailing a completed and signed HAN Device Submission Form, Application and Agreement, all required items, and receiving an email from the utility to mail your devices. Otherwise, the utilities cannot track your devices and it will prevent us from placing them in the validation queue.

Validation Queue

Your HAN device is placed in the validation queue upon receipt. The utility testing body will notify you via email when the HAN device enters the validation queue.

Interoperability Test Cases

The CA IOU's testing body will test the interoperability use cases indicated in *Appendix A*. These use cases are tested on all types of HAN devices submitted for validation.

Security Test Cases

Each IOU may have additional security test cases that are unique to that utility (i.e. back office systems, infrastructure, and meter hardware and firmware). Each utility will provide you with instructions on completing any additional security test cases when they clear your device for submission to the validation testing.

Performance Feedback

Throughout the validation process, the testing body gathers and records feedback on your HAN device. If the testing body encounters an issue with your device, a representative may contact you for input. Otherwise, at the end of the testing process, the testing body will provide you with a copy of the test case results on your device (see *Appendix A* for the list of interoperability test cases).

Device Acceptance or Rejection

If your HAN device passes all mandatory use cases, your device will be accepted and becomes part of the utility's list of validated HAN devices.

If your device fails one or more of the use cases, it will receive an overall "Fail" result. The testing body will return the test report noting which use case(s) failed.

If you have given the testing body permission to keep your HAN devices, they will keep the devices for future testing between devices, lab purposes, and demonstration events.

If you have not given the testing body permission to keep your HAN devices, they will send the remaining devices back to you. Note that some device may be destroyed in the testing process as part of the testing.

Meter Hardware and Firmware Updates

As each CA IOU uses new meter hardware or meter firmware in the future, you will have the option of having your device retested with the new hardware/firmware combinations. The CA IOUs understand that such meter changes may interrupt or impact device network compatibility.

CA IOUs cannot be responsible for ensuring that validated devices remain compatible. It is the manufacturers' responsibility to disclose this to purchasers of their devices. *Such updates may require device changes or updates by you, and retesting if you wish them to be re-validated.*

The latest version of meters, hardware and firmware combinations can be found on the individual utilities' websites provided above.

Device Retesting and Revalidation Requirements

The following criteria will require mandatory device retesting and revalidation:

- 1) The utility updates their meter hardware or meter firmware.
- 2) If manufacturer makes any changes to the device (i.e. firmware or hardware)..
- 3) Addition/exposure of a new feature and/or cluster to the ZigBee firmware.
- 4) Layout change of the module used; HW, SW or FW changes for the device(s) that the ZigBee stack and app are running on, with the exception of changes in interface that do not affect ZigBee or radio functionality (color display vs black and white, push button light switch vs paddle switch, etc.)

Note: The last three criteria above also follow the ZigBee SEP retesting requirements.

In addition to the above mandatory retesting and revalidation requirements, the testing bodies reserve the right to retest all previously validated devices at any time.

DEVICE SUBMISSION FORM, APPLICATION AND AGREEMENT

MANUFACTURER INFORMATION		
Business Name ("Applicant"): ADDRESS:	Lead Business Contact Name: Email: Phone: Lead Technical Contact Name: Email: Phone:	
DEVICE CERTIFICATION <i>Answers must be "Yes" on #1 - #4 below before the lab can invite you to send devices for validation</i>		
1. Is the device SEP certified? Please attach a copy of the certificate and PICS document.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2. Does the device have production certificates?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
3. Is the device FCC certified? <i>Please attach a copy of the certificate.</i>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
SUBMISSION INFORMATION		
4. Has this device been previously submitted (on different hardware or firmware versions, for instance)? If so, to which testing body? What were the results? If it did not pass, please explain:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
5. Have you tested your device with an Itron meter? a. If yes, at what type of event? (E.g. at another utility, an interoperability event, or with a development kit obtained from Itron)? _____ b. What meter hardware, form factor, firmware version, and model did you test with your device? _____	<input type="checkbox"/> Yes	<input type="checkbox"/> No
6.. Have you tested your device with a SSN meter? a. If yes, at what type of event? (E.g. at another utility, an interoperability event, or with a development kit obtained from SSN)? _____ b. What meter hardware, form factor, firmware version, and model did you test with your device? _____	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	<input type="checkbox"/> Yes	<input type="checkbox"/> No

BUSINESS REQUIREMENTS <i>All answers must be provided or answered "Yes" before the testing body can invite you to send devices for validation. Optional information is noted where applicable.</i>		
7. Where are your devices commercially available to end use customer? Please list website(s) or retailer(s).	<input type="checkbox"/> Yes	<input type="checkbox"/> No
8. How are you providing customer support for your device? E.g. email/FAQs & troubleshooting online; phone support		
9. Are the device's specs and documentation included with the device? Please attach a copy of the documents	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Please indicate which documents are included:		
- User Guide (required)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Installation Guide (required)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Device release notes (required)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Other _____	<input type="checkbox"/> Yes	<input type="checkbox"/> No
10. Does the device identify the currently installed firmware and hardware versions, manufacturer, model name, serial number, MAC address, and Installation Code:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Programmatically or on the device?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- On the device packaging? (optional)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
11. Optional Item: If validated and kept, can the utility display the device at HAN-related demonstrations?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
DEVICE INFORMATION (For your convenience, you only need complete one form for each device model submitted, and not four for the four sample devices (or two sample devices, in the case of appliances). Note that the testing body will keep these devices for testing.		
Device Type, Model Name, and ZigBee Device ID:	Your Device Hardware/Firmware Versions (Note that these must match the ZigBee Certification. If they don't, please contact certification@zigbee.org to obtain instructions on the recertification process. HW and FW submitted for validation testing must be those sold to customers):	
ZigBee Processor and Stack Version (e.g. EM357 using EmberZNetPro 4.6.4, or similar if Freescale, TI, Atmel, others)		
Microcontroller (MCU) and version (e.g. ARM Cortex-M3, TI MSP430, Freescale HSC08, etc.)		
Real Time Operating System (RTOS) and version (e.g. Linux, Windows CE, VxWorks, LynxOS, QNX, OSE, etc.), if applicable.		
Please provide any profile extensions included in your device's operation. It is mandatory that devices that use clusters from profiles other than SEP must use SEP application-layer encryption unless otherwise specifically specified from not doing so in the SEP specification.		
Information on the samples of the same device to be validated (Vendor needs to submit 4 devices except for appliances, in which case 2 samples should be submitted)		
Serial Number	MAC ID	Install Code
1)		
2)		
3)		
4)		

RELEASE AND LIMITATION OF LIABILITY

The "Applicant," whose signature is below, has received and read the Home Area Network Device Eligibility and Compatibility Validation Guide ("Guide"), incorporated herein by reference, and has submitted a device for testing and validation by the California electric investor-owned utilities' (CA IOUs¹) testing bodies. Applicant must sign this Release and Limitation of Liability agreement ("Agreement") before the CA IOU testing bodies will begin testing or validation of the Applicant's device. This Agreement is a "standard form" document that cannot be modified without prior approval by the California Public Utilities Commission (CPUC).

Validation and Compatibility Not Guaranteed

Without limiting the generality of the contents of the Guide, Applicant acknowledges and agrees that the CA IOUs shall have no liability hereunder for non-compatibility of Applicant's devices with the CA IOUs' smart meters or other technology systems, for any reason whatsoever. CA IOUs may upgrade or modify their smart meter or other technology systems at any time and in any way, in their sole discretion, which may render Applicant's devices incompatible and/or inoperable with such systems. Applicant bears the risk of failing to disclose this contingency to purchasers and users of its devices. Such upgrades or modifications may require device changes by Applicant and retesting in order to be re-validated.

No Device Endorsement

The CPUC has ordered the CA IOUs to publish, for a limited time, a list of devices compatible with their meters. Applicant acknowledges that device validation does not constitute endorsement by the CA IOUs. Rather, device validation means only that the particular version of the device was determined to have been able to connect to the smart meter and provide real time energy information. Applicant may not use the logos of any of the CA IOUs in their marketing materials without advance written approval of the affected IOU.

Timing and Duration of Testing

The CPUC has authorized the CA IOUs to conduct compatibility testing on a first-come, first-served basis, and has recognized that the CA IOUs' role in testing is temporary and will cease either upon CA IOUs' exhaustion of testing-related funding, or upon adoption of a robust standards-based interoperability certification process by one or more independent third-party laboratories. Accordingly, Applicant has no reasonable expectation that its device will be tested within a particular time frame, or that the CA IOUs will have time and resources to devote to re-testing a device that has either failed earlier rounds of testing or that requires additional testing due to upgrades on the meter side or the device side.

Indemnification and Release of Liability

Applicant shall defend, indemnify and hold the CA IOUs, their current and future parent companies, subsidiaries, affiliates, and their respective directors, officers, managers, shareholders, employees, agents, and representatives (each a "CA IOU Indemnified Party," and, collectively, the "CA IOU Indemnified Parties") harmless for, from and against all damages, losses, liabilities, expenses and costs (including, without limitation, reasonable outside and allocated in-house attorneys' fees) arising out of or in connection with Applicant's (i) failure to comply with any applicable law, ordinance, rule, or regulation or strict liability imposed by any laws and regulations; or (ii) breach of any provision, warranty, or representation of this Agreement. Applicant shall defend, indemnify and hold the CA IOU Indemnified Parties harmless, from and against all damages, losses, liabilities, expenses and costs (including, without limitation, reasonable outside and allocated in-house attorneys' fees) arising out of or in connection with any act or omission by Applicant or its employees or authorized agents related to or in connection with this Agreement that results in (a) injury to or death of persons, including but not limited to customers, employees of Applicant, and members of the general public; or (b) damage or destruction to property; or (c) statements, advertisements, marketing material or representations pertaining to Applicant's devices.

Applicant shall indemnify, defend and hold all CA IOU Indemnified Parties harmless from and against any and all claims, actions, suits, proceedings, losses, liabilities, penalties, fines, damages, costs or expenses, including without limitation, reasonable outside and allocated in-house attorneys' fees of any kind whatsoever arising from or in connection with (a) actual or alleged infringement or misappropriation by Applicant of any patent, copyright, trade secret, trademark, service mark, trade name, or other intellectual property right; and (b) Applicant's violation of any third party license to use intellectual property.

¹ The California IOUs are Southern California Edison Company, Pacific Gas and Electric Company and San Diego Gas & Electric Company.

CA IOUs shall have no liability to Applicant hereunder for damages of any kind, whether consequential, indirect, direct or otherwise, including damages relating to the market success or failure of a device submitted pursuant to the Guide

Applicant represents and warrants that (a) the execution hereof and such submission has received all necessary legal and corporate or business entity authorizations and does not conflict with any legal or contractual requirements to which it is subject; (b) the individual signing below has authority to obligate it hereunder, that all information submitted by it is true and correct, and (c) all such contact information below shall be updated by it so as to remain true and correct at all times during which its devices remain validated.

This form contract may be modified, from time to time, by the California Public Utilities Commission in the exercise of its discretion.

Applicant: _____

Signed By: _____

Name and Title of Signatory _____

Date: _____

APPENDIX A, INTEROPERABILITY TEST CASES

CA IOU Interoperability Testing Requirements
To be tested on each IOU's meters

	Tests	Test Objective
Provisioning and Commissioning	Join the meter	The device is capable of joining the meter and authenticating with success.
	Key establishment procedure	Each step of the key establishment procedure is successful.
	Rejoin the meter after device soft reset	The device shall be able to rejoin by itself, at network level, to the previously associated meter after a device reset. (e.g. button press, menu option, pinhole reset)
	Rejoin the meter after device power outage (device power outage = 5 min)	The device shall be able to rejoin by itself, at network level, to the previously associated meter after power failure.
	Rejoin the meter after device power outage (duration = 1 min). Test with (10) cycles of power outages.	The device shall rejoin at network level to the previously associated meter after power outage. This will be tested with 10 power outages with the duration of each outage = 1 min.
	Rejoin the meter after meter power outage (meter power outage = 15 min)	The device shall be able to rejoin at network level to the previously associated meter after a 15 min power outage in the meter.
	Rejoin the meter after meter power outage (meter power outage = 12 hour)	The device shall be able to rejoin at network level to the previously associated meter after a 12 hour power outage in the meter.
	Rejoin the meter after meter soft reset	The device shall rejoin at network level to the previously associated meter after a soft reset in the meter. <i>(Note that this is tested on PG&E meters only)</i>
	Commission to a different meter, HAN device hard reset	The device shall be capable to be commissioned to a different meter.
	HAN device leave	HAN device can be decommissioned from the HAN network by the meter.
	Rejoin after long (24 hour) power outage on HAN device	HAN Device can rejoin to the previously associated meter after powering off the HAN device for 24 hours.
Time	Commissioning after network outage (with other networks in the channel)	The HAN device shall be able to join the meter (after a power outage) in a channel with the meter plus three additional ZigBee networks in operation while the HAN join flags is on.
	Synchronize time after join	The meter is a time server, the HAN device shall be able to detect the meter as a time server and synchronize with it.
	Synchronize time after reset	The device shall be able to re-synchronize time with the meter after a meter soft reset.
	Synchronize time after rejoin on device power outage	The device shall be able to synchronize time with the meter after a rejoining procedure or recovering from power outage.

	Synchronize time after meter power outage	The device shall synchronize time after recovering the communication with the meter.
Metering	Summation Format 1 decimal place	The device shall support, (and if applicable display) the summation information from the meter using the formatting information from the meter with at least 1 decimal precision
	Demand Format 1 decimal place	The device shall support, (and if applicable display) the current demand or consumption using the formatting information from the meter with at least 1 decimal of precision.
	Historical Format 1 decimal place	The device might support, (and if applicable display) historical consumption, and if it does, it shall use the formatting information from the meter with at least 1 decimal of precision.
	Unit of measure	The device shall not have the usage value for this attribute hardcoded. (Changing the value of this attribute prior to joining the HAN devices shall show the HAN device reading this attribute and displaying the usage in the proper units.)
	Summation formatting	The device shall support, (and if applicable display) the consumption information according to the meter's configuration.
	Change Divisor Attribute	The device must use the attribute from the meter to apply the correct divisor for energy usage.
	Change Multiplier Attribute	The device must use the attribute from the meter to apply the correct multiplier for energy usage.

Price	Support price information from the meter only	Devices shall not have fixed or hardcoded price data.
Profile Extension	No manufacturer specific profiles/clusters	The HAN device shall not have any manufacturer specific profile/clusters.
	All APS communications shall be secured	Any APS profile specific communication shall be secured with APS layer encryption. All ZCL commands and cluster specific shall be secured.
Freq Agility	Change channel frequency	The HAN device shall be able to change to a different channel frequency as indicated by the electric meter and continue to resume HAN operations without errors. <i>(Note that this is tested on PG&E meters only)</i>
	Device works on all sixteen ZigBee (802.15.4) channels	The HAN device shall be able to change to any of the sixteen ZigBee (802.15.4) channels in the spectrum while attempting to join the meter.

Longevity	Connection lifetime, 72 hours	The HAN device shall remain connected and actively communicating with the electric meter for a period of at least 72 hours.
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